

COMPUTER OPERATOR AND PROGRAMMING ASSISTANT

NSQF LEVEL - 4

1ST Semester

TRADE THEORY

SECTOR: IT & ITES



Directorate General of Training

**DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA**



**NATIONAL INSTRUCTIONAL
MEDIA INSTITUTE, CHENNAI**

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

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MEDIA INSTITUTE, CHENNAI**

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Sector : IT & ITES

Duration : 1 - Year

**Trade : Computer Operator and Programming Assistant 1st Semester - Trade Theory
NSQF level 4**

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FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Computer Operator and Programming Assistant Trade Theory 1st Semester in IT & ITES Sector**. The NSQF Level - 4 Trade Theory will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 4 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 4 the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

RAJESH AGGARWAL

Director General/ Addl. Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

New Delhi - 110 001

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PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

R. P. DHINGRA
EXECUTIVE DIRECTOR

Chennai - 600 032

ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisations to bring out this **Instructional Material (Trade Theory)** for the trade of **Computer Operator and Programming Assistant** under the IT & ITES Sector

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NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

TRADE THEORY

The manual of trade theory consists of theoretical information for the First Semester course of the COPA Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade Theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise atleast one class before performing the related skills in the system lab. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.

TRADE PRACTICAL

The trade practical manual is intended to be used in workshop . It consists of a series of practical exercises to be completed by the trainees during the First Semester course of the COPA trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered.

The manual is divided into twelve modules to maintain completeness of learning process in a stipulated time basis.

The skill training in the computer lab is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

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LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

- **Install and setup operating system and related software in a computer.**
- **Create, format and edit document using word processing application software.**
- **Create, edit and develop a workbook by using spreadsheet application software.**
- **Create and customize slides for presentation.**
- **Create and manage database file by using MS Access**
- **Install, setup/ configure, troubleshoot and secure computer network including Internet.**
- **Develop static webpages using HTML.**

SYLLABUS

First Semester

Duration: Six Month

Week No.	Ref. Learning Outcome	Professional Skills (Trade Practical) with Indicative hours	Professional Knowledge (Trade Theory)
1.	<ul style="list-style-type: none"> • Apply safe working practices • Install and setup operating system and related software in a computer. 	<p>Safe working practices</p> <ol style="list-style-type: none"> 1. Visit COPA Lab. of the institutes and locate the electrical connections with computer system setup (6 hrs) 2. Identifying safety symbols and hazard identification.(4 Hrs) 3. Practice safe methods of fire fighting in case of electrical fire. (4 hrs) 4. Use of fire extinguishers. (4 Hrs) <p>Computer components</p> <ol style="list-style-type: none"> 5. Identify computer peripherals and internal components of a disassembled desktop computer. (6 Hrs) 6. Assemble components of desktop computer. (6 Hrs) 	<p>Safe working practices</p> <ul style="list-style-type: none"> • Scope of the COPA trade. • Safety rules and safety signs. • Types and working of fire extinguishers. <p>Introduction to Computer components</p> <ul style="list-style-type: none"> • Introduction to computer system. Concepts of hardware and Software. • Function of motherboard components and various processors. • Various Input / Output devices in use and their features.
2.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Using Windows Operating System</p> <ol style="list-style-type: none"> 7. Practice on Windows interface and navigating windows. (9 Hrs) 8. Practice on managing files and folders using removable drives. (6 Hrs) 9. Customize the desktop settings and manage user accounts. (6 Hrs) 10. View system properties and control panel details. (6 Hrs) 11. Work with keyboard shortcut commands. (6 Hrs) 12. Print and scan document using different commands.(3 Hrs) 	<p>Introduction Windows Operating System</p> <ul style="list-style-type: none"> • Introduction to operating System • Main features of Windows OS • Concept of various shortcut commands.
3.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Computer basics and Software Installation</p> <ol style="list-style-type: none"> 13. View the BIOS settings and their modifications. (3 Hrs) 14. Install Windows OS (5 Hrs) 15. Format Hard Disk and create partition (3 Hrs) 16. Identify and rectify common hardware and software issues during OS installation. (4 Hrs) 17. Install necessary application software for Windows i.e. Office Package, PDF Reader, Media Player etc. (5 Hrs) 18. Configure Bluetooth and wi-fi settings. (3 Hrs) 19. Install Drivers for printer, scanner, webcam and DVD etc. (4 Hrs) 20. Burn data, video and audio files on CD/DVD using application software. (3 Hrs) 	<p>Computer basics and Software Installation</p> <ul style="list-style-type: none"> • Introduction to the booting process. • Introduction to various types of memories and their features. • Basic Hardware and software issues and their solutions. • Usage of Application software and Antivirus.

4 - 5	<ul style="list-style-type: none"> Install and setup OS and related software in a computer. 	<p>DOS Command Line Interface & Linux Operating Systems</p> <p>21. Use basic DOS commands for directory listing (10 hrs) 22. Manage files and folders using DOS commands (6 hrs) 23. Install Linux operating system.(6 Hrs) 24. Install necessary application software for Linux i.e. Office Package, PDF Reader, MediaPlayer etc. (6 Hrs) 25. Use Basic Linux commands for directory listing, file and folder management, password etc. (10Hrs) 26. Use the Linux GUI for file and folder management, exploring the system etc. (10 Hrs) 27. Customize desktop settings and manage user accounts in Linux. (6 Hrs) 28. View system properties and manage system setting in Linux (6 Hrs)</p>	<p>Introduction to DOS Command Line Interface & Linux Operating Systems</p> <ul style="list-style-type: none"> Introduction to basic DOS Internal and External Commands. Introduction to Open Source Software. Introduction to Linux Operating System features, structure, files and processes. Basic Linux commands.
6 - 8	Create, format and edit document using word processing application software.	<p>Using Word Processing Software</p> <p>29. Open MS Word and familiarise with basic word components. (3 Hrs) 30. Practice creating, saving and renaming of word documents.(3 Hrs) 31. Edit document using basic formatting tools. (8 Hrs) 32. Practice Inserting and formatting tables and other objects. (12 Hrs) 33. Work with Page layout settings and printing documents. (6 Hrs) 34. Use templates, autocorrect tools, and record and execute a macro. (6 Hrs) 35. Use Mail merge tool. Use conditional Mail Merge, External Data Source. Practice Letters, Label & Envelop printing using Mail Merge (10 Hrs). 36. Use Table of Context, Indexing, Hyperlink, Bookmark, Comment, equation,symbols,citation, crossreference, footnote, translate, synonyms, thesaurus, spell check & grammer, compare etc. (6 Hrs) 37. Practice Typing using open source tutor. (24 Hrs) 38. Practice of using shortcut keys and use Open Office as word processor. (12 Hrs)</p>	<p>Word Processing Software</p> <ul style="list-style-type: none"> Introduction to the various applications in MS office. Introduction to Word features, Office button, toolbars. Creating, saving and formatting and printing documents using Word. Working with objects, macro, mail merge, templates and other tools in Word.
9 - 11	<ul style="list-style-type: none"> Create, format, edit and develop a workbook by using spreadsheet application software. 	<p>Using Spread Sheet Application</p> <p>39. Open MS Excel and familiarise with basic application components. (4 Hrs) 40. Practice create, save and format excel sheets. (9 Hrs) 41. Use absolute and relative referencing, linking sheets, conditional formatting etc. (9 Hrs) 42. Practice Excel functions of all major categories i.e. Financial, Logical, Text, date & time, Lookup, Math, Statistical etc. (12 Hrs) 43. Use various data types in Excel, sorting, filtering and validating data. (8 Hrs) 44. Create and format various static and dynamic charts. (10 Hrs) 45. Practice Importing & exporting excel data. (4 Hrs) 46. Perform data analysis using "what if" tools and Pivot Table and record and execute a macro. (10 Hrs) 47. Modify Excel page setup and printing and use open office as Spreadsheet application. (4 Hrs) 48. Execute simple projects using Excel & Word. (20 Hrs)</p>	<p>Spread Sheet Application</p> <ul style="list-style-type: none"> Introduction to Excel features and Data Types. Cell referencing and linking Sheets. Introduction to various functions in all categories of Excel. Concepts of sorting, filtering and validating data. Analyzing data using charts, data tables, pivot tables, goal seek and scenarios.

12 - 13	Create and customize slides for presentation.	<p>Image editing and creating Presentations</p> <p>49. Use Windows Paint or image editing software like Open Office Draw, GIMP, IrfanView or a similar tool. (6 Hrs)</p> <p>50. Perform Image editing using open source applications. (12 Hrs)</p> <p>51. Open power point presentation and familiarise with basic application components. (6 Hrs)</p> <p>52. Create Slide shows, Insert picture and theme. (6 Hrs)</p> <p>53. Add new slide, format text, link with word and excel documents. (5 Hrs)</p> <p>54. Practice animating slide transitions and objects. (4 Hrs)</p> <p>55. Create slide shows by inserting audio & video and sync with presentation. (6 Hrs)</p> <p>56. Modify slide page setup and print the slides. (3 Hrs)</p> <p>57. Create a simple presentation project using open office. (12 Hrs)</p>	<p>Image editing, Presentations</p> <ul style="list-style-type: none"> • Introduction to Open Office. • Introduction to the properties and editing of images. • Introduction to different formats of images and their uses. • Introduction to Power Point and its advantages. • Creating Slide Shows. • Fine tuning the presentation and good presentation technique.
14 - 15	Create and manage database file by using MS Access.	<p>Database Management with MS Access</p> <p>58. Create database and design a simple tables in Access. (6 Hrs)</p> <p>59. Practice enforcing integrity constraints and modify properties of tables and fields. (6 Hrs)</p> <p>60. Create relationships and join tables. (6 Hrs)</p> <p>61. Create and format Forms. (6 Hrs)</p> <p>62. Create simple queries with various criteria and calculations. (12 Hrs)</p> <p>63. Create Simple update, append, make table, delete and crosstab queries. (9 Hrs)</p> <p>64. Modify form design with controls, macros and events. (6 Hrs)</p> <p>65. Import and export data to/from Access and create and format types of reports. (6 Hrs)</p> <p>66. Compress and Encrypt databases. (3 Hrs)</p>	<p>Database Management Systems</p> <ul style="list-style-type: none"> • Concepts of Data and Databases. • Overview of popular databases, RDBMS, OODB and NOSQL. • Rules for designing good tables. Integrity rules and constraints in a table. • Relationships in tables. • Introduction to various types of Queries and their uses. • Designing Access Reports and Forms. • Introduction to macros, designer objects controls, their properties and behaviour.
16 - 17	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Configuring and using Network</p> <p>67. View Network connections. (3 Hrs)</p> <p>68. Connect a computer to a n/w and share Devices i.e. Printers, files, folders and drives. (6 Hrs)</p> <p>69. Work with various Network devices, connectors/cables. Create straight/cross cable and punch a UTP cable in the patch socket and test the connectivity. (6 Hrs)</p> <p>70. Practice IP Addressing and Subnet masking for IPV4/ IPV6 and pinging to test networks. (6 Hrs)</p> <p>71. Configure Hub and Switch. (6 Hrs)</p> <p>72. Set up and configure wired and wireless LAN in a Computer Lab within at least three computers. Use patch panel & I/O Box for wired LAN and installing & configuring Internet connection in a single PC and in a LAN. (12 Hrs)</p>	<p>Networking Concepts</p> <ul style="list-style-type: none"> • Introduction to Computer Networks, Necessity and Advantages. • Client Server and peer to Peer networking concepts. • Concept of Proxy Server and proxy firewall server. • Concept of DHCP Server. • Introduction to LAN, WAN and MAN. • Network topologies. Network components, viz. Modem, Hub, Switch, Router, Bridge, Gateway etc. • Network Cables, Wireless networks and Blue Tooth technology. • Concept of ISO - OSI 7 Layer Model. • Overview of Network protocols Viz.TCP/IP, FTP, Telnet etc.

		<p>73. Setup a proxy server/DHCP Server with firewall.(9 Hrs)</p> <p>74. Setup video conferencing using open source s/w(6 Hrs)</p> <p>75. Use various tools (by open source /free) for network troubleshooting, maintenance and security for both Wired and Wireless(6 Hrs)</p>	<ul style="list-style-type: none"> • Concept of Logical and Physical Addresses, Subnetting and Classes of Networks.
18	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Using Internet</p> <p>76. Browse the Internet for information (use at least 3 popular browsers). (3 Hrs)</p> <p>77. Create and use e-mail for communication with attachment, priority setting, address book. (3 Hrs)</p> <p>78. Communicate with text, video chatting and social networking sites. (6 Hrs)</p> <p>79. Use online dictionary, translation software, storage space, share files with e-mail links, download manager, download & upload YouTube files, google map & earth etc. Update windows & other software. (6 Hrs)</p> <p>80. Configure Outlook, mail service in mobile phones. Use tools like Skype, Google+ etc. (6 Hrs)</p> <p>81. Browser setting for Bookmark, cookies, favourites and pop ups, default website, trusted site, restricted site, content, history and advanced setup. (6 Hrs)</p>	<p>Internet Concepts</p> <ul style="list-style-type: none"> • Introduction to www, Concept of Internet, Web Browsers, internet servers and search engines. • Concepts of Domain naming Systems and E mail communication. • Introduction to video chatting tools and Social Networking concepts.
19-21	Develop static web pages using HTML.	<p>Designing Static Web Pages</p> <p>82. Practice with basic HTML elements (e.g. head, title, body), tag and attributes. (3 Hrs)</p> <p>83. Design simple web page with text, paragraph and line break usingHTML tags. (5 Hrs)</p> <p>84. Format text, change background colour and insert pictures in web page. (6 Hrs)</p> <p>85. Design simple web page with tables and lists. (6 Hrs)</p> <p>86. Use marquees, hyperlinks and mailto link in designing web pages.(6 Hrs)</p> <p>87. Create frames, add style and design layout. (10 Hrs)</p> <p>88. Insert text, check and combo box in web page. (6 Hrs)</p> <p>89. Design web page using password field, submit button, reset button and radio button etc. (6 Hrs)</p> <p>90. Design a web page adding flash file, audio and video files. (10 Hrs)</p> <p>91. Design web page with forms and form controls using HTML tags.(8 Hrs)</p> <p>92. Create web page using Cascading Style Sheet (CSS). (12 Hrs)</p> <p>93. Use WYSIWYG (Kompozer) web design tools to design and edit web pages with various styles. (12Hrs)</p>	<p>Web Design Concepts</p> <ul style="list-style-type: none"> • Concepts of Static and Dynamic Web pages. • Introduction to HTML and various tags in HTML. • Concepts of different controls used in Web Pages. • Concepts of CSS and applying CSS to HTML. • Introduction to open source CMS viz, Joomla, Word press etc. and Web authoring tools viz. Kompozer, Front Page etc. • Concept of good web page designing techniques.
22-23	Industrial Visit/Project work	<p>1. Create a simple web site of at least 5 web pages which will include Images, tables, charts, lists and hyperlink on any topic like Student Information System, Book Store, and Organisations etc.</p> <p style="text-align: center;">OR</p> <p>2. Setup and configure a LAN using at least 3 computers connected with wire and 3 computers connected with wireless and secure it.)</p>	
24-25		Revision	
26		Examination	

Electrical safety

Objective : At the end of this lesson you shall be able to

- explain how to rescue a person who is in contact with a live wire.

The severity of an electric shock will depend on the level of current which passes through the body and the length of time of contact. Do not delay, act at once. Make sure that the electric current has been disconnected.

If the casualty is still in contact with the supply - break the contact either by switching off the power, removing the plug or wrenching the cable free. If not, stand on some insulating material such as dry wood, rubber or plastic, or using whatever is at hand to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)

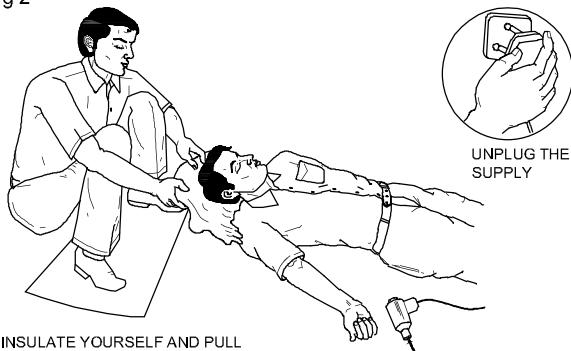
If you remain un-insulated, do not touch the victim with your bare hands until the circuit is made dead or person is moved away from the equipment.

Fig 1



EL110421

Fig 2



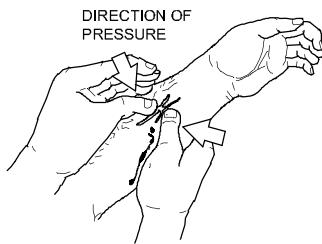
EL110422

If the victim is aloft, measures must be taken to prevent him from falling or atleast make him fall safe.

Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

If the casualty is unconscious but is breathing, loosen the clothing about the neck, chest and waist and place the casualty in the recovery position.(Fig 3)

Fig 3



EL110433

Keep a constant check on the breathing and pulse rate.

Keep the casualty warm and comfortable. (Fig 4)

Send for help.

Do not give an unconscious person anything by mouth.

Do not leave an unconscious person unattended.

If the casualty is not breathing - Act at once - don't waste

Fig 4



EL110424

Safety practice - fire extinguishers

Objectives : At the end of this lesson you shall be able to

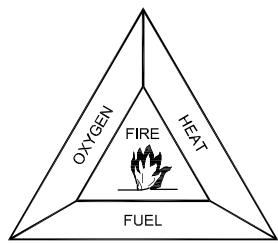
- explain how to rescue a person who is in contact with a live wire
- distinguish the different types of fire extinguishers
- determine the correct type of fire extinguisher to be used based on the class of fire
- describe the general procedure to be adopted in the event of a fire.

Fire is the burning of combustible material. A fire in an unwanted place and on an unwanted occasion and in an uncontrollable quantity can cause damage or destroy property and materials. It might injure people, and sometimes cause loss of life as well. Hence, every effort must be made to prevent fire. When a fire outbreak is discovered, it must be controlled and extinguished by immediate corrective action.

Is it possible to prevent fire? Yes, fire can be prevented by eliminating anyone of the three factors that causes fire.

The following are the three factors that must be present in combination for a fire to continue to burn. (Fig 1)

Fig 1



Accumulation of combustible refuse (cotton waste soaked with oil, scrap wood, paper, etc.) in odd corners are a fire risk. Refuse should be removed to collection points.

The cause of fire in electrical equipment is misuse or neglect. Loose connections, wrongly rated fuses, overloaded circuits cause overheating which may in turn lead to a fire. Damage to insulation between conductors in cables causes fire.

Clothing and anything else which might catch fire should be kept well away from heaters. Make sure that the heater is shut off at the end of the working day.

Highly flammable liquids and petroleum mixtures (thinner, adhesive solutions, solvents, kerosene, spirit, LPG gas etc.) should be stored in the flammable material storage area.

Blowlamps and torches must not be left burning when they are not in use.

Extinguishing fires: Fires are classified into four types in terms of the nature of fuel.

Different types of fires (Fig 2, Fig 3 Fig 4 & Fig 5) have to be dealt with in different ways and with different extinguishing agents.

An extinguishing agent is the material or substance used to put out the fire, and is usually (but not always) contained in a fire extinguisher with a release mechanism for spraying into the fire.

It is important to know the right type of agent for extinguishing a particular type of fire; using a wrong agent can make things worse. There is no classification for 'electrical fires' as such, since these are only fires in materials where electricity is present.

Fuel: Any substance, liquid, solid or gas will burn, if there is oxygen and high enough temperatures.

Heat: Every fuel will begin to burn at a certain temperature. It varies and depends on the fuel. Solids and liquids give off vapour when heated, and it is this vapour which ignites. Some liquids do not have to be heated as they give off vapour at normal room temperature say 15°C, eg. petrol.

Oxygen: Usually exists in sufficient quantity in air to keep a fire burning.

Extinguishing of fire: Isolating or removing any of these factors from the combination will extinguish the fire. There are three basic ways of achieving this.

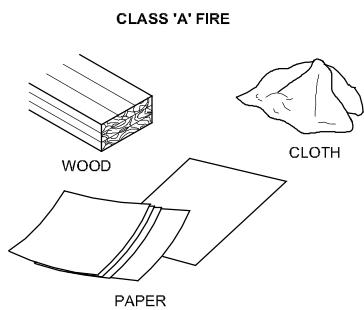
- **Starving** the fire of fuel removes this element.
- **Smothering** - ie. isolate the fire from the supply of oxygen by blanketing it with foam, sand etc.
- **Cooling** - use water to lower the temperature. Removing any one of these factors will extinguish the fire.

Preventing fires: The majority of fires begin with small outbreaks which burn unnoticed until they have a secure hold. Most fires could be prevented with more care and by following some simple common sense rules.

Fuel

Extinguishing

Fig 2

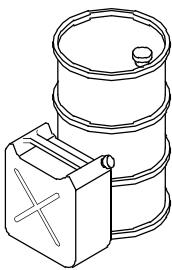


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Most effective ie. cooling with water. Jets of water should be sprayed on the base of the fire and then gradually upwards.

Fig 3

CLASS 'B' FIRE



FLAMMABLE LIQUIDS AND LIQUIFIABLE SOLIDS

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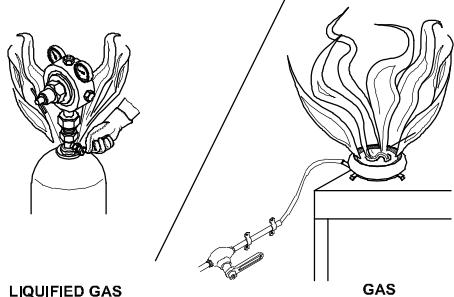
Should be smothered. The aim is to cover the entire surface of the burning liquid. This has the effect of cutting off the supply of oxygen to the fire.

Water should never be used on burning liquids.

Foam, dry powder or CO₂ may be used on this type of fire.

Fig 4

CLASS 'C' FIRE



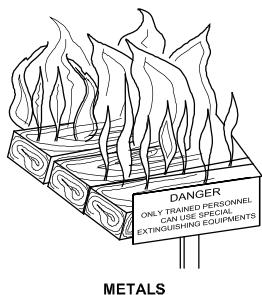
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Extreme caution is necessary in dealing with liquefied gases. There is a risk of explosion and sudden outbreak of fire in the entire vicinity. If an appliance fed from a cylinder catches fire - shut off the supply of gas. The safest course is to raise an alarm and leave the fire to be dealt with by trained personnel.

Dry powder extinguishers are used on this type of fire.

Fig 5

CLASS 'D' FIRE



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Special powders have now been developed which are capable of controlling and/or extinguishing this type of fire.

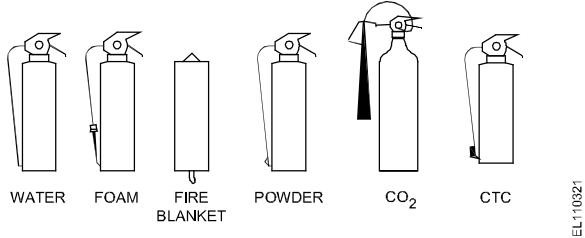
The standard range of fire extinguishing agents is inadequate or dangerous when dealing with metal fires.

Fire on electrical equipment.

Halon, Carbon dioxide, dry powder and vapourising liquid (CTC) extinguishers can be used to deal with fires in electrical equipment. Foam or liquid (eg. water) extinguishers must not be used on electrical equipment under any circumstances.

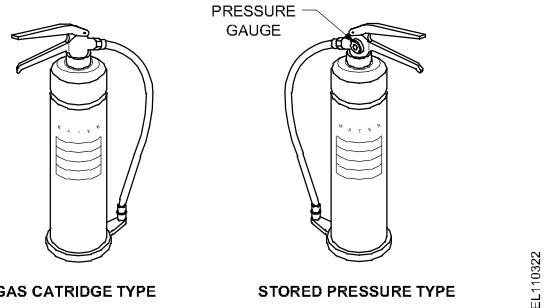
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)

Fig 1



Water-filled extinguishers: There are two methods of operation. (Fig 2)

Fig 2

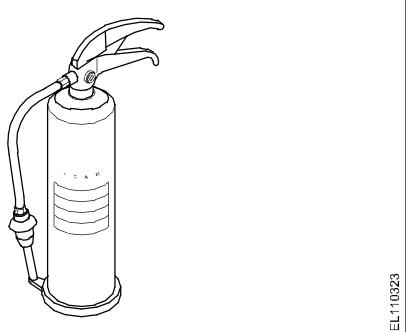


- Gas cartridge type
- Stored pressure type

With both methods of operation the discharge can be interrupted as required, conserving the contents and preventing unnecessary water damage.

Foam extinguishers (Fig 3): These may be of stored pressure or gas cartridge types. Always check the operating instructions on the extinguisher before use.

Fig 3



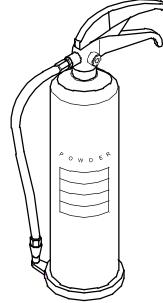
Most suitable for

- flammable liquid fires
- running liquid fires.

Must not be used on fires where electrical equipment is involved.

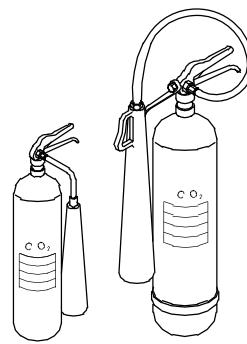
Dry powder extinguishers (Fig 4): Extinguishers fitted with dry powder may be of the gas cartridge or stored pressure type. Appearance and method of operation is the same as that of the water-filled one. The main distinguishing feature is the fork shaped nozzle. Powders have been developed to deal with class D fires.

Fig 4



Carbon dioxide (CO₂): This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5).

Fig 5

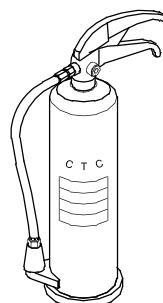


Suitable for Class B fires. Best suited where contamination by deposits must be avoided. Not generally effective in open air.

Always check the operating instructions on the container before use. Available with different gadgets of operation such as - plunger, lever, trigger etc.

Halon extinguishers (Fig 6): These extinguishers may be filled with carbon-tetrachloride and Bromochlorodifluoro methene (BCF). They may be either gas cartridge or stored pressure type.

Fig 6



They are more effective in extinguishing small fires involving pouring liquids. These extinguishers are particularly suitable and safe to use on electrical equipment as the chemicals are electrically non-conductive.

The fumes given off by these extinguishers are dangerous, especially in confined space.

The general procedure in the event of a fire:

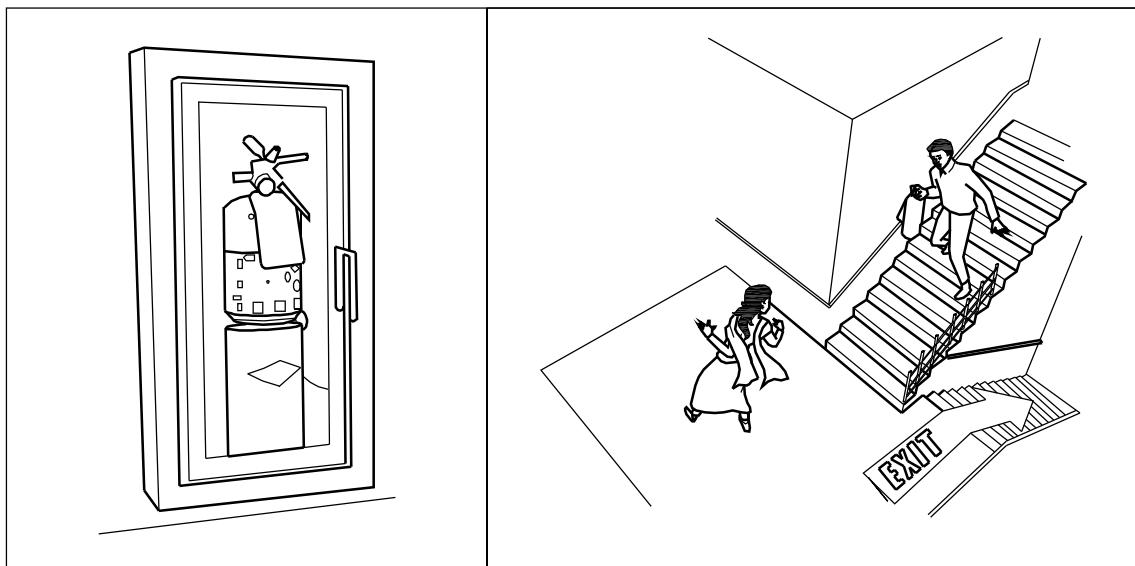
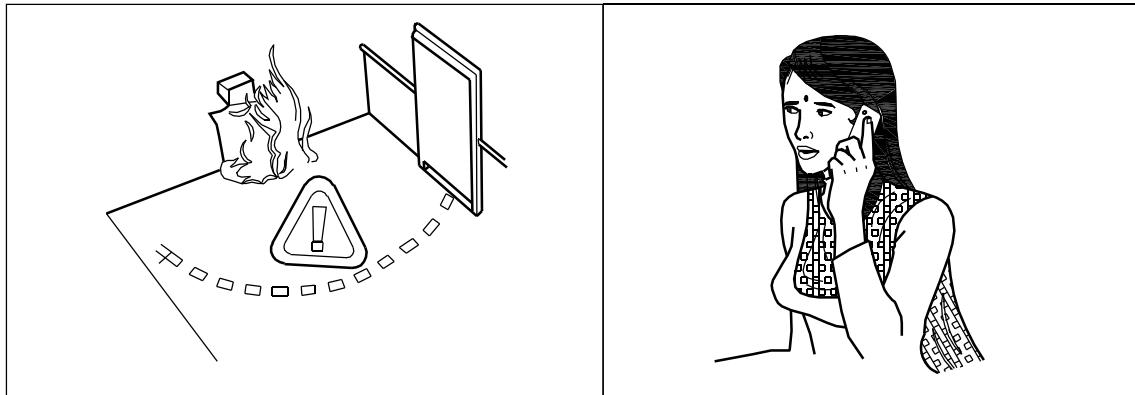
- Raise an alarm.
- Turn off all machinery and power (gas and electricity).

- Close the doors and windows, but do not lock or bolt them. This will limit the oxygen fed to the fire and prevent its spreading.
- Try to deal with the fire if you can do so safely. Do not risk getting trapped.
- Anybody not involved in fighting the fire should leave calmly using the emergency exits and go to the designated assembly point. Failure to do this may mean that some person being unaccounted for and others may have to put themselves to the trouble of searching for him or her at risk to themselves.

Practice on fire extinguishers

Objectives: At the end of this lesson you shall be able to

- state about the selection of the fire extinguishers according to the type of fire
- state the method of operation of the fire extinguisher
- explain how to extinguish the fire.



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PROCEDURE (Fig 1)

- Alert people surrounding by shouting fire, fire, fire when observe the fire.
- Inform fire service or arrange to inform immediately.
- Open emergency exist and ask them to go away.
- Put "off" electrical power supply.

Don't allow people to go nearer to the fire

- Analyze and identify the type of fire. Refer Table1.

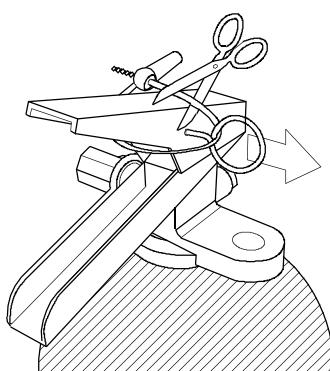
Table-1

Class 'A'	Wood, paper, cloth, solid material
Class 'B'	Oil based fire (grease, gasoline, oil) liquefiable gases
Class 'C'	Gas and liquefiable gases
Class 'D'	Metals and electrical equipment

Assume the fire is 'B' type (flammable liquefiable solids)

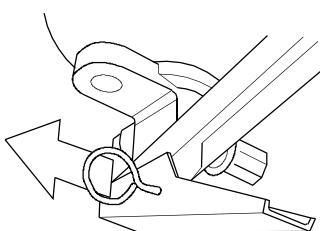
- Select CO₂ (Carbon di oxide) fire extinguisher.
- Locate and pickup, CO₂ fire extinguisher. Click for its expiry date.
- Break the seal (Fig 2)

Fig 2



- Pull the safety pin from the handle (Pin located at the top of the fire extinguisher) (Fig 3)

Fig 3



- Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 4)

Fig 4

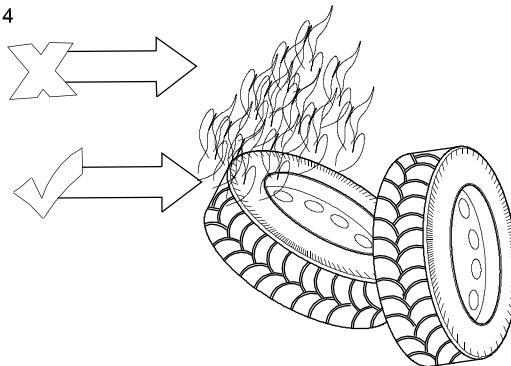


Fig 104-H4

Keep your self low

- Squeeze the handle lever slowly to discharge the agent (Fig 5)
- Sweep side to side approximately 15 cm over the fuel fire until the fire is put off (Fig 5)

Fig 5

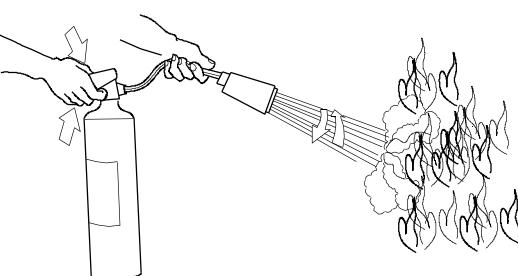


Fig 104-H5

Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up
- Do not be panick belong as it put off promptly.
- If the fire doesn't respond well after you have used up the fire extinguisher move away yourself away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke leave it for the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of the extinguisher. Remember P.A.S.S. This will help you to use the fire extinguisher.

P for Pull

A for Aim

S for Squeeze

S for Sweep

Introduction to computers

Objectives : At the end of this lesson you shall be able to

- define and classify computers
- list the advantages and limitations of computers
- list the applications of computer
- describe the voltages and currents in the computer.

Computer - Definitions

A computer is an electronic machine, operating under the control of instructions stored in its own memory that can accept data (input), manipulate the data according to specified rules (process), produce results (output), and store the results for future use.

Technically, a computer is a programmable machine. This means it can execute a list of programmed instructions and respond to new instructions that it is given.

History of Computer

Charles babbage's machine

The working principles of today's computers were provided by an English mathematician Charles Babbage around 1833's invented a machine called the "Analytical Engine". A machine which could calculate and print tables of functions using limited techniques.

The Analytical Engine had four parts. A mill, which was the section which did the calculations, essentially the CPU; the store, where the information was kept recorded, essentially the memory; the reader, which would allow data to be entered using punched cards, essentially the keyboard, and the printer.

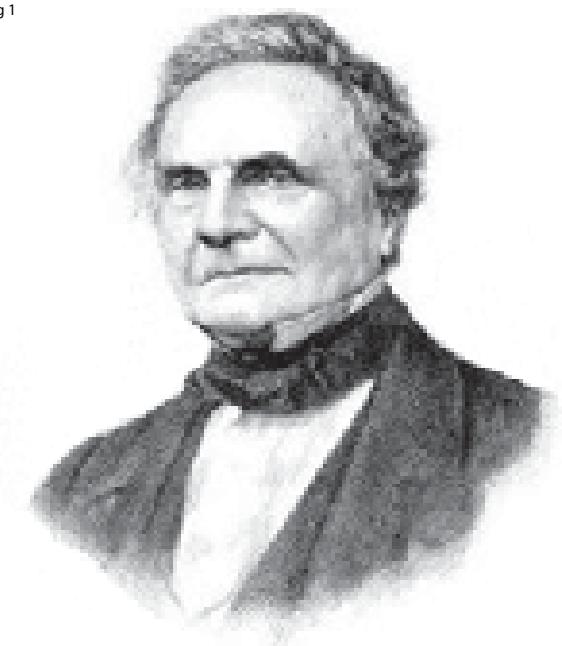
Hence, Charles Babbage is considered as the "Father of the Computer" as in fig-1.

The generations of computers are characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices. The various generations of computers are listed below:

First Generation (1946-1954): In 1946 the digital computer using **electronic valves** (Vacuum tubes) are known as first generation computers. The first '**computer**' to use electronic valves i.e. vacuum tubes. The high cost of vacuum tubes prevented their use for main memory. They stored information in the form of propagating sound waves.

The vacuum tube consumes a lot of power. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

Fig 1



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Mark I :The IBM Automatic Sequence Controlled Calculator (ASCC), called the Mark I by **Harvard University**, was an **electro-mechanical computer**. Mark I is the first machine to successfully perform a long series of **arithmetic and logical operation**. Mark I is the **First Generation Computer**.

ENIAC: It was the first electronic computer built in 1946 at University of Pennsylvania, USA by John Eckert and John Mauchy. It was named Electronic Numerical Integrator and Calculator (ENIAC). The ENIAC was 30-50 feet long, weighted 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors and required 150,000 watts of electricity. Today computer is many times as powerful as ENIAC, still size is very small.

EDVAC: It stands for **Electronic Discrete Variable Automatic Computer** and was developed in 1950. The concept of storing data and instructions inside the computer was introduced here. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantage of storing instruction was that computer could do logical decision internally. The EDVAC was a **binary serial computer** with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.

EDSAC: It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes at Cambridge University in 1949.** The **EDSAC** is the first **stored-program computer.** The EDSAC performed computations in the three millisecond range. It performed arithmetic and logical operations without human intervention. The key to the success was in the stored instructions which it depended upon solely for its operation.

This machine marked the beginning of the computer age.

UNIVAC-1: It stands for **Universal Automatic computer** and it was the First commercial computer developed by United States In 1951. The machine was 25 feet by 50 feet in length, contained 5,600 tubes, 18,000 crystal diodes, and 300 relays. It utilized serial circuitry, 2.25 MHz bit rate, and had an internal storage capacity 1,000 words or 12,000 characters.

The UNIVAC was used for **general purpose computing** with large amounts of input and output. The UNIVAC was also the first computer to come equipped with a magnetic tape unit and was the **first computer to use buffer memory.**

Limitations of First Generation Computer

Followings are the major drawbacks of First generation computers.

- They used valves or vacuum tubes as their main electronic component.
- They were large in size, slow in processing and had less storage capacity.
- They consumed lots of electricity and produced lots of heat.
- Their computing capabilities were limited.
- They were not so accurate and reliable.
- They used machine level language for programming.
- They were very expensive.

Second Generation (1955-1964): The second-generation computer used **transistors** for CPU components and **ferrite cores for main memory&magnetic disks** for secondary memory. They used high-level languages such as **FORTRAN (1956), ALGOL (1960) & COBOL (1960 - 1961).** Input Output (I/O)processor was included to control I/O operations.

Manufacturing cost was also very low. Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. Some of the second generation computers are IBM 1620, IBM 1401,CDC 3600.

- Transistors were used instead of Vacuum Tube.
- Processing speed is faster than First Generation Computers (Micro Second)
- Smaller in Size (51 square feet)
- The input and output devices were faster.

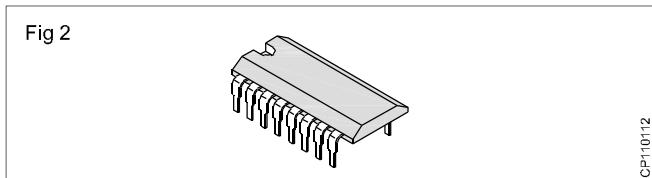
Third Generation (1964-1977): By the development of a small chip consisting of the capacity of the **300 transistors.** These Integrated Circuits (IC)s are popularly known as **Chips.**

A single IC has many transistors, registers and capacitors built on a single thin slice of silicon. So it is quite obvious that the size of the computer got further reduced. Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750.** Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high. Very soon ICs were replaced by **LSI (Large Scale Integration),** which consisted about 100 components.

An IC containing about 100 components is called LSI as in (Fig 2).

Features



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- They used Integrated Circuit (IC) chips in place of the transistors.
- Semiconductor memory devices were used.
- The size was greatly reduced, the speed of processing was high, and they were more accurate and reliable.
- Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) were also developed.
- The mini computers were introduced in this generation.
- They used high level language for programming.

Fourth Generation (1978 - present): An IC containing about 100 components is called LSI (Large Scale Integration) and the one, which has more than 1000 such components, is called as VLSI (Very Large Scale Integration).

It uses large scale Integrated Circuits(LSIC) built on a single silicon chip called microprocessors. Due to the development of microprocessor it is possible to place computer's central processing unit(CPU) on single chip. These computers are called microcomputers.

Later very large scale Integrated Circuits(VLSIC) replaced LSICs. Thus the computer which was occupying a very large room in earlier days can now be placed on a table. The personal computer (PC) that you see in your school is a Fourth Generation Computer Main memory used fast semiconductors chips up to 4 M bits size. Some of the Fourth generation computers are IBM PC, Apple-Macintosh, etc.

Hard disks were used as secondary memory. Keyboards, dot matrix printers etc. were developed. Operating System (OS)-such as MS-DOS, UNIX, Apple's Macintosh were available. Object oriented language, C++ etc were developed.

Features

- They used Microprocessor (VLSI) as their main switching element.
- They are also called as micro computers or personal computers.
- Their size varies from desktop to laptop or palmtop.
- They have very high speed of processing; they are 100% accurate, reliable, diligent and versatile.
- They have very large storage capacity.

Fifth Generation (PRESENT AND FUTURE): 5th generation computers use ULSI (Ultra-Large Scale Integration) chips. Millions of transistors are placed in a single IC in ULSI chips.

64 bit microprocessors have been developed during this period.. Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed (fig. 3).

Fig 3



Fifth generation computing devices, based on Artificial Intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. Artificial intelligence includes:

- **Games Playing:** Programming computers to play games such as chess and checkers
- **Expert Systems:** Programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms)
- **Natural Language:** Programming computers to understand natural human languages
- **Neural Networks:** Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains
- **Robotics:** programming computers to see and hear and react to other sensory stimuli

Table - 1

GENERATION	ELECTRONIC COMPONENT	ADVANTAGES	DISADVANTAGES
First	Vaccum tube	Helped in calculation and computational work	1.Big size 2.Very costly 3.Slow speed 4.Low accuracy 5.Low storage 6.High power requirements 7.High heat generation 8.High failure rate 9.Used machine language 10.No operating system
Second	Transistor	1.Smaller size 2.Less cost 3.Better speed 4.Low power consumption and less heat generation 5.Better storage capacity 6.Better accuracy and more reliability	1.Need air conditioning 2.Constant maintenance 3.No operating systems 4.Later stage computers used assembly languages
Third	Integrated Circuits(IC) small & medium scale	1.Better in all aspects compared to I & II 2.Used operating systems and high level language	1.Initial problem with manufacturers 2.No insight obtained into internal working
Fourth	VLSI or Microprocessor	1.Low cost 2.Excellent speed and reliability 3.Computers close to man	1.Less powerful than main frame computers
Fifth (Knowledge Information Processing Systems)	ULSI or Bio-Chips	1.Very cheap 2.super speeds 3.Very high storage capacity 4.Highly sophisticated OS 5.posses intelligence and decision making ability	1.New low level language needed

Classification of computers

Computers are classified according to the following criteria:

- Principle of Operation
- Computing Power, Memory Capacity and cost
- Technological Development
- Principle of operation
 - Analog computer
 - Digital Computer
 - Hybrid Computer

It is a computer that measures continuously changing physical quantities such as current, temperature, pressure etc. and converts them into quantities which can be used as data for computation. As these computers deal with continuously varying quantities they will give only approximate results. Its output is usually displayed on a meter or scale. Analog computer has low memory and fewer functions. These are used for engineering and scientific applications.

- Thermometer
- Speedometer
- Analog clock

Analog Computer

Digital Computer

A digital computer works with digital data. Digital computer uses binary number system. Binary number system consists of only two digits '0' and '1'. A digital computer represents data in digital signals. A '0' represents OFF and a '1' represents ON. Digital computer performs arithmetic and logical operations on data. It gives output in digital form.

Digital computers are very fast. These computers can

store results. They have large Memory (that is data storing capacity). Today most of the computers used in offices and homes are Digital computers.

The digital computers are further divided into the following two groups:

- Special purpose computers
- General purpose computers

Table 2

Analog Computers	Digital Computers
<p>1. Analog Computers Work on continuous values.</p> <p>2 Analog Computers have low memory.</p> <p>3 Analog computers have Slow speed.</p> <p>4 Analog computers are less reliable.</p> <p>5 Analog computers used in engineering</p> <p>6 Analog computers are used to calculate / measure analog quantities like speed and temperature.</p> <p>7 Analog computers provide less accurate results.</p> <p>8 Normally Analog Computers are specific purpose</p> <p>9 Normally Analog Computers are specific purpose</p> <p>10 Examples of Analog computers are: thermometer, analog clock, speedometer etc.</p>	<p>Digital computers Work on discrete values.</p> <p>Digital computers have a very large memory</p> <p>Digital computers have fast speed.</p> <p>Digital computers are more reliable.</p> <p>Digital computers are used in all fields of life, science and medical fields.</p> <p>Digital computers are used to calculate mathematical and logical operations. It can solve addition, subtraction, division, multiplication and other mathematical and statistical operations.</p> <p>Digital computers provide 100% accurate results.</p> <p>Digital Computers are general purpose</p> <p>Digital Computers are general purpose</p> <p>Examples of digital computers are:</p> <p>Personal Computer, laptops, smart phones etc.</p>

Special Purpose Computers

It is a computer designed to solve specific type of problem. The computers used in ships and aircrafts, etc.

General Purpose computers

It is a computer designed to solve a wide variety of problems. A General purpose Computer can store different programs and process them.

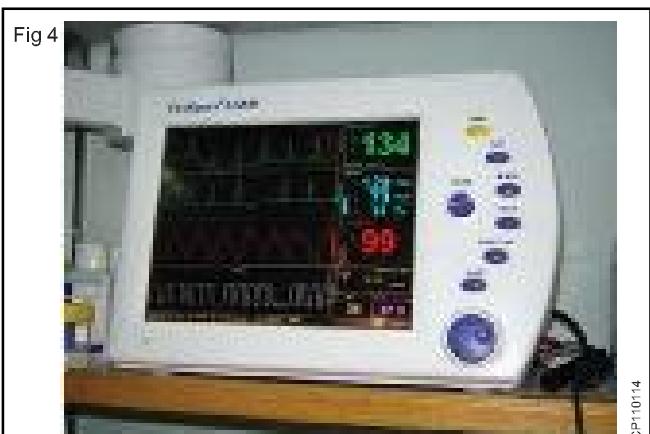
The differences between analog and digital computers are listed in table 2

Hybrid Computer (Fig. 4)

A hybrid computer is a combination of both analog and digital computer. Hybrid computer can handle both analog and digital data. A hybrid computer combines the best characteristics of both the analog and digital computer. It can accept data in both analog and digital form.

Applications

Hybrid computer devices are used in hospitals that may calculate patient's heart function, temperature and blood pressure etc. This calculation may be converted into



numbers and shown in digital form. For example, The Vital Signs Monitoring unit also called (VSM) in short. It has Blood Pressure monitor, ECG monitor, respiratory monitor, and is also used for monitoring anesthesia.

- Hybrid computers are also used in spaceships and missile system.

- Hybrid Computer Machines are generally used in scientific applications
- Hybrid computers are used for controlling industrial processes.

Computers are classified on the basis of computing power, memory capacity and cost.

- Microcomputer or Personal Computer.
- Mini Computer.
- Mainframe Computer.
- Super Computer.

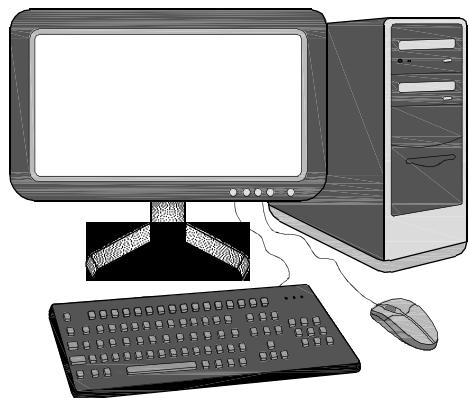
Micro Computers

Micro computer is also called personal computer. It was introduced in 1970. Examples of personal computers are PC and Apple Macintosh. The major types of personal computers are desktop computer and portable computer.

Desktop Computer

These computers can easily fit on a table or desktop, hence the name. These computers come in two models or casings. In Desktop model, the system unit is placed on the desktop or table. Monitor is placed on the system unit. In Tower model, both monitor and system unit are placed on the table as in (Fig 5).

Fig 5



TOWER MODEL COMPUTER

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Portable computer

Portable is a personal computer that can be carried from one place to other easily. Notebook computer and handheld computer (smart phone) are examples of portable computers. Notebook computer is also called laptop computer. Laptop computers are very small in size and can be placed easily on lap.

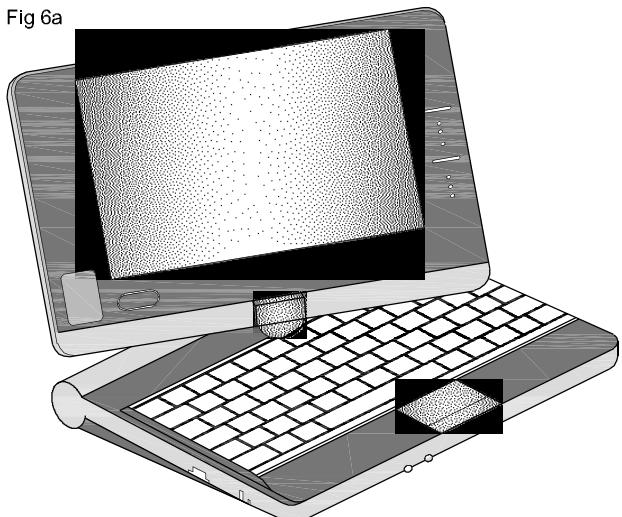
Lap top computer or notebook computer

The laptop computer or notebook computer will be as shown in fig 6a and fig 6b. It is also called as tower model computer.

Palmtop Computer/Digital Diary /Notebook /PDAs:

A handheld computer (like smart phone) is also portable. Hand held computer is known as palmtop computer.

Fig 6a



LAP TOP COMPUTER OR NOTE BOOK COMPUTER

CP110116a

Fig 6



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Palmtops have no keyboard but the screen serves both as an input and output device. It easily fits in the hand of the user.

Uses of Micro Computer

The PC is the most common type of computer used in the office. It is now widely used in many homes. These are also used for business and engineering application.

Mini Computer

Mini computers were introduced in the 1960s. Minicomputer is larger and more powerful computer than personal computer. It can execute five million instructions per second. It generally consists of two or more processors.

Minicomputer can serve up to 4000 connected users simultaneously. It is normally accessed by users via personal computer or terminal. A device with a monitor and keyboard is called terminal. It is also known as dumb terminal. It has no processing power and cannot work as stand-alone computer. Some of the minicomputers models are VAX-8800, AS400

Uses of Mini Computer

Mini computers are often used by small and medium-sized companies to provide centralized store of information.

Mainframe Computer

Mainframe computers were introduced in 1975. A mainframe computer is a very large computer in size. It is processors. It is designed to perform multiple tasks for multiple users at the same time. Mainframe computers can serve up to 50,000 users at the same time.

The users access a mainframe computer through terminal or personal computer. A typical mainframe computer can execute 16 million instructions per second. Some of the main computers models are

- NEC 610
- DEC 10

Uses of Mainframe Computer

Mainframe computers are used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, and transaction processing.

Super computer

Super computers were introduced in 1980s. Super computer is the fastest computer. Super computer is the biggest in size and the most expensive in price than any other computers.

It is the most sophisticated, complex and advanced computer. It has a very large storage capacity. It can process trillions of instructions in one second. Super Computer is the fastest and most powerful computer of a time. Supercomputers are very expensive. Supercomputers are used for highly calculation-intensive tasks. Super computers are also used for specialized applications that require immense amounts of mathematical calculations.

Applications of Super Computer

- Weather forecasting,
- Animated graphics like in Hollywood movies,
- Fluid dynamic calculations
- Nuclear energy research
- Space science
- Weapon and missile design
- Petroleum exploration, and etc.

Today, supercomputers are produced by traditional companies such as Cray, IBM and Hewlett- Packard. Since October 2010, the Tianhe-1A supercomputer has been the fastest in the world; it is located in China.

The main difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a single program as fast as possible, whereas a mainframe uses its power to execute many

programs concurrently. The modern super computer consists of thousands of microprocessors. Super computer uses high-speed facilities such as satellite for online processing.

Sum of the super computers models are CRAY-XP, ETA-10, Param and Deep Blue .

Advantages of computers

- A computer has a very high processing speed with high reliability.
- Large volume of information can be stored in the memory any particular data/program can be retrieved immediately.
- Solution to a complicated problem is possible at a very high speed.
- Processing of large volume of data saves a lot of clerical work which reduces the processing cost.
- Computers perform operations efficiently at environments where presence of human being is not possible such as furnace, poisonous atmosphere, vacuum, unmanned satellite, etc.

Limitation of computers

- High initial cost.
- Input information has to be prepared in the form of statements called program which requires a considerable amount of knowledge.
- usage of computers will be economical only when there is clerical data processing for large volume of data and are repetitive in nature
- It is a merely a machine it cannot correct errors on its own.

Functions of Computers

All computers are made up of following basic units as shown in fig (7). They are as follows:-

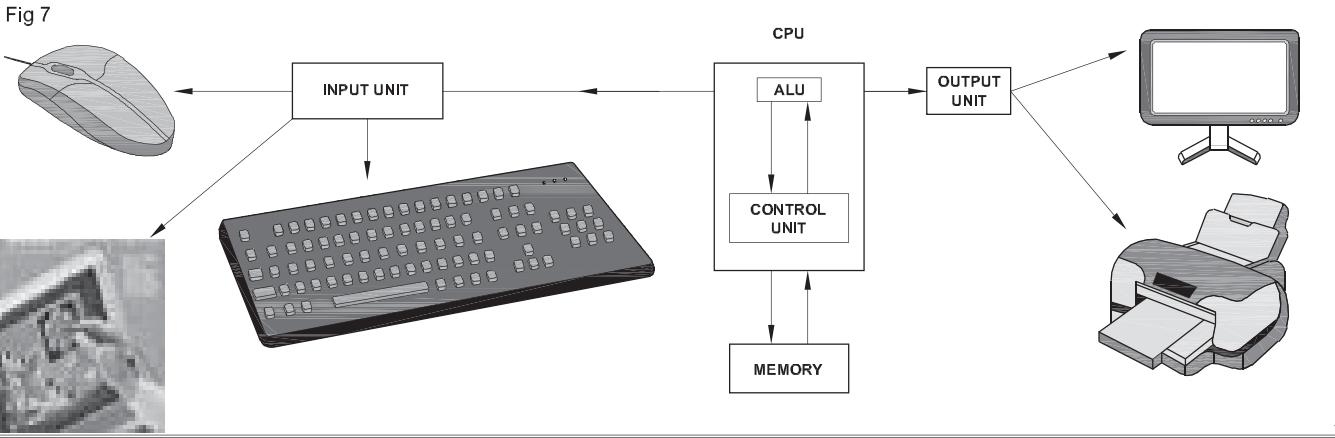
- 1 Input Unit
- 2 Central processing Unit (CPU)
 - a) Arithmetic Logic Unit(ALU)
 - b) Control Unit (CU)
- 3 Memory
- 4 Output Unit

Input Unit

Computers need to receive data and instruction in order to solve any problem. Therefore we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Some of the input devices are listed in table 1.

Input devices perform the following functions.

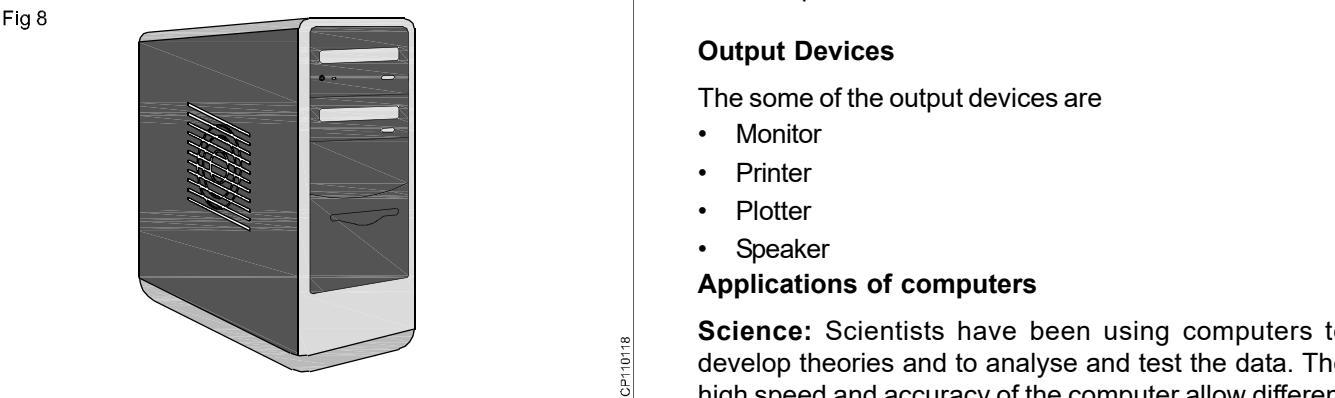
- Accept the data and instructions from the outside world.



- Convert it to a form that the computer can understand.
- Supply the converted data to the computer system for further processing.

Central Processing Unit (CPU) (Fig. 8)

The central processing unit (CPU) is the electronic brain



of the computer as in fig-8. The CPU in a personal computer is usually a single chip. It organizes and carries out instructions that come from either the user or from the software. The processor is made up of many components. CPU performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

Two typical components of a **CPU** are the following:

The arithmetic logic unit (ALU), which performs arithmetic and logical operations.

The control unit (CU), which extracts instructions from memory and decodes and executes them, calling on the ALU when necessary.

Memory

Memory refers to the physical device used to store the program or data on the temporary or permanent basis for

use in a computer or other digital electronic device. There are two types of memory in computer.

- Primary Memory
- Secondary Memory

Output Unit

Output unit receive the informations from the processing unit and provide the results in human readable form.

Output Devices

The some of the output devices are

- Monitor
- Printer
- Plotter
- Speaker

Applications of computers

Science: Scientists have been using computers to develop theories and to analyse and test the data. The high speed and accuracy of the computer allow different scientific analyses to be carried out. They can be used to generate detailed studies of how earthquakes affect buildings or pollution affects weather pattern. Satellite-based applications have not been possible without the use of computers. Moreover, it would not be possible to get the information of the solar system and the cosmos without computers.

Education: Computers have also revolutionized the whole process of education. Currently, the classrooms, libraries and museums are efficiently utilizing computers to make the education much more interesting. Unlike recorded television shows, computer-aided education (CAE) and computer-based training (CBT) packages are making learning much more interactive.

Medicine and Health Care: There has been an increasing use of computers in the field of medicine. Now, doctors are using computers right from diagnosing the illness to monitoring a patient's status during complex surgery. By using automated imaging techniques, doctors are able to look inside a person's body and can study



each organ in detail (e.g. CT scans or MRI scans), which was not possible few years ago. There are several examples of special-purpose computers that can operate within the human body such as cochlear implant, a special kind of hearing aid that makes it possible for deaf people to hear.

Engineering/Architecture/Manufacturing: The architects and engineers are extensively using computers in designing and drawings. Computers can create objects

that can be viewed from all the three dimensions. By using techniques like virtual reality, architects can explore houses that have been designed but not built. The manufacturing factories are using computerized robotic arms to perform hazardous jobs. Besides, computer-aided manufacturing (CAM) can be used in designing the product, ordering the parts and planning production. Thus, computers help in coordinating the entire manufacturing process.

Entertainment: Computers are finding greater use in entertainment industry. They are used to control the images and sounds. The special effects, which mesmerize the audience, would not have been possible without the computers. In addition, computerized animation and colourful graphics have modernized the film industry.

Communication: E-mail or electronic mail is one of the communication media in which computer is used. Through e-mail, messages and reports are passed from one person to one or more persons with the aid of computer and telephone line. The advantage of this service is that while transferring the messages it saves time, avoids wastage of paper and so on. Moreover, the person who is receiving the messages can read the messages whenever he is free and can save it, reply it, forward it or delete it from the computer.

Business Application: This is one of the important uses of the computer. Initially, computers were used for batch-processing jobs, where one does not require the immediate response from the computer. Currently, computers are mainly used for real-time applications (like at the sales counter) that require immediate response from the computer. There are various concerns where computers are used such as in business forecasting, to prepare pay bills and personal records, in banking operations and data storage, in various types of life insurance business and as an aid to management. Businesses are also using the networking of computers, where a number of computers are connected together to share the data and the information. Use of e-mail and the Internet has changed the ways of doing business.

Publishing: Computers have created a field known as desktop publishing (DTP). In DTP, with the help of computer and a laser printer one can perform the publishing job all by oneself. Many of the tasks requiring long manual hours such as making table of contents and index can be automatically performed using the computers and DTP software.

Banking: Computers are extensively used in the field of banking and finance. People can use the ATM (automated teller machine) services 24 hours a day to deposit and withdraw cash. When different branches of the bank are connected through computer networks, the inter branch transactions such as cheque and draft can be performed without any delay.

Railway Reservation System

Using this system, the user can perform following operations through online. (web site: www.irctc.co.in)

- search the train and its timings
- check seats and birth availability
- booking and cancelling tickets
- status of PNR (Passenger Name Record)

Telephone / Electricity Board Billing:

The users can do the following operations through online by using this system. (Web site: portal.bsnl.in - BSNL)

- Register the telephone / electricity board number
- Check and pay the bill amount
- Register the complaints

E-Governance

E-Governance implies technology driven governance. E-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between Government-to-Citizens (G2C), Government-to-Business(G2B),Government-to-Government(G2G) as well as back office processes and interactions within the entire government frame work.

E-Governance covers all the sectors with a view to providing hassle free, transparent and efficient service to the common man (both in urban and rural areas).

Introduction to CPU architecture and motherboard

Objectives: At the end of this lesson you shall be able to

- state what is hardware and test the internal and external hardware
- brief the listed hardware
- state what is partitions and their types
- explain the booting and its procedures.

Computer Hardware

The physical units of a computer are called as the hardware of a computer.

Internal hardware examples

- Blu-Ray, CD-ROM, and DVD
- CPU
- Hard drive
- Motherboard
- RAM
- Sound card
- Video card
- SMPS

External hardware examples

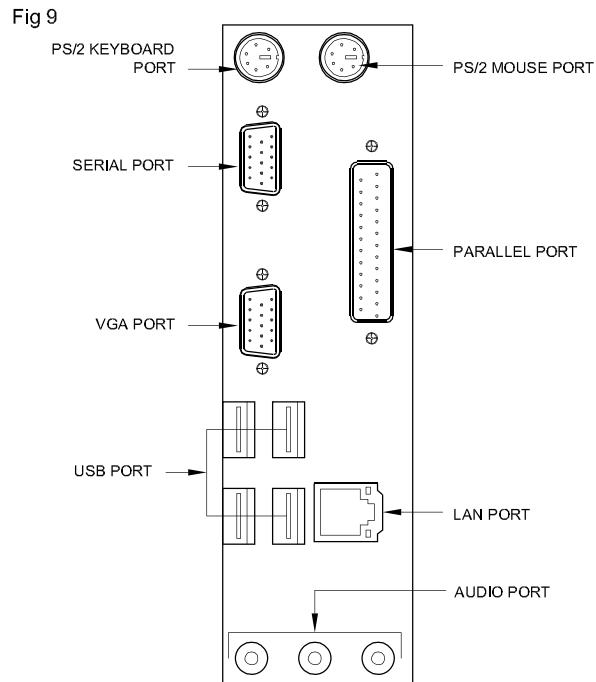
- Flat-panel, Monitor, and LCD
- Keyboard
- Mouse
- Printer
- Scanner

CPU & ALU

Central Processing Unit (CPU) is the heart of the Computer. It is the hardware that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system.

CPU Ports and Connectors

A port is a connector at the back of a Computer cabinet where you plug in an external device such as a printer, keyboard, scanner, modem etc. This allows instructions and data to flow between the computer and the device. The computer ports are also commonly referred to as the Input/output ports (I/O ports). These ports can be either serial or parallel. Fig 1 shows the commonly available ports on a personal computer.



Most connectors are separated, permitting the cable to be plugged in only in the correct direction. The keyboard and mouse use "PS2" (Personal System 2) connectors. The PS2 connectors are color-coded. The purple connector is for the keyboard. The green connector is for the mouse.

- **PS/2 Ports:** Standard keyboards and mouse often connect to the computer via the PS/2 ports. To plug in a keyboard or mouse cable, first match the cable to the connector. Then push the cable into the connector. Be sure not to force the connector because you will end up bending the pins
- **Serial & Parallel Ports:** The serial port and parallel port allow connections to printers and other external devices. To transfer a byte through a serial port, eight bits are queued and sent bit by bit. However, in a parallel port, all the eight bits are transferred simultaneously
- The parallel port, serial port, and video port all use "D" type connectors (DB-25M, DB-9M and DB-15F respectively). These are called D connectors because of their shape, which permits the cables to be plugged in only one way.

CP1-0119

USB (Universal serial bus) Ports

Devices like digital cameras, scanners and printers often connect to the motherboard via the USB ports. A USB connector's distinctive rectangular shape makes it easily recognizable.

USB has a number of features that makes it particularly popular on PCs. First, USB devices are hot swappable. You can insert or remove them without restarting your system

LAN(Local Area Network) Port: The LAN port is used to connect the PC to a local network or to high speed Internet services.

VGA (Video Graphics Array) Ports: The VGA port provides access to integrated video.

Audio ports: It provides access to integrated audio.

The audio jacks are the most confusing connectors on the back panel. Although the jacks are sometimes color-coded, the devices that plug into them rarely.

CPU front Panel shown Fig 2.

Fig 2



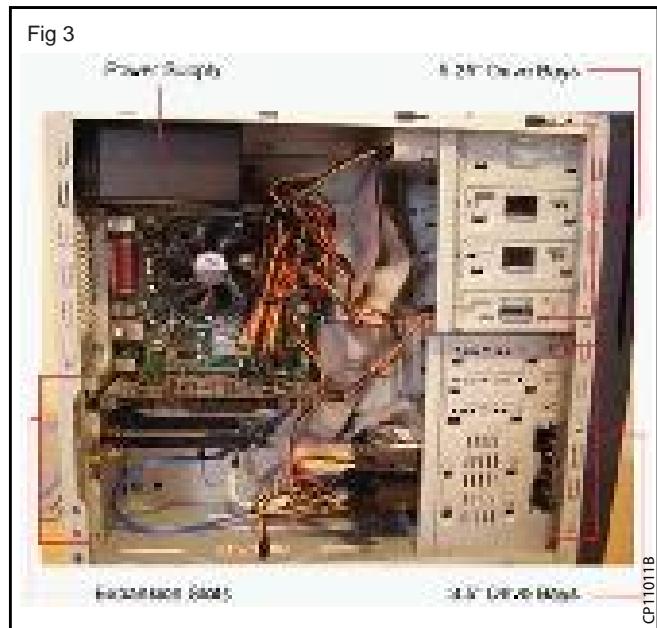
It may contain the following parts.

- Power On/Off Switch
- Power Indicator
- CD/DVD Drive
- CD/DVD Drive Open/Close Button
- CD/DVD Drive indicator
- Floppy Disk Drive
- Floppy Disk Drive Indicator
- USB Ports
- Audio and Mic connectors

Design of CPU Cabinets may vary based on the manufacturer.

The System Unit and Its Components

The system unit is a box-like unit filled with a number of useful components, each performing a discrete function. These components work together to accomplish the main function of the computer, viz. accept and process input and deliver output. This section will elaborate on these components one by one. Fig 3 shows the various components of the system unit.



Power Supply

The power supply connects to nearly every device in the PC to provide power. It is located at the rear of the case. The system unit draws power from the AC mains through a power protection device.

This power is not directly supplied to the internal components. Instead, one of the components, called the internal power supply, converts the AC input into DC output of 5 and 12 volts. Normally, the **internal power supply** is referred to as **Switched Mode Power Supply (SMPS)**.

The SMPS provides cable connectors to supply the required voltage to the other internal components like the floppy drives, the hard disk drive, the motherboard and external device such as the keyboard. The ON/OFF switch of the system unit is actually a part of the SMPS.

Fan

The **SMPS** has a small fan, called the exhaust fan, attached to **SMPS(Fig. 4)**. This fan rotates as long as the computer is switched on. Its function is to cool the **SMPS** unit.

Drive Bays: The 5.25" and 3.5" drive bays house the many kinds of storage devices a computer might contain.

Expansion Slots: An expansion slot is a slot located inside a computer mother board that allow additional peripherals to be connected to it.

Fig 4

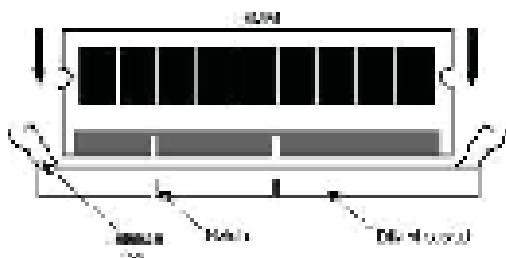


CP1010C

Memory Slot

Memory Slot is used to insert a Random Access Memory(RAM) shown in fig 5

Fig 5



CP1010D

Storage Drivers

Storage drivers such as hard drives, optical drives and floppy drives all connect to the motherboard via cables and is mounted inside the computer.

IDE & SATA Cables: Fig 6 shows two hard disk drives that connect in different ways to the motherboard. One uses the older IDE cable connection while the other uses SATA(Serial Advanced Technology Attachment) cable which provides for faster hard drive access.

Fig 6



CP1010E

Power Port: Power is delivered to drives via cables that plug into the power port on the drives.

Peripheral cards slot

The peripheral cards are the spare expansion slots available on the mother board on which peripheral cards can be inserted.

The following are the peripheral cards

- Sound card
- Video card
- Modem
- Wireless network

Fig. 7 shows the peripheral card, designed with a PCI (Peripheral component interconnect) connector.

Fig 7



CP1010F

Motherboard

The motherboard is a printed circuit that is the foundation of a computer and allows the CPU, RAM, and all other computer hardware components to function with each other as on fig 8.

Fig 8



CP1010G

The motherboard is the primary component of the entire system. A mother board is a large board containing a number of tiny electronic circuits and other components are visible. All peripheral devices are connected to the motherboard. The components of the motherboard are:

- Keyboard / mouse port
- Parallel and Serial port
- Processor Socket
- AGP Slot
- PCI Slots
- ISA Slot
- CMOS Battery
- Data Card Connector
- Memory Slots
- Floppy Port
- Fan Header
- Main Power Connector

Floppy Port :The floppy drive connects to the computer via a 34-pin ribbon cable, which in turn connects to the motherboard. A floppy controller is one that is used to control the floppy drive.

RAM slots: Random-Access Memory (RAM) stores programs and data currently being used by the CPU.

RAM is measured in units called bytes. RAM has been packaged in many different ways

- SIMM-Single inline memory module -32 or 72 Pin
- DIMM- Dual Inline Memory module -168 pin.

In most of the PC's uses of the DIMM module

ROM BIOS Chip: This means Read Only Memory Basic Input-Output System.

The built-in software that determines what a computer can do without accessing programs from a disk. On PCs, the **BIOS** contains all the code required to control the keyboard, display screen, disk drives, serialcommunications, and a number of miscellaneous functions.

The BIOS is typically placed in a **ROM** chip that comes with the computer (it is often called a **ROM BIOS**). This ensures that the **BIOS** will always be available and will not be damaged by disk failures.

It also makes it possible for a computer to boot itself. Because RAM is faster than **ROM**, though, many computer manufacturers design systems so that the BIOS is copied from **ROM** to **RAM** each time the computer is booted. This is known as shadowing.

Many modern PCs have flash **BIOS**, which means that the **BIOS** have been recorded on a flash memory chip, which can be updated if necessary. The PC **BIOS** is fairly standardized, so all PCs are similar at this level (although there are different **BIOS** versions). Additional **DOS** functions are usually added through software modules.

This means you can upgrade to a newer version of DOS without changing the **BIOS**. PC **BIOS** that can handle Plug-and-Play (PnP) devices are known as PnPBIOS. These BIOS are always implemented with flash memory rather than ROM.

CMOS Battery

CMOS (Complementary Metal-Oxide-Semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the **BIOS** settings.

Most **CMOS** batteries will last the lifetime of a motherboard (up to 10 years in most cases) but will sometimes need to be replaced. Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery.

ISA slot: (Industry Standard Architecture) It is the standard architecture of the Expansion bus. Motherboard may contain some slots to connect ISA compatible cards.

PCI slot : Intel introduced the Peripheral Component Interconnect bus protocol. The PCI bus is used to connect I/O devices to the main logic of the computer. **PCI** bus has replaced the ISA bus. PC motherboards have one PCI slot but generally more than one.

The **PCI** bus architecture is a processor-independent bus specification that allows peripherals to access system memory directly without using the CPU.

AGP slot: The Accelerated Graphics Port (AGP) is a high-speed point-to-point channel for attaching a video card to a computer's motherboard.

Power supply plug in

The Power supply, as its name implies, provides the necessary electrical power to make the PC (Personal Computer) operate. The power supply takes standard 110-V AC power and converts into +/-12-Volt, +/-5-Volt, and 3.3-Volt DC power. The power supply connector has 20-pins, and the connector can go in only one direction.

Hard Disk and Partitions

Partitioning is a process of dividing the Hard disk into several chunks, and uses any one of the portion or partition to install OS or use two or more partitions to install multiple OS..

But it can always have one partition, and use up the entire Hard disk space to install a single OS, but this will become data management nightmare for users of large Hard disks.

Now, because of the structure of the Master Boot Record (MBR), has only four partitions, and these four partitions are called **Primary Partitions**.

Extended Partition is not a usable partition by itself, but it's like a "container" and it is used to hold **Logical Drives**! That is this Extended Partition can be subdivided into multiple logical partitions.

In order to boot into a Partition, **it must be designated as bootable partition** or Active Partition. Active Partition is that partition which is flagged as bootable or which contains OS, this is generally a Primary Partition.

Types of Partitions:

- Master
- Partition
- Extended and
- Logical Extended

Master Boot Record (MBR): MBR is a small 512 bytes partition which is at the first physical sector of the hard disk. The location is denoted as CHS 0,0,1 meaning 0th Cylinder, 0th Head and 1st Sector.

MBR contains a small program known as bootstrap program which is responsible for booting into any OS. MBR also contains a table known as Partition Table.

This Partition Table is a table which lists the available Primary Partitions in the hard disk. Partition table considers whole Extended Partition as one Primary partition and lists it in the table!

So a Partition table can have two possible entries:-

- Up to 4 Primary Partitions.
- Up to 3 Primary Partitions and 1 Extended Partition.(Total not exceeding 4) .

Partition Boot Sector (PBR): This is the logical first sector, that is sector at the start of a Primary Partition. This is also 512 byte area, which contains some programs to initialize or run OS files. All Primary Partitions have its own PBRs.

Extended Boot Sector (EBR): This is the logical first sector, that is the sector at the start of the Extended Partition. This EBR contains a Partition Table, which lists the available Logical Partitions inside Extended Partition. That is it contains the Starting addresses of each Logical Partitions.

Logical Extended Boot Sector (LEBR): This is the logical first sector residing at the start of each Logical Partition. This is similar to PBR for Primary Partitions.

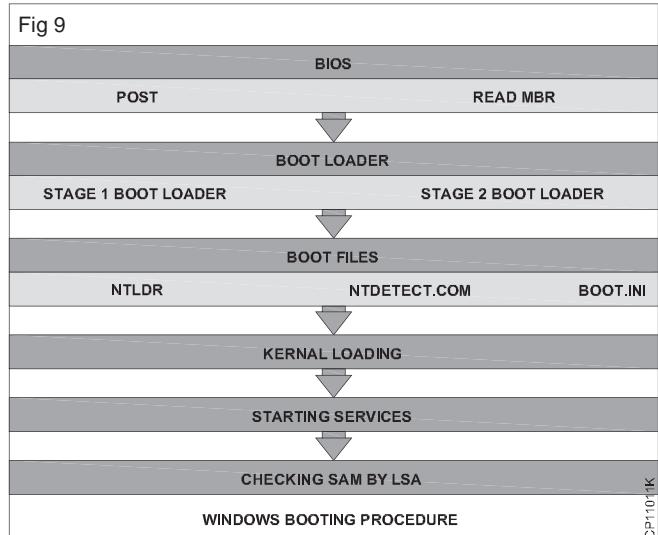
Booting

Booting is a process of loading the operating system (OS) and checking all the system software and hardware those are installed in the computer.

Booting procedure of Windows operating system

Functions of BIOS

The first process starts, when the computer switched on Basic Input Output System (BIOS) perform two functions, to conduct POST and read MBR (Fig 9).



POST - POST stands for Power On Self Test. POST checks all the hardware devices connected to a computer like RAM, hard disk etc and make sure that the system can run smoothly with those hardware devices. If the POST is a failure the system halts with a beep sound.

Now BIOS checks the **boot priority**. We can set the boot priority as CD drive, hard disk or floppy drive.

MBR - The next duty of BIOS is to read the MBR. MBR stands for Master Boot Record and it's the first sector on a hard disk. MBR contains the partition table and boot loader.

Functions of Boot loader

Now BIOS has passed the control to boot loader and boot loader is a small program which loads kernel to computers memory. Actually there are two stages of boot loaders, stage 1 boot loader and stage 2 boot loader.

The stage 1 boot loader is a link to the stage 2 boot loader. The stage 2 boot loader resides in the boot partition and it loads the kernel to memory.

Boot files and functions

There are three boot files in a Windows operating system and they are NTLDR, NTDETECT.COM and Boot.ini. The boot files are found in the active partition of hard disk and its normally C drive in a Windows machine.

NTLDR - NTLDR stands for NT Loader and it's the second stage boot loader. The path of NTLDR is C:\Windows\i386\NTLDR.

Boot.ini - Boot.ini contains the configuration files of NTLDR. When the operating system is loaded we cannot pass any arguments to kernel, so those arguments are passed through boot.ini. You can edit boot.ini by opening through notepad. The path of Boot.ini is C:\boot.ini.

NTDETECT.COM

This file detects hardware's and passes information to NTLDR. Using the collected information the NTLDR creates a hardware key and this key is used to detect hardware's.

A new hardware key is generated after each reboot of the operating system and that's why system asks to reboot after installation of a new hardware. The hardware keys created by NTLD.R can be found in Windows registry at HKEY_LOCAL_MACHINE\HARDWARES.

Kernel and its functions

After executing the functions of boot files the control is passed to Kernel. ntoskrnl.exe is the kernel file in a Windows machine and its path is C:\Windows\system32\ntoskrnl.exe.

Kernel acts as a layer between software and hardware. The library file hal.dll (C:\Windows\system32\hal.dll) helps Kernel to interact with hardware's. HAL stands for Hardware Abstraction Layer and this hal.dll file is machine specific.

Now the drivers for hardware's are loaded from the file C:\Windows\system32\config\system and the Kernel is loaded to primary memory.

Services and log in procedure

When kernel is loaded in the primary memory, services for each process is started and the registry entry for those services can be found at HKEY_LOCAL_MACHINE\System - Current control set - Services.

Winlogon.exe (C:\Windows\system32\winlogon.exe) is the last service started during this process. Winlogon.exe starts the log in procedures of windows machine. It first calls the library file msgina.dll (C:\Windows\system32\msgina.dll).

MSGINA stands for Microsoft Graphics Identification and Authentication and it provides the log in window. Now msginal.dll passes the control to LSA (Local Security Authority), it verifies the username and password from the SAM file. SAM (Security Accounts Manager) contains the information about all users created in a Windows operating system.

Now the booting procedure is over and it has reached the desktop of Windows operating system.

Voltage: Every electric charge is capable of doing work by moving another charge either by attraction or by repulsion. This ability of a charge to do work represents its potential. Voltage is generated by the separation of charges. Voltage or electric potential is the state of separated charges striving to neutralize each other. The unit of electric potential is volt. Potential difference is necessary to cause flow of electric current.

Methods of voltage generation: Voltage can be generated by several ways. Some methods of generating voltage are:

- Voltage from friction
- Voltage from moving magnets or coils
- Voltage from pressure or tension in crystals
- Voltage from heat
- Voltage from light

- Voltage from chemical reactions

Measuring voltage: Voltage exists between any two points with different levels of charge. Voltage between any two points can be measured using an instrument called VOLTMETER. Meters used to measure current is called Ammeter. There are meters which can be used to measure voltage and current and a few other electrical parameters like resistance. Such meters are called MULTIMETERS.

Types of voltage: As discussed in above paragraphs there are several sources by which voltage can be developed. Depending upon the voltage source, the voltage developed can be,

Direct voltage: It is of constant magnitude. It remains at the same amplitude from the moment it is switched ON till the moment it is switched - OFF.

Alternating voltage: In this type, voltage source changes its polarity regularly and therefore the direction of developed voltage.

A mixed voltage is a combination of direct voltage and alternating voltage. The level of voltage is not constant. It varies around a mean value.

Electric Current: Electric current is produced when electric charges move in a definite direction. This movement is not only of negative charges but also of positive charges. The strength of electric current is the quantity of charge which flows across a given cross section of a conductor every second. The unit of current strength is Ampere.

$$\text{Current strength} = \frac{\text{Quantity of charge}}{\text{time}}$$

Measuring current: Electric current is the flow of charge, in a conductor. So, to measure current must pass through the measuring device. The current measuring instrument is called the ammeter or the current meter. There are different types of ammeters used for measuring different quantities of current.

Types of current: Voltage causes electrical current to flow. If the cause of current flow is a direct voltage source, then the current caused by it is called direct current (d.c.). On the other hand, then the current caused is referred as the alternating current. If a mixed voltage AC and DC is applied to an electrical circuit, a mixed current (AC and DC) will flow through the circuit.

Types of power supply: Irrespective of how the electricity is generated, electricity can be classified into two types.

- Alternating current, generally known as AC supply.
- Direct current, generally known as DC supply.

AC supply: The term alternating current supply is given to a supply source that makes current to flow through a circuit which reverses or alternates its direction periodically.

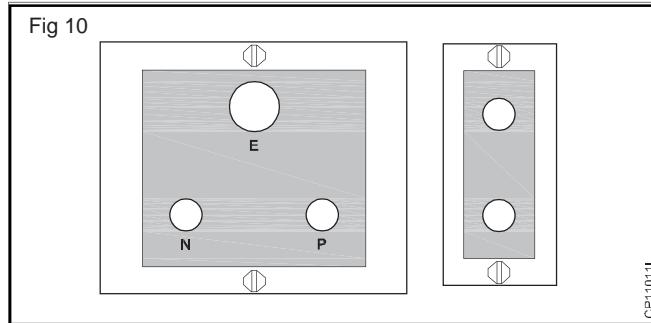
Advantages of AC supply

- Reduced transmission loss over long distances.
- Voltage levels can be changed using simple devices called transformers.
- Reduced severity of electrical shock.
- Generating equipments are simple and cheaper
- Can be easily converted to DC supply.

DC supply: The term direct current supply is given to a supply source that makes current to flow through a circuit in one direction only. Example of DC supply is batteries. Some types of generators are also designed to give d.c. supply. Such generators are called DC generators.

Low tension (LT) voltage: The domestic voltage of 240 volts AC (generated and supplied by hydro or Thermal or Nuclear generating stations) is called the low tension (LT) voltage. LT lines enters residential buildings from electricity poles called as service connection. This 240 volts is used to light up the lamps, run fans etc in homes. To connect electrical appliances at home, 240V AC is available in either two-pin or three - pin sockets. This LT voltage of 240 volts, 50Hz is also used to supply electrical and electronic gadgets such as Iron box, washing machine, personal computer etc.

Phase, Neutral and Earth points of LT supply: The domestic AC mains supply of 240V, 50Hz, is available at consumers residence either in a 2-pin outlet (Phase - Neutral) or in a 3-pin outlet (phase -Neutral and Ground). These are commercially referred to as 2/3 pin sockets. These sockets look similar to the ones shown in Fig. 10.



Phase: The line or phase point in a socket, can be termed as the point from where the electricity starts flowing into a closed circuit.

Neutral: The neutral point in the socket, can be termed as the point which receives electricity from the closed circuit.

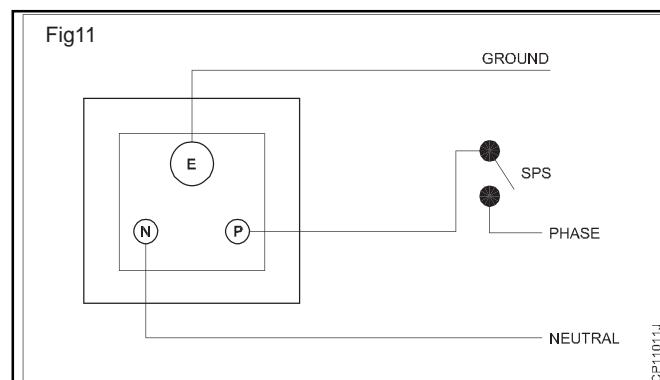
Earth / Ground: The ground (some call it Earth) point in an electrical socket provides the easiest path for the leakage current and other minor electrical defect currents of appliances.

Two pin mains sockets are used to supply main to such equipments or apparatus or gadgets generally having its cabinets/chassis made of plastic such as radio, tape

recorders etc., Hence such gadgets does not need earth pin/point on the socket.

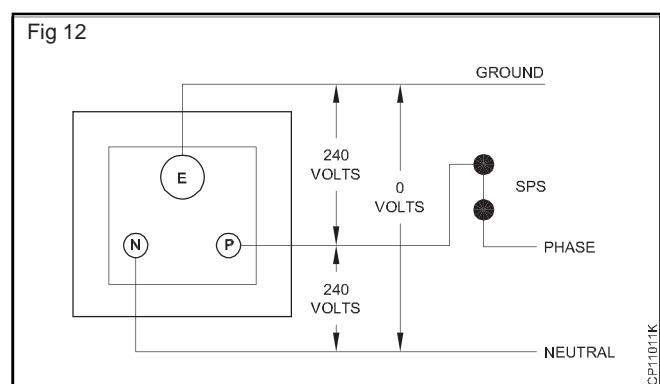
Iron box, washing machines, drill guns, Desk top computer invariably need sockets with provision of earth pin, because of the possibility of shock while using these equipments. Hence such equipments/gadgets make use of AC mains socket with earth.

Connection of 3-pin AC mains socket: Fig 11 shows how the main supply is connected to the socket.



Note that in a AC outlet be it a 2-pin or a 3-pin phase is always connected to the socket through a switch. This prevents the users from getting electrical shock when the switch is put in off position.

The standard voltage appearing across the 3-pin terminals is shown in Fig12



The voltages across the pins of the socket can be measured using an AC voltmeter or a multimeter in AC volts range.

As a quick test to find out whether or not a socket is delivering the AC supply as required, a simple instrument called line tester which looks similar to a small screw driver can be used. This instrument will have a small bulb in it which glows if it is touched to the phase pin in the socket. Ask your instructor to demonstrate the use of such line tester to check a AC mains socket.

Most Desk top computers need AC mains supply for its operation. Although the mains supply available in the 3-pin socket shown above can be used, mostly this AC supply is cleaned fro spikes before connecting to computers. The device used for cleaning the spikes in the mains AC supply are called Spike Arrestors or Spike busters.

Computers are used with spike busters because, AC spikes are likely to damage the costly computers. In addition to spike busters, most computers use other power safety devices called the voltage stabilizers and uninterrupted power supplies.

Power supply in computers: Power supply unit in computers are firmly fitted on the processing unit cabinet using torx screws. Generally there will be four such screws fitted to fix the power supply unit in the cabinet.

Windows Operating System

Objective: At the end of this exercise you shall be able to

- list out the windows versions and features

Windows versions and its features

Microsoft Windows has seen nine major versions since its first release in 1985. Over 29 years later, Windows looks very different but somehow familiar with elements that have survived the test of time, increases in computing power and - most recently - a shift from the keyboard and mouse to the touchscreen.

Here's a brief look at the history of Windows, from its birth at the hands of Bill Gates with Windows 1 to the latest arrival under new Microsoft chief executive SatyaNadella.

Windows 1

The first version of Windows

This is where it all started for Windows. The original Windows 1 was released in November 1985 and was Microsoft's first true attempt at a graphical user interface in 16-bit.

Development was spearheaded by Microsoft founder Bill Gates and ran on top of MS-DOS, which relied on command-line input.

It was notable because it relied heavily on use of a mouse before the mouse was a common computer input device. To help users become familiar with this odd input system, Microsoft included a game, Reversi (visible in the screenshot) that relied on mouse control, not the keyboard, to get people used to moving the mouse around and clicking onscreen elements.

Windows 2

Windows 2 with overlapping windows.

Two years after the release of Windows 1, Microsoft's Windows 2 replaced it in December 1987. The big innovation for Windows 2 was that windows could overlap each other, and it also introduced the ability to minimise or maximise windows instead of "iconising" or "zooming".

The control panel, where various system settings and configuration options were collected together in one place, was introduced in Windows 2 and survives to this day.

Microsoft Word and Excel also made their first appearances running on Windows 2.

Windows 3

Windows 3.0 got colourful.

The first Windows that required a hard drive launched in 1990. Windows 3 was the first version to see more widespread success and be considered a challenger to

Apple's Macintosh and the Commodore Amiga graphical user interfaces, coming pre-installed on computers from PC-compatible manufacturers including Zenith Data Systems.

Windows 3 introduced the ability to run MS-DOS programmes in windows, which brought multitasking to legacy programmes, and supported 256 colours bringing a more modern, colourful look to the interface.

More important - at least to the sum total of human time wasted - it introduced the card-moving timesink (and mouse use trainer) Solitaire.

Windows 3.1

Windows 3.1 with Minesweeper.

Windows 1 and 2 both had point release updates, but Windows 3.1 released in 1992 is notable because it introduced TrueType fonts making Windows a viable publishing platform for the first time.

Minesweeper also made its first appearance. Windows 3.1 required 1MB of RAM to run and allowed supported MS-DOS programs to be controlled with a mouse for the first time. Windows 3.1 was also the first Windows to be distributed on a CD-ROM, although once installed on a hard drive it only took up 10 to 15MB (a CD can typically store up to 700MB).

Windows 95

Windows 95: oh hello Start menu.

As the name implies, Windows 95 arrived in August 1995 and with it brought the first ever Start button and Start.

It also introduced the concept of "plug and play" - connect a peripheral and the operating system finds the appropriate drivers for it and makes it work. That was the idea; it didn't always work in practice.

Windows 95 also introduced a 32-bit environment, the task bar and focused on multitasking. MS-DOS still played an important role for Windows 95, which required it to run some programmes and elements.

Internet Explorer also made its debut on Windows 95, but was not installed by default requiring the Windows 95 Plus! pack. Later revisions of Windows 95 included IE by default, as Netscape Navigator and NCSA Mosaic were popular at the time.

Windows 98

Windows 98, the last great DOS-based Windows.

Released in June 1998, Windows 98 built on Windows 95 and brought with it IE 4, Outlook Express, Windows

Address Book, Microsoft Chat and NetShow Player, which was replaced by Windows Media Player 6.2 in Windows 98 Second Edition in 1999.

Windows 98 introduced the back and forward navigation buttons and the address bar in Windows Explorer, among other things. One of the biggest changes was the introduction of the Windows Driver Model for computer components and accessories - one driver to support all future versions of Windows.

USB support was much improved in Windows 98 and led to its widespread adoption, including USB hubs and USB mice.

Windows ME

Windows ME was one to skip.

Considered a low point in the Windows series by many - at least, until they saw Windows Vista - Windows Millennium Edition was the last Windows to be based on MS-DOS, and the last in the Windows 9x line.

Released in September 2000, it was the consumer-aimed operating system twinned with Windows 2000 aimed at the enterprise market. It introduced some important concepts to consumers, including more automated system recovery tools.

IE 5.5, Windows Media Player 7 and Windows Movie Maker all made their appearance for the first time. Autocomplete also appeared in Windows Explorer, but the operating system was notorious for being buggy, failing to install properly and being generally poor.

Windows 2000

Windows 2000 was ME's enterprise twin.

The enterprise twin of ME, Windows 2000 was released in February 2000 and was based on Microsoft's business-orientated system Windows NT and later became the basis for Windows XP.

Microsoft's automatic updating played an important role in Windows 2000 and became the first Windows to support hibernation.

Windows XP

Windows XP still survives to this day.

Arguably one of the best Windows versions, Windows XP was released in October 2001 and brought Microsoft's enterprise line and consumer line of operating systems under one roof.

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It was based on Windows NT like Windows 2000, but brought the consumer-friendly elements from Windows ME. The Start menu and task bar got a visual overhaul, bringing the familiar green Start button, blue task bar and vista wallpaper, along with various shadow and other visual effects.

ClearType, which was designed to make text easier to read on LCD screens, was introduced, as were built-in

CD burning, autoplay from CDs and other media, plus various automated update and recovery tools, that unlike Windows ME actually worked.

Windows XP was the longest running Microsoft operating system, seeing three major updates and support up until April 2014 - 13 years from its original release date. Windows XP was still used on an estimated 430m PCs when it was discontinued.

Its biggest problem was security: though it had a firewall built in, it was turned off by default. Windows XP's huge popularity turned out to be a boon for hackers and criminals, who exploited its flaws, especially in Internet Explorer, mercilessly - leading Bill Gates to initiate a "Trustworthy Computing" initiative and the subsequent issuance of Service Pack updates that hardened XP against attack substantially.

Windows Vista

Windows Vista, arguably worse than Windows ME.

Windows XP stayed the course for close to six years before being replaced by Windows Vista in January 2007. Vista updated the look and feel of Windows with more focus on transparent elements, search and security. Its development, under the codename "Longhorn", was troubled, with ambitious elements abandoned in order to get it into production.

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It was buggy, burdened the user with hundreds of requests for app permissions under "User Account Control" - the outcome of the Trustworthy Computing initiative which now meant that users had to approve or disapprove attempts by programs to make various changes.

The problem with UAC was that it led to complacency, with people clicking "yes" to almost anything - taking security back to the pre-UAC state. It also ran slowly on older computers despite them being deemed as "Vista Ready" - a labelling that saw it sued because not all versions of Vista could run on PCs with that label.

PC gamers saw a boost from Vista's inclusion of Microsoft's DirectX 10 technology.

Windows Media Player 11 and IE 7 debuted, along with Windows Defender an anti-spyware programme. Vista also included speech recognition, Windows DVD Maker and Photo Gallery, as well as being the first Windows to be distributed on DVD. Later a version of Windows Vista without Windows Media Player was created in response to anti-trust investigations.

Windows 7

Windows 7 was everything Windows Vista should have been.

Considered by many as what Windows Vista should have been, Windows 7 was first released in October 2009. It was intended to fix all the problems and criticism faced by Vista, with slight tweaks to its appearance and a

concentration on user-friendly features and less "dialogue box overload".

It was faster, more stable and easier to use, becoming the operating system most users and business would upgrade to from Windows XP, forgoing Vista entirely.

Handwriting recognition debuted in 7, as did the ability to "snap" windows to the tops or sides of the screen, allowing faster more automatic window resizing.

Windows 7 saw Microsoft hit in Europe with antitrust investigations over the pre-installing of IE, which led to a browser ballot screen being shown to new users allowing them to choose, which browser to install on first boot.

Windows 8

Windows 8 focused more on touch than a keyboard and mouse.

Released in October 2012, Windows 8 was Microsoft's most radical overhaul of the Windows interface, ditching the Start button and Start menu in favour of a more touch-friendly Start screen.

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The new tiled interface saw programme icons and live tiles, which displayed at-a-glance information normally associated with "widgets", replace the lists of programmes and icons. A desktop was still included, which resembled Windows 7.

Windows 8 was faster than previous versions of Windows and included support for the new, much faster USB 3.0 devices.

The Windows Store, which offers universal Windows apps that run in a full-screen mode only, was introduced. Programs could still be installed from third-parties like other iterations of Windows, but they could only access the traditional desktop interface of Windows.

The radical overhaul was not welcomed by many. Microsoft attempted to tread a fine line between touchscreen support and desktop users, but ultimately desktop users wanting to control Windows with a traditional mouse and keyboard and not a touchscreen felt Windows 8 was a step back.

There were also too few touchscreens in use, or on offer, to make its touch-oriented interface useful or even necessary - despite the parallel rise of tablets such as the iPad, and smartphones, which had begun outselling PCs by the end of 2010.

Windows RT, which runs on ARM-based processors traditionally found in smartphones and non-PC tablets, was introduced at the same time as Windows 8 with the Microsoft Surface tablet.

It looked and felt like Windows 8, but could not run traditional Windows applications, instead solely relying on the Windows Store for third-party apps.

Windows 8.1

Windows 8.1 and the great reappearance of the Start button.

A free point release to Windows 8 introduced in October 2013, Windows 8.1 marked a shift towards yearly software updates from Microsoft and included the first step in Microsoft's U-turn around its new visual interface.

Windows 8.1 re-introduced the Start button, which brought up the Start screen from the desktop view of Windows 8.1. Users could also choose to boot directly into the desktop of Windows 8.1, which was more suitable for those using a desktop computer with a mouse and keyboard than the touch-focused Start screen.

Windows 10

With Windows 10, Microsoft is trying to keep some of the touch and tablet features it created for Windows 8, combine them with the familiar Start menu and desktop, and run it all on top of an improved operating system with more security, a new browser, the Cortana assistant, its own version of Office for on-the-go editing and plenty of new features intended to make life simpler.

Of course, that also means it's very different to use, whether you come from Windows 7, Windows 8 or Windows XP. You have to look in a new place even to turn your PC off.

On top of that, Windows 10 is more than just a PC operating system; it's also what will run on Windows phones - and on small tablets as well, because a 6-inch phone and a 7-inch tablet aren't such very different devices.

Microsoft is expecting people to put Windows 10 on a billion devices (which ought to encourage more app developers to at least take a look at building their apps for Windows phones and tablets, as well as for Xbox One and HoloLens).

The Start menu evolves

The full-screen Start screen of Windows 8 is back to being a Start menu in Windows 10 that tries to combine the best of both options. A scrolling Start menu that's restricted to a single column, with jump lists and flyout menus for extra options, divided into frequently used and recently installed programs, with the option to switch to a scrolling view of all the applications, sorted alphabetically.

Fig 1



But also get an extra pane ,where can pin Windows 8-style tiles, complete with 'rotating 3D cube' animations of live tiles. drag the Start menu to be a larger size or even set it to be full screen.

Desktop Background

Another component of the Desktop is the Background. This is simply an image that appears at the back of the screen. Most computers come with a pre-selected background, but change it to any image.

To change the background, follow these steps:

1. Right-click on the background and choose "Personalize"
2. From the Personalization window, choose from a series of pre-selected pictures or browse for your own.

After choosing a picture, the Background will change automatically.

Start Menu

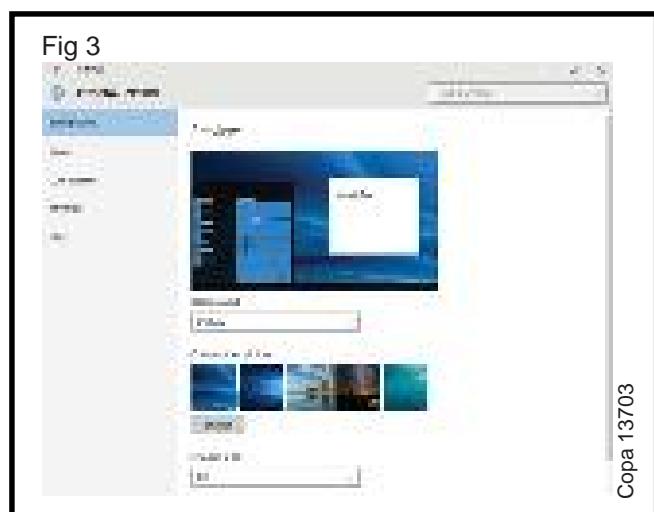
If looking for a specific application, open the Start Menu and click "All Applications". This will open an alphabetical



Fig 2

Copa 13702

list of all the applications installed on computer.



File Explorer

If you are looking for a specific document, another

alternative is to use the File Explorer by clicking on the Folder icon on the Taskbar.

In the File Explorer window, browse all the folders and documents.

Fig 4

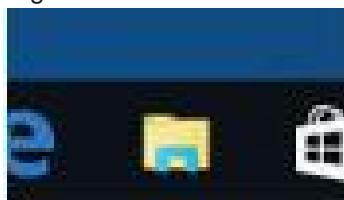


Copa 13704

Virtual Desktops

One of the new features of Windows 10 is the addition of Virtual Desktops. This allows you to have multiple desktop screens where to keep open windows organized.

Fig 5



Copa 13705

To add a virtual desktop, follow these steps:

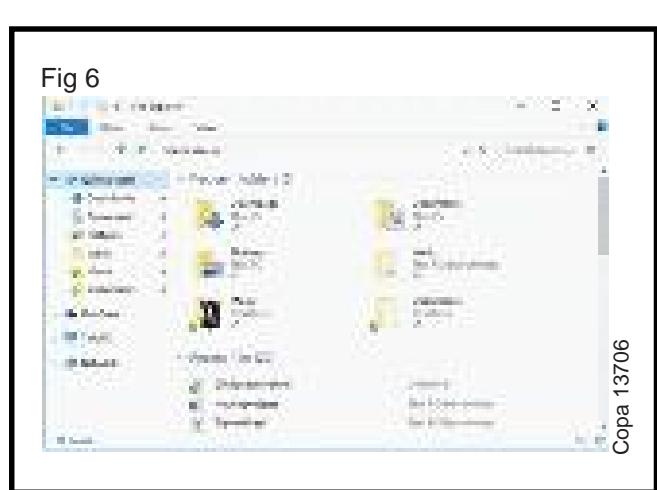


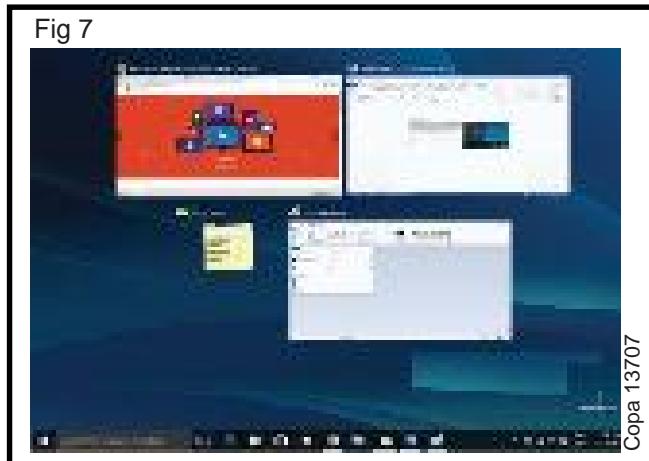
Fig 6

Copa 13706

1. Click Task View on the Taskbar
2. Click the "New desktop" option on the lower-right corner. You can access or delete the new Desktop by clicking Task View again.

Cortana helps as with search and control

Cortana, the Windows Phone assistant, shows up in

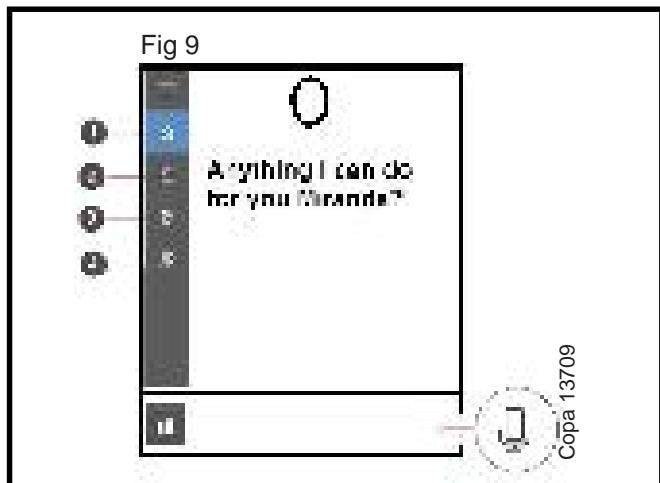


Windows 10 as a search pane on the taskbar, which can also trigger by saying 'Hey Cortana' - and when start searching the Start menu.



That gets the apps have installed, documents access to, apps could install from the Store, search results from the web and a range of other information - including from apps and services that integrate with Cortana.

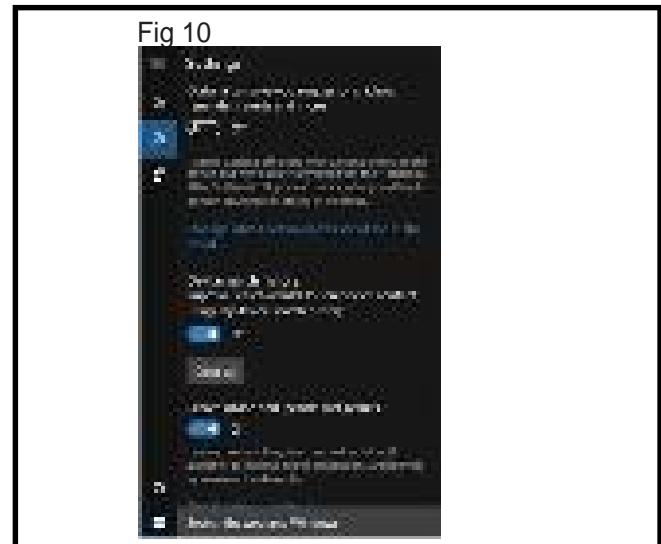
Activating Cortana



If Cortana isn't active, can turn it on by typing "Cortana" in the Taskbar search to access the Cortana settings, or just clicking the "Gear" icon on the left-side of the menu. After activating Cortana, it will start gathering information about to personalize the experience.

Task switcher

Most Windows users don't know the Alt-Tab keyboard



combination to see and switch between all running apps, so as well as having a redesigned task switcher with bigger



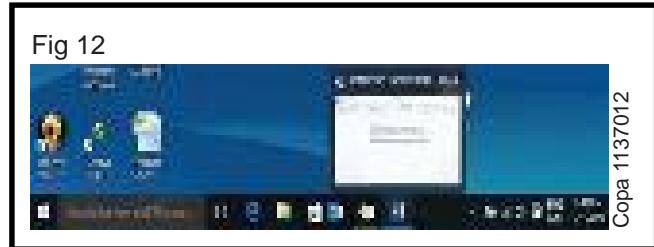
thumbnails, Windows 10 also puts a task view icon in the taskbar to help them find it.

TASKBAR

The Windows 10 taskbar sits at the bottom of the screen giving the user access to the Start Menu, as well as the icons of frequently used applications. On the right-side, the Taskbar features the Notification Area which informs the user of different things like the state of the Internet connection or the charge of the laptop battery.

The icons in the middle of the Taskbar are "pinned" applications, which is a way to have a quick access to

applications you use frequently. "Pinned" applications will stay in the Taskbar until you "unpin" them.



Pin an Application to the Taskbar

Step 1: Search for the application you want to pin in the Start Menu.

Step 2: Right-click on the application.

Step 3: Select "More" option at the top of the menu.

Step 4: Select the "Pin to taskbar" option.

Unpin an Application from the Taskbar

To "unpin" it, just right-click the icon in the Taskbar and select "Unpin from taskbar". You can "pin" it back again



any time you want.

Notification Area

The Notification Area is located at the right side of the



Taskbar. It shows different types of notifications from your computer like your Internet connection, or the volume level.

At first, the Notification Area shows a limited amount of icons. But you can click the upward arrow on its left-side to see other icons as well.

Snap Assist

Because all the apps and programs run in windows on the



desktop, instead of modern apps from the Store being in their own space, and can no longer drag across the left edge of the screen to bring another app on screen and get a split view. Instead, drag windows into the corners of the screen to get the familiar Snap view.

Now use all four corners of the screen if want each window to take up a quarter of the screen instead of half, and the space that isn't filled by the window you just dragged shows thumbnails of your other windows to make it easier to snap the next one into place.

Action Center

If we used Windows Phone 8.1 (or Android and/or iOS), we used to a notification centre can drag down from the top of the screen.

Windows 10 puts that on the right of the screen, where the charms bar was in Windows 8, with notifications from various apps at the top and the choice of various settings buttons at the bottom for quick access.

The command prompt

Those of us that use the command prompt have been stuck with pretty much the same experience since the 1990s, but in Windows 10 can finally resize the command prompt window and use familiar keyboard shortcuts to copy and paste at the command prompt.

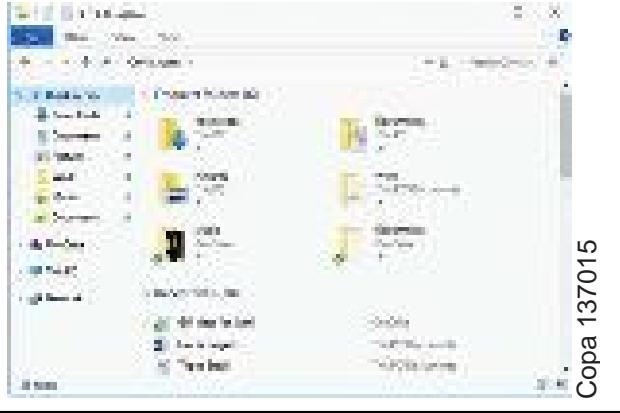
It's far from ground-breaking but it's a very welcome improvement after years of frustration.

FILE EXPLORER

File Explorer is the file management application used by Windows operating systems to browse folders and files. It provides a graphical interface for the user to navigate and access the files stored in the computer.

The main way to access the File Explorer is by clicking the folder icon in the Taskbar. After clicking the icon, the File Explorer window will open.

Fig 15



The initial File Explorer window is comprised of the following sections:

1. The **File Explorer ribbon**, which resembles the ribbon featured in Microsoft Office. The ribbon contains buttons for common tasks to perform with your files and folders.
2. The **Navigation Pane** gives you access to your libraries of documents and pictures, as well as your storage devices. It also features frequently used folders and network devices.
3. The **Frequent folders section** on the right features the folders you've worked with recently to allow for quick access to them.
4. The **Recent files section** in the lower part of the window features files and documents that you've opened recently.

The new Edge browser

To catch up with fast-moving browsers like Chrome and Firefox, Microsoft took its browser back to basics, ripping out years of code that didn't fit with web standards and making a lean, fast browser.

It's a work in progress - it won't get support for things like ad-blocking extensions until a while after Windows 10 launches - but can do plenty of neat things here. For example, and can scribble notes on a web page to send to a friend and Edge has Cortana built in to pull useful information out of web pages, like the phone number of a restaurant, or the opening hours.

Sites like Medium that didn't work properly with IE should look better and have more features in Edge.

Multiple desktops

User need to arrange a lot of windows and don't have multiple monitors, user can put them on multiple virtual desktops. And can use Alt-Tab to move between apps as usual and then Windows-Ctrl and the left and right arrow keys to move between desktops.

Schedule restarts

No more having Windows announce that you have fifteen minutes to get everything done before it restarts to apply an update. Instead of leaving Windows 10 to decide when to do that, if there's an update that will need a restart and can have Windows ask when you want to schedule that for.

user can only do that once the update has been downloaded. If user want to have certain times off-limits for restarts, they will need the features in Windows Update for Business (for Windows 10 Pro and Enterprise) which lets block restarts so they don't happen in working hours, or on certain dates.

Universal apps - including Office

Windows 10 gets a new Windows Store, where download desktop programs as well as modern Windows apps. Many of those apps will be universal apps that are the same code on a PC, a Windows phone, an Xbox One and even on HoloLens, with the interface changing to suit the different screen sizes. The Office for Windows apps like Word and Excel are universal apps, as are the Outlook Mail and Calendar apps.

Settings and control panel

The Windows 8 Settings app has taken over many more of the settings that used to be in Control Panel, and it has a Control Panel-style interface with icons to navigate with. But the old Control Panel interface is still there, for settings that aren't in the new Settings app (or if you're just used to finding things there).

Windows 10 - Keyboard Shortcuts

Like most Windows applications, there are several keyboard shortcuts you can use to make it easier or faster for some to perform certain tasks.

Most of the new Windows shortcuts use the Windows key () combined with other keys to perform several actions. The following are some of the most common or useful shortcuts used in Windows 10.

Keyboard Shortcuts for Navigating Windows 10

Press This	To Do This
Windows Logo	Toggle the Start menu
Windows Logo+A	Open the Notifications pane
Windows Logo+B	Activate the notification area's Show Hidden Icons arrow (press Enter to display the hidden icons)
Windows Logo+C	Open Cortana for voice commands
Windows Logo+D	Minimize all open windows to display the desktop
Windows Logo+E	Run File Explorer
Windows Logo+F	Display the Start menu and activate the Search box
Windows Logo+H	Display the Share pane
Windows Logo+I	Run the Settings app
Windows Logo+K	Display the Devices pane
Windows Logo+L	Lock your computer
Windows Logo+M	Minimize all windows
Windows Logo+O	Turn the tablet orientation lock on and off
Windows Logo+P	Display the Project pane to configure a second display
Windows Logo+Q	Open Cortana for voice commands
Windows Logo+R	Open the Run dialog box
Windows Logo+S	Open Cortana for keyboard commands
Windows Logo+T	Activate the taskbar icons (use the arrow keys to navigate the icons)
Windows Logo+U	Open the Ease of Access Center
Windows Logo+W	Activate the Search box
Windows Logo+X	Display a menu of Windows tools and utilities
Windows Logo+Z	Display an app's commands (although this works in only some Modern apps)
Windows Logo+=	Open Magnifier and zoom in
Windows Logo+-	Zoom out (if already zoomed in using Magnifier)
Windows Logo+,	Temporarily display the desktop
Windows Logo+Enter	Open Narrator
Windows Logo+Left	Snap the current app to the left side of the screen
Windows Logo+Right	Snap the current app to the right side of the screen
Windows Logo+Up	Restore a minimized app; maximize a restored app
Windows Logo+Down	Restore a maximized app; minimize a restored app
Windows Logo+PgUp	Move the current app to the left monitor
Windows Logo+PgDn	Move the current app to the right monitor
Windows Logo+PrtSc	Capture the current screen and save it to the Pictures folder
Windows Logo+Ctrl+D	Create a virtual desktop
Windows Logo+Ctrl+Right	Switch to the next virtual desktop
Windows Logo+Ctrl+Left	Switch to the previous virtual desktop
Windows Logo+Ctrl+F4	Close the current virtual desktop
Windows Logo+Tab	Open Task View, which displays thumbnails for each running app as well as the available virtual desktops

Handling printers

Objectives : At the end of this lesson you shall be able to

- explain about typewriter
- explain about printer
- explain types and cost of printers
- explain programming languages for printers
- explain how to locate printer driver files.

Typewriter

A typewriter is a mechanical or electromechanical device with keys that, when pressed, cause characters to be printed on a medium, usually paper as on Fig 1. Typically one character is printed per keypress, and the machine prints the characters by making ink impressions of type elements similar to the sorts used in movable type letterpress printing.

Fig 1



Fig 2



After their invention in the 1860s, typewriters quickly became indispensable tools for practically all writing other than personal correspondence. They were widely used by professional writers, in offices, and for business correspondence in private homes. By the end of the 1980s, word processors and personal computers had largely displaced typewriters in most of these uses.

Computer printer

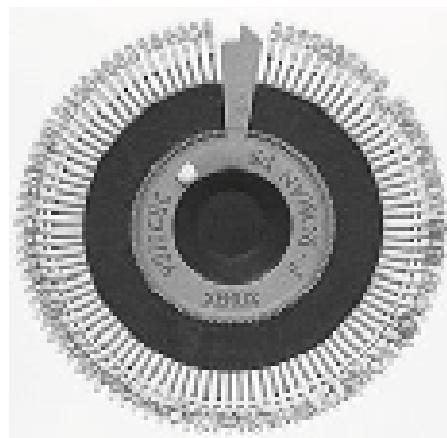
A printer is a piece of hardware for a computer as on Fig 2. It is a device that must be connected to a computer which allows a user to print items on paper, such as letters and pictures. It can also work with digital cameras to print directly without the use of a computer.

Types of printers

Today, the following types of printers are in regular use:

Daisy wheel printing is an impact printing technology invented in 1969 by David S. Lee at Diablo Data Systems as on Fig 3. It uses interchangeable pre-formed type elements, each with typically 96 glyphs, to generate high-quality output comparable to premium typewriters such

Fig 3



as the IBM Selectric, but two to three times faster. Daisy wheel printing was used in electronic typewriters, word processors and computers from 1972. According to Webster's, the daisy wheel is so named because of its resemblance to the daisy flower.

Dot-matrix printers are now almost extinct. They used a ribbon and made a lot of noise. There were models with 9 pins and models with 24 pins as on Fig 4. A dot matrix printer or impact matrix printer is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism on a typewriter.

Fig 4



Inkjet printing is a type of computer printing that creates a digital image by propelling droplets of ink onto paper as on Fig 5. Inkjet printers are the most commonly used type of printer, and range from small inexpensive consumer models to very large professional machines that can cost tens of thousands of dollars.

Fig 5



The concept of inkjet printing originated in the 20th century, and the technology was first extensively developed in the early 1950s. Starting in the late 1970s inkjet printers that could reproduce digital images generated by computers were developed, mainly by Epson, Hewlett-Packard (HP), and Canon. In the worldwide consumer market, four manufacturers account for the majority of inkjet printer sales: Canon, HP, Epson, and Lexmark, a 1991 spin-off from IBM.

The plotter is a computer printer for printing vector graphics as on Fig 6. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. It is now commonplace to refer to

Fig 6



such wide-format printers as "plotters," even though they technically are not.

Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are restricted to line art, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines.

Laser printing is a digital printing process that rapidly produces high quality text and graphics on plain paper. As with digital photocopiers and multifunction printers (MFPs), laser printers employ a xerographic printing process, but differ from analog photocopiers in that the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

A laser beam projects an image of the page to be printed onto an electrically charged rotating drum coated with selenium or, more common in modern printers, organic photoconductors. Photoconductivity allows charge to leak away from the areas exposed to light.

Dry ink (toner) particles are then electrostatically picked up by the drum's charged areas, which have not been exposed to light. The drum then prints the image onto paper by direct contact and heat, which fuses the ink to the paper.

Cost of printers

There are different costs with a printer. Printers that are more expensive to buy will usually be less expensive in the consumables (the ink, toner, or ribbon used by the printer). Therefore, laser printers are often more expensive to buy than inkjet printers, but are not expensive to use over a long period of time.

Inkjet printers on the other hand have a higher cost of consumables because the ink tanks they use are more expensive than the toner for a laser printer.

Laser printers that can print in color are usually more expensive than those that only print in black and white.

Other options, like being able to print on both sides of a sheet of paper, to automatically sort the output, or to staple the output will also make a printer more expensive.

Common programming languages for printers include:

- ESC/P
- Postscript
- PCL
- GDI
- HPGL and HPGL/2
- PDF
- VPS

How to Locate Printer Driver Files

Printers can be connected to a computer by a variety of wired and wireless methods, but all printers require drivers to be installed on a computer. The printer drivers are small programs that help communicate information from the operating system to the printer.

Driver errors can make the printer unusable. Using the Windows device manager, you can look up details about the drivers as well as pinpoint their physical location on your hard drive.

Scanner

A scanner is an electronic device which can capture images from physical items and convert them into digital formats, which in turn can be stored in a computer, and viewed or modified using software applications.

Different types of scanners are available with different resolutions. In the world of electronic data transmission, scanning is considered to be the most cost-effective and reliable way of transmitting images.

The basic principle of a scanner is to analyze an image and reproduce it to a digital one using the optical character recognition techniques.

Fig 7



Copa 110107

Prominent features of a scanner include:

- Reliability - Unlike certain forms of data transmission, scanning involves only transfer of hard images to digital forms. The role of the end-user is limited in case of scanning. And as they are not dependent on two-way communication, they can also help in storing important information or transmitting important information.
- Efficiency - Modern scanners are built for efficiency and speed. And it comes with ease of use as well as convenience.
- Quality - Scanning ensures the best resolution possible for digital images. Compared to fax machines, which may find it difficult to reproduce the accurate details, scanners can reproduce images with high resolution and precision. They are quite useful for photography and engineering arenas.
- Cost saving - One of the biggest advantages of scanning is the replacement of physical files/forms with digital ones. Along with saving physical space, which has to be used for storage, there are also environmental benefits by using scanner.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

The Basic Input/Output System (BIOS), also known as System BIOS, ROM BIOS or PC BIOS is a generally accepted standard defining a firmware interface.

The fundamental purpose of the BIOS is to initialize and test the system hardware components and load an operating system from a mass memory device. The BIOS is special software that interfaces the major hardware components of the computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM. The BIOS is a firmware (software instructions permanently recorded on a chip located on your motherboard). (Refer Fig.1).



Functions of BIOS

The BIOS software has a number of different roles, but its most important role is to load the operating system. The BIOS checks and initializes the PC hardware each time the system powers up or restarts before handing over control to the operating system. Some of the other common tasks that the BIOS performs include:

- A power-on self-test (POST) for all of the different hardware components in the system to make sure everything is working properly
- Activating other BIOS chips on different cards installed in the computer - For example the graphics cards often have their own BIOS chips.
- Providing a set of low-level routines that the operating system uses to interface to different hardware devices. They manage things like the keyboard, the screen, and the ports, especially when the computer is booting.

- Managing a collection of settings for the hard disks, clock, etc.

CMOS Setup

The first thing the BIOS will do is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed.

Configuring BIOS

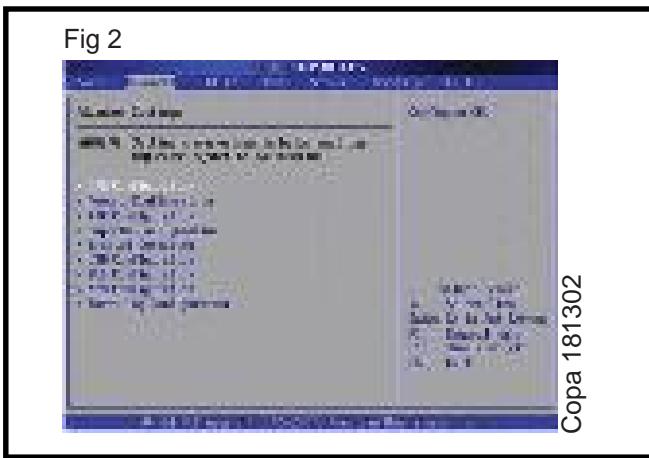
The BIOS checks the CMOS Setup for custom settings. To change the CMOS settings we need to enter the CMOS setup. To enter the CMOS Setup, a certain key or combination of keys must be pressed during the initial startup sequence. Most systems use "Esc," "Del," "F1," "F2," "Ctrl-Esc" or "Ctrl-Alt-Esc" to enter setup. There is usually a line of text at the bottom of the display that tells "Press ___ to Enter Setup."

The BIOS setup shows a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

- System Time/Date - Set the system time and date
- Boot Sequence - The order that BIOS will try to load the operating system
- Plug and Play - A standard for auto-detecting connected devices; should be set to "Yes" if your computer and operating system both support it
- Mouse/Keyboard - "Enable Num Lock," "Enable the Keyboard," "Auto-Detect Mouse"...
- Drive Configuration - Configure hard drives, CD-ROM and floppy drives
- Memory - Direct the BIOS to shadow to a specific memory address
- Security - Set a password for accessing the computer
- Power Management - Select whether to use power management, as well as set the amount of time for "standby" and "suspend"

- Exit - Save your changes, discard your changes or restore default settings.

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium or Ni-Cad battery can supply enough power to keep the data for years. Major BIOS manufacturers include American Megatrends Inc. (AMI), Phoenix Technologies, Winbond etc. A typical BIOS screenshot is shown in fig. given below.(Refer Fig.2)



Installing the Windows operating System

A hard disk needs to be partitioned (though not mandatory) and formatted before you can store data on it.

Partitioning

A partition, sometimes also called a volume, is an area on a hard disk that can be formatted with a file system and identified with a letter of the alphabet. For example, drive C on most Windows computers is a partition. the first three partitions you create are primary partitions. These can be used to start an operating system. If you want to create more than three partitions, the fourth partition is created as an extended partition.

An extended partition is a container that can hold one or more logical drives. Logical drives function like primary partitions except that they cannot be used to start an operating system.

Many computers are partitioned as a single partition that equals the size of the hard disk. Partitioning a hard disk into several smaller partitions is not required, but it can be useful for organizing data on your hard disk.

Creating more than one partition has the following advantages:

- Separation of the operating system (OS) and program files from user files.
- Having a separate area for operating system virtual memory swapping/paging.
- Keeping frequently used programs and data near each other.

- Use of multi-boot setups, which allow users to have more than one operating system on a single computer. For example, one could install Linux and Microsoft Windows or other operating systems on different partitions of the same HDD and have a choice of booting into any operating system at power-up.
- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected.
- Raising overall computer performance on systems where smaller file systems are more efficient.
- Partitioning for significantly less than the full size available can reduce the time for diagnostic tools such as checkdisk to run.

Formatting

Disk formatting is the process of preparing a data storage device such as a hard disk drive, solid-state drive or USB flash drive for initial use. It is the act of creating a file system on a volume, so that the operating system can store and retrieve data on that volume.

Formatting of a disk is of two categories:

- 1 Low-level formatting (i.e., closest to the hardware) marks the surfaces of the disks with markers indicating the start of a recording block. It also provides information about block checks done for future use by the disk controller to read or write data. This is intended to be the permanent foundation of the disk, and is often completed at the factory. A hard disk needs to be partitioned and formatted before you can store data on it
- 2 High-level formatting creates the file system format within a disk partition or a logical volume. This formatting includes the data structures used by the OS to identify the logical drive or partition's contents. This may occur during operating system installation, or when adding a new disk.

Installing the Windows operating System

The three basic types of windows installation procedures are as follows:

- Install on a brand new disk or computer system
- Erase the disk, format it, and install.
- Install into a new directory for dual-booting

For the first two methods, it must be ensured that the computer can boot from a DVD or any other removable drive. To do this the drive boot order needs to be changed in the BIOS. The latest Windows DVDs are bootable and run the Setup program automatically. Then the installation can be done by following the procedure step by step as indicated on the subsequent screens as in trade practicals.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

Format a hard drive

Fig 1



Copa 110101

There are many reasons why it is required to format a hard drive, such as to install Windows fresh, to get rid of a virus or malware or simply because a pc is refreshed or cleaned up on selling.

The process can be different depending on whether it's an only hard drive and whether there is a spare PC or not.

It cannot be formatted, the hard drive on which Windows is running. In order to do this, it is in need to boot the PC from a Windows installation disc, a USB flash drive or another bootable disc.

Format a disk?

Formatting is the process of deleting all the data on the hard drive, but beware of 'Quick Format' which leaves all data in place and makes the drive appear to be empty. A quick format is ok if there is a brand new hard drive, or need to reinstall Windows, but not if its disposing of the disk or giving it to someone else.

A word of warning: make sure to have successfully backed up any photos, videos, music and other documents from the drive before formatting it. Although deleted files can be recovered in some situations, prevention is always better than cure.

Format hard drive partitions

It's important to understand about partitions before getting started. A hard drive can be divided up into smaller sections, called partitions. It's possible to format one partition while leaving the others untouched.

If it is required to format the entire hard drive and use the entire capacity in one block, delete the partition information.

Format a hard drive from the BIOS?

Many people ask how to format a hard disk from BIOS. The short answer is no.

If it is required to format a disk and you can't do it from within Windows, create a bootable CD, DVD or USB flash drive and run a free third-party formatting tool.

One option is Darik's Boot and Nuke (DBAN), which is free for personal use. This program will totally erase and format your hard disk, allowing for a clean install of a new OS, but the process cannot be undone.

Fig 2



Copa 110102

DBAN is supposedly only able to create a bootable CD/DVD-R, but if don't have any blank discs or a burner, there is a workaround available in the form of a separate third-party program.

Universal USB Installer will quickly and easily convert the DBAN ISO image downloaded to run from a bootable USB. Simply insert a blank USB flash drive, run the Universal USB Installer setup program, and follow the prompts.

It will ask to scroll through and pick the Linux Distribution want to install to USB (in this case, the latest version of DBAN), followed by its location on the computer and the letter of the USB drive like to install it to.

Once that information is complete, click create.

Fig 3



To boot from this USB drive rather than usual boot device (in most cases, this would be the hard drive), it have to be changed some settings in the BIOS.

In the BIOS, navigate to the boot order settings, and change the primary boot device to the USB drive (it shouldn't need to be plugged in to make this selection). After saved the settings and exited the BIOS, insert the bootable USB, restart the computer.

Fig 4



The PC should automatically boot the DBAN software, which will guide through the process of erasing the hard drive, with options for different levels of data-wiping.

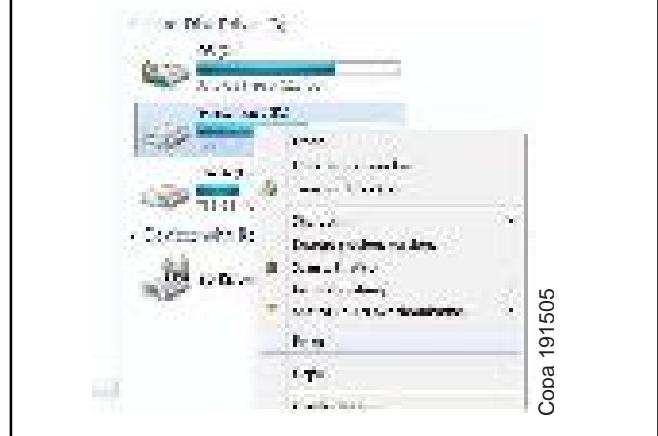
It will treat the USB as another drive so to avoid inadvertently wiping that as well, remove it after booted into DBAN.

Quick format a hard drive?

Yes, but don't use this method if want the data to be permanently erased. A quick format doesn't delete the data but instead erases only the pointers to the files.

Windows Vista, 7, 8 and 10 have a built-in Disk Management tool (see below), but the fastest way to format a hard drive is to click the Start button, then Computer and right-click on the hard drive to wipe. It can't be formatted the drive on which Windows is installed for obvious reasons.

Fig 5



By default Quick Format is checked, and choose the file system and allocation unit size as well as changing the volume label (the drive's name). Typically, leave all settings unchanged and click the Start button. In under a minute the hard drive will be formatted.

Fig 6



Choose NTFS as the file system if it isn't already selected for Windows Vista, 7, 8 or 10 and ensure the Allocation Unit Size is set to 'Default Allocation Size'.

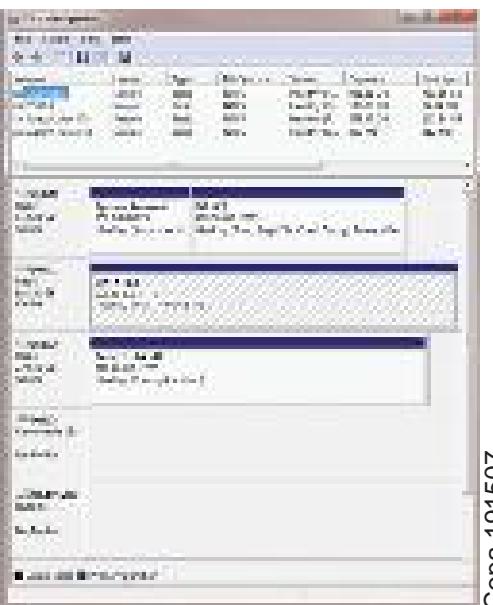
Using the Disk Management tool

Type diskmgmt.msc or Disk Management into the search box in Vista, 7, 8 or 10 and then click on only result that appears in the menu above, with the same name.

This is the easiest way to launch Disk Management, but also find it in the Control Panel if search for 'disk' and select the 'Create and format hard disk partitions'.

Disk Management isn't as powerful as a standalone partition management tool, but it is still capable of formatting data.

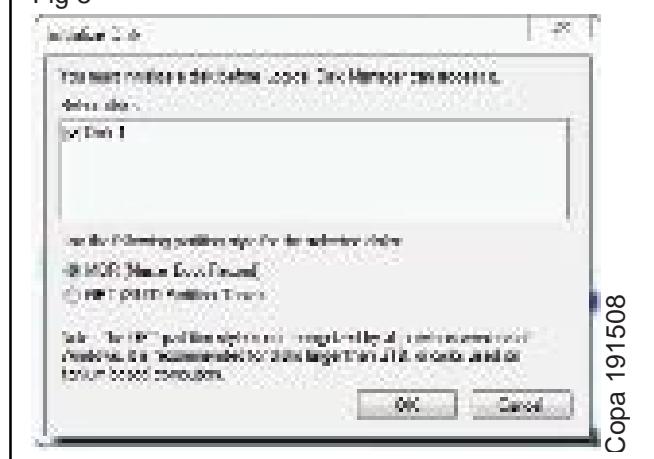
Fig 7



If it is to install a new (additional) hard drive in a PC, it might be a thing to wonder why it doesn't appear in Windows Explorer. The reason is because it needs to be initialised and formatted -which can be done in Disk Management.

When the tool loads, it will analyse all of the computer's drives and will prompt to initialise a new disk that it finds.

Fig 8



If the disk is larger than 2TB, opt for GPT (GUID Partition Table). This setting also lets to create more than four partitions.

If don't see a prompt, look in the list of drives and see one that says 'Not Initialized'. Right-click on it and choose Initialize Disk.

Once that's done, right-click in the hatched Unallocated space and choose New Simple Volume...

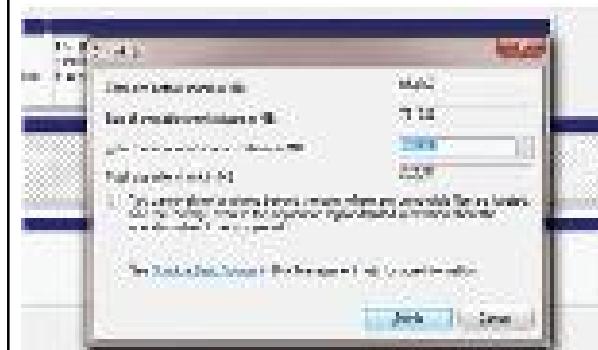
Follow the instructions, choosing how big to want the partition to be (in MB - 1024MB = 1GB), and which drive letter to assign (one will be chosen, but can opt to change it if desired).

If select a size for the partition that's smaller than the total capacity of the drive, say 500B on a 1TB drive, end up with some unallocated space on the drive which can format by repeating the process just completed.

change partition size

Disk Management can be used to expand or shrink a partition. Simply right-click on one and choose the appropriate option from the menu that appears. If shrinking, the partition will be checked to find out how much empty space it contains.

Fig 9



It's a little confusing as the numbers are displayed in MB rather than GB, but it can be adjusted the amount of space to shrink and the 'Total size after shrink' will be updated, also can't shrink a partition beyond the point where files are located - it may be able to free up space by defragmenting the drive first.

Conversely it can only expand a partition if there is unused space on the drive. If not, the option will be greyed out.

Resetting Windows

If PC is having problems and the user don't wish to lose the personal files by wiping the hard drive, then it might want to refresh or reset the PC which can be done in Windows 8 and 10.

If user looking to keep your personal files and settings, but want to have a fresh Windows install, it's all want to refresh the PC.

Do note that a refresh will remove all programs and apps installed on the machine, but will keep the Windows-default programs intact.

A reset reinstalls Windows and deletes all files, settings and programs, it is suggested performing this if have previously backed up all the files and don't mind transferring user's personal files.

Windows 10 has a slightly different approach and might confuse those coming from Windows 8. Microsoft removed the refresh option and has instead combined the refresh and reset options into one setting.

Fig 10



Copa 1915010

To find the option, open the Start Menu, click on Settings > Update & security > Recovery > Get started (under the Reset this PC option).

Upon selecting the option, it will present with three separate options:

- Keep my files
- Remove everything
- Restore factory settings (not available on all PCs)

'Keep my files' saves personal files but deletes user settings, drivers and programs, whilst also reinstalling Windows 10.

'Remove everything' also gets rid of personal files and 'Restore factory settings' does the same actions as 'Remove everything', but also resets the PC to the version of Windows which came with the machine.

This option will only be available to those who bought a pre-built PC or laptop which came with Windows already pre-installed.

Troubleshooting computer

Objectives: At the end of this lesson you shall be able to

- state the basic steps involved in troubleshooting a PC
- explain the basic approach to solve a problem
- list the probable defects and symptoms in a faulty Computer
- analyse the causes for the complaints
- state the shortest path for servicing the defects.
- list the probable defect and symptoms in the faulty Computer
- analyse the causes for the complaint “When windows is started, system runs surface test and goes to safemode” with the help of a Problem Tree and TSC

Basic Troubleshooting

One of the difficulties while troubleshooting problems on a PC is that in most cases they are not what they seem. The cause behind a frequent hanging of a PC may be due to one of six or more well defined areas or a dozen of unidentified problems. The problem could be due to software or hardware. Even with years of experience and training, PC technicians come out with troubleshooting procedures that do not solve the real problem. For example a personal computer running windows operating system with several i/o cards connected may freeze the screen , mouse, and keyboard and take as long as 3 minutes before responding. After trying out with all the options like replacing a memory module, installing new parallel port and NIC drivers, the technician finally checks the system logs to find that a vital operating system library was corrupted and needed to be reinstalled. The issue to be mentioned here is that if the technician used a systematic approach to troubleshooting, the problem would likely have been solved much sooner. Maintaining a good troubleshooting plan certainly gives us the scope to approach the problem in a more systematic and scientific manner. A troubleshooting plan is nothing but a written check list that we use for any problem. The elements that should be included in any troubleshooting plan are as follows

- Maintenance record
- Identification of possible causes
- Identification of possible solutions
- Application and testing of solutions
- Follow-up

In the maintenance record, record the hardware installed in the PC when it is installed, all preventive maintenance activities, all software updates or additions, and all hardware installations and upgrades. Further any problems that occur and the actions you take to resolve them should be recorded . when it comes to troubleshooting a PC, with the maintenance record one can pin down a problem and devise solution for it. The first entry in such record should be a profile of the PC, which includes its configuration, operating system, and the date each component was installed.

Such tables gives an idea of the type of information one should include in the sytem configuration, as summerised below:

- The processor's make, model and speed.
- Amount of system memory(RAM) and the memory module type, size and configuration of the memory
- Hard disk size and the type of interface
- Make, model and speed of the compact disk (CD) or digital versatile disk (DVD) drive
- Memory size of the video or graphics adapter
- Make, model, type and speed of the modem
- The version number of the operating system
- A list of software applications installed on the PC
- A list of peripheral equipment attached to the PC, indicating the port to which they are attached

The maintenance record should be updated each time any maintenance work is carried over on the PC. Any time new or replacement hardware is installed, record the activity and update the system configuration. The activity entries should include

- Date of the activity or changes made to the system
- The make, model and serial number of any hardware removed or added to the PC
- The name, version and publisher of any software added to the PC
- Detailed information on any configuration changes made to the basic input/output system(BIOS) or other configuration for the new device or software.

Troubleshooting approach

For solving any problems associated with PC, first go through the maintenance record of that PC and follow a systematic procedure for isolating the problem. The standard problem solving process includes the following steps

Identify the problem: This is the most difficult part of the process. To perform this step successfully collect all the data about the problem

Identify possible causes: analyse all the symptoms of the problem and try to list all the causes in order from the most likely to the least likely.

Identify possible solutions: identify solutions for each of the causes that are identified. A possible cause could have more than one possible solution.

Analyze the possible solutions: if two solutions produce the same result, consider the one which is more economic and apply the same.

After following the above steps and on solving the problem update the maintenance record and make necessary entries into it. In some cases the problems may be very clear and the solution is very transparent and even in such cases try to follow the above mentioned steps to make it a practice to follow the systematic approach. Whenever a problem occurs with a PC, while following the steps, try to collect the information about the system by answering questions such as

- Under what circumstances this problem cropped up?
- Were there any indications in the form of beep codes/ error messages or any clear symptoms?
- What softwares were active when the problem happened?
- Has it happened for the first time or occurred in the past also?
- Were there any configuration changes made during the session that required a restart that was not performed?

Optimizing the PC:

APC which was functioning absolutely well and developed a symptom of slowing down or if it is unable to keep pace with the demands of newer software, one of the possible solutions is to consider updating or optimizing the PC to enhance its performance. Optimization steps may cost money , but many involve software you already own or software readily available on the web.

Optimizing the BIOS and Boot process:

BIOS setup configuration includes many settings in the CMOS. How quickly the system boots and performs depends on the these settings. Enabling of valuable features such as system caching or using the quick POST process are very vital for optimum performance.

Optimizing the hard disk: Windows ScanDisk and Disk Defragmenter utilities are the best tools available for optimizing the hard disk in terms of usage and access speeds. ScanDisk is used to check a disk for errors and repair them or remove unrecoverable areas of the disk from the usage tables to prevent future errors. Similarly Disk Defragmenter organizes data file fragments into a more optimized and logical format that provides for faster access times and less head movement.

Optimizing the Expansion cards: The best way to optimize I/O controllers and other expansion cards is to install them in the correct order. No harm is done even if

they are installed out of order, but there is some benefit to be gained from putting them in the proper sequence. On a Pentium system, use PCI cards and avoid ISA cards, if possible. All I/O adapters including video cards, sound cards, NICs, modems and SCSI adapters are available for the PCI expansion bus. Consult the motherboard documentation and install video card in the first PCI slot, followed by the NIC, modem, and sound card, in that order.

Optimizing the processor: One can speed up the processor in the following ways

- Replace it with a faster speed or higher level processor
- Use a utility from the processor manufacturer to apply patches or fixes to the processor's logic
- Overclock the processor

The requirement for replacing the processor with a higher level or faster processor is that your motherboard and chipset will support the new processor both logically and physically. Logically the chipset and motherboard must support the bus speed of the processor and have the supporting circuits it requires. It is often much better to replace the complete motherboard. Some times the manufacturer of the processor may release some utilities that will improve some aspect of processor's capabilities such as video processing, buffer handling, caching and other processor based functions. Overclocking a processor means running a processor at speeds faster than it was released to support. Most processors are capable of running at speeds higher than their nominal speeds. The nominal speed of a processor is the speed at which it has been tuned to run with a certain chipset, motherboard, cooling system, and other components of the PC. Raising the speed of the processor can create heating problems on the processor and lead to frequent system lockups, memory problems and other issues.

Troubleshooting sources of Non-software problems:

Any time pc fails for no apparent software reason, check the following areas

- Ensure proper AC power
- Scan the PC for a computer virus
- Ensure that CPU fan is spinning
- Ensure proper connections of external I/O connectors
- Reseat the expansion cards and check the power and data cables of internal devices
- Most of the boot problems are the result of a recent change, check out the BIOS setup configuration data
- To install any new hardware or software, visit manufacturer's web site for any known conflict or incompatibility
- Check for any resource conflict if any new hardware or software is installed.

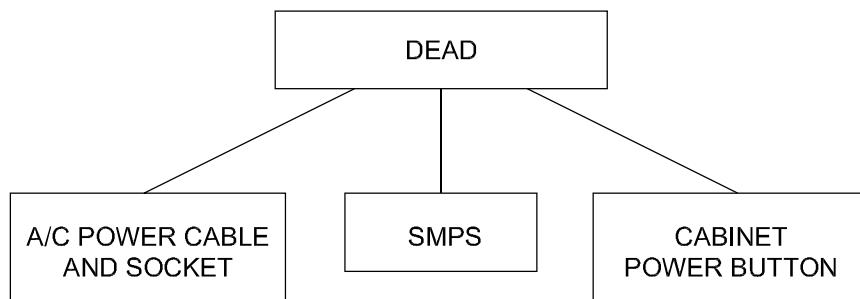
The forth coming lessons on Troubleshooting PC are provided with Problem Trees for different type of problems which a user face normally. Each Tree with a specific

problem gives scope to analyse the areas to be suspected or looked into for fixing the problem. This lesson includes a Problem Tree for a PC which is Dead with no display on monitor.

PROBLEM TREE : PT- 01

Observed symptom : Dead

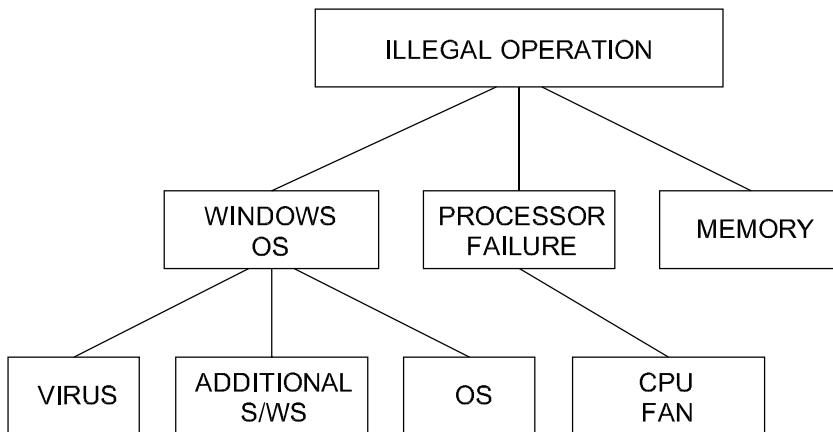
Additional symptom : No display



PROBLEM TREE : PT- 02

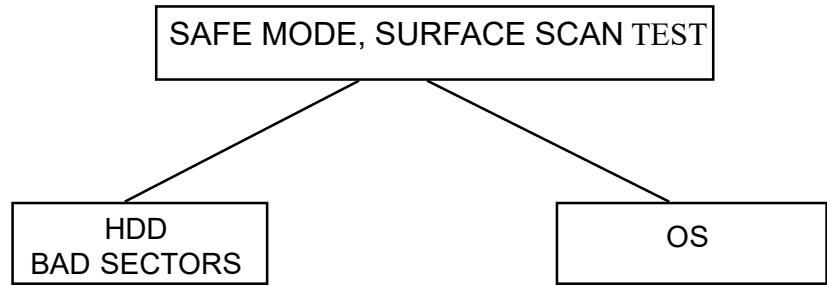
Observed symptom : Windows shows “illegal operation”

Additional symptom : Windows not working



Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”.

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

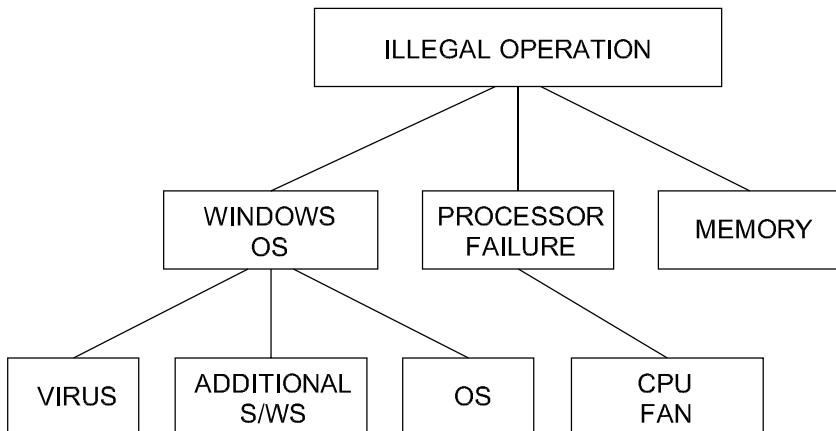


Discuss the Troubleshooting chart (TSC-01) and Service flow sequence (SFS-01) for the complaint “When windows is started system runs surface test and goes to safemode” referring to exercise 2.33

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 02

Observed symptom : Windows shows “illegal operation”
Additional symptom : Windows not working

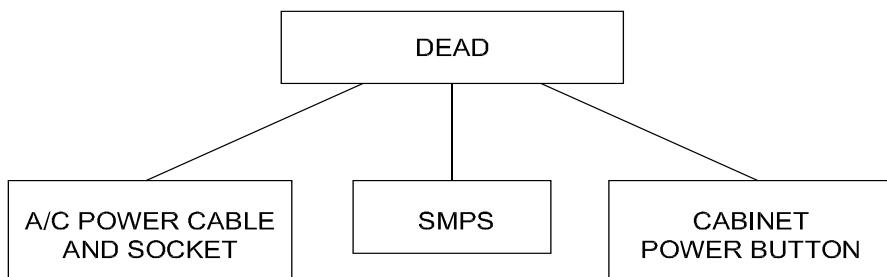


Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 03

Observed symptom : DVD drive can't read
Additional symptom :



Application softwares

Objective: At the end of this lesson you shall be able to

- describe various software types.

Application software

Application software is a term which is used for software created for a specific purpose. It is generally a program or collection of programs used by end users. It can be called an application or simply an app.

In fact all the software other than system software and programming software are application software.

Application software definition

A software which is developed to help the user to perform specific tasks is called application software.

The different types of application software include the following:

Application Software Type	Examples
Word processing software	MS Word, WordPad and Notepad
Database software	Oracle, MS Access etc
Spreadsheet software	Apple Numbers, Microsoft Excel
Multimedia software	Real Player, Media Player
Presentation Software	Microsoft Power Point, Keynotes
Enterprise Software	Customer relationship management system
Information Worker Software	Documentation tools, resource management tools
Educational Software	Dictionaries: Encarta, Britannica Mathematical: MATLAB Others: Google Earth, NASA World Wind
Simulation Software	Flight and scientific simulators
Content Access Software browsers	Accessing content through media players, web
Application Suites	OpenOffice, Microsoft Office
Software for Engineering and Product Development	IDE or Integrated Development Environments

There are various different types of application software such as licensed, sold, freeware, shareware and open source.

Application software's either need to be installed or can run online. Application software's can also be distinguished on the basis of usage into the following:

- Utility programs
- Generic programs
- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software
- Database software
- Presentation software
- Internet Browsers
- Email Programs
- Graphic Programs (Pixel based)
- Graphic Programs (vector based)
- Communication software: Communication through audio, video or chat based means

Bluetooth devices

Objectives : At the end of this lesson you shall be able to

- describe the meaning of Bluetooth
- describe the method of using Bluetooth
- list the major applications of Bluetooth.

Introduction:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the range 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). It is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device.

It can connect up to eight devices (items of electronic equipment) at the same time. The chip can be plugged into items such as computers, digital cameras, mobile phones and faxes. Bluetooth is particularly convenient in certain situations - for example, when transferring files from one mobile phone to another without cables. Sending music and photos between a PC and a mobile phone is another useful application.

Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a quasi optical wireless path must be viable.

Range is power-class-dependent, but effective ranges vary in practice varying from 10 to 100 m.

The name 'Bluetooth' reflects the Scandinavian origins of the technology. It is named after a 10th century Danish viking, King Harald Blåtand (translating as 'Bluetooth' in English). He united and controlled Denmark and Norway, hence the association of uniting devices through Bluetooth.

Using Bluetooth

To use Bluetooth, the device must be Bluetooth enabled. For this purpose a device called "Dongle" may be used. A dongle is a device that plugs into the computer to enable it to use Bluetooth. Every manufacturer of compatible devices will have their own instructions for accessing Bluetooth. For detailed instructions you will need to see the manual, but as a general guide:

To set up Bluetooth:

(Identify the blue tooth icon on devices.)

- 1 Turn on, or enable, Bluetooth. Ensure your device is 'visible' and not 'hidden', so other nearby devices can pick up the signal.
- 2 Give your device a name to identify it when connecting to other compatible equipment.

When devices like mobile phones, laptops, tablets etc. enable Bluetooth the Bluetooth icon is on.

To establish a Bluetooth connection:

- 1 Find the file you wish to send.
- 2 Select the option to send it via Bluetooth - your device will search for other devices within range and display them.
- 3 Scroll to the device you wish to connect with and select it.
- 4 If the other device needs 'pairing', you will need to enter a passcode - a bit like a PIN number - and make sure it is entered on the other device.

When the connection is established, the data will start to send. You do not need worry about a clear line of sight between devices.

List of Bluetooth applications

Some of the Bluetooth applications are as follows:

Wireless control of and communication between a mobile phone and a handsfree headset.(Refer fig. 1)

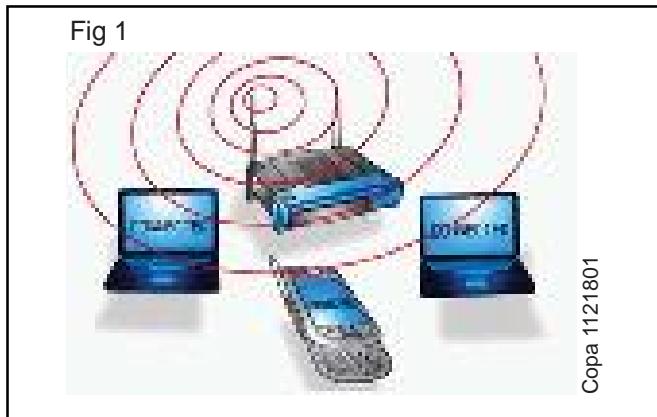


- Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.
- Wireless control of and communication with tablets and speakers such as iPad and Android devices.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being the mouse, keyboard and printer.

- Transfer of files, contact details, calendar appointments, and reminders between devices with OBEX(Objects exchange).
- Replacement of previous wired RS-232 serial communications in test equipment, GPS receivers, medical equipment, bar code scanners, and traffic control devices.
- Wireless bridge between two Industrial Ethernet networks.
- Wireless controllers in gaming consoles.
- Personal security application on mobile phones for prevention of theft or loss of items. The protected item has a Bluetooth marker (e.g., a tag) that is in constant communication with the phone. If the connection is broken (the marker is out of range of the phone) then an alarm is raised.

Wi-Fi:

Wi-Fi is a popular wireless networking technology. Wi-Fi stands for "wireless fidelity". The Wi-Fi was invented by NCR corporation/AT&T in Netherlands in 1991. By using this technology we can exchange the information between two or more devices. Wi-Fi has been developed for mobile computing devices, such has laptops, but it is now extensively using for mobile applications and consumer electronics like televisions, DVD players and digital cameras. There should be two possibilities in communicating with the Wi-Fi connection that may be through access point to the client connection or client to client connection. Wi-Fi is a one type of wireless technology. It is commonly called as wireless LAN (local area network). Wi-Fi allows local area networks to operate without cable and wiring. It is making popular choice for home and business networks. A computer's wireless adaptor transfers the data into a radio signal and transfers the data into antenna for users.

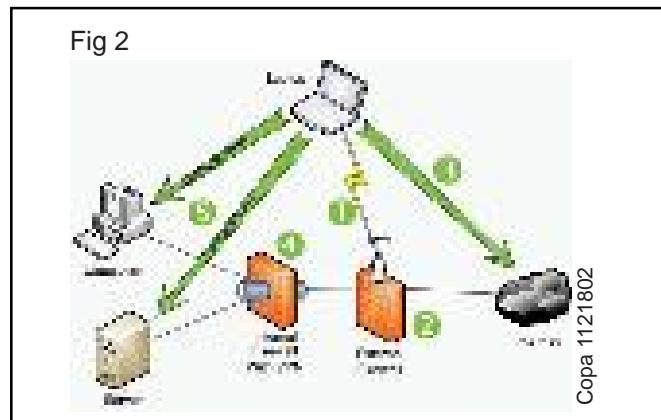


Working Principle:

Wi-Fi is a high speed internet connection and network connection without use of any cables or wires. The wireless network is operating three essential elements that are radio signals, antenna and router. The radio waves are keys which make the Wi-Fi networking possible. The computers and cell phones are ready with Wi-Fi cards. Wi-Fi compatibility has been using a new creation to constituent within the ground connected with community network. The actual broadcast is connected with in sequence in fact it is completed by way of stereo system surf as well as the worth of wires with monitor to classification prone. Wi-Fi allows the person in order to get access to web any place in the actual provided area.

And can now generate a system within Resorts, library, schools, colleges, campus, personal institutes, as well as espresso stores as well as on the open public spot to help to make the company much more lucrative as well as interact with their own customer whenever. Wi-Fi compatibility can make surf with stare to company using their inspiring cable television much a smaller amount force down.

The radio signals are transmitted from antennas and routers that signals are picked up by Wi-Fi receivers, such has computers and cell phones that are ready with Wi-Fi cards. Whenever the computer receives the signals within the range of 100-150 feet for router it connect the device immediately. The range of the Wi-Fi is depends upon the environment, indoor or outdoor ranges. The Wi-Fi cards will read the signals and create an internet connection between user and network. The speed of the device using Wi-Fi connection increases as the computer gets closer to the main source and speed is decreases computer gets further away.



Security:

Security is impairment element in the Wi-Fi technology. Security is our personal decision but having a wireless connection we should pay attention to protect our private details. We can connect easily to unsecured wireless routers. The problem is any one is connected to the wireless router using the data like download games, download apps and planning terrorist activities, sharing illegal music and movie files etc. So it is necessary to provide security to the wireless technologies based devices.

DVDs, CDs and burning DVDs

Objectives : At the end of this lesson you shall be able to

- describe the features of CDs & DVDS
- describe the main formats of DVDs
- describe DVD burning
- describe the features of CDs.

Introduction

DVD (sometimes called as "digital video disc" or "digital versatile disc") is a digital optical disc storage format. DVDs can be used with many types of players, including PCs and standalone players.

These discs are known as DVD-ROM, because data can only be read and not written or erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased multiple times.

DVD features and formats

DVDs are used in DVD-Video consumer digital video format and in DVD-Audio consumer digital audio format. They can also be used in a special AVCHD format (Advanced Video Coding High Definition) often used with AVCHD format camcorders. DVDs containing other types of information may be referred to as DVD data discs.

A typical recordable DVD can hold about 4.7 gigabytes (GB). However, the total amount of disc space that you can use to burn files to the disc is less than the amount that's often listed on the disc itself. This is because the disc capacity is calculated differently when it's used in a computer. For example, a typical DVD-R that has a listed disc capacity of 4.7 GB can only store about 4.37 GB of data on the disc. DVDs offer a storage capacity of approximately 4.7 GB. DVD discs do not deteriorate over time and are unaffected by magnetic fields.

The type of recordable disc to be used depends on a few different factors, such as:

- The types of recordable discs that work with the disc burner.
- The disc drive on the computer or device will read the disc after it is burned.
- The total size of all the files that will be burned on to a disc.

DVD burning

The process of recording source material onto an optical disc (CD or DVD) is called burning / writing or optical disc authoring. Creating an optical disc usually involves first creating a disk image with a full file system designed for the optical disc, and then actually burning the image to the disc. Many programs are available as bundled applications to create the disk image and burn the files.

The speed at which a DVD can be written is expressed as a multiplier: 16X means 16 times faster than just playing it. Speeds up to 52X are also very common.

CD or DVD formats

For burning DVDs, the two main disc formats in use are:

- Live File System and
- Mastered disc formats.

Live File System format :

Discs that use the Live File System format are often more convenient because you can copy selected files immediately and as often as you want, just like you can with a USB flash drive. This is convenient if you want to keep a disc in your CD, DVD, or Blu ray Disc burner and copy files whenever the need arises. In this format you can copy and erase files over and over again. However, the Live File System optical disc format is only readable by Windows 7, Windows Vista, and Windows XP systems. These discs are not blank after they're formatted.

Discs formatted in this format have the option name in the Burn a Disc dialog box: "Like a USB flash drive."

Mastered disc formats:

If we want to create an optical disc that can be used to transfer data files to older versions of the Windows operating system or even to another operating system, we need to use the Mastered optical disc format. Also if we want to burn music or pictures and use the disc in regular CD, DVD, or Blu ray Disc players that can play MP3 files and show digital pictures, we should use the Mastered optical disc format.

The Mastered format works just like burning CDs in Windows XP. In other words, when we write the disc, we copy a file or a group of files to the optical disc all at once. Once this is done, the disc is closed and we cannot copy more files to the disc nor can we delete the existing files. Hence it is recommended not to copy files immediately; it is a good practice to assemble the entire collection of files that needed to be copied to the disc and then burn them all at once.

Discs formatted with the Mastered option have the option in the Burn a Disc dialog box: "With a CD/DVD player."

There are many types of tools available to create data, music, video and audio discs. We can also create

backups that span across multiple discs, rip music tracks from Audio CDs and create or burn disc images in different formats. They may also provide features like automatic audio conversion from WAV, MP3, FLAC, WMA files, disc copying, compressed file backup and restore, disk erasing, VCD/SVCD support, project burning etc..

Blu - ray Discs

Blu-ray, also known as Blu-ray Disc (BD) is the name of a new optical disc format that is rapidly replacing DVD. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc.

The name Blu-ray is derived from the underlying technology, which utilizes a blue-violet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). They are referred to as "Blu-ray" discs or BDs.

The following formats are part of the present day Blu-ray Disc specification:

- 1 BD-ROM - read-only format for distribution of HD movies, games, software, etc.
- 2 BD-R - recordable format for HD video recording and PC data storage.
- 3 BD-RE - rewritable format for HD video recording and PC data storage.

At present, a single-layer disc can hold 25GB and a dual-layer disc can hold 50GB. Over 9 hours of high-definition (HD) video on a 50GB disc. About 23 hours of standard-definition (SD) video on a 50GB disc.

Command line interface with DOS

Objectives: At the end of this lesson you shall be able to

- describe the hierarchical directory system in DOS
- use dos commands to create directories and subdirectories
- use dos commands to change and list directory
- use dos commands to access specific files.

Hierarchical Directory System: Hierarchy in simple terms, is, organisation or an arrangement of entities. Entities can be anything such as objects, files, people, ideas, or any other thing.

Arrangement refers to, for example, Currency can be arranged by denomination. Pebbles can be arranged by their size .

There are many other ways to organize entities besides hierarchically. But, hierarchical organization is special because by this arrangement you can name each entity by its relationship to other entities.

In DOS, entities are the *Directories* in a directory system. Here, the hierarchy begins with the essential *core* or *root entity*. For instance, in a family tree, we may consider great-great-grand father who was the root cause of our existence as the core entity. In DOS , this core entity is referred to as the *the root directory*.

As in the example considered above, if we consider great-great-grandfather as the *root directory*, then, great-grand father, grand father, father are referred as *sub directories*. So the directories under the root directory are called subdirectories in DOS. These subdirectories can trace their paths back to the root directory.

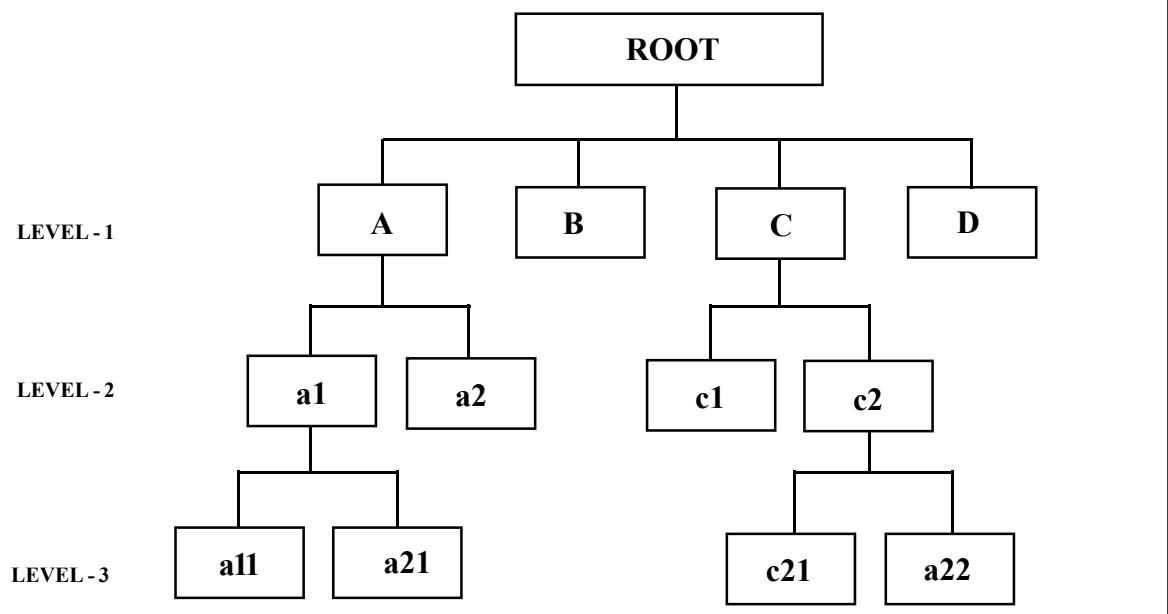
The DOS hierarchical file system is called a *tree-structured file system*. At the base of this tree structure is the root directory.

In a family tree, say, Govinda is the son of Rajappa, who is son of Ramappa who is son of Venkappa. Venkappa is the head or root of the family tree for Govinda.

One can create many directories from the root. The root will then be the parent of each of these directories. You can also create subdirectories that stem from other subdirectories that stem from other subdirectories and so on. These new subdirectories have a subdirectory as their parent directory. How subdirectories are arranged hierarchically from the root is illustrated in Fig 1. The DOS directory system is often called a *tree-structured directory system*.

Three levels of subdirectories are represented in Fig 1. Regardless of the number of levels, the relationship of the subdirectories is important. Each subdirectory, as well as the root directory, can contain user files. Two files can have the same file name and extension as long as the files reside in different directories. This is because, DOS needs to know which of two same-named files your command specifies. For this, DOS needs the name of the directories, starting from the root, that lead to the desired file. This sequence of directory names leading to a file is called a *path*.

Fig 1



A path is a chain of directory names that tell DOS how to find a file that you want. Each directory is separated from the other by a ‘\’ character. This ‘\’ is referred to as the DOS *directory delimiter*. A files full path name including the drive specifier (C: or D: etc.,) is the absolute indicator of where the file is located. Typical path notation are given below;

D:\Animals\Domestic\Pets\Dog.txt
C:\Admin\Accounts\Tours\Bata.txt

Further details of path and directory structure will be discussed at appropriate lessons.

DOS COMMANDS

1 MKDIR Makes or Creates a new Directory.

or

MD

Syntax

MKDIR C:pathname\dirname

Or

MD d:pathname\dirname

Where,

C: is the disk drive for the sub directory

path\ indicates the path to the directory that will hold the subdirectory being created.

dirname is the name of the subdirectory being creating.

Switch

(None)

Important Notes

- **MKDIR or its short form MD makes new subdirectories under the selected root directory.**
- It is possible to create as many subdirectories as you want , but remember: *DOS accepts no more than 63 characters, including backslashes, for the path name.*
- Do not create too many levels of subdirectories and with long names.
- You cannot create a directory name that is identical to a file name in the current directory.

For example, if you have a file named FLIES in the current directory, you cannot create a subdirectory by the name FLIES in this directory. However, if the file FLIES is given an extension FLIES.DOC , then the names will not conflict and you can create a subdirectory by name FLIES.

Examples

To create the subdirectory by name **Drivers** under the **current drive**, the instruction will be,

MKDIR\Drivers

Or

MD\Drivers

C:\Devices>MD \Printers

This instruction creates a subdirectory by name **Printers** under the current drive C:. Note that although the command is issued from another subdirectory named devices, the newly created subdirectory **Printers** does not get created under the directory Devices but directly under the root C:. This may be verified by issuing DIR command under C:\ and under C:\Devices.

To create a subdirectory under the directory Devices the instruction will be,

C:\Devices>MD Printers

Discuss the following different varieties of creating directories:

C:\Devices\Printers>MD C:\Devices\Plotters

2 CHDIR or CD

Changes or shows the path of the current directory.

Syntax

CHDIR d: path

Or, using the short form:

CD d : path

D : path are valid disk drive and directory names.

Switch

(None)

You have two methods for maneuvering through the hierarchical directories with CD: (1) starting at the root , or top, directory of the disk and moving down, or (2) starting with the current directory and moving in either direction.

To start at the root directory of a disk, you must begin the path with the path character (\), as in \ or B:\. When DOS sees \ as the first character in the path, the system starts with the root directory. Otherwise, DOS starts with the current directory.

Changing Drives: Computer will have built in memory, the hard disk and it will also have provision to store/read data from floppy disk, compact disk etc. Every disk is identified by a name such as C drive, A drive, B drive etc. C drive is represented by C: and A drive is represented by A: and so on. DOS allows to change from current or default drive by typing the letter identification of disk drive desired followed immediately by a colon as shown in the example below:

C> a:

This command instructs to change control from **C** drive to **D** drive.

If the disk drive is not accessed due to non availability of floppy or any other reason, DOS will display an error message

Not ready error reading drive A

Abort, Retry, Fail ?

It is required to press either A,R or F keys, which are defined below

A Directs DOS to abort the command that was responsible for the error. If this option is selected DOS will terminate the command and redisplay prompt.

R Directs DOS to retry the command that caused the error. In most cases this option is selected to correct the problem that was causing the error. (Floppy disk might not be inserted).

F Directs DOS to ignore the error and attempt to continue processing. In some cases DOS will have an error when it reads a portion of disk.

DOS COMMAND

DIR Displays a list of files and subdirectories in a directory.

Syntax

```
DIR C:pathname [/P] [/W] [/A[[:]attribs]] [/O[[:]sortord]]  
[/S] [/B] [/L] [/C[H]]
```

Where,

- **C:** is the disk drive holding the directory for displaying list of files and subdirectories
- **path/** specifies directory and/or files to list.
- **filename** specifies file or list of files to display, if file name is not specified all the files in the directory will be listed.
- **[/P] [/W]** specifies the switches for formatting the output.

Switch

/ P Pauses after each screenful of information and waits to press any key. On pressing any key another screenful or remaining information will be displayed. Command is DIR/P

/ W Uses wide format of 80-column to display file names only and information about file size, date, and time is not displayed. Command is DIR/W

/ A Displays files with specified attributes.

attribs

D Directories

R Read-only files

H Hidden files

S System files

A Files ready to archive - Prefix meaning "not"

/ O List be files in sorted order.

sorted N By name (alphabetic)

S By size (smallest first)

E By extension (alphabetic)

D By date & time (earliest first)

G Group directories first

- Prefix to reverse order

C By compression ratio (smallest first)

/ S Displays files in specified directory and all subdirectories.

/ B Uses bare format (no heading information or summary).

/ L Uses lowercase.

/ C[H] Displays file compression ratio; /CH uses host allocation unit size.

Important Notes:

- In the directory listing similar files can be listed by using wildcards (* and ?), where (*) star and (?) question mark are called wild characters or wild cards. * can replace remaining characters and ? can replace any single character.
- When DIR is used without parameters or switches, It displays the disks volume label and serial number; one directory or filename per line, including the file size in bytes, and the date and time the file was modified; and the total number of files listed, their cumulative size and the free space (in bytes) remaining on the disk.

Examples

DIR *.txt

*.txt instruction will list all files having txt extension in the specified directory.

DIR ???T.*

???T instruction will search for files having four characters which ends with T like TEST, REST etc. And * instructs that these files may have any extension like .txt, .dat etc.

Methods to display the contents of a text file

Objectives: At the end of this lesson you shall be able to

- use DOS commands to display the contents of a text file
- use DOS commands to copy, rename, delete and undelete files.

DOS Commands

TYPE Displays the contents of a text file.

Syntax

TYPE C:path/filename

Where,

- **C:** is the disk drive holding the file for displaying.
- **path/** Specifies the location of file for displaying.
- **filename** specifies file to display.

Switch

(none)

Important notes:

- **TYPE** command provides a quick way to display contents of an ASCII file without having to use another program. The file is stored on the disk as ASCII (American Standard code for Information Interchange) text which is standard way the computer translates binary (ones and zeros) into letters, numbers & symbols. If the information is not stored in the ASCII format, on using TYPE command the information will look like gibberish.
- On issuing command DOS will look in drive specified, moves into the path to reach the filename specified. Then it simply translates ASCII format into the characters, numbers and symbols and displays on the monitor. The video monitor can show 24 lines of information only. If the file contains more than 24 lines starting lines can not be seen since the type command simply scrolls all information on to the screen. Scrolling can be controlled by pressing Control + S keys together (on holding control key press S key and release both the keys is called as Control + S) scrolling of information will stop on the monitor. After viewing the contents on the screen any key can be pressed to scroll through the remaining contents. To view the contents of the file screen page by screen page, MORE command can also be used. which will stop the scrolling of information on the screen exactly after a screen page and in the screen page at 24 line a prompt message — More— is displayed. After pressing any key another screen page will be displayed. MORE is a filter e.g. it is a program that manipulates the stream of standard characters to the file to the standard output (monitor) screen page by screen page.

Examples

1 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt**

C:\COPA\ DOS\ PRACT_3 is the path to the file TEST.txt and TYPE is the command to be executed by DOS.

2 C:\>TYPE C:\COPA\ DOS\ PRACT_3>**TEST1.txt**

This results in the same output as in example1. While working from C: (C drive) this command can be issued without changing the directories.

3 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt | MORE**

This will also result in the same output but displayed screen page by screen page. Screen page can be changed on press of any key. Along with MORE another character is prefixed ‘|’ this is called the piping command, Which will route the output of TYPE command to another command MORE and the MORE filter outputs the information.

Renaming of file(s)

RENAME This command allows to change

Or the name of a file.

REN

Syntax

REN C: PATH\filename1.ex1 filename2.ex2

Where,

- **C:** is the disk drive holding the file for displaying.
- **PATH/** Specifies the location of file for displaying.
- **filename1.ex1** is the file to be renamed
- **filename2.ex2** is the new filename

Important Notes:

- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be renamed.
- A valid file name with appropriate extension is to be given for new filename.
- Wild characters are permitted in the file names by which required group of files can be renamed.

- Only file names will be changed and contents remain same.
- If attempted to change a file name to a name that already exists in the directory.

DOS prompts an error message

Duplicate file name or file not found

- If a invalid file name or the new name is not given, then also DOS prompts an error message

Rules for the file names.

- A File name must have 1 to 8 characters.
- An optional extension of 1 to 3 characters
- A period (.) between the name and extension name, if extension is used
- All letters from A through Z (lower case letters are automatically transferred to uppercase), 0 to 9 numbers and special characters & symbols \$ # & @ ! ^ () _ - { } ' ~ are permitted in the file name.
- The control characters such as Esc, Del, or space bar cannot be used in the file name.
- The characters + = / [] : ; ? * < > : are not permitted.
- Each file name in a directory must be unique.

Examples:

1 C:\COPA\ DOS\ PRACT_3>REN TEST2.txt
CHECKED.txt

C:\COPA\ DOS\ PRACT_3\ is the drive and path to the TEST2.txt file

TEST2.txt is the file name to be renamed

CHECKED.txt is the new filename

2 C:\COPA\ DOS\ PRACT_3>REN *.pic *.jpg the pic extension will be changed to jpg extension files.

Copying files:

COPY Copies one or more files to another location.

Syntax

COPY [/A | /B] source [/A | /B] [+ source [/A | /B] [+ ...]] [destination[/A | /B]] [/V] [/Y | /-Y] source specifies the file or files to be copied. Destination specifies the directory and/or filename for the new file(s).

Switches

/A Indicates an ASCII text file.

/B Indicates a binary file.

/V Verifies that new files are written correctly.

/Y Suppresses prompting to confirm you want to overwrite an existing destination file.

/-Y Causes prompting to confirm you want to overwrite an existing destination file.

Instructor shall discuss the simple switches with at least two examples in each case .

For further details on COPY command switches refer any tutorial or hand book on DOS

Important Notes:

- DOS command COPY can duplicate one or more files. In the same directory with different names or from one directory to other directory either in the same name or in different name.
- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used.
- Exact file name with extension is to be given for the file to be copied
- A valid file name with appropriate extension is to be given for new copied filename
- Wild characters are permitted in the file names by which required group of files can be copied
- On copying, both source and target files will have same contents.
- Copy overwrites the target file with the same name
- Copy will not allow to copy a file to it self that is source and target files should not be same
- If the destination file name is not specified while concatenation the first file name will become the destination name. After the first file name, additional source files must be preceded by a plus (+) sign.

Example

1 C:\COPA\ DOS\ PRACT_3>**COPY TEST2.txt TRIAL.txt**

With the above command C:\COPA\ DOS\ PRACT_3 directory TEST2.txt file will be copied as TRIAL.txt file in the same directory. On listing the directory both the files will have same details and on viewing the contents of both the file will be same. After copying DOS prompts a message 1 file copied

2 C:\COPA\ DOS\ PRACT_3>**COPY *.bmp *.pic**

With the above command C:\COPA\ DOS\ PRACT_3 directory all files with bmp extension file will be copied as pic extension files in the same directory. While copying DOS prompts the name of file it has copied and after completion of copying it prompts the number of files copied.

3 C:\COPA\ DOS\ PRACT_3>**COPY *.pic C:\COPA\ DOS\ PRACT_4**

All files with pic extension in C:\COPA\ DOS\ PRACT_3 directory will be copied to C:\COPA\ DOS\ PRACT_4 directory with same name & extension.

Using *.* after the copy command will copy all files with all extension to the destination.

Copy concatenating: Multiple file can be combined to form a single file by use of + between the source files and is called as concatenation

Example 4 C:\COPA\ DOS\ PRACT_3\ COPYTEST2.txt
+ TRIAL.txt CONCAT1.txt

With the above command TEST2.txt and TRIAL.txt will be combined and CONCAT1.txt file will be created which will have the contents of first two source files.

Deleting file

DEL Deletes the files specified.

or

Erase

Syntax

DEL C: path/filename [/P]

ERASE C: path/filename [/P]

Where,

- **C:** is the disk drive holding the file to be deleted.
- **path/** Specifies the location of file to be deleted.
- **filename** is the file to be deleted

Switch

/P Prompts for confirmation before deleting the specified file. Using the /P switch

If the /P switch is used, DEL displays the name of a file and prompts with a message in the following format:

filename, Delete (Y/N)?

Press Y to confirm the deletion, N to cancel the deletion and display the next filename (if a group of files are specified), or CRTL+C to stop the DEL command.

Important Notes

- If the drive is not specified current disk drive will be used
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be deleted
- Wild characters are permitted in the file names by which required group of files can be deleted
- On deleting, files name(s) will be removed from the directory.
- All the files in a directory can be deleted by typing the DEL command followed by [drive:]path. Wildcard also can be used (*) and (?) to delete more than one file at a time. However, Wildcards should be used cautiously with the DEL command to avoid deleting files unintentionally.

The following command is given for deleting all the files.

del *.*

DEL displays the following prompt:

All files in directory will be deleted! Are you sure (Y/N)?

Press Y and then ENTER to delete all files in the current directory, or

press N and then ENTER to cancel the deletion.

- Directories can not be removed with DEL command a separate command is available for removing the directory.
- Once the file is deleted it can not be recovered if the memory space is occupied by a new file. If accidentally file (s) are deleted immediately it can be recovered by using utility command.
- The space occupied by the deleted file on the disk or diskette is freed.
- Check for the typographic errors in the file names before the press of enter key to activate delete command

Example

1 C:\COPA\ DOS\ PRACT_3>DEL TEST2.txt

With the above command TEST2.txt file will be deleted from the C:\COPA\ DOS\ PRACT_3 directory. On listing the directory TEST2.txt will not be available.

2 C:\COPA\ DOS\ PRACT_4>DEL *.txt

With the above command in the C:\COPA\ DOS\ PRACT_4 directory all files with txt extension will be deleted.

3 C:\COPA\ DOS\ PRACT_3\TEMP > DEL *.*

All files with any extension in C:\COPA\ DOS\ PRACT_3\TEMP directory will be deleted.

Recovering deleted files:

UNDELETE delete protection facility

Syntax

UNDELETE C: path/filename [/DT | /DS | /DOS]

UNDELETE [/LIST | /ALL | /PURGE[DRIVE] | / STATUS | /LOAD | /UNLOAD

/UNLOAD | /S[DRIVE] | /T[DRIVE]-entrys]]

Where,

- **C:** is the disk drive holding the files to be undeleted.
- **path/** Specifies the location of file to be undeleted.
- **filename** is the file to be undeleted

Switches

/LIST	Lists the deleted files available to be recovered.
/ALL	Recover files without prompting for confirmation.
/DOS	Recover files listed as deleted by MS-DOS.
/DT	Recover files protected by Delete Tracker.
/DS	Recover files protected by Delete Sentry.
/LOAD	Loads Undelete into memory for delete protection.
/UNLOAD	Unloads Undelete from memory.
/PURGE[drive]	Purges all files in the Delete Sentry directory.
/STATUS	Display the protection method in effect for each drive.
/S[drive]	Enables Delete Sentry method of protection.
/T[drive][-entries]	Enables Delete Tracking method of protection.

Important Notes:

Once a file is deleted from disk, it may not be possible to retrieve it. Although the UNDELETE command can retrieve deleted files, it can do so with certainty only if no other files have been created or changed on the disk. If a file is accidentally deleted and it is required to keep, stop what all other activities on the computer and immediately use the UNDELETE command to retrieve the file.

Example

1 C:\COPA\ DOS\ PRACT_3>UNDELETE TEST2.txt

With the above command TEST2.txt file will be recovered. On listing TEST2.txt file will be available in C:\COPA\ DOS\ PRACT_3 directory.

2 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE

With the above command multiple files can be recovered. DOS will prompt for confirmation of undeletion of each file and asks to type the first letter of the file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

3 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE /ALL

With the above command multiple files can be recovered. DOS will not prompt for confirmation of undeletion of each file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

Introduction to Linux operating system

Objectives: At the end of this lesson you shall be able to

- overview of linux
- define futures of linux
- explain application area of linux
- describe about kernel.

Overview of Linux

The operating system

Developers need special tools (like the compilers and command lines found in GNU) to write applications that can talk to the kernel. They also need tools and applications to make it easy for outside applications to access the kernel after the application is written and installed.

This collective set of tools, combined with a kernel, is known as the operating system. It is generally the lowest layer of the computer's software that is accessible by the average user. General users get to the operating system when they access the command line.

Linux provides powerful tools with which to write their applications: developer environments, editors, and compilers are designed to take a developer's code and convert it to something that can access the kernel and get tasks done.

Like the kernel, the Linux operating system is also modular. Developers can pick and choose the operating tools to provide users and developers with a new flavor of Linux designed to meet specific tasks.

Introduction to Linux

Linux (pronounced Lih-nucks) is a UNIX-like operating system that runs on many different computers. Although many people might refer to Linux as the operating system and included software, strictly speaking, Linux is the operating system kernel, which comes with a distribution of software.

Linux was first released in 1991 by its author Linus Torvalds at the University of Helsinki. Since then it has grown tremendously in popularity as programmers around the world embraced his project of building a free operating system, adding features, and fixing problems.

Linux is popular with today's generation of computer users for the same reasons early versions of the UNIX operating system enticed fans more than 20 years ago. Linux is portable, which means you'll find versions running on name-brand or clone PCs, Apple Macintoshes, Sun workstations, or Digital Equipment Corporation Alpha-based computers. Linux also comes with source code, so you can change or customize the software to adapt to your needs. Finally, Linux is a great operating system, rich in features adopted from other versions of UNIX.

Where is Linux?

One of the most noted properties of Linux is where it can be used. Windows and OS X are predominantly found on personal computing devices such as desktop and laptop computers. Other operating systems, such as Symbian, are found on small devices such as phones and PDAs, while mainframes and supercomputers found in major academic and corporate labs use specialized operating systems such as AS/400 and the Cray OS.

Linux, which began its existence as a server OS and has become useful as a desktop OS, can also be used on all of these devices. „From wristwatches to supercomputers,“ is the popular description of Linux' capabilities.

The future of Linux

Linux is already successful on many different kinds of devices, but there are also many technological areas where Linux is moving towards, even as desktop and server development continues to grow faster than any other operating system today.

Linux is being installed on the system BIOS of laptop and notebook computers, which will enable users to turn their devices on in a matter of seconds, bringing up a streamlined Linux environment. This environment will have Internet connectivity tools such as a web browser and an e-mail client, allowing users to work on the Internet without having to boot all the way into their device's primary operating system—even if that operating system is Windows.

At the same time, Linux is showing up on mobile Internet devices (MIDs). This includes embedded devices such as smart phones and PDAs, as well as netbook devices—small laptop-type machines that feature the core functionality of their larger counterparts in a smaller, more energy-efficient package.

The growth of cloud computing is a natural fit for Linux, which already runs many of the Internet's web servers. Linux enables cloud services such as Amazon's A3 to work with superior capability to deliver online applications and information to users.

Related to Linux' growth in cloud computing is the well-known success of Linux on supercomputers, both in the high-performance computing (HPC) and high-availability (HA) areas, where academic research in physics and bioengineering, and firms in the financial and energy

industries need reliable and scalable computing power to accomplish their goals.

Many of the popular Web 2.0 services on the Internet, such as Twitter, Linked In, YouTube, and Google all rely on Linux as their operating system. As new web services arrive in the future, Linux will increasingly be the platform that drives these new technologies.

Current application of Linux operating systems

Today Linux has joined the desktop market. Linux developers concentrated on networking and services in the beginning, and office applications have been the last barrier to be taken down. They don't like to admit that Microsoft is ruling this market, so plenty of alternatives have been started over the last couple of years to make Linux an acceptable choice as a workstation, providing an easy user interface and MS compatible office applications like word processors, spreadsheets, presentations and the like. On the server side, Linux is well-known as a stable and reliable platform, providing database and trading services for companies like Amazon, the well-known online bookshop, US Post Office, the German army and many others. Especially Internet providers and Internet service providers have grown fond of Linux as firewall, proxy- and web server, and you will find a Linux box within reach of every UNIX system administrator who appreciates a comfortable management station. In post offices, they are the nerve centres that route mail and in large search engine, clusters are used to perform internet searches. These are only a few of the thousands of heavy-duty jobs that Linux is performing day-to-day across the world. It is also worth to note that modern Linux not only runs on workstations, mid- and high-end servers, but also on "gadgets" like PDA's, mobiles, a shipload of embedded applications and even on experimental wristwatches. This makes Linux the only operating system in the world covering such a wide range of hardware.

The code

Linux is also unique from other operating systems in that it has no single owner. Torvalds still manages the development of the Linux kernel, but commercial and private developers contribute other software to make the whole Linux operating system.

The kernel

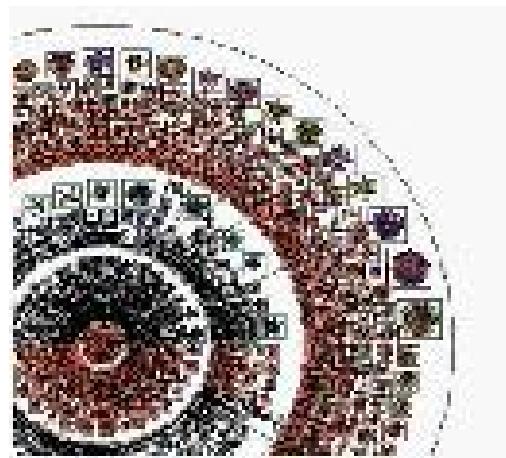
All operating systems have kernels, built around the architectural metaphor that there must be a central set of instructions to direct device hardware, surrounded by various modular layers of functionality. The Linux kernel is unique and flexible because it is also modular in nature.

Modularity is desirable because it allows developers to shed parts of the kernel they don't need to use. Typically a smaller kernel is a faster kernel, because it isn't running processes it does not need.

If a device developer wants a version of Linux to run on a cell phone, she does not need the kernel functionality that deals with disk drives, Ethernet devices, or big monitor screens. She can pull out those pieces (and others), leaving just the optimized kernel to use for the phone.

The kernel of the Window operating system (which few people outside of Microsoft are allowed to look at without

Fig 1



paying for the privilege) is a solidly connected piece of code, unable to be easily broken up into pieces. It is difficult (if not impossible) to pare down the Windows kernel to fit on a phone.

This modularity is significant to the success of Linux. The ability to scale down (or up) to meet the needs of a specific platform is a big advantage over other operating systems constrained to just a few possible platforms.

Modularity also effects stability and security as well. If one piece of the kernel code happens to fail, the rest of the kernel will not crash. Similarly, an illicit attack on one part of the kernel (or the rest of the operating system) might hamper that part of the code, but should not compromise the security of the whole device.

The environments

The windows, menus, and dialog boxes most people think of as part of the operating system are actually separate layers, known as the windowing system and the desktop environment.

These layers provide the human-oriented graphical user interface (GUI) that enables users to easily work with applications in the operating system and third-party applications to be installed on the operating system.

In Linux, there a lot of choices for which windowing system and desktop environment can be used, something that Linux allows users to decide. This cannot be done in Windows and it's difficult to do in OS X.

Like the operating system and kernel, there are tools and code libraries available that let application developers to more readily work with these environments (e.g., gtk+ for GNOME, Qt for KDE).

The applications

Operating systems have two kinds of applications: those that are essential components of the operating system itself, and those that users will install later. Closed operating systems, like Windows and OS X, will not let users (or developers) pick and choose the essential component applications they can use. Windows developers must use Microsoft's compiler, windowing system, and so on.

Linux application developers have a larger set of choices to develop their application. This allows more flexibility to build an application, but it does mean a developer will need to decide which Linux components to use.

The distributions

A Linux distribution is a collection of (usually open source) software on top of a Linux kernel. A distribution (or short, distro) can bundle server software, system management tools, documentation and many desktop applications in a central secure software repository. A distro aims to provide a common look and feel, secure and easy software management and often a specific operational purpose.

Let's take a look at some popular distributions.

Red hat

Red Hat is a billion dollar commercial Linux company that puts a lot of effort in developing Linux. They have hundreds of Linux specialists and are known for their excellent support. They give their products (Red Hat Enterprise Linux and Fedora) away for free. While Red

Hat Enterprise Linux (RHEL) is well tested before release and supported for up to seven years after release, Fedora is a distro with faster updates but without support.

Ubuntu

Canonical started sending out free compact discs with Ubuntu Linux in 2004 and quickly became popular for home users (many switching from Microsoft Windows). Canonical wants Ubuntu to be an easy to use graphical Linux desktop without need to ever see a command line. Of course they also want to make a profit by selling support for Ubuntu.

Debian

There is no company behind Debian. Instead there are thousands of well organised developers that elect a Debian Project Leader every two years. Debian is seen as one of the most stable Linux distributions. It is also the basis of every release of Ubuntu. Debian comes in three versions: stable, testing and unstable. Every Debian release is named after a character in the movie Toy Story.

Other

Distributions like Cent OS, Oracle Enterprise Linux and Scientific Linux are based on Red Hat Enterprise Linux and share many of the same principles, directories and system administration techniques. Linux Mint, Edubuntu and many other ubuntu named distributions are based on Ubuntu and thus share a lot with Debian. There are hundreds of other Linux distributions.

Handling commands and various editors

Objectives: At the end of this lesson you shall be able to

- know about terminal
- explain the command shell
- list out the directory layout of linux
- define the linux commands
- list out the special characters of linux OS
- explain various editors in linux OS.

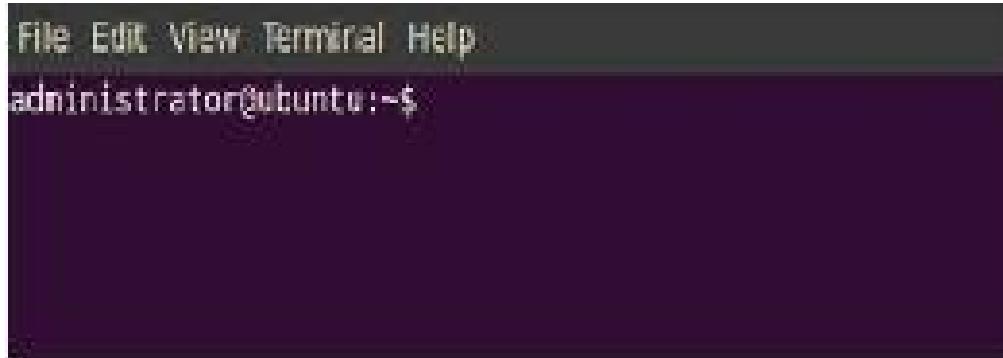
Starting up a terminal

To access the shell we will use a shell-like application, also called a terminal emulator. There is a huge number of good terminal applications out there, including the default ones in GNOME or KDE, or Yakuake, Guake, rxvt and so on. For now let's just stick with the default that

Some of the most popular shells are:

- **bash** - the Bourne-Again Shell, the default shell on most Linux systems.
- **sh** - the Bourne Shell, an older shell which is not so widely used anymore.

Fig 1



comes with your system. If you're using GNOME you can access the terminal by going to **Applications -> Accessories -> Terminal** or pressing Alt+F2 and typing gnome-terminal in the run box that appears, followed by Enter. If you're running KDE you can type instead **console** after pressing Alt+F2.

Depending on the distribution, the prompt may look something like **user@host\$**. The first part before the ampersand is the login username, and the other one is the hostname of the computer.

Command shell

A shell is a **command interpreter** which allows you to interact with the computer. The way things work is pretty simple: you type in commands, the shell interprets them, performs the tasks it was asked to do, and finally it sends the results to the standard output, which is usually the screen.

This is a list of files inside the root directory. The root directory is the first location in the file system tree hierarchy, and it is represented by the **slash** character :/.

- **csh** - the 'C' Shell, which accepts a syntax which resembles the 'C' programming language.
- **tcsh** - an improved version of the 'C' Shell.
- **ksh** - the Korn Shell, initially developed in the early 1980's.
- **dash** - Debian Almquist Shell, a shell created by the Debian distribution.

Listing of shells available in the system

```
$ cat /etc/shells/
```

The above command will display the following output as on Fig 2.

In this tutorial we will focus on **Bash**, since it is the most widely used and also one of the most powerful shells out there. Bash is a modern implementation of the older Bourne Shell (**sh**), developed by the GNU project, which provides a huge amount of tools and which, together with the Linux kernel, desktop environments like GNOME or KDE and applications which run on top of them, comprise the whole Linux platform. On a Debian or Ubuntu distribution, the default shell used by the system is specified in the file **/etc/passwd** (default being Bash).

Fig 2

```
File Edit View Terminal Help
administrator@ubuntu:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/csh
/bin/sh
/usr/bin/es
/usr/bin/ksh
/bin/ksh
/usr/bin/rc
/usr/bin/tcsh
/bin/tcsh
/usr/bin/esh
/bin/dash
/bin/bash
/bin/rbash
/usr/bin/screen
administrator@ubuntu:~$
```

How to display default shell in the system

Type the following command in the terminal

\$ echo \$SHELL

And press Enter key. The default shell will be displayed as on Fig 3.

Fig 3

```
File Edit View Terminal Help
administrator@ubuntu:~$ echo $SHELL
/bin/bash
administrator@ubuntu:~$
```

The Linux directory layout

Directory	Description
	The nameless base of the file system. All other directories, files, drives, and devices are attached to this root. Commonly (but incorrectly) referred to as the "slash" or "/" directory. The "/" is just a directory separator, not a directory itself.
/bin	Essential command binaries (programs) are stored here (bash, ls, mount, tar, etc.)
/boot	Static files of the boot loader
/dev	Device files. In Linux, hardware devices are accessed just like other files, and they are kept under this directory.
/etc	Host-specific system configuration files.
/home	Location of users' personal home directories (e.g. /home/Susan).
/lib	Essential shared libraries and kernel modules.
/proc	Process information pseudo-file system. An interface to kernel data structures
/root	The root (super user) home directory.
/sbin	Essential system binaries (fdisk, fsck, init, etc.).
/tmp	Temporary files. All users have permission to place temporary files here.
/usr	The base directory for most shareable, read-only data (programs, libraries, documentation, and much more).
/usr/bin	Most user programs are kept here (cc, find, du, etc.).
/usr/include	Header files for compiling C programs.
/usr/lib	Libraries for most binary programs
/usr/local	"Locally" installed files. This directory only really matters in environments where files are stored on the network. Locally-installed files go in /usr/local/bin, /usr/local/lib, etc.). Also often used for Software packages installed from source, or software not officially shipped with the distribution.
/usr/sbin	Non-vital system binaries (lpd, useradd, etc.)
/usr/share	Architecture-independent data (icons, backgrounds, documentation, terminfo, man pages, etc.).
/usr/src	Program source code. E.g. The Linux Kernel, source RPMs, etc.
/usr/X11R6	The X Window System
/var	Variable data: mail and printer spools, log files, lock files, etc.

What are Linux commands?

Linux commands are executable binary files which can be ran to perform certain tasks, like for example listing the files in a directory running an entire graphical application. Examples of frequently used commands are ls, cd, pwd, date or cat. With the exception of executable files, there is also a category called shell built-ins, which are commands provided by the shell itself (Bash in our case). We'll deal with those later.

The general form of a Linux command is:

command options(s) filename(s)

Which specifies a command, followed by one or more parameters, and optionally one or more files to apply it on. For example:

```
$ echo -e 'Hello, world!\n'
```

Will output the text 'Hello, world!' followed by a newline character. The **-e** parameter (also called argument, or switch in this case) tells the echo command to interpret escaped characters, like the trailing **\n**, which will add a newline after the text inside the single quotes. Ignore the leading dollar sign, it just signifies the shell prompt.

A command may or may not have arguments. An argument can be an option or a filename.

Special characters in linux operating system

It is important to know that there are many symbols and characters that the shell interprets in special ways. This means that certain typed characters: a) cannot be used in certain situations, b) may be used to perform special operations, or, c) must be "escaped" if you want to use them in a normal way.

Character	Description
\	Escape character. If you want to reference a special character, you must "escape" it with a backslash first. Example: touch /tmp/filename*
/	Directory separator, used to separate a string of directory names. Example: /usr/src/linux
.	Current directory. Can also "hide" files when it is the first character in a filename.
..	Parent directory
~	User's home directory
*	Represents 0 or more characters in a filename, or by itself, all files in a directory. Example: pic*2002 can represent the files pic2002, picJanuary2002, picFeb292002, etc.
?	Represents a single character in a filename. Example: hello?.txt can represent hello1.txt, helloz.txt, but not hello22.txt
[]	Can be used to represent a range of values, e.g. [0-9], [A-Z], etc. Example: hello[0-2].txt represents the names hello0.txt, hello1.txt, and hello2.txt
	"Pipe". Redirect the output of one command into another command. Example: ls more
>	Redirect output of a command into a new file. If the file already exists, over-write it. Example: ls > myfiles.txt
>>	Redirect the output of a command onto the end of an existing file. Example: echo .Mary 555-1234. >> phonenumbers.txt
<	Redirect a file as input to a program. Example: more < phonenumbers.txt
;	Command separator. Allows you to execute multiple commands on a single line. Example: cd /var/log ; less messages

The cd command

The cd command is used to change the current directory (i.e., the directory in which the user is currently working) in Linux and other Unix-like operating systems. It is similar to the CD and CHDIR commands in MS-DOS.

cd's syntax is

cd [option] [directory]

The items in square brackets are optional. When used without specifying any directory name, cd returns the user to the previous current directory. This provides a convenient means of toggling between two directories.

When a directory name is provided, cd changes the current directory to it. The name can be expressed as an absolute pathname (i.e., location relative to the root directory) or as a local pathname (i.e., location relative to the current directory). It is usually more convenient to use a local pathname when changing to a subdirectory of the current directory.

As an example, the following would change the current directory, regardless of where it is on the system (because it is an absolute path), to the root directory (which is represented by a forward slash):

cd /

Likewise, the following would change the current directory, regardless of its location, to the /usr/sbin directory (which contains non-vital system utilities that are used by the system administrator):

cd /usr/sbin

If a user currently in the directory /usr/local/share/man/ desired to change to the directory /usr/local/share/man/man2, which is a subdirectory of the current directory, it would be possible to change by using the absolute pathname, i.e.,

cd /usr/local/share/man/man2

However, it would clearly be much less tedious to use the relative pathname, i.e.,

cd man2

On Unix-like operating systems the current directory is represented by a singledot and its parent directory (i.e., the directory that contains it) is represented by two consecutive dots. Thus, it is possible (and often convenient) to change to the parent of the current directory by using the following:

cd ..

Another convenient feature of cd is the ability for any user to return directly to its home directory by merely using a tilde as the argument. A home directory, also called a login directory, is the directory on a Unix-like operating system that serves as the repository for a user's personal files, directories and programs. It is also the directory that a user is first in after logging into the system. A tilde is a short, wavy, horizontal line character that represents the

home directory of the current user. That is, any user can return immediately to its home directory by typing the following and then pressing the Enter key:

cd ~

This is easier than typing the full name of the user's home directory, for instance, /home/josephine in the case of a user named josephine. (And it is just one of the numerous shortcuts that help make the command line on Unix-like operating systems so easy to use.)

When followed by a space and then a hyphen, cd both returns the user to the previous current directory and reports on a new line the absolute pathname of that directory. This can further enhance the already convenient toggling capability of cd. Toggling is particularly convenient when at least one of the two directories has a long absolute pathname, such as /usr/local/share/man/man2.

cd has only two options, and neither of them are commonly used. The -P option instructs cd to use the physical directory structure instead of following symbolic links. The -L option forces symbolic links to be followed.

The pwd command

The pwd command reports the full path to the current directory.

The current directory is the directory in which a user is currently operating while using a command line interface. A command line interface is an all-text display mode and it is provided via a console (i.e., a display mode in which the entire screen is text only) or via a terminal window (i.e., a text-only window in a GUI).

The full path, also called an absolute path, to a directory or file is the complete hierarchy of directories from the root directory to and including that directory or file. The root directory, which is designated by a forward slash (/), is the base directory on the filesystem (i.e., hierarchy of directories), and it contains all other directories, subdirectories and files on the system. Thus, the full path for any directory or file always begins with a forward slash.

pwd is one of the most basic commands in Linux and other Unix-like operating systems, along with ls, which is used to list the contents of the current directory, and cd, which is used to change the current directory.

pwd's syntax is

pwd [option]

Unlike most commands, pwd is almost always used just by itself, i.e.,

Pwd

That is, it is rarely used with its options and never used with arguments (i.e., file names or other information provided as inputs). Anything that is typed on the same line after pwd, with the exception of an option, is ignored, and no error messages are returned.

As an example, if a user with the username janis is in its home directory, then the above command would typically return /home/janis/ (because, by default, all home

directories are located in the directory /home). Likewise, if a user were currently working in directory /usr/share/config (which contains a number of program configuration files), then the same command would return /usr/share/config.

pwd is useful for confirming that the current directory has actually been changed to what the user intended after using cd. For example, after issuing the cd command to change the current directory from /home/janis to /usr/share/config, pwd could be used for confirmation; that is, the following sequence of commands would be issued:

```
cd /usr/share/config/  
pwd
```

The standard version of pwd has a mere two options, both of which are employed only infrequently. The --help option is used as follows:

```
pwd --help
```

This option displays information about pwd, of which there is very little because it is such a simple command (i.e., it only has two options and accepts no arguments).

The other option is --version, which displays the version number, i.e.,

```
pwd --version
```

Although it is often thought of as standing for present working directory, pwd is actually an acronym for print working directory. The word print is traditional UNIX terminology for write or display, and it originated when computer output was typically printed on paper by default because CRT (cathode ray tube) display monitors were not yet widely available.

The echo command

echo is a built-in command in the bash and C shells that writes its arguments to standard output.

A shell is a program that provides the command line (i.e., the all-text display user interface) on Linux and other Unix-like operating systems. It also executes (i.e., runs) commands that are typed into it and displays the results. bash is the default shell on Linux.

A command is an instruction telling a computer to do something. An argument is input data for a command. Standard output is the display screen by default, but it can be redirected to a file, printer, etc.

The syntax for echo is

```
$ echo $USER  
$ echo "Hello world"
```

The items in square brackets are optional. A string is any finite sequence of characters (i.e., letters, numerals, symbols and punctuation marks).

When used without any options or strings, echo returns a blank line on the display screen followed by the command prompt on the subsequent line. This is because pressing the ENTER key is a signal to the system to start a new

line, and thus echo repeats this signal.

When one or more strings are provided as arguments, echo by default repeats those strings on the screen. Thus, for example, typing in the following and pressing the ENTER key would cause echo to repeat the phrase This is a pen. on the screen:

```
echo This is a pen.
```

It is not necessary to surround the strings with quotes, as it does not affect what is written on the screen. If quotes (either single or double) are used, they are not repeated on the screen.

Fortunately, echo can do more than merely repeat verbatim what follows it. That is, it can also show the value of a particular variable if the name of the variable is preceded directly (i.e., with no intervening spaces) by the dollar character (\$), which tells the shell to substitute the value of the variable for its name.

For example, a variable named x can be created and its value set to 5 with the following command:

```
x = 5
```

The value of x can subsequently be recalled by the following:

```
echo The number is $x.
```

Echo is particularly useful for showing the values of environmental variables, which tell the shell how to behave as a user works at the command line or in scripts (short programs).

For example, to see the value of HOME, the environmental value that shows the current user's home directory, the following would be used:

```
echo $HOME
```

Likewise, echo can be used to show a user's PATH environmental variable, which contains a colon-separated list of the directories that the system searches to find the executable program corresponding to a command issued by the user:

```
echo $PATH
```

echo, by default, follows any output with a newline character. This is a non-printing (i.e., invisible) character that represents the end of one line of text and the start of the next. It is represented by \n in Unix-like operating systems. The result is that the subsequent command prompt begins on a new line rather than on the same line as the output returned by echo.

The -e option is used to enable echo's interpretation of additional instances of the newline character as well as the interpretation of other special characters, such as a horizontal tab, which is represented by \t. Thus, for example, the following would produce a formatted output:

```
echo -e "\n Projects: \n\ntplan \n\tcode \n\nttest\n"
```

(The above command should be written on a single line, although it may render as two lines on smaller display screens.) The -n option can be used to stop echo from adding the newline to output.

By making use of output redirection, echo provides a very simple way of creating a new file that contains text. This is accomplished by typing echo followed by the desired text, the output redirection operator (which is a rightward pointing angle bracket) and finally the name of the new file. The file can likewise be formatted by using special characters. Thus, for example, the formatted output from the above example could be used to create a new file called project1:

```
echo -e "\n Project1: \n\n\tplan \n\twrite \n\ttest\n" > project1
```

The contents of the new file, including any formatting, can be verified by using a command such as cat or less, i.e.,

less project1

echo can likewise be a convenient way of appending text to the end of a file by using it together with the append operator, which is represented by two consecutive rightward pointing angle brackets. However, there is always the risk of accidentally using a single bracket instead of two, thereby overwriting all of the contents of the file, and thus, this feature is best reserved for use in scripts.

echo can also be used with pattern matching, such as the wildcard character, which is represented by the star character. For example, the following would return the phrase The gif files are followed by the names of all the .gif image files in the current directory:

```
echo -e The gif files are *.gif
```

The cal command

Displays calendar of current month.

```
$ cal
```

July 2012

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

'cal' will display calendar for specified month and year.

```
$ cal 08 1991
```

August 1991

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Date command

Display current time and date.

```
$ date
```

```
Fri Jul 6 01:07:09 IST 2012
```

If you are interested only in time, you can use 'date +%T' (in hh:mm:ss):

```
$ date +%T
```

```
01:13:14
```

tty command

Displays current terminal.

```
$ tty
```

```
/dev/pts/0
```

whoami command

This command reveals the current logged in user.

```
$ whoami
```

```
raghu
```

id command

This command prints user and groups (UID and GID) of current user.

```
$ id
```

```
uid=1000(raghu) gid=1000(raghu)
```

groups = 1000 (raghu), 4(adm), 20(dialout), 24(cdrom), 46(plugdev), 112(lpadmin), 120(admin), 122(sambashare)

By default information about current user is displayed. If another username is provided as an argument, information about that user will be printed:

```
$ id root
```

```
uid=0(root) gid=0(root) groups=0(root)
```

Clear command

This command clears the screen.

Getting help command

For all its advantages, a big disadvantage of command line is that there are a lot of commands and even more are their options and usage. But nobody can remember all commands. There are some smarter ways of using command line. Linux provides us with several such resources discussed here:

--help option

With almost every command, '--help' option shows usage summary for that command.

```
$ date --help
```

```
Usage: date [OPTION]... [+FORMAT]
```

or: date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]

Display the current time in the given FORMAT, or set the system date.

The whatis command

The whatis command provides very brief descriptions of command line programs (i.e., all-text mode programs) and other topics related to Linux and other Unix-like operating systems.

It accomplishes this by searching the short descriptions in the whatis database for each keyword provided to it as an argument (i.e., input data). This database contains just the title, section number and description from the NAME section of each page in the man manual that is built into most Unix-like systems.

The syntax for whatis is:

whatis keyword(s)

For example, the following provides a single line summary of the head command (which by default displays the first ten lines of each file that is provided to it as an argument):

whatis head

whatis can be used to simultaneously search for information about multiple topics. For example, the following would provide information about both head and tail (which by default reads the final ten lines of files):

whatis head tail

The output of whatis is limited by the fact that it provides only a single line for each keyword found in the database; thus it supplies incomplete information about even moderately complex commands. For example, the following use of whatis to obtain information about the cat command generates the output "concatenate files and print on the standard output":

whatis cat

However, this omits some important information about cat, particularly the facts that it is very convenient to use for reading files and that it is also used to create and write to files.

whatis is similar to the apropos command. However, apropos is more powerful in that its arguments are not limited to complete words but can also be strings (i.e., any finite sequences of characters) which comprise parts of words. Both commands are unusual in that they have no options.

The man command (which is used to read the built-in manual pages), when used with its -f option, produces the same output as whatis. Thus, for example,

man -f cat

is equivalent to

whatis cat

Info pages

Info documents are sometimes more elaborated than man pages. But for some commands, info pages are just the same as man pages. These are like web pages. Internal links are present within the info pages. These links are called nodes. Info pages can be navigated from one page to another through these nodes.

\$ info date

Word processors in the Linux environment

Text editors are used by many different types of people. Casual users, writers, programmers, and system administrators will all use a text editor at one time or another in Linux.

Use of text editor

A text editor is just like a word processor without a lot of features. All operating systems come with a basic text editor. Linux comes with several. The main use of a text editor is for writing something in plain text with no formatting so that another program can read it. Based on the information it gets from that file, the program will run one way or another.

vi Editor

"vi" (pronounced "vee eye") is a text editor with a deceptively simple appearance that belies its great power and efficiency. New users soon realize that there is far more to this little program than meets the eye.

vi, or one of its clones, is found in almost every version of Linux and Unix, and, in fact, it is the only editor that is available in virtually every Unix installation.

History of vi

The vi editor was developed starting around 1976 by Bill Joy, who was then a graduate student at the University of California at Berkeley. Joy later went on to help found Sun Microsystems and became its Chief Scientist.

"ed" was the original Unix text editor. Like other early text editors, it was line oriented and used from dumb printing terminals. Joy first developed "ex" as an improved line editor that supported a superset of ed commands. He then developed vi as a "visual interface" to ex. That is, it allows text to be viewed on a full screen rather than only one line at a time. vi takes its name from this fact.

vi remains very popular today in spite of the development and widespread availability of GUI (graphical user interface) mode text editors which are far more intuitive and much easier for beginners to use than text-mode text editors such as vi. GUI-mode text editors include gedit and Emacs, both of which have become very common on Linux and other Unixes today.

Features of vi

- It is present in almost every Linux Unix system, even the most minimal.
- It is very small. In fact, some versions have a total code size of less than 100KB. This makes it easy to include vi on even the tiniest versions of Linux, such as those in embedded systems and those that run from a single floppy disk.
- It is typist-friendly, at least once you get used to it. For example, the commands are very short, usually just a few keystrokes. And because vi does not use the mouse, there is never any need to remove one's hands

from the keyboard. This can speed up editing substantially.

- It is very powerful, as just a few very short commands can make sweeping changes to large documents. In fact, vi is more powerful than most of its users realize, and few of them know more than just fraction of all the commands.

Opening and closing file

vi can be used both when your system is in text mode (the entire screen is devoted to text and there are no images) and when your system is in GUI mode (the screen contains windows, images and menus). When it is in GUI mode (usually KDE or Gnome), vi runs in a terminal window. A terminal window is a text-only window, and it can usually be opened by clicking on an icon (small image) of a computer screen.

(In the case of Red Hat Linux, the terminal window can be opened by clicking on the icon of a red hat in the lower left hand corner of the screen, opening the System Tools menu and then selecting Terminal from that menu. It can be convenient to add the icon for the terminal window to the launcher panel along the bottom of the screen, if it is not already there.)

There are at least two ways to use vi to simultaneously create and open a new file. One is by just typing vi at the command line, like this:

vi

This creates an empty file that will not have a name until you save its contents to disk (i.e., transfer the text you typed into it to your hard disk, floppy disk, etc. for long term storage).

A second way to open a new file is by typing vi followed by the name of the file to be created, for example:

vi apple

This creates a new file named "apple" in the current directory (the directory or folder which is currently open on your all-text screen or your terminal window).

If you want, it could create the same file with an extension such as ".txt" added to the end of the file name. In Linux this is merely a matter of convenience (or habit), and it generally makes no real difference for the file because it remains a plain text file in either case. For example:

vi apple.txt

To close a file to which no changes have been made, hit ESC (the Esc key, which is located in the upper left hand corner of the keyboard), then type :q (a colon followed by a lower case "q") and finally press ENTER. (The term "hit" is used here instead of "press" to emphasize that it is not necessary to keep the ESC key held down but just to press it momentarily.)

To close a file to which changes have been made (such as text having been added or removed) without saving the

changes, hit ESC, type :q! and then press ENTER. This is sometimes referred to as a "forced quit."

vi works with a buffer (a block of memory in the RAM chips). When you open an existing file, vi copies that file from the hard disk (or floppy, CDROM, etc.) to a buffer. All changes that you make to a file are initially made only to the copy in the buffer, and they are only made to the file itself when you "save" your changes. "Saving" a file means writing (i.e., transferring) the contents of the buffer to the hard disk (or floppy disk).

Likewise when you open a new file. All text you enter (and subsequent edits you make to it) exists only in the buffer until you save the file to disk.

To save the changes that have been made to a file, hit ESC, type :w and then press ENTER. The "w" stands for "write." An alternative, and perhaps easier, way to save a file and quit at the same time is to hit ESC and then type ZZ (two capital Z's in succession).

After you have created a new text file and closed it, you might want to confirm that nothing went wrong and that the file actually exists. Probably the simplest way to do this is to use the standard Unix ls command, which displays a list of all of the files in the current directory.

Entering text

vi has two basic modes of operation: command mode and text insert mode. How to switch back and forth between them is probably the most confusing thing about vi for beginners. But it is actually very simple, and once you get used to it you might also find it quite efficient.

Command mode is the default mode when a file (existing or new) is opened. (This is the opposite of most text and word processors and therefore may seem counter-intuitive.) Because every file opens initially in command mode, you can not immediately begin typing text. That is, everything that is typed on the keyboard is interpreted by vi to be a command.

Examples of the many types of commands can perform on a file while in command modes are:-

- Switching to text insert mode.
- Moving the cursor around the file.
- Deleting characters or lines.
- Transposing characters.
- Changing case.
- Appending the contents of the file to another (closed) file.
- Setting vi options.
- Saving the file to disk.
- Closing the file and quitting vi.

The other mode, text insert mode, is also referred to as simply "insert mode" or "input mode." It is used for entering text into the buffer memory (and simultaneously onto the screen). In this mode everything that is typed on the keyboard is added to the text and does not become a command (although you can perform some command operations in text mode with vi clones).

The most common way to switch from command mode to the input mode is to use the i (which stands for "insert" or "input") command. This is accomplished by simply typing the letter i while in command mode. Now you are ready to start typing text.

Unlike word processors and even most word editors, there is no automatic word wrap in the traditional version of vi (although you will notice it in some clones). New lines are started by pressing ENTER.

When finished typing text or need to perform some other operation such as moving to a different position in the text or deleting some of it, hit ESC in order to return to the command mode.

Once you have typed some text, you can use the four basic commands for moving the cursor around the text. These commands enable you to go to any desired location in order to modify the text, including making insertions and deletions. The four basic cursor positioning commands are:

- h move cursor one character to left
- j move cursor one line down
- k move cursor one line up
- l move cursor one character to right

Each of these commands can be either used by itself or modified by typing an integer in front of it to indicate the number of characters or lines to move. For example, typing (in command mode, of course)

3j - will move the cursor down three lines. Or typing 2h will move it two characters to the left.

These commands can be repeated by holding the key down. If attempting an impossible movement, such as pressing k when the cursor is on the top line, the screen might flash or a beeping sound might be made (depending on how your computer is set up).

The cursor can be moved directly to any desired line by using the G command preceded by the line number. For example, typing

5G - moves the cursor to the fifth line from the top of the text. Just typing G without any number moves the cursor to the final line of text.

When you switch from command mode to input mode with the i command and then start typing text, each character you type is placed to the left of the character covered by the cursor. This causes the character covered by the cursor as well as everything to its right to be shifted to the right.

There will be times when it needs to place a character to the right of the character under the cursor. This is particularly useful when the cursor is over the last character in a line and you want to append the line. To do this, simply use the a (lower case "a," which stands for "append") command instead of the i command to switch from command mode into insert mode.

After it has saved a file that have created or modified using vi, might want to verify that its contents are really what you had intended. One way to do this is to use cat, the Unix concatenation utility. (No, this has no relationship to the popular domesticated animal whose name has the same spelling). For example, type:

```
cat /home/john/fruit/lemon
```

Editing Text

vi offers a rich assortment of commands for editing text. Among the most basic are those used for deleting or erasing.

The x (lower case "x") command deletes the character immediately under (i.e., covered by) the cursor. To delete any desired character, just switch to the command mode (if you are not already there) and then use an appropriate combination of the h, j, k and l commands (of course, one at a time) to move the cursor to that character. Then type x and the character is deleted.

By pressing x continuously instead of just hitting it once, the cursor continuously moves to the right and each character under it is successively deleted.

The X (upper case "X") command is similar except that it deletes the character to the left of the cursor rather than the character under it.

There are several additional commands for deleting text. The D (upper case "D") command removes the text on the current line from the character under the cursor to the end of the line.

The d (lower case "d") command is very flexible because it can be modified to delete any number of characters, words or lines. Typing d by itself will not do anything, but typing dw causes the character the cursor is resting on and the remaining characters to the right of it in the same word to be deleted. (The "w" stands for "word.")

Typing 2dw causes the character under the cursor, the remaining characters to the right of it in the same word and all of the characters in the next word to be deleted. For example, typing 2dw with the cursor on the "a" of the string "pineapple plantation" causes the string "apple plantation" to be deleted.

As another example, typing 3dw with the cursor on the "j" of the string "the bluejay flew south" causes the string "jay flew south" to be deleted. That is, "jay" and two words to the right of it are deleted.

Deleting an entire line can be accomplished with the dd command. This command can also be used to delete multiple lines by preceding it with an integer representing the number of lines to be removed. For example, typing

2dd will delete two consecutive lines beginning with the current line.

With some terminals, deletion of a line causes it to be replaced on the screen with an "@" character. This character merely represents an empty line and is not inserted into the text. Its purpose is to relieve the processor from having to redraw the screen (i.e., change the whole screen). This character can be removed if desired by typing r (or I on some terminals) while holding down the CTRL key.

The change command c (lower case "c") differs from the delete command in that it not only deletes a section of text but also activates insert mode to allow you to type in replacement text. After you have completed typing in the replacement text, be sure to press ESC to return to the command mode.

As is the case with d, the c command is not used by itself but is only used in combination with another letter after it and an optional integer before it.

For example, the command cw (which stands for "change word") deletes the characters in the current word under and to the right of the cursor and then switches vi to the insert mode so that you can enter text to replace the deleted characters. The number of new characters typed in can be the same as, fewer or more than the number deleted.

The amount of text to be changed can be increased by preceding the command with a number. For instance, typing 2cw will additionally remove the next word for replacement with whatever is typed in. The space between the words is not preserved.

The d and c commands can also be modified by other characters in addition to "w." For example they can be used with "b," which stands for "back." Thus, typing 3bd will delete the characters to the left of the cursor in the current word together with the two words to the left of the current word.

The cc command erases the current line, leaving it blank and awaiting replacement text. Preceding this command with an integer will delete that number of lines, beginning with the current line. For example, typing 5cc will allow you to change five consecutive lines starting with the current line.

Another change command, R, differs from the c commands in that it does not initially delete anything. Rather, it activates insert mode and lets you replace the characters under the cursor one at a time with characters that you type in.

vi supports several types of transposition. Transposing the order of two adjacent characters is easy with the xp command. Just place the cursor on the left-most of the two characters, type x to erase the left character and then type p for the deleted character to be put to the right of the cursor.

Two adjacent words can be transposed with the deep command. To use it, position the cursor in the space just to the left of the word on the left and type deep. Two adjacent

lines can be transposed with the ddp command by placing the cursor on the upper line and typing ddp.

It is also a simple matter to change the case of a letter. When the cursor is over the desired letter, hit the "~" (tilde) key. This will change a capital letter to a small letter and visa versa.

The J (upper case "J") command is used to join the next line to the current line. The opposite operation, splitting a line, is accomplished in insert mode by merely positioning the cursor over what will be the first character of the new line and then hitting ENTER.

vi also has an undo capability. The u (lower case "u") command is used to reverse the effects of an already issued command that has changed the buffer, but which is not yet written to disk. U (upper case "U") undoes all of the changes that have been made to the current line during your current visit to it

Searching Text

vi also has powerful search and replace capabilities. To search the text of an open file for a specific string (combination of characters or words), in the command mode type a colon (:), "s," forward slash (/) and the search string itself. What you type will appear on the bottom line of the display screen. Finally, press ENTER, and the matching area of the text will be highlighted, if it exists. If the matching string is on an area of text that is not currently displayed on the screen, the text will scroll to show that area.

The formal syntax for searching is:

:s/string

For example, suppose you want to search some text for the string "cherry." Type the following and press ENTER:

:s/cherry

The first match for "cherry" in your text will then be highlighted. To see if there are additional occurrences of the same string in the text, type n, and the highlight will switch to the next match, if one exists.

The syntax for replacing one string with another string in the current line is

:s/pattern/replace/

Here "pattern" represents the old string and "replace" represents the new string. For example, to replace each occurrence of the word "lemon" in a line with "orange," type:

:s/lemon/orange/

The syntax for replacing every occurrence of a string in the entire text is similar. The only difference is the addition of a "%" in front of the "s":

%s/pattern/replace/

Thus repeating the previous example for the entire text instead of just for a single line would be:

%s/lemon/orange/

Working with multiple files

It is easy to insert text into an open file from another file. All that is necessary is to move the cursor to the location where you want the text inserted, then type

:r filename

where "filename" is the name of the file to insert.

For example, if you want to copy the contents of the file "peach" into the file "fruit," you would first position the cursor to the desired line in "fruit" and then type

:r peach

Notice that this operation causes no change to the file "peach."

You can also append text from the currently open file to any other file. This is accomplished using the :w (colon + "w") command followed without a space by >>. For example, to append the contents of a currently open file named "pear" to the file named "apple," type

:w>> apple

At times it can be convenient to open multiple files simultaneously. This is efficiently accomplished by just listing all of the files to be opened after the vi command. For example, to simultaneously open files about three kinds of fruit, type:

vi apple pear orange

This allows you to edit "apple" first. After saving "apple," typing :n calls up "pear" for editing.

If you want to simultaneously open all files in the current directory, just type vi * (vi + space + asterisk).

Additional operations

As you have learned, creating and opening files in vi can be a very simple matter. However, many combinations of options are available that can add much power and flexibility for these tasks, as can be seen by looking at the full syntax for opening files:

vi [flags] [cmd] [filename]

The square brackets ([]) around each section of arguments (modifiers) of the command indicates that they are optional. (That is, a file can be opened by just typing vi alone or by typing it with any combination of the three arguments. For instance, the example of vi dog contains only the mandatory vi and the optional third argument, which is the name of the file to open.)

As only one of many possible examples of adding options for opening files, an existing file can be opened with the cursor appearing on any desired line instead of just on the first line. (One situation in which this can be particularly useful is if your file is part of a program which you are writing and the compiler reports an error on a specific line in that file.) This is accomplished by adding the + (plus sign) command followed the desired line number. For example, to open the file "apple" with the cursor located on the third line, type:

vi +3 apple

Use of the + command without any modifying number opens a file with the cursor positioned on the last line of text. This can save some keystrokes when you want to open a file just to append data to the end of it. For example:

vi + apple

You have already learned several commands for switching from command mode to insert mode, including i for inserting to the left of the cursor position, a for inserting to the right of the cursor position and the c commands for changing text. A more complete list is as follows:

a	appends after current cursor position.
A	appends at end of current line.
c	starts a change option.
C	starts a change option from current position to end of current line.
i	inserts to the left of the cursor position.
I	inserts at start of line.
o	cursor moves to new, blank line below its current position.
O	cursor moves to new, blank line above its current position.
R	replaces characters one at a time.

A simple way to obtain basic information about any file that is currently open, including name, size and the current line number, is to hold down CTRL and type g. This data appears on the bottom line of the display.

Summary of commands

The following list contains the basic commands presented in the first eight pages of this tutorial along with occasional examples of usage (shown in parenthesis). They are presented in roughly the same order in which they appear in the tutorial. (All commands that begin with a colon are followed by ENTER.)

vi	typed at the command line to open one or more files in the same directory (vi tomato.txt opens a file named "tomato.txt" in the current directory) (vi parsley sage rosemary opens the three files "parsley," "sage" and "rosemary" in the current directory)
vi *	typed at the command line to open every file in the current directory
:q	closes (quits) a file to which no changes have been made
:q!	quits without saving any changes
:w	writes (i.e., saves) the current file to disk
:wq	writes the buffer contents to disk (i.e., saves changes) and quits
zz	same as :wq
i	activates text insert mode, inserting text immediately under the current position of the cursor.
h	moves the cursor one character to the left (2h moves the cursor two characters to the left)
j	moves the cursor one line down (3j moves the cursor three lines down)
k	moves the cursor one line up
l	moves the cursor one character to the right
G	moves the cursor to the desired line; moves the cursor to the last line of text if not preceded by a modifying integer (5G moves the cursor to the fifth line)
a	switches to insert mode and allows insertion of text immediately to the right of the cursor.
x	deletes the character immediately under the cursor (xxx deletes the character immediately under cursor and then deletes the two characters to its right)
X	deletes a single character to the left of cursor
D	removes the text on the current line from the character under the cursor to the end of the line
dw	deletes the character immediately under the cursor and the remaining characters to the right of it in the same word (2dw deletes the character immediately under the cursor, the remaining characters to the right of it in same word and all of the next word)
dd	deletes the entire line containing the cursor, and the cursor then moves to the next line (2dd deletes two consecutive lines beginning with the current line)
cw	deletes the character under the cursor and to its right in the same word and allows new characters to be typed in to replace them (2cw deletes the character under the cursor and to its right in the same word and in the next word, and then allows replacement characters to be typed in)

cc	erases the current line and allows replacement text to be typed in (2cc erases the current line and the next line and allows replacement text to be typed in for both lines)
cb	deletes the characters to the left of the cursor in the current word and allows replacement characters to be typed in (3cb deletes the characters to the left of the cursor in the current word together with the two words to its left and then allows replacement text to be typed in)
R	activates text input mode allowing text under and to the right of the cursor to be overwritten one character at a time
xp	transposes two adjacent characters
deep	transposes two adjacent words
ddp	transposes two adjacent lines
~	changes case of the character under the cursor
J	joins the current line with the next line
u	reverses the effects of the most recent command that has changed the buffer
U	undoes all changes made to the current line during the current visit to it
:s/	searches the text for the first instance of a designated string (:s/cucumber searches the text for the first instance of the string "cucumber")
n	searches the text for the next instance of a designated string
:s/ / /	replaces the first instance of a designated string (:s/cucumber/radish/ replaces the first instance of the string "cucumber" with the string "radish")
:%s/ / /	replaces every instance of a designated string (:%s/cucumber/radish/ replaces every instance of the string "cucumber" with the string "radish")
:r	inserts text into the currently open file from another file (:r lettuce.txt inserts text into the currently open file from the file named "lettuce.txt")
:w>>	appends the text from the currently open file into another file (:w>> cabbage appends the text from the currently open file into the file named "cabbage")

pico editor

pico is a simple text editor in the style of the pine composer.

Syntax

pico [options] [file]

Description

pico is a simple, display-oriented text editor based on the pine message composer. As with pine, commands are displayed at the bottom of the screen, and context-sensitive help is provided. As characters are typed they are immediately inserted into the text.

Editing commands are entered using control-key combinations. As a work-around for communications programs that swallow certain control characters, you can emulate a control key by pressing ESCAPE twice, followed by the desired control character. For example, "ESC ESC c" would be equivalent to entering a ctrl-c. The editor has five basic features: paragraph justification, searching, block cut/paste, a spelling checker, and a file browser.

Paragraph justification (or filling) takes place in the paragraph that contains the cursor, or, if the cursor is between lines, in the paragraph immediately below. Paragraphs are delimited by blank lines, or by lines beginning with a space or tab. Unjustification can be done immediately after justification using the control-U key combination.

String searches are not sensitive to case. A search begins at the current cursor position and wraps around the end of the text. The most recent search string is

offered as the default in subsequent searches.

Blocks of text can be moved, copied or deleted with creative use of the command for mark (Ctrl-^), delete (Ctrl-k) and undelete (Ctrl-u). The delete command will remove text between the "mark" and the current cursor position, and place it in the "cut" buffer. The undelete command effects a "paste" at the current cursor position.

The spell checker examines all words in the text. It then offers each misspelled word for correction while highlighting it in the text. Spell checking can be cancelled at any time. Alternatively, pico will substitute for the default spell checking routine a routine defined by the SPELL environment variable. The replacement routine should read standard input and write standard output.

The file browser is offered as an option in the "Read File" and "Write Out" command prompts. It is intended to help in searching for specific files and navigating directory hierarchies. Filenames with sizes and names of directories in the current working directory are presented for selection. The current working directory is displayed on the top line of the display while the list of available commands takes up the bottom two. Several basic file manipulation functions are supported: file renaming, copying, and deletion.

Movement commands:

Depending on your system, the arrow keys or the backspace key may not work. Instead, you can use these commands to perform the same tasks.

To	Hold down Ctrl key and press	Instead of
Delete a character	backspace	backspace
Move up a line	p	up arrow
Move down a line	n	down arrow
Move left one space	b	left arrow
Move right one space	f	right arrow
Move to the end of line	e	end

Some pico editor options

^C Cancel allows you to stop a process at any time. If you make a mistake, just hold down the Ctrl key and press c.

^G get help

Get clear and concise assistance from the Pico help, in case something unexpected happens or you need additional information about a command.

^X Exit

Exit Pico at anytime. If made changes to a file or worked on a new file, but you haven't saved the changes, you see this message:

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) (y/n)?

Answering no (press n) will close Pico and bring you back to the prompt without saving your file.

Answering yes (press y) will allow you to save the file you've been working on (see Write Out section below for details).

^O WriteOut

Save the file without hassles or worries. Fill in the name of the file beside the File Name to write: prompt. If the file already has a name, then press enter.

^T To Files option lets to save the text over a file that exists in the directory. By choosing the To Files option, Pico takes you to a directory Browser.

^R Read File

Insert text from another file into your current text file. This option allows you to search through your directories for a file that you would like to add to your text. This option is especially handy if you've saved a document and would like to add its content to the new file you're working on. Text from the file you select is placed on the line directly above your cursor.

At the Insert file : prompt you may either type a file name or use the Browser options.

^T To Files option lets you import a text file directly into the file you're currently typing. By choosing the To Files option, Pico takes you to a directory Browser.

^Y Prev Pg

Move quickly to the previous page. Although you could just as easily press the up arrow key several times, this command quickly jumps your cursor up one page.

^V Next Pg

Move quickly to the next page. Although you could just as easily press the down arrow key several times, this command quickly jumps your cursor down one page.

^K Cut text

Cut a line of text. This option allows you to cut a full line of text. By using the uncut command and your arrow keys, you can then paste the cut text at another location in your document. To cut specific text in a line or to cut several lines of text, first select the text (see Selecting Text on the next page).

Selecting text

To select text for cutting and pasting use the following steps:

Move the cursor to the beginning of the text to select

Hold down the Ctrl key and press ^

Use the right arrow key or hold down Ctrl and press f to highlight text

When you have highlighted the appropriate text, hold down the Ctrl key and press k to cut it.

Paste the text you cut, anywhere in your document, using UnCut Text

^U UnCut Text

Paste text that previously cut. If use this option to undo an accidental cut of text or place cut text at another location in the document. The text you cut is pasted on the line directly above the cursor.

^C Cur Pos

Indicate the current position of the cursor, relative to the entire document. This is a helpful option if you'd like to check exactly where in the document. The status line indicates the following items:

[line 8 of 18 (44%), character 109 of 254 (42%)]

^J Justify

Even out lines of text. This command is handy when accidentally type extra spaces between words or press the key before reaching the end of a line. The option evens the length of text lines automatically.

^U UnJustify

UnJustify lines of text. For the messy line look you can always select the UnJustify option.

^W Where is

Find a particular string of text quickly. This option allows you to do a word search in your text. This option is especially handy for longer documents. If the word you designated at the Search: prompt is found, it places the cursor beside it.

^T To Spell

Check for spelling errors. The spell check option allows to correct spelling errors throughout the document. If spell

checker finds a misspelled word or a word it doesn't recognize (don't worry, this rarely happens), it will correct the word. At the Edit a replacement: prompt, type in the correct spelling of a word. However, if you don't want to make any changes, simply press the enter key.

Any words that have corrected but re-occur in the document can be automatically replaced. At the Replace a with b? [y]: prompt press y to replace all occurrences of the misspelled word or n to ignore.

Pine Editor

pine is a program for accessing email and newsgroups.

Syntax

pine [options] [address, address]

Description

pine is a screen-oriented message-handling tool. In its default configuration, pine offers an intentionally limited set of functions geared toward the novice user, but it also has a growing list of optional power-user and personal-preference features. pine's basic feature set includes:

- View, Save, Export, Delete, Print, Reply and Forward messages.
- Compose messages in a simple editor (pico) with word-wrap and a spelling checker. Messages may be postponed for later completion.
- Full-screen selection and management of message folders.
- Address book to keep a list of long or frequently-used addresses. Personal distribution lists may be defined. Addresses may be taken into the address book from incoming mail without retyping them.
- New mail checking and notification occurs automatically.
- Context-sensitive help screens.

pine supports MIME (Multipurpose Internet Mail Extensions), an Internet Standard for representing multipart and multimedia data in email. pine allows you to save MIME objects to files, and in some cases, can also initiate the correct program for viewing the object. It uses the system's mailcap configuration file to determine what program can process a particular MIME object type. pine's message composer does not have multimedia capability

itself, but any type of data file (including multimedia) can be attached to a text message and sent using MIME's encoding rules. This allows any group of individuals with MIME-capable mail software to exchange formatted documents, spread-sheets, image files, etc, via Internet email.

pine uses the "c-client" messaging API to access local and remote mail folders. This library provides a variety of low-level message-handling functions, including drivers for a variety of different mail file formats, as well as routines to access remote mail and news servers, using IMAP (Internet Message Access Protocol) and NNTP (Network News Transport Protocol). Outgoing mail is usually handed off to the send mail program but it can optionally be posted directly via SMTP.

Examples

Pine

Launch **pine**.

pine address@example.com

Launch pine, and immediately begin composing an email addressed to address@example.com.

Joe editor

'joe'- sounds like a comic strip. Actually, they are two other text editors that I like and I think are a little easier to manage. They're like 'vi' in that you use them to create and edit non-formatted text, but they're a little more user-friendly. Using 'joe' 'joe' was created by Joseph Allen, so that's why it's called Joe.

The majority of joe's commands are based on the CTRL-K keys and a third key. The most important of these is CTRL-K-H which gets 'help'. Help shows the key combinations to use with 'joe'.

The most important thing about 'joe' is the logical concept that you can just start writing if you want. Try writing anything you want.

To save it, press CTRL-K-D. To save and quit, CTRL-K-X.

To quit without saving, CTRL-C, (without the K).

The feature of 'joe' is that if edit a file again, it will save the previous file with a tilde on the end, like 'tryjoe~' That little tilde file has saved times. 'joe' is a very good option for writing those short text files.

Managing files and directories

Objectives: At the end of this lesson you shall be able to

- define manipulating files and directories
- define basic file commands
- explain other file commands
- define additional useful commands in linux OS.

Manipulating files or directories

Using Linux isn't different from any other computer operating system. You create, delete, and move files on your hard drive in order to organize your information and manage how your system works or looks. This section shows you how to do these tasks quickly and easily.

Although the graphical interface for Linux, the X Window System, may offer drag and drop or multiple selections in order to copy or delete files, many of the commands you'll learn here form the base of these operations. It is worth knowing how these programs work, even if you don't use Linux in the console mode.

Working with files

In this chapter we learn how to recognise, create, remove, copy and move files using commands like file, touch, rm, cp, mv and rename, etc...

All files are case sensitive

Files on Linux (or any Unix) are case sensitive. This means that FILE1 is different from

file1, and /etc/hosts is different from /etc/Hosts (the latter one does not exist on a typical Linux computer).

The file command

The file command attempts to classify each filesystem object (i.e., file, directory or link) that is provided to it as an argument (i.e., input). Thus, it can usually provide immediate information as to whether some specified object is, for example, a GIF89a image file, a directory, a GNU tar archive, ASCII English text, a symbolic link, an HTML document, an empty file, bzip2 compressed data, an ELF 32-bit LSB executable, etc.

File accomplishes this by probing each object with three types of tests until one succeeds. The first is a filesystem test, which uses the stat system call to obtain information from the object's inode (which contains information about a file). A system call is a request in a Unix-like operating system for a service performed by the kernel (i.e., the core of the operating system).

The second test checks to see if there is a magic number, which is a number embedded at or near the beginning of many types of files that indicates the file format(i.e., the type of file).

In the event that the first two tests fail to determine the type of a file, language tests are employed to determine if

it is plain text (i.e., composed entirely of human-readable characters), and, if so, what type of plain text, such as HTML (hypertext markup language) or source code (i.e., the original version of a program as written by a human). In this situation, file also attempts to determine the natural language (e.g., English, Turkish or Japanese) that is used in the file.

A simplified version of file's syntax is

file [option(s)] object_name(s)

File has several options, but it is most commonly used without any of them. For example, information about a file named file1 that is located in the current directory (i.e., the directory in which the user is currently working) could be obtained by merely typing the following and pressing the RETURN key:

file file1

Information about the types of all of the files in the current directory can be obtained by using the star wildcard to represent every object in that directory as follows:

file *

Likewise, information about all of the files in another directory can be obtained by using that directory as an argument and following it immediately by a forward slash and the star wildcard. For example, the following classifies all of the objects in the /boot directory:

file /boot/*

The square brackets wildcard can be used together with the star wildcard to show the file types for only those objects whose names begin with specified letters or with a specified range of letters. For example, the following would show only those objects in the current directory whose names begin with letters a through g:

file [a-g]*

The -k option tells file to not stop at the first successful test, but to keep going; this can result in the reporting of additional information about some filesystem objects. The -b (i.e., brief) option tells file to not prepend filenames to output lines, which can be useful when compiling statistics about file types. The -v option returns information about the version of file that is installed.

Creating files and directories command

mkdir command

The mkdir command is used to create new directories.

A directory, referred to as a folder in some operating systems, appears to the user as a container for other directories and files. However, Unix-like operating systems treat directories as merely a special type of file that contains a list of file names and their corresponding inode numbers. Each inode number refers to an inode, which is located in inode tables (which are kept at strategic locations around the filesystem) and which contains all information about a file (e.g., size, permissions and date of creation) except its name and the actual data that the file contains.

mkdir has the following example

```
$ mkdir example
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

directory_name is the name of any directory that the user is asking mkdir to create. Any number of directories can be created simultaneously.

Thus, for example, the following command would create three directories within the current directory (i.e., the directory in which the user is currently working) with the names dir_1, dir_2 and dir_3:

```
mkdir dir_1 dir_2 dir_3
```

If a directory name provided as an argument (i.e., input) to mkdir is the same as that of an existing directory or file in the same directory in which the user is asking mkdir to create the new directory, mkdir will return a warning message such as mkdir: cannot create directory `dir_1': File exists and will not create a file with that name. However, it will then continue to create directories for any other names provided as arguments.

It is necessary for a user to have write permission (i.e., permission from the system to create or change a file or directory) in the parent directory (i.e., the directory in which the new directory is to be created) in order to be able to create a new directory.

Directories created by mkdir automatically include two hidden directories, one representing the directory just created (and represented by a single dot) and the other representing its parent directory (and represented by two consecutive dots). This can be seen by using the ls (i.e., list) command with its -a option, which tells ls to show all directories and files, (including hidden ones) in any directory provided to it as an argument, or in the current directory if there are no arguments, i.e.,

```
ls -a
```

mkdir's -m option is used to control the permissions of new directories. New directories are by default created with the read, write and execute (i.e., run as a program if

a program) permissions enabled for the owner (i.e., the creator of the directory by default) and group and the read and execute permissions enabled for other users. Thus, for example, to create a directory named dir_4 for which all three types of permissions were enabled for all users, the sequence 777 would be employed after -m, for example:

```
mkdir -m 777 dir_4
```

The first digit represents the owner, the second represents the group and the third represents other users. The number 7 represents all three types of permission (i.e., read, write and execute), 6 stands for read and write only, 5 stands for read and execute, 4 is read only, 3 is write and execute, 2 is write only, 1 is execute only and 0 is no permissions.

Thus, for example, to create a new directory named dir_5 for which the owner has read and write permissions, the group has read permission and other users have no permissions, the following would be used:

```
mkdir -m 640 dir_5
```

The -p (i.e., parents) option creates the specified intermediate directories for a new directory if they do not already exist. For example, it can be used to create the following directory structure:

```
mkdir -p food/fruit/citrus/oranges
```

It is very easy to confirm that this series of directories has been created by using the du (i.e., disk usage) command with the name of the first directory as an argument. In the case of the above example this would be

du food

Other options include -v (i.e., verbose), which returns a message for each created directory, --help, which returns brief information about mkdir, and --version, which returns the version number of the currently installed mkdir program

touch command

The touch command updates the access and modification times of each FILE to the current system time.

If you specify a FILE that does not already exist, touch creates an empty file with that name.

If the FILE argument is a dash ("") is handled specially and causes touch to change the times of the file associated with standard output.

```
$ touch file1 file2 file3
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file2
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

A feature of touch is that, in contrast to some commands such as cp (which is used to copy files and directories) and mv (which is used to move or rename files and

directories), it does not automatically overwrite (i.e., erase the contents of) existing files with the same name. Rather, it merely changes the last access times for such files to the current time.

Several of touch's options are specifically designed to allow the user to change the timestamps for files. For example, the -a option changes only the access time, while the -m option changes only the modification time. The use of both of these options together changes both the access and modification times to the current time, for example:

touch -am file3

The -r (i.e., reference) option followed directly by a space and then by a file name tells touch to use that file's time stamps instead of current time. For example, the following would tell it to use the times of file4 for file5:

touch -r file4 file5

The -B option modifies the timestamps by going back the specified number of seconds, and the -F option modifies the time by going forward the specified number of seconds. For example, the following command would make file7 30 seconds older than file6.

touch -r file6 -B 30 file7

The -d and -t options allow the user to add a specific last access time. The former is followed by a string (i.e., sequence of characters) in the date, month, year, minute:second format, and the latter uses a [[CC]YY]MMDDhhmm[.ss] format. For example, to change the last access time of file8 to 10:22 a.m. May 1, 2005, 1 May 2005 10:22 would be enclosed in single quotes and used as follows, i.e.,:

touch -d '1 May 2005 10:22' file8

Partial date-time strings can be used. For example, only the date need be provided, as shown for file9 below (in which case the time is automatically set to 0:00):

touch -d '14 May' file9

Just providing the time, as shown below, automatically changes the date to the current date:

touch -d '14:24' file9

The most commonly used way to view the last modification date for files is to use the ls command with its -l option. For example, in the case of a file named file10 this would be

ls -l file10

The complete timestamps for any file or directory can be viewed by using the stat command. For example, the following would show the timestamps for a file named file11:

stat file11

The --help option displays a basic list of options, and the --version option returns the version of the currently installed touch program.

Copy, move and remove commands

Copy command

The cp command is used to copy files and directories. The copies become independent of the originals (i.e., a subsequent change in one will not affect the other).

cp's basic syntax is

\$cp source destination

As a safety precaution, by default cp only copies files and not directories. If a file with the same name as that assigned to the copy of a file (or a directory with the same name as that assigned to the copy of a directory) already exists, it will be overwritten (i.e., its contents will be lost). However, the owner, group and permissions for the copy become the same as those of the file with the same name that it replaced. The last access time of the source file and the last modification time of the new file are set to the time the copying was performed.

When a copy is made of a file or directory, the copy must have a different name than the original if it is to be placed in the same directory as the original. However, the copy can have the same name if it is made in a different directory. Thus, for example, a file in the current directory (i.e., the directory in which the user is currently working) named file1 could be copied with the same name into another directory, such as into /home/john/, as follows:

cp file1 /home/john/file1

Any number of files can be simultaneously copied into another directory by listing their names followed by the name of the directory. cp is an intelligent command and knows to do this when only the final argument (i.e., piece of input data) is a directory. The files copied into the directory will all have the same names as the originals. Thus, for example, the following would copy the files named file2, file3 and file4 into a directory named dir1:

cp file2 file3 file4 dir1

The -r (i.e., recursive) option, which can also be written with an upper case R, allows directories including all of their contents to be copied. (Directories are not copied by default in order to make it more difficult for users to accidentally overwrite existing directories which have the same name as that assigned to the copy being made and which might contain critical directory structures or important data.) Thus, for example, the following command would make a copy of an existing directory called dir2, inclusive of all its contents (i.e., files, subdirectories, their subdirectories, etc.), called dir3:

cp -r dir2 dir3

The -i (i.e., interactive) option prompts the user in the event that any name assigned to a copy is already in use by another file and that file would thus be overwritten. Entering the letter y (either lower case or upper case) in response to the prompt causes the command to continue; any other answer prevents the command from overwriting the file. Thus, for example, if it is desired to make a copy of a directory called dir4 and call it dir5 and if a directory named

dir4 already exists, the following would prompt the user prior to replacing any files with identical names in the latter directory:

```
cp -ri dir4 dir5
```

The -a option preserves as much of the structure and attributes of the original directory and its contents as possible in the new directory and is thus useful for creating archives. It is similar to the -r option in that it copies directories recursively; however, it also never follows symbolic links. It is equivalent to the -rdp combination of options.

All the files in a directory can be copied to another directory by using the star wildcard. The star character represents any single character or any combination of characters. Thus, for example, the following would copy all of the files in a directory named dir6 into another existing directory called dir7:

```
cp dir6/* dir7
```

cp can also be used with the star wildcard or other pattern matching characters to selectively copy files and directories. For example, to copy all of the files in the current directory that have the filename extension .html into another existing directory called dir8, the following would be used:

```
cp *.html dir8
```

In this case, the star wildcard represents anything whose name ends with the .html extension.

Among the other options for cp are -b, which makes backup copies of each destination file, -f (i.e., force), which removes destination files that cannot be opened and tries again, -s, which makes symbolic links instead of copying, -u (i.e., update), which copies only if the source file is newer than the destination file or if the destination file is missing, -v (i.e., verbose), which makes brief comments about what is going on, and -x, which tells cp to stay on the same filesystem.

Move command

The mv command is used to rename and move files and directories. Its general syntax is:

```
$ mv source destination
```

The arguments are names of files and directories. If two file names are provided as arguments, mv renames the first as the second. If a list of arguments is provided and the final argument in the sequence is the name of an existing directory, mv moves all of the other items into that directory. If the final argument is not an existing directory and more than two arguments are provided, an error message is returned.

If the destination file is located in the same directory as the source file, then the source file can only be renamed. If both are in different directories, then the source file is moved to the directory named in the destination argument, in which it can keep its original name or be assigned a new name. If the target is a directory, then the source file

or directory is moved into that directory and retains its original name.

Thus, for example, the following would rename a file called file1 to file2, while keeping it in the current directory (i.e., the directory in which the user is currently working):

```
mv file1 file2
```

The following would move a file named file3, without changing its name, from the current directory to an existing subdirectory of the current directory named dir1:

```
mv file3 dir1/file3
```

mv can be used to move any number of files and directories simultaneously. For example, the following command moves all files and directories, including all the contents of those directories, from the current directory to the directory /home/alice/new/:

```
mv * /home/alice/new/
```

The asterisk is a wildcard character that represents any string (i.e., sequence of characters). Thus, in the above example it represents the name of every file and directory in the current directory.

mv makes it as easy to move a file or directory up the hierarchy of directories (i.e., closer to the root directory) as down it. For example, the following would move a file named file4, which is currently located in the sub-subdirectory dir/dir/ of the user's home directory, to the top level in the user's home directory:

```
mv dir/dir/file4 ~
```

The root directory is the directory that contains all other directories on a Unix-like operating system and which is at the top of the hierarchy of directories. A user's home directory is the directory in which a user finds itself by default after logging into the system and which can be represented by the tilde (wavy horizontal linecharacter).

By default, mv does not provide any confirmation on the display screen if its action is completed without problems. This is consistent with the rule of silence tenet of the Unix philosophy.

Thus it is wise for users new to Unix-like operating systems to always use the -i option, which makes mv interactive in the situation in which files and/or directories with the same name already exist in the destination directory. For example, the above command would be made interactive as follows:

```
mv -i * /home/alice/new/
```

Among mv's few other options are -b, which tells it to make a backup copy of each file that would otherwise be overwritten or removed, and -v, which tells it to be verbose and display the name of each file before moving it. Detailed information (including all options) about mv can be obtained by using its --help option, and information about the current version can be obtained by using its --version option.

Remove or Delete

\$ rmdir

'rmdir' command removes any empty directories, but cannot delete a directory if a file is present in it. To use 'rmdir' command, you must first remove all the files present the directory you wish to remove (and possibly directories if any).

Remove files and directories

The rm (i.e., remove) command is used to delete files and directories on Linux and other Unix-like operating systems.

The general syntax for rm is:

rm [options] [-r directories] filenames

The items in square brackets are optional. When used just with the names of one or more files, rm deletes all those files without requiring confirmation by the user. Thus, in the following example, rm would immediately delete the files named file1, file2 and file3, assuming that all three are located in the current directory (i.e., the directory in which the user is currently working):

rm file1 file2 file3

Error messages are returned if a file does not exist or if the user does not have the appropriate permission to delete it. Write-protected files prompt the user for a confirmation (with a y for yes and an n for no) before removal. Files located in write-protected directories can never be removed, even if those files are not write-protected.

The -f (i.e., force) option tells rm to remove all specified files, whether write-protected or not, without prompting the user. It does not display an error message or return error status if a specified file does not exist. However, if an attempt is made to remove files in a write-protected directory, this option will not suppress an error message.

The -i (i.e., interactive) option tells rm to prompt the user for confirmation before removing each file and directory. If both the -f and -i options are specified, the last one specified takes affect.

As a safety measure, rm does not delete directories by default. In order to delete directories, it is necessary to use the -r option, which is the same as the -R option. This option recursively removes directories and their contents in the argument list; that is, the specified directories will first be emptied of any subdirectories (including their subdirectories and files, etc.) and files and then removed. The user is normally prompted for removal of any write-protected files in the directories unless the -f option is used.

If a file encountered by rm is a symbolic link, the link is removed, but the file or directory to which that link refers will not be affected. A user does not need write permission to delete a symbolic link, as long as the user has write permission for the directory in which that link resides.

The rm command supports the -- (two consecutive dashes) parameter as a delimiter that indicates the end of the options. This is useful when the name of a file or directory

begins with a dash or hyphen. For example, the following removes a directory named -dir1:

rm -r -- -dir1

Other options include -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rm, and --version, which tells the version of rm that is currently in use. Some differences exist among the various versions of rm, so it is always wise to read the documentation for the particular system.

The rmdir command differs from rm in that it is only used to remove empty directories

The rmdir command

The rmdir command is used to remove empty directories in Linux

The syntax for rmdir is

rmdir [option] directory_names

When used without any options, rm will delete any empty directories whose names are supplied as arguments (i.e., inputs) regardless of whether such directories have write permission or not. Thus, for example, the following command would remove two empty directories named dir1 and dir2 that are located in the current directory (i.e., the directory in which the user is currently working):

rmdir dir1 dir2

The ability to remove only empty directories is a built-in safeguard that helps prevent the accidental loss of data. This is important because once deleted, it is extremely difficult or impossible to recover deleted data on Unix-like operating systems1.

The -p (i.e., parents) option tells rmdir to remove the parent directories of the specified directory if each successive parent directory will, in turn, become empty and if each parent directory has write permission. Thus, for example, the following would remove dir5, dir4 and dir3 if dir5 were empty, dir4 only contained dir5 and dir3 only contained dir4 (which, in turn, contained dir5):

rmdir -p dir3/dir4/dir5

This provides a symmetry with the -p option of the mkdir command, which is used to create directories. Thus, the above set of nested directories could be easily created with the following:

mkdir -p dir3/dir4/dir5

In contrast to the rm command, which is used to delete both files and directories, there is no -r option for rmdir. at least on the GNU version that is standard on Linux. That option allows rm to recursively delete a directory by first deleting all of its contents, beginning with those in the lowest levels of subdirectories. Thus, if a user wants to remove an entire directory structure, it is usually most efficient to use rm with its -r option rather than trying to first remove the contents of each directory, its subdirectories, etc.

Three options that rmdir shares with rm are -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rmdir, and --version, which tells the version of rmdir that is currently in use. Some differences exist among the various versions of rmdir, so it is always wise to read the documentation for the particular system.

Listing and combining files with the cat command

The cat (concatenate file) command is used to send the contents of files to your screen. This

command may also be used to send files' contents into other files. Hour 6 covers terms such as standard input, standard output, and redirection, and this section shows you some basic uses for this command.

Although cat may be useful for reading short files, it is usually used to either combine, create, overwrite, or append files. To use cat to look at a short file, you can enter

\$ cat test.txt

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

The cat command also has a number of options. If you'd like to see your file with line

numbers, perhaps to note a specific phrase, you can use the -n option:

\$ cat -n test.txt

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

and also use cat to look at several files at once, because cat accepts wildcards, for example:

\$ cat -n test*

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.
- This is the first line of test2.txt.
- This file was also created by cat.
- This is the last line of test2.txt.

As you can see, cat has also included a second file in its output, and has numbered each line of the output, not each file. Note that also see both files with

\$ cat test.txt test2.txt

The output will be exactly the same as if had used a wildcard. But looking at several files is only one way to use cat. You can also use the cat command with the redirection operator > to combine files. For example, if you would like to combine test.txt and test2.txt into a third file called test3.txt, you can use

\$ cat test* > test3.txt

check the result with

ls -l test*

In this case, user first decide whether you want the contents of test.txt to go into test2.txt, or the contents of test2.txt to go into test.txt . Then, using cat with the >> redirection operator, you might type

\$ cat test.txt >> test2.txt

This appends the contents of test.txt to the end of the test2.txt . To check the results, use cat again:

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

Note that if you had entered the command.

\$ cat -n test.txt >> test2.txt

The test2.txt file would look like

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

Finally, here's a trick you can use if you want to create a short text file without running a word processor or text editor. Because the cat command can read the standard input (more about this in Hour 6), you can make the cat command create a file and fill it with your keystrokes.

Here's how:

\$ cat > myfile.txt

Now, enter some text:

\$ cat > myfile.txt

This is the cat word processor.

This is the end of the file.

Then, when you're done typing, press Ctrl+D to close the file. To see if this works, try

```
$ ls -l myfile.txt
```

```
-rw-rw-r-- 1 bball bball 61 Nov 12 18:26 myfile.txt
```

```
$ cat myfile.txt
```

This is the cat word processor.

This is the end of the file.

user should also know that the cat command will print out the contents of any file, and not

just text files. Although cat may be useful to look at one or several short files,

Other file commands

The clear Command

The clear command is used to remove all previous commands and output from consoles and terminal windows in Unix-like operating systems.

A console is an all-text mode user interface that occupies the entire screen of the display device and which does not sit on top of a graphical user interface (GUI). A terminal window is a text-only window in a GUI that emulates a console and which can be opened by clicking the appropriate icon (i.e., small image) or menu item.

Clear is one of the very few commands in Unix-like operating systems that accepts neither options nor arguments (i.e., input files). That is, it is only used as follows:

Clear

After the clear command has been issued, all that remains on the display screen is the command prompt in the upper left hand corner. A command prompt, also referred to as a prompt, is a short text message at the start of a line that informs the user that the system is ready for the next command, data element or other input.

The descriptions are rather terse, and they can seem somewhat cryptic to new users. However, users typically find them to be increasingly useful as they become more familiar with them and gain experience in the use of Unix-like operating systems.

The man command itself is extremely easy to use. Its basic syntax is

```
man [option(s)] keyword(s)
```

man is most commonly used without any options and with only one keyword. The keyword is the exact name of the command or other item for which information is desired. For example, the following provides information about the ls command (which is used to list the contents of any specified directory):

```
man ls
```

As another example, the following displays the man page about the man pages:

```
man man
```

man automatically sends its output through a pager, usually the program less. A pager is a program that causes the output of any program to be displayed one screenful at a time, rather than having a large amount of text scroll down the screen at high (and generally unreadable) speed.

less writes a colon at the bottom of the screen to indicate the end of the on-screen page. The user can move to the next page by pushing the space bar and can return to the previous page by pressing the b key. Pressing the q exits the man pages and returns the user to the shell program.

Each man page is a self-contained article that is divided into a number of sections, the headers for which are labeled with upper case letters. The sections for commands are typically something like NAME, SYNOPSIS, DESCRIPTION, OPTIONS, AUTHOR, BUGS, COPYRIGHT, HISTORY and SEE ALSO, although there may be some differences according to the particular command. Some of these might be broken down into subsections, particularly OPTIONS in the case of a command that has numerous options.

Also, the man pages as a whole are organized into sections, each containing pages about a specific category of topics as shown below. The section to which an article belongs is indicated in parenthesis in the top line, before the NAME header.

1. executable programs or shell commands
2. system calls
3. library routines
4. special files (i.e., devices in the /dev directory)
5. file formats
6. games
7. macro packages
8. system administration commands
9. kernel routines

Some topic names will have multiple articles, depending on context. For instance, there are two articles for mount, one corresponding to its use as a command in system management (i.e., to logically attach partition or other devices to the main filesystem) and the other for use in the C programming language. Generally, the most commonly used topic is displayed by default, and there are references to any other topics with the same name in the SEE ALSO section at the bottom of the final on-screen page.

The syntax to specify an article from a particular section is:

```
man section_number keyword
```

Thus, for example, the following would display the article about mount from Section 2 instead of from the default Section 8:

man 2 mount

The -w and -W options tell man to not actually display the man pages, but to provide the location(s) of the file(s) that would be formatted or displayed. If no arguments (i.e., input files) are provided, a list of directories that is searched by man for man pages is returned.

The -f option produces the same output as the whatis command. whatis provides very brief descriptions of commands from a database that is automatically created from the first line of the NAME section of each relevant man page.

The Whoami and who command

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output. Standard output is, by default, the display screen, unless redirected to a file, printer, etc.

whoami is particularly useful when using shells such as ash and sh that do not show the name of the current user in the command prompt (a short text message at the start of the command line on an all-text display). It is also useful for confirming the current owner of a session after using the su (i.e., substitute user) command, which changes the owner of the session without the original owner having to first log out.

A shell is a program that provides the traditional, text-only user interface for Unix-like operating systems. Its primary function is to read commands that are typed into a console (i.e., an all-text display mode) or terminal window (an all-text window in a GUI) and then execute (i.e., run) them.

The formal syntax for whoami is:

whoami [option]

When used without any options or redirection, as it usually is, i.e.,

Whoami

and followed by pressing the ENTER key, whoami displays on the monitor screen the user name of the owner of the current session.

There are only two options for whoami: --help and --version. The former outputs the very brief description that is contained in the man (i.e., built-in system manual) pages, and the latter outputs the number of the version currently installed on the system.

whoami produces the same result as the id command (which by default provides more detailed information about the current user than does whoami) when id is used with its -u and -n options, i.e.,

id -un

The -u option tells id to provide only the identification for the current owner of the session, and the -n option tells it to present that identification as the user name instead of as a number.

The who command differs from whoami in that it provides a list of all users currently logged into the system as well

as additional information about each of those users (including login times and terminal numbers). It also differs in that, in the event of a change in ownership of a login session through the use of the su command, it reports the original owner of the session, whereas whoami provides the user name of the effective (i.e., current) owner of the session.

stat command

File Stat - Display Information About File

For example, to find out more information about 101hacks.txt file, execute the stat command as shown below.

\$ stat 101hacks.txt

File: '/home/sathiyamoorthy/101hacks.txt'

Size: 854 Blocks: 8 IO Block: 4096 regular file

Device: 801h/2049d Inode: 1058122 Links: 1

Access: (0600/-rw-----) Uid: (1000/ sathiya)
Gid: (1000/ sathiya)

Access: 2009-06-28 19:29:57.000000000 +0530

Modify: 2009-06-28 19:29:57.000000000 +0530

Change: 2009-06-28 19:29:57.000000000 +0530

Details of Linux stat command output

- **File:** '/home/sathiyamoorthy/101hacks.txt' - Absolute path name of the file.
- **Size:** 854 - File size in bytes.
- **Blocks:** 8 - Total number of blocks used by this file.
- **IO Block:** 4096 - IO block size for this file.
- **Regular file** - Indicates the file type. This indicates that this is a regular file. Following are available file types.
 - regular file. (ex: all normal files).
 - directory. (ex: directories).
 - socket. (ex: sockets).
 - symbolic link. (ex: symbolic links.)
 - block special file (ex: hard disk).
 - character special file. (ex: terminal device file).
- Device: 801h/2049d - Device number in hex and device number in decimal
- Inode: 1058122 - Inode number is a unique number for each file which is used for the internal maintenance by the file system.
- Links: 1 - Number of links to the file
- Access: (0600/-rw---): Access specifier displayed in both octal and character format. Let us see explanation about both the format.

- **Uid:** (1000/ sathiya) - File owner's user id and user name are displayed.
- **Gid:** (1000/ sathiya) - File owner's group id and group name are displayed.
- **Access:** 2009-06-28 19:29:57.000000000 +0530 - Last access time of the file.
- **Modify:** 2009-06-28 19:29:57.000000000 +0530 - Last modification time of the file.
- **Change:** 2009-06-28 19:29:57.000000000 +0530 - Last change time of the inode data of that file.

Dir Stat - Display Information About Directory You can use the same command to display the information about a directory as shown below.

\$ stat /home/ramesh

File: '/home/ramesh'

Size: 4096 Blocks: 8 IO Block: 4096 directory

Device: 803h/2051d Inode: 5521409 Links: 7

Access: (0755/drwxr-xr-x) Uid: (401/ramesh)
Gid: (401/ramesh)

Access: 2009-01-01 12:17:42.000000000 -0800

Modify: 2009-01-01 12:07:33.000000000 -0800

Change: 2009-01-09 12:07:33.000000000 -0800

head command

The head command reads the first few lines of any text given to it as an input and writes them to standard output (which, by default, is the display screen).

head's basic syntax is:

head [options] [file(s)]

The square brackets indicate that the enclosed items are optional. By default, head returns the first ten lines of each file name that is provided to it.

For example, the following will display the first ten lines of the file named aardvark in the current directory (i.e., the directory in which the user is currently working):

head aardvark

If more than one input file is provided, head will return the first ten lines from each file, precede each set of lines by the name of the file and separate each set of lines by one vertical space. The following is an example of using head with two input files:

head aardvark armadillo

If it is desired to obtain some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, the above example could be modified to display the first 15 lines from each file:

head -n15 aardvark armadillo

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in

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between. Thus, the following command would produce the same result:

head -n 15 aardvark armadillo

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell head how many lines to return. Thus, the following would produce the same result as the above commands:

head -15 aardvark armadillo

head can also return any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the start of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, the following would display the first five bytes of each of the two files provided:

head -c 5 aardvark anteater

When head counts by bytes, it also includes the newline character, which is an un-printing (i.e., invisible) character that is designated by a backslash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the start of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or on paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would display the first five kilobytes of the file aardvark:

head -c5k aardvark

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case head would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like head: aardvark: invalid number of bytes:

head -c aardvark

If head is used without any options or arguments (i.e., file names), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the first ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

head -n3

As is the case with other command line (i.e., all-text mode) programs in Linux and other Unix-like operating systems, the output from head can be redirected from the display monitor to a file or printer using the output redirection operator (which is represented by a rightward-pointing angular

bracket). For example, the following would copy the first 12 lines of the file Yuriko to the fileDecember:

head -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two consecutive rightward pointing angle brackets) could be used to add the output from head to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

head -n 12 Yuriko >> December

The output from other commands can be sent via a pipe (represented by the vertical bar character) to head to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to head, which, in turn, displays the first ten lines of the output that it receives from ls:

ls | head

This output could easily be redirected, for example to the end of a file namedfile1 as follows:

ls | head >> file1

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reverse alphabetic order prior to appending file1:

ls | head | sort -r >> file1

The -q (i.e., quiet) option causes head to not show the file name before each set of lines in its output and to eliminate the vertical space between each set of lines when there are multiple input sources. Its opposite, the -v (i.e., verbose) option, causes head to provide the file name even if there is just a single input file.

The tail command is similar to the head command except that it reads the final lines in files rather than the first lines.

As is the case with other commands on Unix-like operating systems, additional information can be obtained about head and tail by using the man and infocommands to reference the built-in documentation, for example

man head

or

info tail

tail command

The tail command reads the final few lines of any text given to it as an input and writes them to standard output (which, by default, is the monitor screen).

The basic syntax for tail is:

tail [options] [filenames]

\$ tail -n 4 /etc/passwd

The square brackets indicate that the enclosed items are optional. By default, tail returns the final ten lines of each file name that is provided to it.

For example, the following command will print (traditional Unix terminology for write) the last ten lines of the file named aardvark in the current directory (i.e., the director in which the user is currently working) to the display screen:

tail aardvark

If more than one input file is provided, tail will print the last ten lines from each file to the monitor screen. Each set of lines will be preceded by the name of the file and separated by one vertical space from other sets of lines. The following is an example of using tail with multiple input files:

tail file1 file2 file3

If it is desired to print some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, to print the final 15 lines from each file in the above example, the command would be modified as follows:

tail -n15 file1 file2 file3

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in between. Thus, the following command would produce the same result:

tail -n 15 file1 file2 file3

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell tail how many lines to print. Thus, the following would produce the same result as the above commands:

tail -15 file1 file2 file3

tail can also print any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the end of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, to view the final five bytes of each of the two files aardvark and anteater, the following command would be used:

tail -c 5 file1 file2

When tail counts by bytes, it also includes the newline character, which is a non-printing (i.e, invisible) character that is designated by a backward slash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the end of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would print the last five kilobytes of the file aardvark:

tail -c5k file1

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case tail would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like tail: aardvark: invalid number of bytes:

tail -c file1

If tail is used without any options or arguments (i.e., inputs), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the final ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

tail -n3

As is the case with other command line (i.e., all-text mode) programs in Unix-like operating systems, the output of tail can be redirected from the monitor to a file or printer using the redirection operator (which is represented by a rightward pointing angular bracket). For example, the following would write the final 12 lines of the file Yuriko to the file December:

tail -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two rightward pointing angular brackets) could be used to add the output from tail to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

tail -n 12 Yuriko >> December

The output from other commands can be piped (i.e., sent) to tail to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to tail, which, in turn, prints the final ten lines of the output that it receives from ls to the monitor screen:

ls | tail

This output could easily be redirected, for example to a file named last_filenames as follows:

ls | tail >> last_filenames

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reversealphabetic order prior to writing to a file:

ls | tail | sort -r >> last_filenames

The -q (i.e., quiet) option causes tail to not print the file name before each set of lines and to eliminate the vertical space between each set of lines when there are multiple input sources. The -v (i.e., verbose) option causes tail to print the file name even if there is just a single input file.

Tail could be viewed as a counterpart of the head command, which always starts reading from the beginning of files and which can continue until any specified distance from the beginning. However, there are a few differences. Perhaps the most useful of these is that tail is somewhat more flexible in that, in addition to being able to start reading any specified distance from the end of a file, it can also start at any specified distance from the beginning of a file.

Tail can be instructed to begin printing from some number of lines or bytes from the start of a file by preceding the number with a plus sign instead of a minus sign. For example, the following would print each of the designated files to the display monitor beginning with the seventh line and until the end:

tail +7 file1 file2 file3

The c option could be used to tell tail to print each of the designated files beginning with the seventh byte instead of the seventh line:

tail +7c file1 file2 file3

A particularly common application for tail is examining the most recent entries in log files. This is because the newest entries are appended to the ends of such files, which tail excels in showing. As log files can be a rather long, this can eliminate a lot of scrolling that would be necessary if some other command were used to read them. For example, the most recent entries to the log /var/log/messages can easily be viewed by using the following:

tail /var/log/messages

wc command

The wc (i.e., word count) command by default counts the number of lines, words and characters in text.

wc defines a word as a set of contiguous letters, numbers and/or symbols which are separated from other characters by one or more spaces, tabs and/or newline characters (which are generated when the RETURN key is pressed). When counting the number of characters, all characters are counted, not only letters, numbers and symbols, but also spaces, tabs and newline characters. A line is only counted if it ends with a newline character.

wc's syntax is

wc [options] [file_name(s)]

The items in square brackets are optional. If no file names are provided, wc reads from its standard input, which by default is text entered at the keyboard.

This can be seen by typing.

wc

at the command line (i.e., in the all-text mode), pressing the ENTER key to move to a new line and then typing some text on one or more lines. The command isexecuted (i.e., run) by pressing the ENTER key again and then pressing the CONTROL and d keys simultaneously. This causes wc to write in a new line (under the lines of text) its count of the numbers of lines, words and characters in the text.

The following command counts the number of lines, words and characters in a file named file1 that resides in the current directory (i.e., the directory in which the user is currently working) and likewise writes them, followed by the name of the file, to standard output, which is by default the display monitor:

wc file1

wc can provide its output for multiple files by listing the name of each separated by a space. For example,

wc file1 file2 file3

The numbers of lines, words and characters for each file along with its name will be displayed on a separate line and in the order that the files are listed as arguments(i.e., input files). In the case of multiple arguments such as this, wc also provides an additional line that shows the total number of lines, words and characters for all the files.

Likewise, wc can provide a count for all of the text files within a directory. This is accomplished by using the star wildcard character, which represents everythingand is designated by an asterisk (*). For example, the following will display the number of lines, words and characters for each file in the current directory (which is represented by a dot) as well as totals for all files in the directory:

wc . *

wc has only a few options, the most commonly used of which restrict the information it provides. The -l option tells wc to count only the number of lines, the -woption tells it to count only the number of words, the -m option tells it to count only the number of characters and the -c option tells wc to count only the number ofbytes. Thus, for example, the following displays just the number of words in a file named file4:

wc -w file4

The following displays the number of characters in the same file:

wc -m file4

As is generally the case with commands in Unix-like operating systems, any combination of options can be used together. For example, the following would count both the numbers of lines and words in a file named file5:

wc -lw file5

Redirection can be used with wc to create more complex commands. For example, the output from the above command can be redirected using the standard output redirection operator (which is designated by a rightward pointing angle bracket) from the display screen to a file named file6 with the following:

wc -lw file5 > file6

If file6 already exists, its contents will be overwritten; if it does not exist, it will be created. The contents of file6 can be easily confirmed with a text editor or with a command such as cat, which is commonly used to read text files, i.e.,

cat file6

grep command

grep is used to search text for patterns specified by the user. It is one of the most useful and powerful commands on Linux and other Unix-like operating systems.

grep's basic syntax is:

grep [option(s)] pattern [file(s)]

The items in square brackets are optional. When used with no options and no arguments (i.e., input files), grep searches standard input (which by default is text typed in at the keyboard) for the specified pattern and returns each line that contains a match to standard output (which by default is the display screen).

A line of text is defined in this context not as what appears as a line of text on the display screen but rather as all text between two newline characters. Newline characters are invisible characters that are represented in Unix-like operating systems by a backslash followed by the letter n and which are created when a user presses the ENTER key when using a text editor (such as gedit). Thus, a line of text returned by grep can be as short as a single character or occupy many lines on the display screen.

grep can search any number of files simultaneously. Thus, for example, the following would search the three files file1, file2 and file3 for any line that contains thestring (i.e., sequence of characters) Lin:

grep Lin file1 file2 file3

Each result is displayed beginning on a separate line, and it is preceded by the name of the file in which it was found in the case of multiple files. The inclusion of the file names in the output data can be suppressed by using the -h option.

grep is not limited to searching for just single strings. It can also search for sequences of strings, including phrases. This is accomplished by enclosing the sequence of strings that forms the pattern in quotation marks (either single or double). Thus, the above example could be modified to search for the phrase Linux is:

grep 'Linux is' file1 file2 file3

Text searches with grep can be considerably broadened by combining them with wildcards and/or performing recursive searches. A wildcard is a character that can represent some specific class of characters or sequence of characters. The following is a modification of the above example that uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to search all text files in the current directory (i.e., the directory in which the user is currently working):

grep 'Linux is' *

grep's search area can be broadened even further by using its -r option to search recursively through an entire directory tree (i.e., a directory and all levels of subdirectories within it) rather than just the files within a specified directory. For example, the following would search all files in the current

directory and in all of its subdirectories (including their subdirectories, etc.) for every line containing the full name of the creator of Linux:

```
grep -r 'Linus Torvalds' *
```

One of the most commonly employed of grep's many options is -i, which instructs it to ignore case, that is, to ignore whether letters in the pattern and text searched are lower case (i.e., small letters) or upper case (i.e., capital letters). Thus, for instance, the previous example could very easily be converted to a case-insensitive search as follows:

```
grep -ir 'Linus Torvalds' *
```

This would produce the same results as

```
grep -ir 'linUS torvAlds' *
```

Another frequently used option is -c, which causes grep to only report the number of times that the pattern has been matched for each file and to not display the actual lines. Thus, for instance, the following would show the total number of times that the string inu appears in a file named file4:

```
grep -c inu file4
```

Another useful option is -n, which causes grep to precede each line of output with the number of the line in the text file from which it was obtained. The -v option inverts the match; that is, it matches only those lines that do not contain the given pattern.

The -w option tells grep to select only those lines that contain an entire word or phrase that matches the specified pattern. The -x option tells grep to select only those lines that match exactly the specified pattern.

The -l option tells grep to not return the lines containing matches but to only return the names of the files that contain matches. The -L option is the opposite of the -l option (and analogous to the -v option) in that it will cause grep to return only the names of files that do not contain the specified pattern.

grep does not search the names of files for a specified pattern, only the text contained within files. However, sometimes it is useful to search the names of files, as well as of directories and links, rather than the contents of files. Fortunately, this can easily be accomplished by first using the ls command to list the contents of a directory and then using a pipe (which is represented by the vertical bar character) to transfer its output to grep for searching. For example, the following would provide a list of all files, directories and links in the current directory that contain the string linu in their names:

```
ls | grep linu
```

The following example uses ls with its -l (i.e., long) option (which is unrelated to grep's -l option) to find all filesystem objects in the current directory whose permissions have been set so that any user can read, write and execute them:

```
ls -l | grep rwxrwxrwx
```

grep is very useful for obtain information from log and configuration files. For example, it can be used to obtain information about the USB (universal serial bus) devices on a system by filtering the output from the dmesg command (which provides the messages from the kernel as a system is booting up) as follows:

```
dmesg | grep -i usb
```

Among grep's other options are --help, which provides a very compact summary of some of its many capabilities, and -V, or --version, which provides information about the currently installed version.

grep's search functionality can be even further refined through the use of regular expressions. These are a pattern matching system that uses strings constructed according to pre-defined syntax rules to find desired patterns in text. Additional information about grep, including its use with regular expressions, can be obtained from its built-in manual page by using the man command, i.e.,

man grep

The name grep comes from a command in ed, which was the original text editor on the UNIX operating system. The command takes the form g/re/p, which means to search globally for matches to the regular expression (i.e., re), and print (which is UNIX terminology for write on the display screen) lines that are found.

In command

In command is used to create links. Links are a kind of shortcuts to other files. The general form of command is:

```
$ In TARGET LINK_NAME
```

There are two types of links, soft links and hard links. By default, hard links are created. If you want to create soft link, use -s option. In this example, both types of links are created for the file usrlisting.

```
$ In usrlisting hard_link
```

```
$ In -s usrlisting soft_link
```

```
$ ls -l
```

```
total 12
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 hard_link
```

```
lrwxrwxrwx 1 raghu raghu 10 2012-07-09 14:00 soft_link -> usrlisting
```

```
-rw-r--r-- 1 raghu raghu 491 2012-07-06 16:02 usrcopy
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 usrlisting
```

Some additional useful commands

alias command

'alias' is another name for a command. If no argument is given, it shows current aliases. Aliases can be used for short names of commands. For example, you might use clear command frequently. You can create an alias for it:

\$ alias c="clear"

Next time enter c on command line, your screen will be clear. Current aliases can be checked with 'alias' command:

\$ alias

```
alias alert='notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e \'s/^\\s*[0-9]+\\s*//;s/[;&]\\s*alert$//\'")'
```

alias c='clear'

alias egrep='egrep --color=auto'

alias fgrep='fgrep --color=auto'

alias grep='grep --color=auto'

alias l='ls -CF'

alias la='ls -A'

alias ll='ls -alF'

alias ls='ls --color=auto'

w command

The w command shows who is logged in to the system and what they are doing.

A login, logging in or logging on is the entering of identifier information into a system by a user in order to access that system (e.g., a computer or a website). It generally requires the user to enter two pieces of information, first a user name and then a password.

The basic syntax of w is:

w [options] [username1, username2, ...]

The square brackets indicated that the enclosed items are optional. When used without any options, w sends to standard output (which is by default the display screen) a header line followed by a table that contains a line of data for each user currently logged in.

The header shows six items: the current time, how long the system has been running (in minutes) since it was booted up (i.e., started up), how many users are currently logged on, and the system load averages, i.e., the average number of processes active, during the last one, five and 15 minutes. A process is an executing(i.e., running) instance of a program.

The main part of w's output consists of a table showing eight items of information for each user currently logged into the system. The eight columns are labeled USER, TTY, FROM, LOGIN@, IDLE, JCPU, PCPU and WHAT.

USER is the login name of the user. TTY (which now stands for terminal type but originally stood for teletype) is the name of the console or terminal (i.e., combination of monitor and keyboard) that the user logged into, which can also be found by using the tty command. Every time a user logs in across the network, a new tty is assigned to that user.

The consoles can be real or virtual. A feature of Linux systems is the use of virtual consoles, which act as

independent logical consoles that run in separate login sessions, but which are accessed from the same physical console (i.e., the same keyboard and screen). That is, each virtual console can have a different, or the same, user logged into it. On a Red Hat system, seven virtual consoles are configured and active by default.

FROM is the remote host (i.e., the name of some other computer), if any, that the user logged into. LOGIN@ is the time at which the user logged in. IDLE is the number of hours and minutes since the user last typed anything at the keyboard.

JCPU is the number of minutes accumulated by all processes attached to the tty. It does not include past background processes (i.e., low priority processes that operate only in gaps between higher priority foreground processes), but it does include currently running background processes.

PCPU is the time consumed by the current process, named in the WHAT column. WHAT lists the name of the current process along with any options and arguments(i.e., input files) used with the command that launched it.

Among the more useful of w's few options is -h, which tells it to omit the header header line from its output. The -s option tells it to use the short format, which omits the login time, JCPU and PCPU columns. The -l option creates a long listing, which is the same as the default. The -V option displays the version number of the currently installed w program.

By default, w reports on all users. However, it can be made to report on only a specified set of users by providing those usernames in a comma-separated list.

w provides information similar to that which would be provided by a combination of the uptime, who and ps -a commands. uptime produces a single line of output that is the same as w's header line. who shows who is currently logged into the system. ps -a lists all processes with a tty except session leaders (i.e., processes that created sessions).

w can be useful, but there are some faults with the information it provides, and thus its output should only be considered approximate. In particular, the notion of thecurrent process is unclear and there are some problems detecting background processes, even though they usually account for much of the load on the system. Also, the CPU time is only an estimate; for example, if a user leaves a background process running after logging out, the time is credited to the person currently on that terminal.

last command

Display information about the users who logged in and out of the system. The output of last can be very large, so the following output has been filtered (through head) to display top 10 lines only:

```
$ last | head
root tty1 Mon Jul 9 10:06 still logged in
root tty1 Mon Jul 9 10:06 - 10:06 (00:00)
raghu pts/1 :0.0 Mon Jul 9 10:05 - 10:06 (00:00)
raghu pts/0 :0.0 Mon Jul 9 09:34 still logged in
raghu tty7 :0 Mon Jul 9 09:19 still logged in
reboot system boot 2.6.38-13-generi Mon Jul 9 09:09 -
10:12 (01:02)
raghu tty7 :0 Sun Jul 8 23:36 - 00:30 (00:54)
reboot system boot 2.6.38-13-generi Sun Jul 8 23:36 -
00:30 (00:54)
raghu tty7 :0 Sun Jul 8 21:07 - down (01:06)
reboot system boot 2.6.38-13-generi Sun Jul 8 21:07 -
22:14 (01:07)
```

A similar command is lastb that shows last bad login attempts. But this command must be run as root otherwise would get an error of permission denied

```
$ lastb
raghu tty2 Mon Jul 9 10:16 - 10:16 (00:00)
UNKNOWN tty2 Mon Jul 9 10:15 - 10:15 (00:00)
ubuntu tty8 :1 Mon Jul 2 10:23 - 10:23 (00:00)
btmp begins Mon Jul 2 10:23:54 2012
```

du command

du command determines disk usage of a file. If the argument given to it is a directory, then it will list disk usage of all the files and directories recursively under that directory:

```
$ du /etc/passwd
4 /etc/passwd
$ du hello/
52 hello/HelloApp
4 hello/orb.db/logs
20 hello/orb.db
108 hello/
```

df command

df reports file system usage. For example:

```
$ df
Filesystem 1K-blocks Used Available Use% Mounted on
/dev/sda7 10079084 7372872 2194212 78% /
none 1522384 768 1521616 1% /dev
none 1529012 252 1528760 1% /dev/shm
none 1529012 108 1528904 1% /var/run
none 1529012 4 1529008 1% /var/lock
/dev/sda8 5039616 3758824 1024792 79% /home
```

```
/dev/sda2 209715196 196519248 13195948 94%
media/Data
```

fdisk command

The fdisk is the tool for getting partition information, adding and removing partitions. The fdisk tool requires super user privileges. To list all the partitions of all the hard drives available:

```
$ fdisk -l
Disk /dev/sda: 320.1 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x396f396f

Device Boot Start End Blocks Id System
/dev/sda1 1 2611 20971520 7 HPFS/NTFS
/dev/sda2 2611 28720 209715200 7 HPFS/NTFS
/dev/sda3 * 28720 38914 81882113 5 Extended
  /dev/sda5 28720 33942 41943040 7 HPFS/NTFS
  /dev/sda6 33942 34464 4194304 7 HPFS/NTFS
  /dev/sda7 34464 35739 10240000 83 Linux
  /dev/sda8 35739 36376 5120000 83 Linux
  /dev/sda9 36376 36886 4096000 82 Linux swap / Solaris
  /dev/sda10 36887 38276 11164672 83 Linux
  /dev/sda11 38277 38914 5117952 83 Linux
```

fdisk is an interactive tool to edit the partition table. It takes a device (hard disk) as an argument, whose partition table needs to be edited.

\$ fdisk /dev/sda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): m

Command	action
a	toggle a bootable flag
b	edit bsd disk label
c	toggle the dos compatibility flag
d	delete a partition
l	list known partition types
m	print this menu
n	add a new partition
o	create a new empty DOS partition table
p	print the partition table
q	quit without saving changes

s	create a new empty Sun disklabel
t	change a partition's system id
u	change display/entry units
v	verify the partition table
w	write table to disk and exit
x	extra functionality (experts only)

Pressing 'm' at the fdisk prompt prints out above help that lists all the commands available for fdisk. A new partition can be created with n and an existing partition can be deleted with d command. When you are done editing the partitions, press w to write the changes to the disk, and finally, q to quit from fdisk (q dies not save changes).

netstat command

'netstat' is the command used to check the network statistics of the system. It will list the current network connections, routing table information, interface statistics, masquerade connections and a lot more information.

\$ netstat | head

Active Internet connections (w/o servers)

Proto Recv-Q Send-Q Local Address Foreign Address State

Active UNIX domain sockets (w/o servers)

Proto RefCnt Flags Type State I-Node Path

unix 13 [] DGRAM 8498 /dev/log

unix 2 [] DGRAM 6824 @/org/kernel/udev/udevd

unix 3 [] STREAM CONNECTED 56738 /var/run/dbus/
system_bus_socket

unix 3 [] STREAM CONNECTED 56113

unix 3 [] STREAM CONNECTED 29138

unix 3 [] STREAM CONNECTED 29137

history command

This command shows the commands you have entered on your terminal so far.

passwd command

Change your password with 'passwd' command.

shutdown -h now

Finally shut down your system using this command.

Understanding and using file permissions

In Linux and Unix, everything is a file. Directories are files, files are files and devices are files. Devices are usually referred to as a node; however, they are still files.

All of the files on a system have permissions that allow or prevent others from viewing, modifying or executing. If the file is of type Directory then it restricts different actions than files and device nodes. The super user "root" has the ability to access any file on the system. Each file has access restrictions with permissions, user restrictions with owner/group association. Permissions are referred to as bits.

If the owner read & execute bit are on, then the permissions are:

There are three types of access restrictions:

Permission	Action	Chmod option
read	(view)	r or 4
write	(edit)	w or 2
execute	(execute)	x or 1

There are also three types of user restrictions:

User	ls output
owner	-rwx----
group	---rwx---
other	-----rwx

**The restriction type scope is not inheritable:
the file owner will be unaffected by restrictions
set for his group or everybody else.**

Folder/Directory Permissions

Directories have directory permissions. The directory permissions restrict different actions than with files or device nodes.

Permission	Action	chmod option
Read	(view contents, i.e. ls command)	r or 4
Write	(create or remove files from dir)	w or 2
execute	(cd into directory)	x or 1

1. read restricts or allows viewing the directories contents, i.e. ls command
2. write restricts or allows creating new files or deleting files in the directory. (Caution: write access for a directory allows deleting of files in the directory even if the user does not have write permissions for the file!)
3. execute restricts or allows changing into the directory, i.e. cd command

Folders (directories) must have 'execute' permissions set (x or 1), or folders (directories) will NOT FUNCTION as folders (directories) and WILL DISAPPEAR from view in the file browser (Nautilus).

Permissions in Action

```
$ ls -l /etc/hosts
```

```
-rw-r--r-- 1 root root 288 2005-11-13 19:24 /etc/hosts
```

Using the example above we have the file "/etc/hosts" which is owned by the user root and belongs to the root group.

The permissions from the above /etc/hosts ls output

```
-rw-r--r--
```

owner = Read & Write (rw-)

group = Read (r--)

other = Read (r--)

Changing permissions

The command to use when modifying permissions is chmod. There are two ways to modify permissions, with numbers or with letters. Using letters is easier to understand for most people. When modifying permissions be careful not to create security problems. Some files are configured to have very restrictive permissions to prevent unauthorized access. For example, the /etc/shadow file (file that stores all local user passwords) does not have permissions for regular users to read or otherwise access.

```
$ ls -l /etc/shadow
```

```
-rw-r----- 1 root shadow 869 2005-11-08 13:16 /etc/shadow
```

Permissions:

owner = Read & Write (rw-)

group = Read (r--)

other = None (---)

Ownership:

owner = root

group = shadow

chmod with Letters

Usage: chmod {options} filename

Options	Definition
U	owner
G	group
O	other
A	all (same as ugo)
X	execute
W	write
R	read
+	add permission
-	remove permission
=	set permission

Here are a few examples of chmod usage with letters (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
```

```
$ ls -l
```

```
total 0
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod u+x file1
```

```
$ ls -l file1
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod o+wx file2
```

```
$ ls -l file2
```

```
-rwxr--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod g-r file3
```

```
$ ls -l file3
```

```
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod ugo+rwx file4
```

```
$ ls -l file4
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
```

```
$
```

chmod with Numbers

Usage: chmod {options} filename

Options	Definition
#-	owner
#	group
-#	other
1	execute
2	write
4	read

Owner, Group and Other is represented by three numbers. To get the value for the options determine the type of access needed for the file then add.

For example if need a file that has -rw-rw-rwx permissions will use the following:

Owner	Group	Other
read & write 4+2=6	read & write 4+2=6	read, write & execute 4+2+1=7

\$ chmod 667 filename

Another example if you want a file that has --w-r-x-- permissions you will use the following:

Owner	Group	Other
write 2	read & execute 4+1 = 5	execute 1

\$ chmod 251 filename

Here are a few examples of chmod usage with numbers (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
$ ls -l
total 0
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod 744 file1
$ ls -l file1
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod 647 file2
$ ls -l file2
-rw-r--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod 604 file3
$ ls -l file3
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod 777 file4
$ ls -l file4
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
$
```

chmod with sudo

Changing permissions on files that do not have ownership of: (Note that changing permissions the wrong way on the wrong files can quickly mess up the system a great deal!

Please be careful when using sudo!)

```
$ ls -l /usr/local/bin/somefile
-rw-r--r-- 1 root root 550 2005-11-13 19:45 /usr/local/bin/
somefile
```

\$

```
$ sudo chmod o+x /usr/local/bin/somefile
```

```
$ ls -l /usr/local/bin/somefile
```

```
-rw-r--r-x 1 root root 550 2005-11-13 19:45 /usr/local/
bin/somefile
```

\$

Recursive permission changes

To change the permissions of multiple files and directories with one command. Please note the warning in the chmod with sudo section and the Warning with Recursive chmod section.

Recursive chmod with -R and sudo

To change all the permissions of each file and folder under a specified directory at once, use sudo chmod with -R

```
$ sudo chmod 777 -R /path/to/someDirectory
```

```
$ ls -l
```

```
total 3
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file1
```

```
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file2
```

Recursive chmod using find, pipemill, and sudo

To assign reasonably secure permissions to files and folders/directories, it's common to give files a permission of 644, and directories a 755 permission, since chmod -R assigns to both. Use sudo, the find command, and a pipemill to chmod as in the following examples.

To change permission of only files under a specified directory.

```
$ sudo find /path/to/someDirectory -type f -print0 | xargs
-0 sudo chmod 644
```

```
user@host:/home/user$ ls -l
```

```
total 3
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

```
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file2
```

To change permission of only directories under a specified directory (including that directory):

```
$ sudo find /path/to/someDirectory -type d -print0 | xargs
-0 sudo chmod 755
```

```
$ ls -l
```

```
total 3
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

```
drwxr-xr-x 2 user user 4096 Nov 19 20:13 folder
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

Warning with Recursive chmod

WARNING: Although it's been said, it's worth mentioning in context of a gotcha typo. Please note, Recursively deleting or chown-ing files are extremely dangerous. You will not be the first, nor the last, person to add one too many spaces into the command. This example will hose your system:

```
$ sudo chmod -R / home/john/Desktop/tempfiles
```

Note the space between the first / and home. You have been warned.

Changing the file owner and group

A file's owner can be changed using the chown command. For example, to change the foobar file's owner to tux:

```
$ sudo chown tux foobar
```

To change the foobar file's group to penguins, you could use either chgrp or chown with special syntax:

```
$ sudo chgrp penguins foobar
```

```
$ sudo chown :penguins foobar
```

Finally, to change the foobar file's owner to tux and the group to penguins with a single command, the syntax would be:

```
$ sudo chown tux:penguins foobar
```

Note that, by default, you must use sudo to change a file's owner or group.

Difference between chown and chgrp

- 1) Chown command is used to change ownership as well as group name associated to different one, whereas chgrp can change only group associated to it.
- 2) Many people say that regular user is only able to use chgrp to change the group if the user belongs to them. But it's not true; a user can use chown and chgrp irrespective of changing group to one of their groups because chown is located in /bin folder so everyone can use it with some limited access.

umask - Set default permissions

The umask command controls the default permissions given to a file when it is created.

It uses octal notation to express a mask of bits to be removed from a file's mode attributes.

```
[me@linuxbox ~]$ rm -f foo.txt
```

```
[me@linuxbox ~]$ umask
```

```
0002
```

```
[me@linuxbox ~]$ > foo.txt
```

```
[me@linuxbox ~]$ ls -l foo.txt
```

```
-rw-rw-r-- 1 me me 0 2008-03-06 14:53 foo.txt
```

We first removed any old copy of foo.txt to make sure we were starting fresh. Next,

we ran the umask command without an argument to see the current value. It responded with the value 0002 (the value 0022 is another common default value), which is the octal representation of our mask. We next create a new instance of the file foo.txt and observe its permissions.

We can see that both the owner and group both get read and write permission, while everyone else only gets read permission. The reason that world does not have write permission is because of the value of the mask.

```
$ rm foo.txt
```

```
$ umask 0000
```

```
$ > foo.txt
```

```
$ ls -l foo.txt
```

```
-rw-rw-rw- 1 me me 0 2008-03-06 14:58 foo.txt
```

When we set the mask to 0000 (effectively turning it off), we see that the file is now

world writable. To understand how this works, we have to look at octal numbers again.

If we take the mask and expand it into binary, then compare it to the attributes.

Original file mode	--- rw- rw- rw-
Mask	000 000 000 010
Result	--- rw- rw- r--

Ignore for the moment the leading zeros (we'll get to those in a minute) and observe that

where the 1 appears in our mask, an attribute was removed—in this case, the the world

write permission. That's what the mask does. Everywhere a 1 appears in the binary value

of the mask, an attribute is unset. If we look at a mask value of 0022, we can see what it does:

Original file mode	--- rw- rw- rw-
Mask 000 000 010 010	000 000 000 010
Result	--- rw- r-- r--

Again, where a 1 appears in the binary value, the corresponding attribute is unset. Play with some values (try some sevens) to get used to how this works. When you're done, remember to clean up:

```
$ rm foo.txt; umask 0002
```

The Tar command

The tar (i.e., tape archive) command is used to convert a group of files into an archive.

An archive is a single file that contains any number of individual files plus information to allow them to be restored to their original form by one or more extraction programs. Archives are convenient for storing files as well as for transmitting data and distributing programs. Moreover, they are very easy to work with, often much more so than dealing with large numbers of individual files.

Although tar was originally designed for backups on magnetic tape, it can now be used to create archive files anywhere on a file system. Archives that have been created with tar are commonly referred to as tar balls.

Unlike some other archiving programs, and consistent with the Unix philosophy that each individual program should be designed to do only one thing but do it well, tar does not perform compression. However, it is very easy to compress archives created with tar by using specialized compression utilities.

tar's basic syntax is

tar option(s) archive_name file_name(s)

tar has numerous options, many of which are not frequently used. Unlike many commands, tar requires the use of at least one option, and usually two or more are necessary.

tar files are created by using both the -c and -f options. The former instructs tar to create an archive and the latter indicates that the next argument (i.e., piece of input data in a command) will be the name of the new archive file. Thus, for example, the following would create an archive file called file.tar from the three files named file1, file2 and file3 that are located in the current directory (i.e., the directory in which the user is currently working):

tar -cf file.tar file1 file2 file3

It is not absolutely necessary that the new file have the .tar extension; however, the use of this extension can be very convenient because it allows the type of file to be visually identified. It is necessary, however, that the -f option be the final option in a sequence of contiguous, single-letter options; otherwise, the system will become confused as to the desired name for the new file and will use the next option in the sequence as the name.

The -v (i.e., verbose) option is commonly used together with the -c and -f options in order to display a list of the files that are included in the archive. In such case, the above example would become

tar -cvf file.tar file1 file2 file3

tar can also be used to make archives from the contents of one or more directories. The result is recursive; that is, it includes all objects (e.g., directories and files) within each level of directories. For example, the contents of two directories named dir1 and dir2 could be archived into a file named dir.tar with the following:

tar -cvf dir.tar dir1 dir2

It is often convenient to use tar with a wildcard (i.e., a character which can represent some specific class of characters or sequence of characters). The following example uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to create an archive of every object in the current directory:

tar -cf *

By default, tar creates an archive of copies of the original files and/or directories, and the originals are retained.

However, they can be removed when using tar by adding the --remove-files option.

As it has no compression and decompression capabilities of its own, tar is commonly used in combination with an external compression utility. A very handy feature of the GNU version (which is standard on Linux) is the availability of options that will cause standard compression programs to compress a new archive file as soon as it has been created. They are -j (for bzip2), -z (for gzip) and -Z (for compress). Thus, for example, the following would create an archive named files.tar.bz2 of the files file4, file5 and file6 that is compressed using bzip2:

tar -cvjf files.tar.bz2 file4 file5 file6

tar can also be used for unpacking tar files. However, before doing this, there are several steps that should be taken. One is to confirm that sufficient space is available on the hard disk drive (HDD). Another is to move to an empty directory (which usually involves creating one with an appropriate name) to prevent the reconstituted files from cluttering up the current directory and overwriting any files or directories with same names that are in it. In addition, if the archive has been compressed, it must first be decompressed using the appropriate decompression program (which can usually be determined by the filename extension).

In order to unpack a tar file, the -x (for extract) and -f options are required. It is also common to add the -v option to provide a running listing of the files being unpacked. Thus, for example, to unpack the archive file.tar created in a previous example the following would be used:

tar -xvf file.tar

Just as options are available to allow three compression programs to automatically compress newly created tar files, the same options can be used to have the compression programs automatically decompress tar files prior to extraction. Thus, for instance, the following would decompress and extract the contents of the compressed archive files.tar.bz2 that was created in an above example:

tar -xjvf files.tar.bz2

Files can be added to an existing archive using the -r option. As is always the case with tar, it is also necessary to use the -f option to indicate that the following string (i.e., sequence of characters) is the name of the archive. For example, the following would append a file named file7 to file.tar:

tar -rf file.tar file7

The --delete option allows specified files to be completely removed from a tar file (except when the tar file is on magnetic tape). However, this is different from an extraction, as copies of the removed files are not made and placed in the current directory. Thus, for example, the files file1 and file2 can be removed from file.tar with the following:

tar -f file.tar --delete file1 file2

The -t option tells tar to list the contents of an uncompressed archive without performing an extraction. Thus, the following would list the contents of file.tar:

```
tar -tf file.tar
```

Input, output and error redirection in linux

Input/output redirection means the text that is showing on the screen while you are running any command(program)in the shell, that information can be redirect elsewhere and even it can store this output in a file or can be print directly.

This function called Redirection, and can also redirect the input of program.

In Linux systems everything consider as a file.

A file descriptor is number that is associated with every file

When run a program in shell (i.e when execute a command) on the back end Linux access 3 special files.

Standard input - 0 file descriptor(example = mouse,)

Standard output - 1 file descriptor(example = Screen)

Standard error output - 2 file descriptor(example=Screen)

So it can redirect these files to other files. If user redirect standard output (Descriptor = 1) to the printer, instead of showing these outputs on the screen and the computer start getting print on paper.

Output Redirection

Output Redirection is most commonly used, when execute a command it's normally appears on the terminal . If extract any tar file you will notice all the output scrolls down rapidly. And can redirect this output in a file for inspecting the output or can send anybody via email. This is called Output Redirection. Using this operator '>' in shell can redirect the output in a file.

Example :

```
$ ls > output.txt  
$ cat output.txt  
bin  
boot  
dev  
etc  
home  
lib  
lib64  
lost+found  
media  
mnt  
opt  
output.txt  
proc
```

```
root  
sbin  
selinux  
srv  
sys  
tmp  
usr  
var  
$
```

If output.txt file is already exist then '>' operator will overwrite the file for append more output into output.txt use '>>' instead of '>'.

Input Redirection

You can redirect your input by using '<' operator. Cannot run input redirection on all programs or commands. And can use only with that programs or commands that accept Input from keyboard.

Example : user going to send an email and already have Template of that email. and can put template in the email body using input redirect.

```
$ mail ali < mail_template.txt
```

above command launch email program with mail_template.txt contents.

Now due to advancement in GUI, and also lots of good email clients, method is rarely used.

Error Redirection

Error Redirection is very helpful when in trouble. In this case user trying to open a file that is not readable for my user will get permission denied errors. it will redirect these error into error.txt file.

Example :

```
$ cat ali.txt 2> /home/H.Ali/error.txt  
$ cat /home/H.Ali/error.txt  
cat: ali.txt: Permission denied
```

In the above command 2 is descriptor of error redirection file by typing '2>' you are saying redirect any kind of error to the file error.txt

Pipes ' | ' in Linux

Linux pipes allow us connect output stream of 'command a' to input stream of 'command b'. here in my case i will pipe cat commands output into less as input.

Example : cat /var/log/messages | less

we can also use pipe for searching strings specially from large text files.

```
cat /var/log/messages | grep kernal | less
```

grep is a line searcher it will search lines for specific piece of text.

above command will search a keyword 'kernel' with grep and then pipe it again to less.

Pipes in linux

A pipe is a form of redirection that is used in Linux and other Unix-like operating systems to send the output of one program to another program for further processing.

Redirection is the transferring of standard output to some other destination, such as another program, a file or a printer, instead of the display monitor (which is its default destination). Standard output, sometimes abbreviated stdout, is the destination of the output from command line (i.e., all-text mode) programs in Unix-like operating systems.

Pipes are used to create what can be visualized as a pipeline of commands, which is a temporary direct connection between two or more simple programs. This connection makes possible the performance of some highly specialized task that none of the constituent programs could perform by themselves. A command is merely an instruction provided by a user telling a computer to do something, such as launch a program. The command line programs that do the further processing are referred to as filters.

This direct connection between programs allows them to operate simultaneously and permits data to be transferred between them continuously rather than having to pass it through temporary text files or through the display screen and having to wait for one program to be completed before the next program begins.

Examples

A pipe is designated in commands by the vertical bar character, which is located on the same key as the backslash on U.S. keyboards. The general syntax for pipes is:

command_1 | command_2 [| command_3 . . .]

This chain can continue for any number of commands or programs.

A very simple example of the benefits of piping is provided by the dmesg command, which repeats the startup messages that scroll through the console (i.e., the all-text, full-screen display) while Linux is booting (i.e., starting up). dmesg by itself produces far too many lines of output to fit into a single screen; thus, its output scrolls down the screen at high speed and only the final screenful of messages is easily readable. However, by piping the output of dmesg to the filter less, the startup messages can conveniently be viewed one screenful at a time, i.e.,

dmesg | less

less allows the output of dmesg to be moved forward one screenful at a time by pressing the SPACE bar and back one screenful at a time by pressing the b key. The command can be terminated by pressing the q key. (The more command could have been used here instead of less; however, less is newer than more and has additional functions, including the ability to return to previous pages of the output.)

The same result could be achieved by first redirecting the output of dmesg to a temporary file and then displaying the contents of that file on the monitor. For example, the following set of two commands uses the output redirection operator (designated by a rightward facing angle bracket) to first send the output of dmesg to a text file called tempfile1 (which will be created by the output redirection operator if it does not already exist), and then it uses another output redirection operator to transfer the output of tempfile1 to the display screen:

dmesg > tempfile1

tempfile1 > less

However, redirection to a file as an intermediate step is clearly less efficient, both because two separate commands are required and because the second command must await the completion of the first command before it can begin.

The use of two pipes to chain three commands together could make the above example even more convenient for some situations. For example, the output of dmesg could first be piped to the sort filter to arrange it into alphabetic order before piping it to less:

dmesg | sort -f | less

The -f option tells sort to disregard case (i.e., whether letters are lower case or upper case) while sorting.

Likewise, the output of the ls command (which is used to list the contents of a directory) is commonly piped to the less (or more) command to make the output easier to read, i.e.,

ls -al | less

or

ls -al | more

ls reports the contents of the current directory (i.e., the directory in which the user is currently working) in the absence of any arguments (i.e., input data in the form of the names of files or directories). The -l option tells ls to provide detailed information about each item, and the -a option tells ls to include all files, including hidden files (i.e., files that are normally not visible to users). Because ls returns its output in alphabetic order by default, it is not necessary to pipe its output to the sort command (unless it is desired to perform a different type of sorting, such as reverse sorting, in which case sort's -r option would be used).

This could just as easily be done for any other directory. For example, the following would list the contents of the /bin directory (which contains user commands) in a convenient paged format:

ls -al /bin | less

The following example employs a pipe to combine the ls and the wc (i.e., word count) commands in order to show how many filesystem objects (i.e., files, directories and links) are in the current directory:

ls | wc -l

ls lists each object, one per line, and this list is then piped to wc, which, when used with its -l option, counts the number of lines and writes the result to standard output (which, as usual, is by default the display screen).

The output from a pipeline of commands can be just as easily redirected to a file (where it is written to that file) or a printer (where it is printed on paper). In the case of the above example, the output could be redirected to a file named, for instance, count.txt:

```
ls | wc -l > count.txt
```

The output redirection operator will create count.txt if it does not exist or overwrite it if it already exists. (The file does not, of course, require the .txt extension, and it could have just as easily been named count, lines or anything else.)

The following is a slightly more complex example of combining a pipe with redirection to a file:

```
echo -e "orange \npeach \ncherry" | sort > fruit
```

The echo command tells the computer to send the text that follows it to standard output, and its -e option tells the computer to interpret each \ as the newline symbol (which is used to start a new line in the output). The pipe redirects the output from echo -e to the sort command, which arranges it alphabetically, after which it is redirected by the output redirection operator to the file fruit.

As a final example, and to further illustrate the great power and flexibility that pipes can provide, the following uses three pipes to search the contents of all of the files in current directory and display the total number of lines in them that contain the string Linux but not the string UNIX:

```
cat * | grep "Linux" | grep -v "UNIX" | wc -l
```

In the first of the four segments of this pipeline, the cat command, which is used to read and concatenate (i.e., string together) the contents of files, concatenates the contents of all of the files in the current directory. The asterisk is a wildcard that represents all items in a specified directory, and in this case it serves as an argument to cat to represent all objects in the current directory.

The first pipe sends the output of cat to the grep command, which is used to search text. The Linux argument tells grep to return only those lines that contain the string Linux. The second pipe sends these lines to another instance of grep, which, in turn, with its -v option, eliminates those lines that contain the string UNIX. Finally, the third pipe sends this output to wc -l, which counts the number of lines and writes the result to the display screen.

Find hardware devices in Ubuntu Linux with lshw

There are a variety of ways to find out what kind of hardware running in linux, but one of the easiest ways that gives a large amounts of valuable data is to use lshw (Hardware Lister). And lshw is installed by default. Testing of lshw command as shown below...

```
$ sudo lshw
```

Installing

lshw is available on most package management systems.

If use APT (Debian-based distros: Ubuntu, Linux Mint, and others), run the following command in terminal:

```
$ sudo apt-get install lshw
```

If use Yum (Red Hat, Fedora, CentOS, Yellow Dog Linux, etc), run the following command in terminal:

```
$ sudo yum install lshw
```

If these instructions don't match your package manager, look for specific instructions on the lshw site to get it installed on your system.

Using lshw

If you just run lshw by itself on the command line, your screen will be flooded with large amounts of text. Fortunately, it is very easy to get lshw to give you output that meets your needs.

Shorter output

If you just quickly want to quickly find the chipset version of a piece of hardware is, you can run the following to provide a very short output that should give you what you need:

```
$ sudo lshw -short
```

For example, here is a sample when I run this on my Dell Studio 17 laptop (Note: I've removed a large portion of the output to make this fit):

```
$ sudo lshw -short
```

Device class	Description
system	Studio 1735
bus	0H275K
memory	64KiB BIOS
processor	Intel(R) Core(TM)2 Duo CPU T8100 @ 2.10GHz
memory	32KiB L1 cache
memory	3MiB L2 cache
memory	4GiB System Memory
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
display	Mobility Radeon HD 3650
multimedia	RV635 Audio device [Radeon HD 3600 Series]
multimedia	82801H (ICH8 Family) HD Audio Controller
eth1 network	BCM4322 802.11a/b/g/n Wireless LAN Controller
eth0 network	NetLink BCM5784M Gigabit Ethernet PCIe
/dev/sda disk	250GB WDC WD2500BEVS-7

This of course leaves out a lot of detail. Maybe we just need to store the data somewhere so it's easier to work with.

Storing output to a file

If you'd like to put all the lshw output into a file, you can do so easily from the terminal with output redirection.

```
$ sudo lshw > hardware.txt
```

This will run the lshw command and put all the output into a file in the current directory called hardware.txt. Note that this will replace any file in the current directory called hardware.txt. Make sure that you either backup the file, give the output file a unique name, or are prepared to lose that original file's information.

Now you can open the hardware.txt file with your favorite editor and look through the informations.

Creating HTML or XML Output

lshw has the ability to format its output in either HTML or XML. This can be very helpful if you want to post your hardware specs somewhere online to be viewed or to send the data to a storage system.

To create HTML output, simply give lshw the -html option:

```
$ sudo lshw -html > hardware.html
```

This will format the output into a HTML document and save the output in a file called hardware.html.

Creating XML is done with the -xml option:

```
$ sudo lshw -xml > hardware.xml
```

Like before, this will output the document in XML format and save it to hardware.xml.

Date command examples to display and set system date time

Date command is helpful to display date in several formats. It also allows you to set systems date and time.

Here few examples on how to use date command with practical examples.

When execute date command without any option, it will display the current date and time as shown below.

```
$ date
```

```
Mon May 20 22:02:24 PDT 2013
```

1. Display Date from a String Value using -date Option

If you have a static date or time value in a string, you can use -d or -date option to convert the input string into date format as shown below.

Please note that this doesn't use the current date and time value. Instead is uses the date and time value that you pass as string.

The following examples takes an input date only string, and displays the output in date format. If you don't specify time, it uses 00:00:00 for time.

```
$ date --date="12/2/2014"
```

```
Tue Dec 2 00:00:00 PST 2014
```

```
$ date --date="2 Feb 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

```
$ date --date="Feb 2 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

The following example takes an input date and time string, and displays the output in date format.

```
$ date --date="Feb 2 2014 13:12:10"
```

```
Sun Feb 2 13:12:10 PST 2014
```

2. Read Date Patterns from a file using -file option

This is similar to the -d or -date option that we discussed above. But, you can do it for multiple date strings. If you have a file that contains various static date strings, you can use -f or -file option as shown below.

In this example, we can see that datefile contained 2 date strings. Each line of datefile is parsed by date command and date is outputted for each line.

```
$ cat datefile
```

```
Sept 9 1986
```

```
Aug 23 1987
```

```
$ date --file=datefile
```

```
Tue Sep 9 00:00:00 PDT 1986
```

```
Sun Aug 23 00:00:00 PDT 1987
```

3. Get Relative Date Using -date option

You can also use date command to get a future date using relative values.

For example, the following examples gets date of next Monday.

```
$ date --date="next mon"
```

```
Mon May 27 00:00:00 PDT 2013
```

If string=@is given to date command, then date command convert seconds since the epoch (1970-01-01 UTC) to a date.

It displays date in which 5 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@5
```

```
Wed Dec 31 16:00:05 PST 1969
```

It displays date in which 10 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@10
```

```
Wed Dec 31 16:00:10 PST 1969
```

It displays date in which 1 minute (i.e. 60 seconds) is elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@60
```

```
Wed Dec 31 16:01:00 PST 1969
```

4. Display past date

You can display a past date using the -date command. Few possibilities are shown below.

```
$ date --date='3 seconds ago'
```

```
Mon May 20 21:59:20 PDT 2013
```

```
$ date --date="1 day ago"
```

```
Sun May 19 21:59:36 PDT 2013
```

```
$ date --date="yesterday"
```

```
Sun May 19 22:00:26 PDT 2013
```

```
$ date --date="1 month ago"
```

```
Sat Apr 20 21:59:58 PDT 2013
```

```
$ date --date="1 year ago"
```

```
Sun May 20 22:00:09 PDT 2012
```

5. Set Date and Time using -set option

You can set date and time of your system using -s or -set option as shown below..

In this example, initially it displayed the time as 20:09:31. We then used date command to change it to 21:00:00.

```
$ date
```

```
Sun May 20 20:09:31 PDT 2013
```

```
$ date -s "Sun May 20 21:00:00 PDT 2013"
```

```
Sun May 20 21:00:00 PDT 2013
```

```
$ date
```

```
Sun May 20 21:00:05 PDT 2013
```

6. Display Universal Time using -u option

You can display date in UTC format using -u, or -utc, or -universal option as shown below.

```
$ date
```

```
Mon May 20 22:07:53 PDT 2013
```

```
$ date -u
```

```
Tue May 21 05:07:55 UTC 2013
```

7. Display Last Modification Time using -r option

In this example, the current time is 20:25:48

```
$ date
```

```
Sun May 20 20:25:48 PDT 2013
```

The timestamp of datefile is changed using touch command. This was done few seconds after the above date command's output.

```
$ touch datefile
```

The current time after the above touch command is 20:26:12

```
$ date
```

```
Sun May 20 20:26:12 PDT 2013
```

Finally, use the date command -r option to display the last modified timestamp of a file as shown below. In this example, it displays last modified time of datefile as 20:25:57. It is somewhere between 20:25:48 and 20:26:12 (which is when we execute the above touch command to modify the timestamp).

```
$ date -r datefile
```

```
Sun May 20 20:25:57 PDT 2013
```

8. Various Date command formats

You can use formatting option to display date command in various formats using the following syntax:

```
$ date +%<format-option>
```

Command	Description
• apropos whatis	Show commands pertinent to string. See also threadsafe
• man -t ascii ps2pdf - > ascii.pdf	make a pdf of a manual page
which command	Show full path name of command
time command	See how long a command takes
• time cat	Start stopwatch. Ctrl-d to stop. See also sw
dir navigation	
• cd -	Go to previous directory
• cd	Go to \$HOME directory
(cd dir && command)	Go to dir, execute command and return to current dir
• pushd .	Put current dir on stack so you can popd back to it
file searching	
• alias l='ls -l --color=auto'	quick dir listing. See also l
• ls -lrt	List files by date. See also newest and find_mm_yyyy
• ls /usr/bin pr -T9 -W\$COLUMNS	Print in 9 columns to width of terminal
find -name '*.[ch]' xargs grep -E 'expr'	Search 'expr' in this dir and below. See also findrepo
find -type f -print0 xargs -r0 grep -F 'example'	Search all regular files for 'example' in this dir and below
find -maxdepth 1 -type f xargs grep -F 'example'	Search all regular files for 'example' in this dir
find -maxdepth 1 -type d while read dir; do echo \$dir; echo cmd2; done	Process each item with multiple commands (in while loop)
• find -type f ! -perm -444	Find files not readable by all (useful for web site)
• find -type d ! -perm -111	Find dirs not accessible by all (useful for web site)
• locate -r 'file[^/]*\.txt'	Search cached index for names. This re is like glob *file*.txt
• look reference	Quickly search (sorted) dictionary for prefix
• grep --color reference /usr/share/dict/words	Highlight occurrences of regular expression in dictionary
archives and compression	
gpg -c file	Encrypt file
gpg file.gpg	Decrypt file
tar -c dir/ bzip2 > dir.tar.bz2	Make compressed archive of dir/
bzip2 -dc dir.tar.bz2 tar -x	Extract archive (use gzip instead of bzip2 for tar.gz files)
tar -c dir/ gzip gpg -c ssh user@remote 'dd of=dir.tar.gz.gpg'	Make encrypted archive of dir/ on remote machine

	<code>find dir/ -name '*.txt' xargs cp -a --target-directory=dir_txt/ --parents</code>	Make copy of subset of dir/ and below
	<code>(tar -c /dir/to/copy) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) copy/ dir to /where/to/ dir
	<code>(cd /dir/to/copy && tar -c .) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) contents of copy/ dir to /where/to/
	<code>(tar -c /dir/to/copy) ssh -C user@remote 'cd /where/to/ && tar -x -p'</code>	Copy (with permissions) copy/ dir to remote:/where/to/ dir
	<code>dd bs=1M if=/dev/sda gzip ssh user@remote 'dd of=sda.gz'</code>	Backup harddisk to remote machine

rsync (Network efficient file copier: Use the --dry-run option for testing)

	<code>rsync -P rsync://rsync.server.com/path/to/file file</code>	Only get diffs. Do multiple times for troublesome downloads
	<code>rsync --bwlimit=1000 fromfile tofile</code>	Locally copy with rate limit. It's like nice for I/O
	<code>rsync -az -e ssh --delete ~/public_html/ remote.com:'~/public_html'</code>	Mirror web site (using compression and encryption)
	<code>rsync -auz -e ssh remote:/dir/ . && rsync -auz -e ssh . remote:/dir/</code>	Synchronize current directory with remote one

ssh (Secure SHell)

	<code>ssh \$USER@\$HOST command</code>	Run command on \$HOST as \$USER (default command=shell)
•	<code>ssh -f -Y \$USER@\$HOSTNAME xeyes</code>	Run GUI command on \$HOSTNAME as \$USER
	<code>scp -p -r \$USER@\$HOST: file dir/</code>	Copy with permissions to \$USER's home directory on \$HOST
	<code>scp -c arcfour \$USER@\$LANHOST: bigfile</code>	Use faster crypto for local LAN. This might saturate GigE
	<code>ssh -g -L 8080:localhost:80 root@\$HOST</code>	Forward connections to \$HOSTNAME:8080 out to \$HOST:80
	<code>ssh -R 1434:imap:143 root@\$HOST</code>	Forward connections from \$HOST:1434 in to imap:143
	<code>ssh-copy-id \$USER@\$HOST</code>	Install public key for \$USER@\$HOST for password-less log in

networking (Note ifconfig, route, mii-tool, nslookup commands are obsolete)

	<code>ethtool eth0</code>	Show status of ethernet interface eth0
	<code>ethtool --change eth0 autoneg off speed 100 duplex full</code>	Manually set ethernet interface speed
	<code>iw dev wlan0 link</code>	Show link status of wireless interface wlan0
	<code>iw dev wlan0 set bitrates legacy-2.4 1</code>	Manually set wireless interface speed
•	<code>iw dev wlan0 scan</code>	List wireless networks in range
•	<code>ip link show</code>	List network interfaces
	<code>ip link set dev eth0 name wan</code>	Rename interface eth0 to wan
	<code>ip link set dev eth0 up</code>	Bring interface eth0 up (or down)
•	<code>ip addr show</code>	List addresses for interfaces

	ip addr add 1.2.3.4/24 brd + dev eth0	Add (or del) ip and mask (255.255.255.0)
•	ip route show	List routing table
	ip route add default via 1.2.3.254	Set default gateway to 1.2.3.254
•	ss -tupl	List internet services on a system
•	ss -tup	List active connections to/from system
	host pixelbeat.org	Lookup DNS ip address for name or vice versa
•	hostname -i	Lookup local ip address (equivalent to host `hostname`)
•	whois pixelbeat.org	Lookup whois info for hostname or ip address

windows networking (Note samba is the package that provides all this windows specific networking support)

•	smbtree	Find windows machines. See also findsmb
	nmblookup -A 1.2.3.4	Find the windows (netbios) name associated with ip address
	smbclient -L windows_box	List shares on windows machine or samba server
	mount -t smbfs -o fmask=666,guest //windows_box/share /mnt/share	Mount a windows share
	echo 'message' smbclient -M windows_box	Send popup to windows machine (off by default in XP sp2)

text manipulation (Note sed uses stdin and stdout. Newer versions support inplace editing with the -i option)

	sed 's/string1/string2/g'	Replace string1 with string2
	sed 's/(.*\1)\1/\2/g'	Modify anystring1 to anystring2
	sed '/^ *#/d; /^ *\$/d'	Remove comments and blank lines
	sed ':a; /\\$/N; s/\\n//; ta'	Concatenate lines with trailing \
	sed 's/[\t]*\$//'	Remove trailing spaces from lines
	sed 's/\\([`\$\\`])\\1/g'	Escape shell metacharacters active within double quotes
•	seq 10 sed "s/^/ /; s/ *\(\.\{7,\}\)/\1/"	Right align numbers
•	seq 10 sed p paste - -	Duplicate a column
	sed -n '1000{p;q}'	Print 1000th line
	sed -n '10,20p;20q'	Print lines 10 to 20
	sed -n 's/.*<title>\(.*)</title>.*/\1/ip;T;q'	Extract title from HTML web page
	sed -i 42d ~/.ssh/known_hosts	Delete a particular line
	sort -t. -k1,1n -k2,2n -k3,3n -k4,4n	Sort IPV4 ip addresses
•	echo 'Test' tr '[:lower:]' '[:upper:]'	Case conversion
•	tr -dc '[:print:]' < /dev/urandom	Filter non printable characters
•	tr -s '[:blank:]' '\t' </proc/diskstats cut -f4	cut fields separated by blanks
•	history wc -l	Count lines
•	seq 10 paste -s -d ''	Concatenate and separate line items to a

set operations (Note you can export LANG=C for speed. Also these assume no duplicate lines within a file)

sort file1 file2 uniq	Union of unsorted files
sort file1 file2 uniq -d	Intersection of unsorted files
sort file1 file1 file2 uniq -u	Difference of unsorted files
sort file1 file2 uniq -u	Symmetric Difference of unsorted files
join -t'\0' -a1 -a2 file1 file2	Union of sorted files
join -t'\0' file1 file2	Intersection of sorted files
join -t'\0' -v2 file1 file2	Difference of sorted files
join -t'\0' -v1 -v2 file1 file2	Symmetric Difference of sorted files

math

• echo '(1 + sqrt(5))/2' bc -l	Quick math (Calculate φ). See also bc
• seq -f '4/%g' 1 2 99999 paste -sd-+ bc -l	Calculate n the unix way
• echo 'pad=20; min=64; (100*10^6)/((pad+min)*8)' bc	More complex (int) e.g. This shows max FastE packet rate
• echo 'pad=20; min=64; print (100E6)/((pad+min)*8)' python	Python handles scientific notation
• echo 'pad=20; plot [64:1518] (100*10**6)/((pad+x)*8)' gnuplot -persist	Plot FastE packet rate vs packet size
• echo 'obase=16; ibase=10; 64206' bc	Base conversion (decimal to hexadecimal)
• echo \$((0x2dec))	Base conversion (hex to dec) ((shell arithmetic expansion))
• units -t '100m/9.58s' 'miles/hour'	Unit conversion (metric to imperial)
• units -t '500GB' 'GiB'	Unit conversion (SI to IEC prefixes)
• units -t '1 googol'	Definition lookup
• seq 100 paste -s -d+ bc	Add a column of numbers. See also add and funcpy

calendar

• cal -3	Display a calendar
• cal 9 1752	Display a calendar for a particular month year
• date -d fri	What date is it this friday. See also day
• [\$(date -d '12:00 today +1 day' +%d) = '01'] exit	exit a script unless it's the last day of the month
• date --date='25 Dec' +%A	What day does xmas fall on, this year
• date --date='@2147483647'	Convert seconds since the epoch (1970-01-01 UTC) to date
• TZ='America/Los_Angeles' date	What time is it on west coast of US (use tzselect to find TZ)
• date --date='TZ="America/Los_Angeles" 09:00 next Fri'	What's the local time for 9AM next Friday on west coast US

locales

• printf "%'d\n" 1234	Print number with thousands grouping appropriate to locale
-----------------------	--

• BLOCK_SIZE='\1 ls -l	Use locale thousands grouping in ls. See also l
• echo "I live in `locale territory`"	Extract info from locale database
• LANG=en_IE.utf8 locale int_prefix	Lookup locale info for specific country. See also ccodes
• locale -kc \$(locale sed -n 's/\(LC_\)\{4,\}\)=.*/\1/p') less	List fields available in locale database

recode (Obsoletes iconv, dos2unix, unix2dos)

• recode -l less	Show available conversions (aliases on each line)
recode windows-1252.. file_to_change.txt	Windows "ansi" to local charset (auto does CRLF conversion)
recode utf-8/CRLF.. file_to_change.txt	Windows utf8 to local charset
recode iso-8859-15..utf8 file_to_change.txt	Latin9 (western europe) to utf8
recode ../b64 < file.txt > file.b64	Base64 encode
recode /qp.. < file.qp > file.txt	Quoted printable decode
recode ..HTML < file.txt > file.html	Text to HTML
• recode -lf windows-1252 grep euro	Lookup table of characters
• echo -n 0x80 recode latin-9/x1..dump	Show what a code represents in latin-9 charmap
• echo -n 0x20AC recode ucs-2/x2..latin-9/x	Show latin-9 encoding
• echo -n 0x20AC recode ucs-2/x2..utf-8/x	Show utf-8 encoding

CDs

gzip < /dev/cdrom > cdrom.iso.gz	Save copy of data cdrom
mkisofs -V LABEL -r dir gzip > cdrom.iso.gz	Create cdrom image from contents of dir
mount -o loop cdrom.iso /mnt/dir	Mount the cdrom image at /mnt/dir (read only)
wodim dev=/dev/cdrom blank=fast	Clear a CDRW
gzip -dc cdrom.iso.gz wodim -tao dev=/dev/cdrom -v -data -	Burn cdrom image (use --prcap to confirm dev)
cdparanoia -B	Rip audio tracks from CD to wav files in current dir
wodim -v dev=/dev/cdrom -audio -pad *.wav	Make audio CD from all wavs in current dir (see also cdrdao)
oggenc --tracknum=\$track track.cdda.wav -o track.ogg	Make ogg file from wav file

disk space

• ls -lSr	Show files by size, biggest last
• du -s * sort -k1,1rn head	Show top disk users in current dir. See also dutop
• du -hs /home/* sort -k1,1h	Sort paths by easy to interpret disk usage
• df -h	Show free space on mounted filesystems
• df -i	Show free inodes on mounted filesystems
• fdisk -l	Show disks partitions sizes and types (run as root)

• rpm -q -a --qf '%10{SIZE}\t%{NAME}\n' sort -k1,1n	List all packages by installed size (Bytes) on rpm distros
• dpkg-query -W -f='\${Installed-Size;10}\t\${Package}\n' sort -k1,1n	List all packages by installed size (KBytes) on deb distros
• dd bs=1 seek=2TB if=/dev/null of=ext3.test	Create a large test file (taking no space). See also truncate
• > file	truncate data of file or create an empty file

monitoring/debugging

• tail -f /var/log/messages	Monitor messages in a log file
• strace -c ls >/dev/null	Summarise/profile system calls made by command
• strace -f -e open ls >/dev/null	List system calls made by command
• strace -f -e trace=write -e write=1,2 ls >/dev/null	Monitor what's written to stdout and stderr
• ltrace -f -e getenv ls >/dev/null	List library calls made by command
• lsof -p \$\$	List paths that process id has open
• lsof ~	List processes that have specified path open
• tcpdump not port 22	Show network traffic except ssh. See also tcpdump_not_me
• ps -e -o pid,args --forest	List processes in a hierarchy
• ps -e -o pcpu,cpu,nice,state,cputime,args --sort pcpu sed '/^ 0.0 /d'	List processes by % cpu usage
• ps -e -orss=,args= sort -b -k1,1n pr -TW\$COLUMNS	List processes by mem (KB) usage. See also ps_mem.py
• ps -C firefox-bin -L -o pid,tid,pcpu,state	List all threads for a particular process
• ps -p 1,\$\$ -o etime=	List elapsed wall time for particular process IDs
• watch -n.1 pstree -Uacp \$\$	Display a changing process subtree
• last reboot	Show system reboot history
• free -m	Show amount of (remaining) RAM (-m displays in MB)
• watch -n.1 'cat /proc/interrupts'	Watch changeable data continuously
• udevadm monitor	Monitor udev events to help configure rules

system information

• uname -a	Show kernel version and system architecture
• head -n1 /etc/issue	Show name and version of distribution
• cat /proc/partitions	Show all partitions registered on the system
• grep MemTotal /proc/meminfo	Show RAM total seen by the system
• grep "model name" /proc/cpuinfo	Show CPU(s) info
• lspci -tv	Show PCI info

• lsusb -tv	Show USB info
• mount column -t	List mounted filesystems on the system (and align output)
• grep -F capacity: /proc/acpi/battery/BAT0/info	Show state of cells in laptop battery
# dmidecode -q less	Display SMBIOS/DMI information
# smartctl -A /dev/sda grep Power_On_Hours	How long has this disk (system) been powered on in total
# hdparm -i /dev/sda	Show info about disk sda
# hdparm -T /dev/sda	Do a read speed test on disk sda
# badblocks -s /dev/sda	Test for unreadable blocks on disk sda
interactive	
• readline	Line editor used by bash, python, bc, gnuplot, ...
• screen	Virtual terminals with detach capability, ...
• mc	Powerful file manager that can browse rpm, tar, ftp, ssh, ...
• gnuplot	Interactive/scriptable graphing
• links	Web browser
• xdg-open .	open a file or url with the registered desktop application

MS WORD 2010 THEORY

Objectives : At the end of this lesson you shall be able to

- state what is MS Office
- brief what is MS Word and starting steps
- explain various screen blocks of MS Word
- explain procedures to create, save, print a document!

Microsoft office is a application software package introduced by Microsoft Corporation. MS Office consists of the following popular packages :

- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint
- Microsoft Access
- Microsoft Outlook

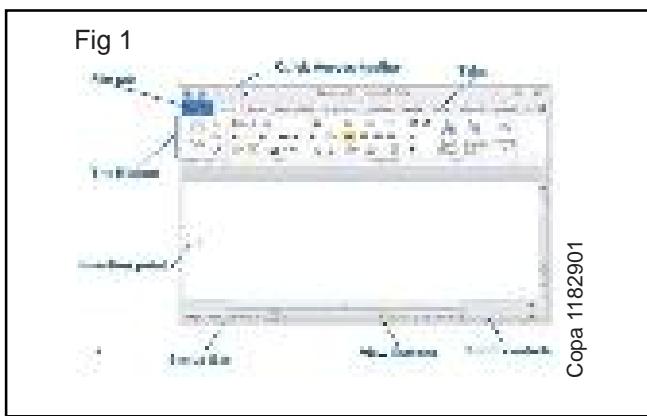
Word 2010

It is a word processor package that helps to create and edit a document. It is the most known word processor of nowadays. It makes professional looking documents by providing a comprehensive set of tools for creating and formatting a document, memos, letters, reports, brochures, business documents and even internet web pages.

Starting Word

Click on the Start > (windows Logo) All programmes > Microsoft office > Microsoft Word. MS Word opens along with a default blank document with default settings page layout.

Fig 1 - Default page layout



Unlike previous version, MS Office 2010 has a common set of features for all the components. It makes it easy to understand and common utilities to remain available on all the packages of MS Office including Word, Excel, PowerPoint, Access, etc. Many features are redesigned so as enabling the diverted users of other packaged can afford with. These enhancements and utilities in Word 2010 are described as below.

The Ribbon tab of Word has eight major parts viz. File, Home, Insert, Page Layout, References, Mailings, Review and View.

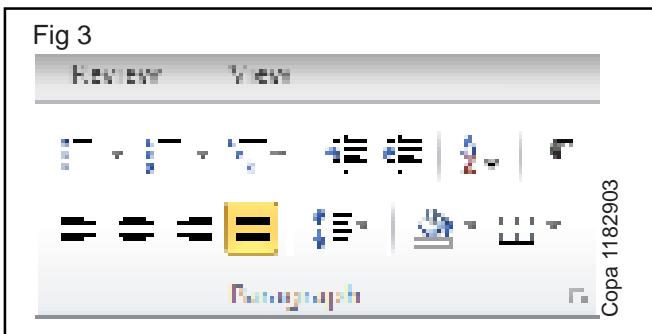
File tab of the ribbon is useful to create a new file, a blank or a template page as required. Ctrl + N always create a new blank document in Office Package. The documents so created can be saved as default word document or given compatible format. Furthermore, permission for accessing a documents can be fixed, share a document on a network, even manage a document to be compatible with previous and external versions. Print option makes the document to get a hard copy or a pdf format according to the installed printer features. Recently opened files can also be viewed to find it easy to work again. Help on word is there in the same tab.

Fig. 2 Home Tab



Home tab has clipboard options including cut, copy, paste and paste special. The Font block has all the options of setting fonts, size, superscript, subscript, bold, italic, underline, strikethrough, font colors, etc.

Fig 3 - Paragraph Group



Paragraph group creates the formatting paragraphs with alignments left, right, center, justify and indentations, para and line spacing. Line and page breaks allows to create pagination options and exceptions of formatting.

Fig 4 - Styles and Editing Group

Fig 4



The Styles group allows preformatted text styles like Heading styles, Paragraph styles, Subtitles, etc. Custom styles can also be stored with altered specifications. The Editing group used to select specific area, find and / or replace option in a specified area in text.

The Insert tab has 7 groups. Fig 5 - Pages, Tables and Illustrations blocks (Fig 5)

Fig 5



Page group makes cover pages, blank pages insertion and page breaks. Tables group helps to insert a table in a text document with ready specified row-column set or a customized table format. Illustration group inserts pictures from external sources, cliparts, shapes, smart art, charts of data, even screenshot into the text document.

Fig 6 - Links and Header/Footer Groups

Fig 6



Links group creates hyperlink on texts, bookmarks and cross references in a document.

The header and footer group inserts header, footer to be appearing on every page and page numbers to display as to placement area.

Fig 7 - Text and Symbols block

Fig 7



Text group allows creating text box, quick parts likely to create brochures, designed text as WordArt, paragraph styles, a signature line, date and time and an object insert option.

Symbols group inserts symbols of equations like math equations or symbols like currency, math symbols, etc.

Fig 8 - Themes and Page Setup Group

Fig 8



Page Layout tab has five major groups. Themes block creates predefined template setup using themes on documents. Even new themes customized can be created and saved for future use.

Page setup group has features on margin around, page orientation i.e. vertical or horizontal, paper size, columns to display, breaks, line numbers and hyphenation.

Fig 9 - Page Background and Paragraph Group

Fig 9



Page Background group creates a watermark, page Background color and page borders. Paragraph block has specified options already discussed in Home -> Paragraph group.

Fig 10 - Arrange Group

Fig 10



The arrange group creates position of objects, text elements, text wrapping, arranging objects, aligning of objects, grouping and transformations.

References tab has six blocks.

Fig 11 - TOC and Footnotes Group

Fig 11

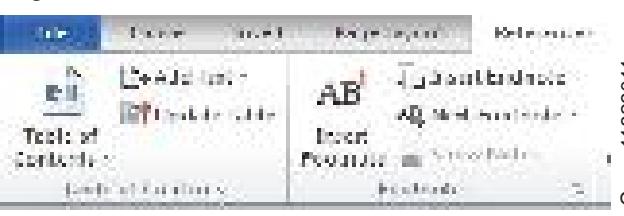


Table of contents creates the TOC of a particular publication document automatically and upon modifications updatable. Footnotes tab creates footnotes of a page, block area which includes explanatory phrases or references. Endnote makes the note at the end of the document.

Fig 12 - Citations, Bibliography and Captions Group



Citation and Bibliography makes an external source as citation, reference tables and credits of authors related to the publication. Captions tab inserts a caption, table of figures, cross references inside a text.

Fig 13 - Index and Table of Authorities Group



Index enters a value on a main topic or sub topic and create the index accordingly. Table of authorities has the citation mark includes the list of the cases, statutes and other authorities cited in the document.

Fig 14 - Create and Mailmerge Groups



Mailings tab used to create mailing of a letter or order using common mailing features. Create block makes envelopes print using predefined formats as well as custom formats. Labels can also be printed to which the delivery address is mentioned.

Mail merge block is used to create mail merge of a letter, email. If a common letter is created and to be sent to many recipients, this option allows to create an Address block where the recipient's info should appear. Even selective recipients can be listed as well as a new recipient list can be created.

Fig 15 - Write and Insert fields Group



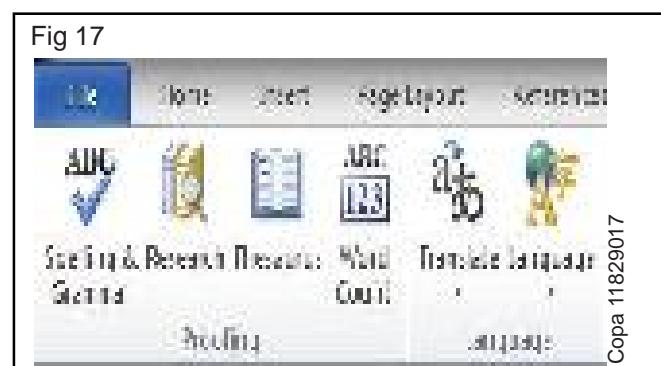
While writing a letter, it has many parts, which this mail merge creates fields of Address Block, Greetings Line, Merged field of content, labels, etc.

Fig 16 - Preview Results and Finish Groups



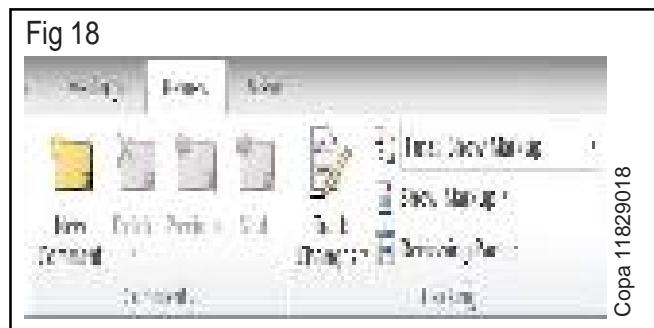
On successful completion of mail merge, it can be previewed and checked for errors for each recipients and edit accordingly. Upon validation the mail merge gets finished.

Fig 17 - Proofing and Language Groups



Review tab here is used for the various document areas to be reviewed. Proofing makes easier to check Spelling and Grammar of a document. Accidental errors can be corrected here. Research refines the search not only inside the document, but also the referenced documents. Thesaurus identifies the completeness of the document using the standard language compatibility of the region like English UK or English USA etc. Word count shows the analysis of the document as total words, total characters, with and without spaces, no. of paragraphs, lines, etc. Here Text blocks can also be included for such analysis.

Language Block helps to translate a page into the installed other languages and to change the proofing language. It requires the direct translator service from Microsoft Online.

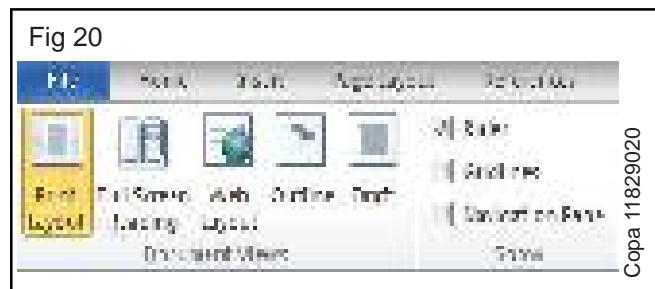
Fig 18 - Comments & Tracking Group

Comments group inserts a comment for a specific paragraph or text block.

Tracking group finds the changes made on a document by other authors in a protected mode. For example, if a document is created by user X and edited by user Y, is tracked separately with Track marks.

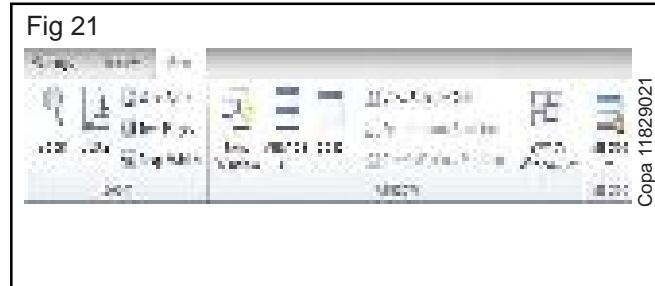
Fig 19 - Changes, Compare and Protect Groups

Changes hence made on the documents can either then accepted or rejected. More than a document can be compared for similarity using Compare. Also the document can be protected from editing by other authors.

Fig 20 - Document views and show Groups

View tab shows the way of displaying the word document. Document views have a Print Layout, a common view of Word, Full Screen Reading, minimises the tabs and ribbons to disappear and easy to read, Web Layout, which previews a html compatible view, Outline, views the basic version of document in mere text mode and Draft mode for a text editing mode.

The Rulers, Gridlines and Navigation Pane can be shown or hidden according to user preferences.

Fig 21 - Zoom / Window / Macro Groups

Also the view of the page can be Zoomed to full page, two pages view, 100% of the document and custom view. To make easy editing a document the window can be split into two, a new window for a document to cut paste, etc. can be created and all open word documents can be arranged for view. While formatting the documents, for repetition of commands the Macro option can be used. It uses the Record option to store the set of commands and repeat it again on other part of document or on another document on a single click.

Creating a file, save and other options

Objectives: At the end of this lesson you shall be able to

- explain how to create a new document, save and print
- state how to edit, format text and document styles
- brief using tables inside word document with data
- explain how to create styles in a document and save for future use
- explain Few unique features of Word 2010
- brief the mail merge processing

Fig 1 - File Info view



Word 2010 new document can be created as usual with Ctrl + N or through File menu New option. Basically the file created is saved as a word document extended format as docx in word file.

Fig 2 - Save options in Word



It can be saved using save as option in any compatible format or old versions of office, like 2003 or earlier versions. Main utility of the word software is the creation of word processing documents. It may be any of a format like publication, letter, brochure, etc. Word supports all type of formatting to design a text based presentation. Also it supports output files in major accepted formats according to industry standards.

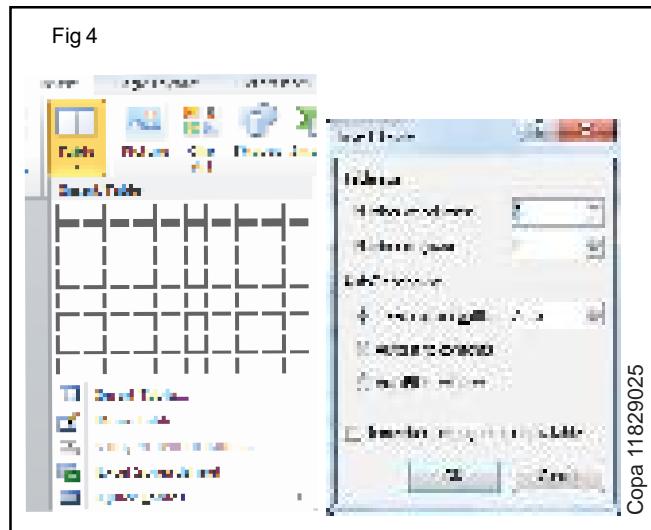
Fig 3 - Print options in word



The saved documents can be printed using the File Menu → Print option and the installed printer support makes it easy to get the document printed. If Adobe Acrobat Professional is installed, the same document can be stored as a PDF file for sharing purposes. Apart from printing and storage, the file created can be published in web as a web page or template that can be used for future publications in same format.

Basic concepts to be noted while using Word are Text properties. It includes Font type, Font size, Text Color, and usual decorations of text. Also creating of paragraphs styles are to be kept in mind. Paragraph alignment has left, right, center and justified settings. Text elements may contain items like ordered list, unordered list, subsection lists. They are found there paragraph formatting block of Home Tab. Indenting of text for creating Quotes is also there inside the same tab. According to the page size, line spacing and paragraph spacing can be adjusted, like before and after paragraph spaces, line heights, etc. The Styles can be predefined to use as ready to put on places where it required. Standard templates are available but it allows to create custom styles too.

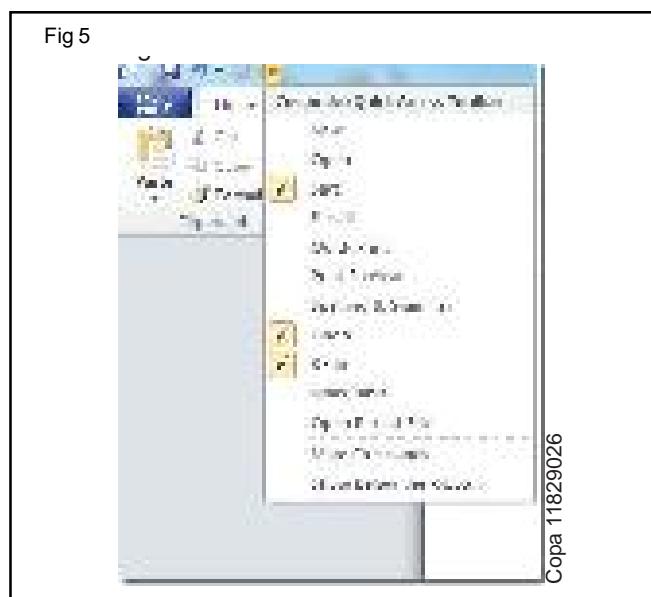
Tables can be inserted for various utilities. Normal table has adjustable width and columns so it can simply inserted with Insert > Table option directly.

Fig 4 - Table insert wizard options

In case of custom sized table is required, it can be created using insert table / draw table options. Insert table allows custom values for columns, width and other properties. Draw table creates custom table using a pen drawing tool through which new table can be drawn according to the available text contents.

Customizable Quick Access Tool Bar

Word 2010's Quick Access Toolbar displays all the commonly used options. It is located in the top left side corner of the application window, near the office button. By default it displays the following three options, Save, Undo and Redo, but is customizable and you may easily add more options to it. (Fig 5)



Paste Preview

It happens with most users that after copying and pasting something into their document, they need to undo the some changes. Word 2010 has made it easy for users, now you may eliminate this unnecessary step by using the paste preview option. It allows users to paste only the values or the formatting. (Fig 6)

Fig 6

Navigation Pane

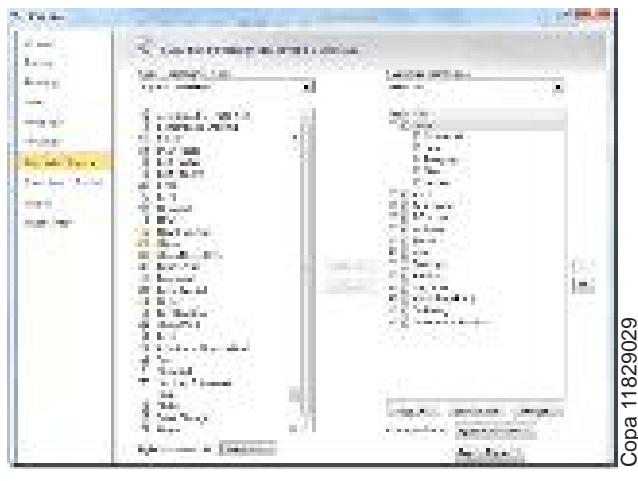
In the previous versions of Microsoft Office, one has to use the Ctrl+F hotkey to find any word or phrase from within a document. Word 2010 has added a new magic to this option, Ctrl+F now summons a Navigation Pane that appears on the left side of the document. You will see the three views available by clicking on their respective tabs, the Heading View, Thumbnail Page View, and the Search Result View. (Fig 7)



Customizable Ribbon Button

Apparently the Ribbon button in Word 2010 looks like the one in Word 2007. But there is one big addition, you may customize the word 2010's Ribbon button. In order to customize the Ribbon button navigate to the following option Office Button > Word Option > Customize Ribbon. (Fig 8)

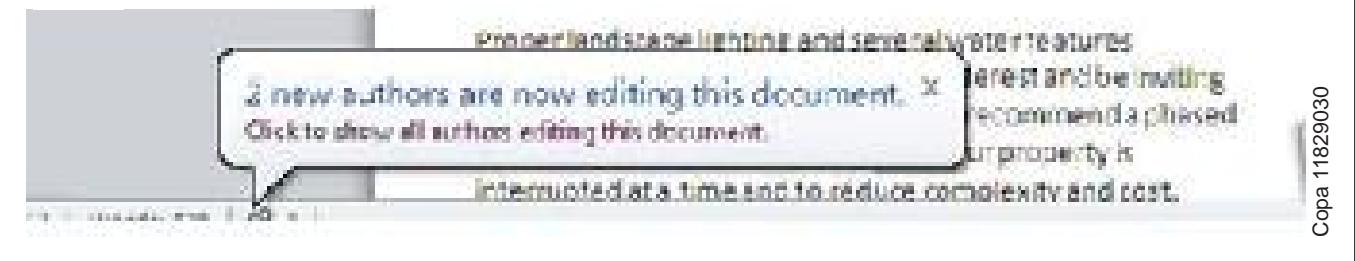
Fig 8



Improved Collaborations

Microsoft Word 2010 has a new feature called co-authoring. It allows more than one authors to edit a document at the same time. Word 2010 tells you how many authors are editing the document and their changes can be viewed too. (Fig 9)

Fig 9



Screen Capture Tool

Word 2010 includes a feature called Screen Capturing, now there is no need to use a third party or additional tool to capture a screenshot in order to use it in Word, just simply use Word 2010's built in tool to capture any area of the screen. A Screenshot may be taken by navigating to the following option Insert > Screenshot. (Fig 10)

Fig 10



Artistic Effects

In Word 2010 users can now apply a number of snazzy artistic effects to the pictures. In order to add the artistic effects to your document, Navigate to the following option Insert > Illustrations > Picture. Then browse and select the picture you want, Once the picture is added to your document, then the Picture Tools contextual tab is displayed and you will be able to see the new Artistic Effects drop down button over here. (Fig 11)

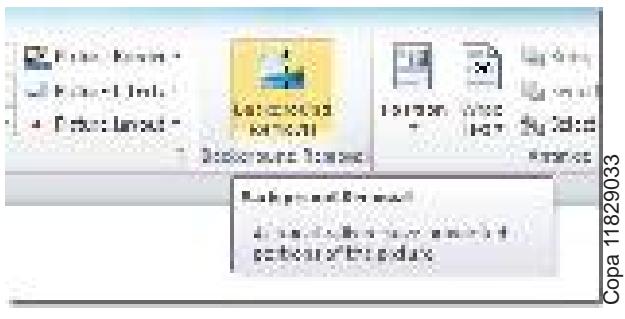
Fig 11



The Background Removal Option

Office 2010 has an awesome option by the name of Background Removal, which simply removes the background of any image. Yes, you don't need Photoshop anymore to remove the background. First insert the picture in your Word document from the Insert > Picture option. Then locate the Background Removal tool and get rid of the background. (Fig 12)

Fig 12



Office Backstage

The Office Backstage is a new concept, it is the enhanced form of the plain old office button and provides a much user-friendly menu. It helps users to manage documents, presentations, or spreadsheets at a greater level. (Fig 13)

Fig 13



Interesting feature, right? Read more about it here.

New Art Effects in WordArt

Just like other features, WordArt has been updated with new colorful art effects. Select the text, then click Word Art and a list of all the available options will be displayed. (Fig 14)

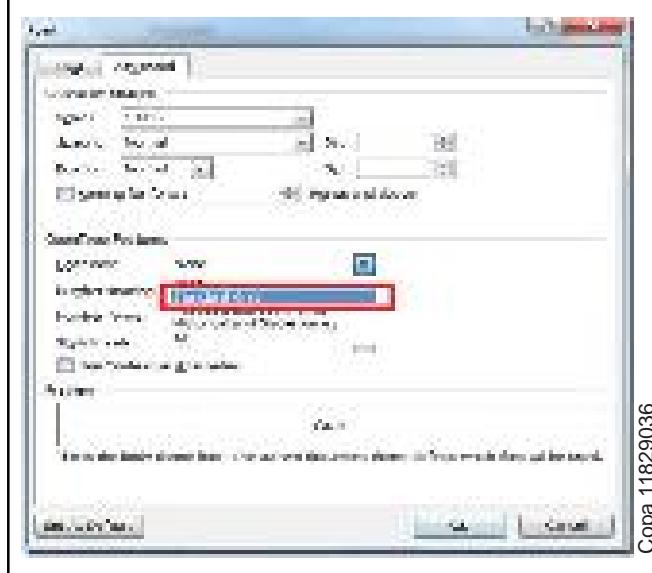
Fig 14



Ligatures

You might have heard about Ligatures. They make the fonts look fancy and they are also used to keep letters separate allowing you to search the text as if the font were regular. Its true that not all fonts support ligatures, but a large variety of the fonts supports them. You may enable them from Font Preferences > advanced, then select the standard only option in the ligatures drop down box. (Fig 15)

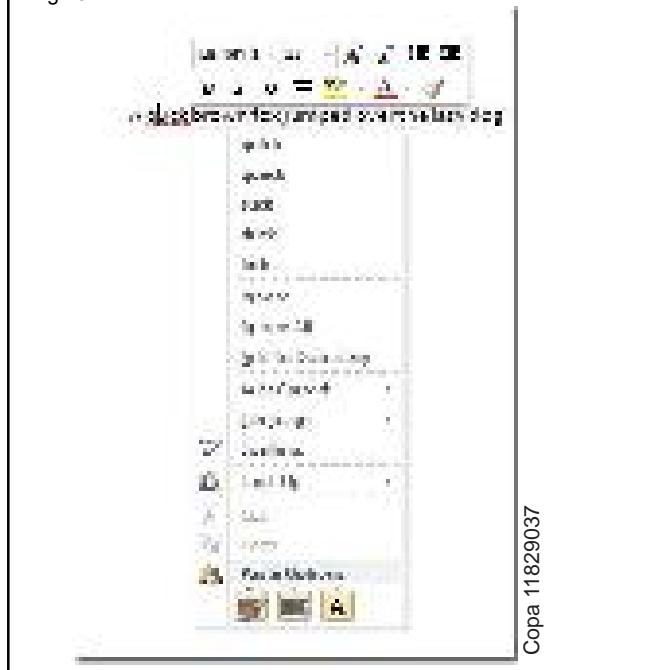
Fig 15



Improved Spell Checks

Word 2010 has added some new features to its spell checker, now it will detect the mistake and suggest changing the sentence.

Fig 16



Shortcut keys in Word 2010

Objective : at the end of the lesson you shall be able to

- Learn the shortcut keys in MS Word.

CTRL+SHIFT+A	converts the selected text to capital letters or vice versa
CTRL+SHIFT+F	Displays the Font dialog box.
CTRL+SHIFT+G	Displays the Word Count dialog box.
CTRL+SHIFT+S	Displays the Apply Styles task pane.
ALT+R	Displays the Review tab
ALT+CTRL+1	Apply Heading 1, Similarly ALT + CTRL + 2 will apply heading 2
CTRL+SHIFT+L	Applies Bullets
CTRL+SHIFT+F5	Bookmark
CTRL + B	Bold Text
CTRL + I	Italic Text
CTRL + U	Underline Text
CTRL+PAGE DOWN	Next
CTRL+E	Navigate to the center Paragraph
CTRL+SHIFT+ENTER	Column Break
CTRL+SHIFT+C	Copy Format
ALT+SHIFT+F7	Dictionary
ALT+CTRL+S	Splits the Document
CTRL+SHIFT+D	Double Underline
CTRL+END	End of Document
END	End of line
CTRL+SHIFT+P	Font size select
SHIFT+F5 or ALT+CTRL+Z	Go Back to previous state

CTRL+SHIFT+.	Grow Font
CTRL+]	Grow Font one point
ALT+SHIFT+R	Header Footer Link
CTRL+K	Hyperlink
CTRL+M	Indentation
CTRL+J	Justifies Paragraph
ALT+F8	Inserts Macros
ALT+SHIFT+K	Mail Merge Check
F10	Menu Mode
ALT+F7	Moves to the Next Misspelling
CTRL+H	Replace
CTRL+P	Print
CTRL+SHIFT+F12	Also launches Print
ALT+SHIFT+BACKSPACE	Redo
F12	Save As
CTRL+SHIFT+K	Small Caps
CTRL+SHIFT+S	Style
SHIFT+F7	Thesaurus
ALT+SHIFT+T	Time Field
CTRL+SHIFT+M	Unindent
	-

Typing practice using open source typing tutor tools

Objectives : At the end of this lesson you shall be able to

- understand about typing software
 - typing Tutor tools.
-

You will be able to learn touch typing quickly and efficiently with the program's intelligent practice lessons, useful support functions and an extensive progress tracker. You can also play a typing game and expand the program with open lessons or make your own to meet your specific needs.

Full courses for Beginner, Advanced and Expert typists

- Introduction course. First time using keyboard. The course covers all characters typed on your keyboard.
- Beginner course. This course helps to learn the position of keys on the keyboard. After completing this course, you will know which finger to use to hit each key without looking at the keyboard. The course also covers upper-case letters, special symbols, and the numeric pad.
- Advanced course, helps to improve your typing speed by memorizing frequently used syllables and words.

Expert course helps you to perfect the skills acquired by typing an actual text.

Progress Tracking

- The statistics reflect your typing speed, accuracy and time-out, complete with a summary at the end of each lesson.
- and it suggests your next step: Go to the next lesson or Try again comparing the results with Course goals.
- You can evaluate your own performance or students at any time by simply looking at charts.
- overall lesson rate, typing speed(WPM, CPM, KPM, WPS, CPS, KPS), accuracy and time-out are enabled in the both: table and chart presentation
- also, for each lesson, statistics by each character and keystroke in the column charts

The Typing Tutor Advantage

- Easy to Get Started
Create classes to group your students, and Import your entire student roster using our simple Student Import tool.
- Reporting
Access and export detailed reporting data. Reports and graphs exist for all levels of data.
- Statistical Graphs & Charts
Both students and teachers have access to detailed graphs and statistics to track progress.
- Complete Course - Novice to Professional
Beginner, Intermediate, Advanced, and Specialty Lessons to help typists of all levels.
- Fun Interactive Typing Games
Students can take a break from the exercises to practice with several educational typing games.
- Typing Test
Students can repeat the typing test to track their progress over time.
- Helpful Typing Hints & Tips
Tips and helpful technique information is constantly provided to reinforce proper typing techniques.
- On-Screen Keyboard & Hand Diagram
Key position and proper finger placement is always displayed to keep beginners from looking at their hands.

Introduction to MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
 - formulas and Functions
 - move Around in Excel 2010
 - conditional Formatting
 - link Excel Spreadsheet Data
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Features & Functions of Microsoft Excel

Whether for work or home use, an Excel spreadsheet is the best tool in Microsoft Office for organizing data and making lists. Although Word documents can include tables and columns, Excel makes laying out information easier. Excel also has a range of functions for designing formulas that automate calculations. Although Excel looks intimidating at first, the program's layout is similar to other Office applications.

Cells and Worksheets

The main portion of Excel's window consists of a spreadsheet -- or worksheet of cells. Just as with a paper spreadsheet, each cell can contain any numbers or any text -- unlike working with an Access database, Excel allows to simply click on any cell and fill it however best fits the project.

In some cases, such as to track spending, if want to use an organized series of rows and columns. Other times, such as building a list of team members, cell order and positioning won't play a major role. One advantage to Excel is how simple it makes reorganizing data: select a cell and drag its border to move it to a new spot on the sheet.

Excel Workbooks

Every Excel file, called a workbook, contains one or more worksheets. To switch between sheets in a workbook, use the tabs in the lower left corner of the window. Since Excel 2010, most workbooks use the file extension XLSX,

whereas older versions used XLS files. New copies of Excel can read these old files, but to open a new workbook in an old edition, the old PC needs the Office compatibility pack.

Formulas and Functions

In addition to containing plain text and numbers, cells can contain formulas, which always start with an equals sign. With a formula, Excel displays the result of an equation in a cell, but automatically keeps that result up-to-date as you change its components. A basic formula can take the place of a calculator: write "=2+4" and Excel displays "6." Formulas also work with data in other cells: "=A1+B1" adds the values of cells A1 and B1.

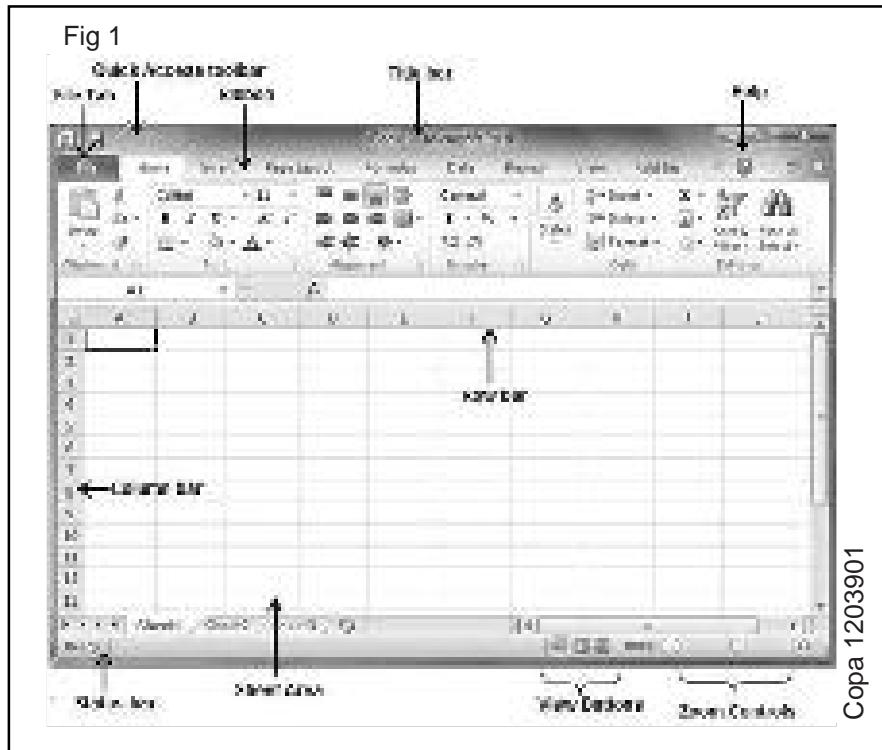
For procedures other than direct arithmetic, use functions to perform various operations on data. Functions' abilities range from simple math, such as "AVERAGE" to average a range of cells, to modifying text, such as "LOWER" to convert a line to lower case.

The two terms are often confused, but remember that each cell can contain only one formula, but each formula can use multiple functions, such as "=AVERAGE(A1, B1)+SUM(A2, B2)" to add the sum of two cells to the average of two other cells.

The following basic window appears when you start the excel application. Let us

now understand the various important parts of this window as shown in fig-1.

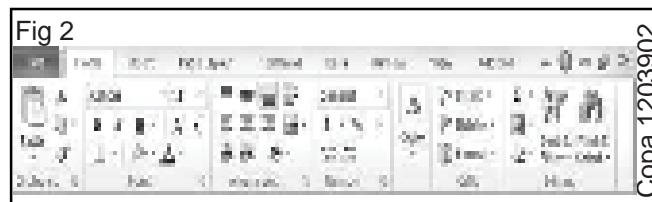
Ribbon Tabs



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As with the rest of Office since 2007, Microsoft has replaced Excel's menus with ribbon tabs as shown in fig-2. The tab as visual menus that remain open each tab contains a set of related features with explanatory icons. For example, the Home tab contains the most common options, such as font and text color, while the Insert tab offers ways to insert tables, text boxes and charts. One tab, File, behaves differently. File still contains basic tasks including "New," "Open" and "Save," but displays these tasks in a full-screen area with extra options, called the backstage view. For example, the "New" button in the backstage view offers a searchable selection of templates for new workbooks.

Ribbon contains commands organized in three



components:

Tabs: They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout is the examples of ribbon tabs.

Groups: They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment etc.

Home: Use this tab when creating, formatting, and editing a spreadsheet.

This tab is arranged into the Clipboard, Font, Alignment, Number, Styles, Cells, and Editing groups.

Insert: Use this when adding particular elements (including graphics, PivotTables, charts, hyperlinks, and headers and footers) to a spreadsheet. This tab is arranged into the Tables, Illustrations, Sparkline, Filter, Charts, Links, and Text groups.

Page Layout: Use this tab when preparing a spreadsheet for printing or reordering graphics on the sheet. This tab is arranged into the Themes, Page Setup, Scale to Fit, Sheet Options, and Arrange groups.

Formulas: Use this tab when adding formulas and functions to a spreadsheet or checking a worksheet for formula errors. This tab is arranged into the Function Library, Defined Names, Formula Auditing, and Calculation groups. Note that this tab also contains a Solutions group when activate certain add-in programs,

Data: Use this tab when importing, querying, outlining, and subtotaling the data placed into a worksheet's data list. This tab is arranged into the Get External Data, Connections, Sort & Filter, Data Tools, and Outline groups.

Review: Use this tab when proofing, protecting, and marking up a spreadsheet for review by others. This tab is arranged into the Proofing, Language, Comments, and Changes groups. Note that this tab also contains an Ink group with a sole Start Inking button if you're running Office 2010 on a Tablet PC or on a computer equipped with some sort of electronic input tablet.

View: Use this tab when changing the display of the Worksheet area and the data it contains. This tab is arranged into the Workbook Views, Show, Zoom, Window, and Macros groups.

Title Bar

This lies in the middle and at the top of the window. Title bar shows the program and the sheet titles.

Help

The Help Icon can be used to get excel related help anytime you like. This provides nice tutorial on various subjects related to excel.

Zoom Control

Zoom control lets to zoom in for a closer look at your text. The zoom control consists of a slider that user can slide left or right to zoom in or out. The + buttons can be clicked to increase or decrease the zoom factor.

View Buttons

The group of three buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch among excel's various sheet views.

Normal Layout view: This displays the page in normal view.

Page Layout view: This displays pages exactly as they will appear when printed. This gives a full screen look of the document.

Page Break view: This shows a preview of where pages will break when printed.

Sheet Area

The area where to enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type.

Row Bar

Rows are numbered from 1 onwards and keeps on increasing as to keep entering data. Maximum limit is 1,048,576 rows.

Column Bar

Columns are numbered from A onwards and keeps on increasing as to keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.

Status Bar

This displays the sheet information as well as the insertion point location. From left to right, this bar can contain the total number of pages and words in the document, language etc.

User can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list

File Tab

The File tab replaces the Office button from Excel 2010. User can click it to check the Backstage view, where user come to open or save files, create new sheets, print a sheet, and do other file-related operations.

Quick Access Toolbar

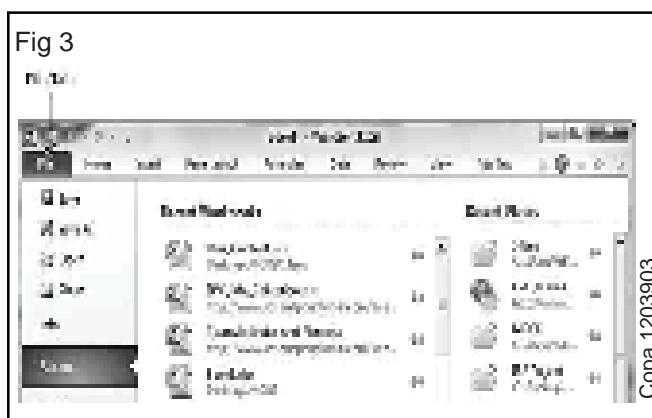
The File tab and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. And customize this toolbar based on the comfort.

Dialog Box Launcher(Fig-3)

This appears as a very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

If already have an opened sheet then it will display a window showing the

details about the opened sheet as shown fig-4. Backstage view shows three columns when select most of the available options in the first column.



First column of the backstage view will have the following options as shown in

Table-1:

Option	Description
Save	If an existing sheet is opened, it would be saved as is, otherwise it will display a dialogue box asking for the sheet name.
Save As	A dialogue box will be displayed asking for sheet name and sheet type. By default, it will save in sheet 2010 format with extension .xlsx.
Open	This option is used to open an existing excel sheet.
Close	This option is used to close an opened sheet.
Info	This option displays the information about the opened sheet.

Option	Description
Recent	This option lists down all the recently opened sheets.
New	This option is used to open a new sheet.
Print	This option is used to print an opened sheet.
Save & Send	This option saves an opened sheet and displays options to send the sheet using email etc.
Help	You can use this option to get the required help about excel 2010.
Options	Use this option to set various option related to excel 2010.
Exit	Use this option to close the sheet and exit.

Sheet Information

When click Info option available in the first column, it displays the following information in the second column of the backstage view:

Compatibility Mode: If the sheet is not a native excel 2007/2010 sheet, a Convert button appears here, enabling to easily update its format. Otherwise, this category does not appear.

Permissions: This option used to protect the excel sheet. And can set a password so that nobody can open the sheet, or lock the sheet so that nobody can edit the sheet.

Prepare for Sharing: This section highlights important information should know about the sheet before send it to others, such as a record of the edits the made as developed the sheet.

Versions: If the sheet has been saved several times, and may be able to access previous versions of it from this section.

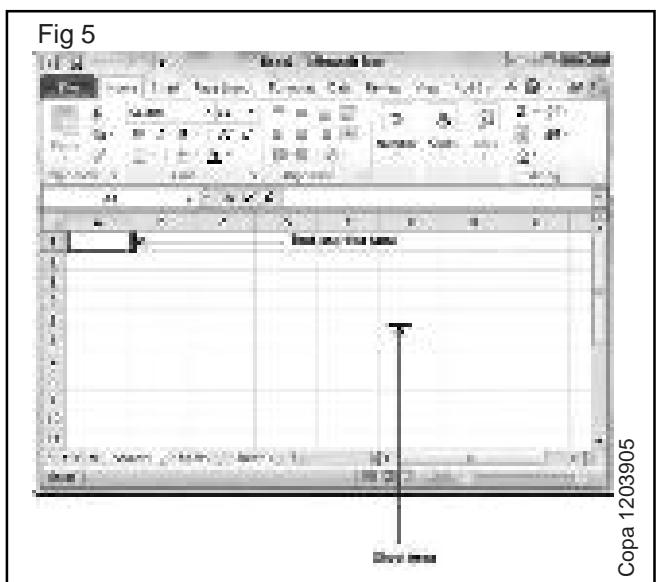
Sheet Properties

When click Info option available in the first column, it displays various properties in the third column of the backstage view. These properties include sheet size, title, tags, categories etc.

User can also edit various properties. Just try to click on the property value and if property is editable, then it will display a text box where can add the text like title, tags, comments, Author.

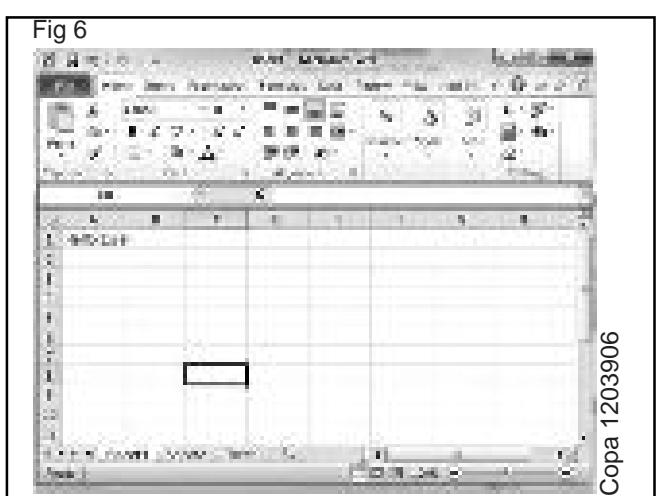
Entering values

A new sheet is displayed by default when open an excel sheet as shown in the fig-5 screen shot.



Sheet area is the place of type the text. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type. When click on a box then the box is highlighted. When double click the box, the flashing vertical bar appears and can start entering the data.

So, just keep the mouse cursor at the text insertion point and start typing whatever text would like to type. We have typed only two words "HelloExcel" as shown fig-6. The text appears to the left of the insertion point.



There are following three important points, which would help while typing:

- Press Tab to go to next column.
- Press Enter to go to next row.
- Press Alt + Enter to enter a new line in the same column.

Move Around in Excel 2010

Excel provides a number of ways to move around a sheet using the mouse and the keyboard.

First of all, let us create some sample text before we proceed. Open a new excel sheet and type any data. A sample data table as shown table-2 and fig-7.

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

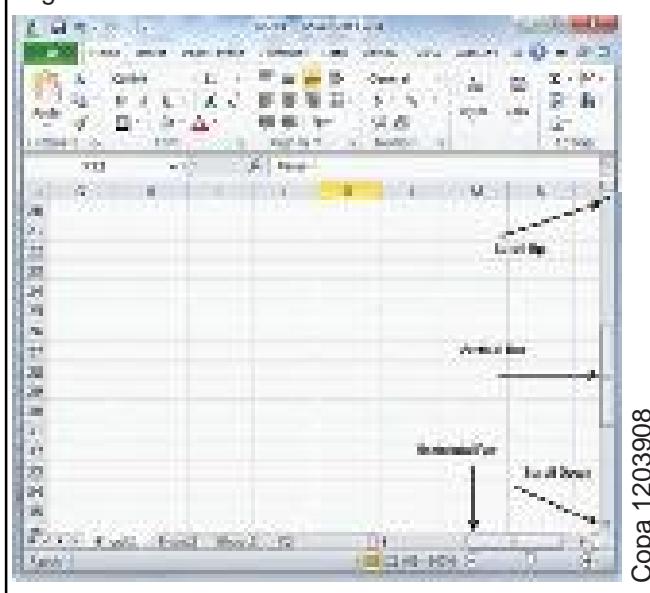
Fig 7 Table-2

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

Moving with Mouse

Mouse can easily move the insertion point by clicking in the text anywhere on the screen. Sometime if the sheet is big then user cannot see a place need to move. In such situations, to use the scroll bars, as shown fig-8 screen shot.

Fig 8



user can scroll the sheet by rolling mouse wheel, which is equivalent to clicking the up-arrow or down-arrow buttons in the scroll bar.

Moving with Scroll Bars

As shown in the above screen capture, there are two scroll bars: one for moving vertically within the sheet, and one for moving horizontally. Using the vertical scroll bar, user may ?

- Move upward by one line by clicking the upward-pointing scroll arrow.
- Move downward by one line by clicking the downward-pointing scroll arrow.
- Move one next page, using next page button (footnote).
- Move one previous page, using previous page button (footnote).
- Use Browse Object button to move through the sheet, going from one chosen object to the next.

Moving with Keyboard

The following keyboard commands, used for moving around your sheet, also move the insertion point -

Keystroke	Where the Insertion Point Moves
→	Forward one box
←	Back one box
↑	Up one box
↓	Down one box
PageUp	To the previous screen
PageDown	To the next screen
Home	To the beginning of the current screen
End	To the end of the current screen

User can move box by box or sheet by sheet. Now click in any box containing data in the sheet. It would have to hold down the Ctrl key while pressing an arrow key, which moves the insertion point as described here -

Key Combination	Where the Insertion Point Moves
Ctrl + →	To the last box containing data of the current row.
Ctrl + ←	To the first box containing data of the current row.
Ctrl + ↑	To the first box containing data of the current column.
Ctrl + ↓	To the last box containing data of the current column.
Ctrl + Page Up	To the sheet in the left of the current sheet.
Ctrl + Page Down	To the sheet in the right of the current sheet.
Ctrl + Home	To the beginning of the sheet.
Ctrl + End	To the end of the sheet.

Moving with Go To Command

Press F5 key to use Go To command as shown in fig-9, which will display a dialogue box contains various options to reach to a particular box.

Normally, we use row and column number, for example K5 and finally press Go To button.

Fig 9



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Conditional Formatting

MS Excel 2010 Conditional Formatting feature enables to format a range of values so that the values outside certain limits, are automatically formatted.

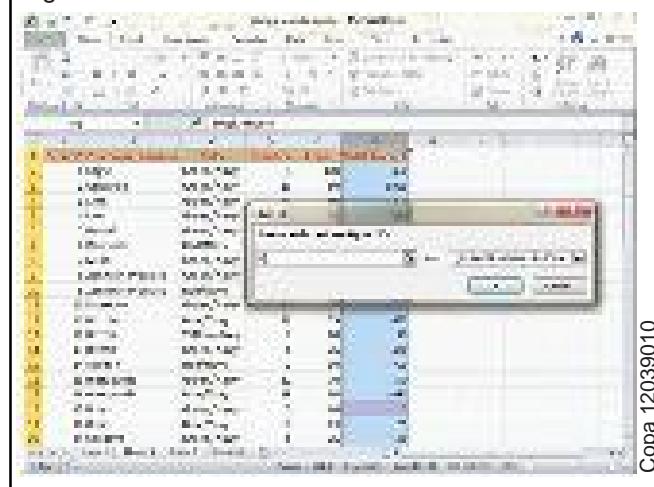
Choose Home Tab " Style group " Conditional Formatting dropdown.

Various Conditional Formatting Options

- **Highlight Cells Rules ?** It opens a continuation menu with various options for defining the formatting rules that highlight the cells in the cell selection that contain certain values, text, or dates, or that have values greater or less than a particular value, or that fall within a certain ranges of values.

Suppose to find cell with Amount 0 and Mark them as red. Choose Range of cell " Home Tab " Conditional Formatting DropDown " Highlight Cell Rules " Equal To as on fig-10.

Fig 10

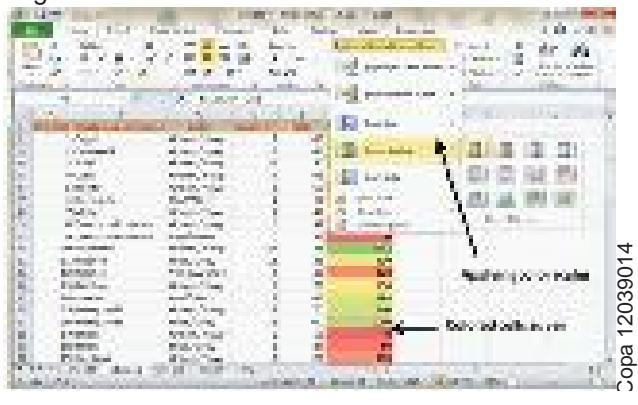


After Clicking ok, the cells with value zero are marked as red as shown in fig-11.

Fig 11

1	Chait	Green,White	10	30	300
2	Carmell	Green,White	10	30	300
3	Caroli	Green,White	10	30	300
4	Jad	Green,White	10	30	300
5	Kirpal	Green,White	10	30	300
6	Kiranpal	Amber	10	30	300
7	Malika	Green,White	10	30	300
8	Malvinder	Green,White	10	30	300
9	Malvinder Singh	Amber	10	30	300
10	Mandeep	Green,White	10	30	300
11	Mandeep Singh	Amber	10	30	300
12	Mandeep	Yellow,White	10	30	300
13	Neha	Green,White	10	30	300
14	Neha	Amber	10	30	300
15	Neha	Yellow,White	10	30	300
16	Neha	Amber	10	30	300
17	Neha	Green,White	10	30	300
18	Neha	Amber	10	30	300
19	Neetu	Green,White	10	30	300
20	Neetu	Amber	10	30	300
21	Neetu	Yellow,White	10	30	300
22	Neetu	Amber	10	30	300
23	Neetu	Green,White	10	30	300
24	Neetu	Amber	10	30	300
25	Neetu	Yellow,White	10	30	300
26	Neetu	Amber	10	30	300
27	Neetu	Green,White	10	30	300
28	Neetu	Amber	10	30	300
29	Neetu	Yellow,White	10	30	300
30	Neetu	Amber	10	30	300
31	Neetu	Green,White	10	30	300
32	Neetu	Amber	10	30	300
33	Neetu	Yellow,White	10	30	300
34	Neetu	Amber	10	30	300
35	Neetu	Green,White	10	30	300
36	Neetu	Amber	10	30	300
37	Neetu	Yellow,White	10	30	300
38	Neetu	Amber	10	30	300
39	Neetu	Green,White	10	30	300
40	Neetu	Amber	10	30	300
41	Neetu	Yellow,White	10	30	300
42	Neetu	Amber	10	30	300
43	Neetu	Green,White	10	30	300
44	Neetu	Amber	10	30	300
45	Neetu	Yellow,White	10	30	300
46	Neetu	Amber	10	30	300
47	Neetu	Green,White	10	30	300
48	Neetu	Amber	10	30	300
49	Neetu	Yellow,White	10	30	300
50	Neetu	Amber	10	30	300
51	Neetu	Green,White	10	30	300
52	Neetu	Amber	10	30	300
53	Neetu	Yellow,White	10	30	300
54	Neetu	Amber	10	30	300
55	Neetu	Green,White	10	30	300
56	Neetu	Amber	10	30	300
57	Neetu	Yellow,White	10	30	300
58	Neetu	Amber	10	30	300
59	Neetu	Green,White	10	30	300
60	Neetu	Amber	10	30	300
61	Neetu	Yellow,White	10	30	300
62	Neetu	Amber	10	30	300
63	Neetu	Green,White	10	30	300
64	Neetu	Amber	10	30	300
65	Neetu	Yellow,White	10	30	300
66	Neetu	Amber	10	30	300
67	Neetu	Green,White	10	30	300
68	Neetu	Amber	10	30	300
69	Neetu	Yellow,White	10	30	300
70	Neetu	Amber	10	30	300
71	Neetu	Green,White	10	30	300
72	Neetu	Amber	10	30	300
73	Neetu	Yellow,White	10	30	300
74	Neetu	Amber	10	30	300
75	Neetu	Green,White	10	30	300
76	Neetu	Amber	10	30	300
77	Neetu	Yellow,White	10	30	300
78	Neetu	Amber	10	30	300
79	Neetu	Green,White	10	30	300
80	Neetu	Amber	10	30	300
81	Neetu	Yellow,White	10	30	300
82	Neetu	Amber	10	30	300
83	Neetu	Green,White	10	30	300
84	Neetu	Amber	10	30	300
85	Neetu	Yellow,White	10	30	300
86	Neetu	Amber	10	30	300
87	Neetu	Green,White	10	30	300
88	Neetu	Amber	10	30	300
89	Neetu	Yellow,White	10	30	300
90	Neetu	Amber	10	30	300
91	Neetu	Green,White	10	30	300
92	Neetu	Amber	10	30	300
93	Neetu	Yellow,White	10	30	300
94	Neetu	Amber	10	30	300
95	Neetu	Green,White	10	30	300
96	Neetu	Amber	10	30	300
97	Neetu	Yellow,White	10	30	300
98	Neetu	Amber	10	30	300
99	Neetu	Green,White	10	30	300
100	Neetu	Amber	10	30	300
101	Neetu	Yellow,White	10	30	300
102	Neetu	Amber	10	30	300
103	Neetu	Green,White	10	30	300
104	Neetu	Amber	10	30	300
105	Neetu	Yellow,White	10	30	300
106	Neetu	Amber	10	30	300
107	Neetu	Green,White	10	30	300
108	Neetu	Amber	10	30	300
109	Neetu	Yellow,White	10	30	300
110	Neetu	Amber	10	30	300
111	Neetu	Green,White	10	30	300
112	Neetu	Amber	10	30	300
113	Neetu	Yellow,White	10	30	300
114	Neetu	Amber	10	30	300
115	Neetu	Green,White	10	30	300
116	Neetu	Amber	10	30	300
117	Neetu	Yellow,White	10	30	300
118	Neetu	Amber	10	30	300
119	Neetu	Green,White	10	30	300
120	Neetu	Amber	10	30	300
121	Neetu	Yellow,White	10	30	300
122	Neetu	Amber	10	30	300
123	Neetu	Green,White	10	30	300
124	Neetu	Amber	10	30	300
125	Neetu	Yellow,White	10	30	300
126	Neetu	Amber	10	30	300
127	Neetu	Green,White	10	30	300
128	Neetu	Amber	10	30	300
129	Neetu	Yellow,White	10	30	300
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131	Neetu	Green,White	10	30	300
132	Neetu	Amber	10	30	300
133	Neetu	Yellow,White	10	30	300
134	Neetu	Amber	10	30	300
135	Neetu	Green,White	10	30	300
136	Neetu	Amber	10	30	300
137	Neetu	Yellow,White	10	30	300
138	Neetu	Amber	10	30	300
139	Neetu	Green,White	10	30	300
140	Neetu	Amber	10	30	300
141	Neetu	Yellow,White	10	30	300
142	Neetu	Amber	10	30	300
143	Neetu	Green,White	10	30	300
144	Neetu	Amber	10	30	300
145	Neetu	Yellow,White	10	30	300
146	Neetu	Amber	10	30	300
147	Neetu	Green,White	10	30	300
148	Neetu	Amber	10	30	300
149	Neetu	Yellow,White	10	30	300
150	Neetu	Amber	10	30	300
151	Neetu	Green,White	10	30	300
152	Neetu	Amber	10	30	300
153	Neetu	Yellow,White	10	30	300
154	Neetu	Amber	10	30	300
155	Neetu	Green,White	10	30	300
156	Neetu	Amber	10	30	300
157	Neetu	Yellow,White	10	30	300
158	Neetu	Amber	10	30	300
159	Neetu	Green,White	10	30	300
160	Neetu	Amber	10	30	300
161	Neetu	Yellow,White	10	30	300
162	Neetu	Amber	10	30	300
163	Neetu	Green,White	10	30	300
164	Neetu	Amber	10	30	300
165	Neetu	Yellow,White	10	30	300
166	Neetu	Amber	10	30	300
167	Neetu	Green,White	10	30	300
168	Neetu	Amber	10	30	300
169	Neetu	Yellow,White	10	30	300
170	Neetu	Amber	10	30	300
171	Neetu	Green,White	10	30	300
172	Neetu	Amber	10	30	300
173	Neetu	Yellow,White	10	30	300
174	Neetu	Amber	10	30	300
175	Neetu	Green,White	10	30	300
176	Neetu	Amber	10	30	300
177	Neetu	Yellow,White	10	30	300
178	Neetu	Amber	10	30	300
179	Neetu	Green,White	10	30	300
180	Neetu	Amber	10	30	300
181	Neetu	Yellow,White	10	30	300
182	Neetu	Amber	10	30	300
183	Neetu	Green,White	10	30	300
184	Neetu	Amber	10	30	300
185	Neetu	Yellow,White	10	30	300
186	Neetu	Amber	10	30	300
187	Neetu	Green,White	10	30	300
188	Neetu	Amber	10	30	300
189	Neetu	Yellow,White	10	30	300
190	Neetu	Amber	10	30	300
191	Neetu	Green,White	10	30	300
192	Neetu	Amber	10	30	300
193	Neetu	Yellow,White	10	30	300
194	Neetu	Amber	10	30	300
195	Neetu	Green,White	10	30	300
196	Neetu	Amber	10	30	300
197	Neetu	Yellow,White	10	30	300
198	Neetu	Amber	10	30	300
199	Neetu	Green,White	10	30	300
200	Neetu	Amber	10	30	300
201	Neetu	Yellow,White	10	30	300
202	Neetu	Amber	10	30	300
203	Neetu	Green,White	10	30	300
204	Neetu	Amber	10	30	300
205	Neetu	Yellow,White	10	30	300
206	Neetu	Amber	10	30	300
207	Neetu	Green,White	10	30	300
208	Neetu	Amber	10	30	300
209	Neetu	Yellow,White	10	30	300
210	Neetu	Amber	10	30	300
211	Neetu	Green,White	10	30	300
212	Neetu	Amber	10	30	300
213	Neetu	Yellow,White	10	30	300
214	Neetu	Amber	10	30	300
215	Neetu	Green,White	10	30	300
216	Neetu	Amber	1		

Fig 14



- **Icon Sets** (Fig-15)? It opens a palette with different sets of icons that can apply to the cell selection to indicate their values relative to each other by clicking the icon set.

See the below screenshot with Icon Sets conditional formatting applied.

Fig 15



- **New Rule:** It opens the New Formatting Rule dialog box, where define a custom conditional formatting rule to apply to the cell selection.
- **Clear Rules:** It opens a continuation menu, where can remove the conditional formatting rules for the cell selection by clicking the Selected Cells option, for the entire worksheet by clicking the Entire Sheet option, or for just the current data table by clicking the This Table option.
- **Manage Rules:** It opens the Conditional Formatting Rules Manager dialog box, edit and delete particular rules as well as adjust their rule precedence by moving them up or down in the Rules list box.

Link Excel Spreadsheet Data

Microsoft Excel provides the ability for cells in one worksheet to be linked to cells in one or more other worksheets. This is a great productivity tool and can reduce the need for additional worksheets!

Linking Excel Worksheet Data Overview

In Excel, a link is a formula that dynamically pulls in data from a cell in another worksheet. The worksheet can be in the same workbook or a different workbook.

The destination worksheet is the worksheet that contains the link formula. The worksheet containing the data that will be brought in is called the source worksheet.

Any time the cell value in the source worksheet changes, the cell containing the link formula will be updated as well the next time the spreadsheet containing the link formula is opened. This is just one of many reasons the Excel software program is so powerful.

Need for Linking Spreadsheet Data

The ability to create links often eliminates the need to have identical data entered and updated in multiple sheets. This saves time, reduces errors, and improves data integrity. For example, a company's prices can be stored in a 'Master Price List' worksheet, and others needing pricing data can link to that worksheet.

Consider a Sales Manager who has a detailed spreadsheet for each salesperson, but would like a summary sheet to compare salespersons' performance and create grand totals. The summary sheet (destination) would bring in data from all the salespersons' sheets (source).

Create the Worksheet Link

Before creating the link, format the cell containing the link formula in the destination worksheet to equal the format of the source data.

For example, if the data from the source spreadsheet is currency with 2 decimal points, then first format the target cell for currency with 2 decimal places.

METHOD ONE

1. In the source worksheet, select the cell need to link to and click the Copy button on the Home tab. Or press **Ctrl+C**, or right-click and select **Copy**.
2. Switch to the destination spreadsheet and click the cell want to link. Then, depending on the version of Excel:
 - Excel 2007, 2010, and 2013: On the Home tab, click the down arrow below Paste and click **Paste Link**. In newer versions also right-click and select the **Paste Link** from the Paste menu.
 - Excel 2003 and older versions: On the Edit menu, click **Paste Special**, and then click **Paste Link**.
3. Return to the source worksheet and press **ESC** to remove the animated border around the cell.

METHOD TWO

This is a fast method that works in a different order than Method One.

1. In the destination worksheet cell that will contain the link formula, enter an equal sign (=).

2. In the source worksheet, click in the cell that contains the data and press the Enter key.

Link Formula Example(Fig-16)

In the example below, using Method One, we click in cell B6 in the source worksheet and click Copy. Then, on the destination worksheet, we click in cell B3, and paste the link. The value (\$3,500) automatically displays.

Follow the same steps to link the data from the Denver and Seattle worksheets to the Store Totals worksheet. And first formatted the cells to display the data as Currency. (Fig 16)

Fig 16

Copa 12039016

Source Worksheet

A	B	C
Atlanta Store	Date: 08/20/09	
	\$ Collected	
1 Register #1	\$1,800	
2 Register #2	\$1,000	
3 Register #3	\$1,200	
Total:	\$3,500	

Destination Worksheet

A	B	C
Store Totals for:	08/20/09	
	\$ Collected	
1 Atlanta	\$3,500	Paste as Link
2 Denver	\$2,900	
3 Seattle	\$3,200	
Total:	\$9,600	

Functions and formulas in MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
- formulas and Functions
- move Around in Excel 2010
- conditional Formatting
- link Excel Spreadsheet Data

Formulas in MS Excel

formula, worksheet will be just simple tabular representation of data. A formula consists of special code, which is entered into a cell. It performs some calculations and returns a result, which is displayed in the cell.

Formulas use a variety of operators and worksheet functions to work with values and text. The values and text used in formulas can be located in other cells, which makes changing data easy and gives worksheets their dynamic nature. For example, it can quickly change the data in a worksheet and formulas works.

Elements of Formulas

A formula can consist of any of these elements ?

- Mathematical operators, such as +(for addition) and *(for multiplication)

Example -

=A1+A2 Adds the values in cells A1 and A2.

- Values or text

Example -

=200*0.5 Multiplies 200 times 0.5. This formula uses only values, and it always returns the same result as 100.

- Cell references (including named cells and ranges)

Example -

=A1=C12 Compares cell A1 with cell C12. If the cells are identical, the formula returns TRUE; otherwise, it returns FALSE.

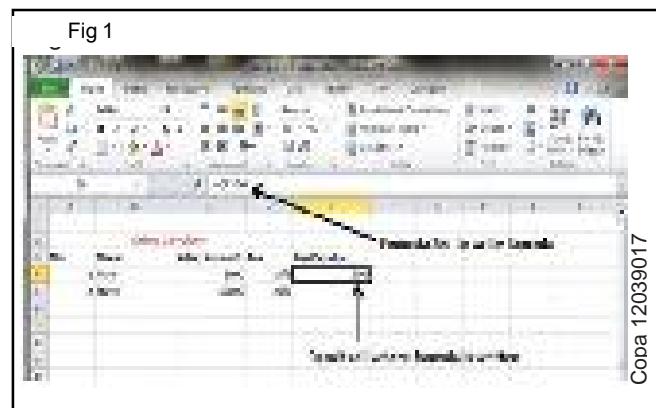
- Worksheet functions (such as SUM or AVERAGE)

Example -

=SUM(A1:A12) Adds the values in the range A1:A12.

Creating Formula

For creating a formula need to type in the Formula Bar. Formula begins with '=' sign. When building formulas manually, and can either type in the cell addresses or can point to them in the worksheet. Using the Pointing method to supply the cell addresses for formulas is often easier and more powerful method of formula building. When using built-in functions, to click the cell or drag through the cell range that want to use when defining the function's arguments in the Function Arguments dialog box as shown in Fig 1.



As soon as complete a formula entry, Excel calculates the result, which is then displayed inside the cell within the worksheet (the contents of the formula, however, continue to be visible on the Formula bar anytime the cell is active). If you make an error in the formula that prevents Excel from being able to calculate the formula at all, Excel displays an Alert dialog box suggesting how to fix the problem.

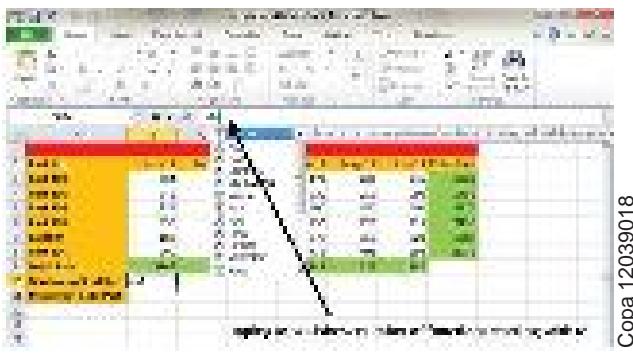
Functions in Formula

Many formulas are created using available worksheet functions. These functions enable to greatly enhance the power of the formulas and perform calculations that are difficult if use only the operators. For example, one can use the LOG or SIN function to calculate the Logarithm or Sin ratio. And cannot do this complicated calculation by using the mathematical operators alone.

Using Functions

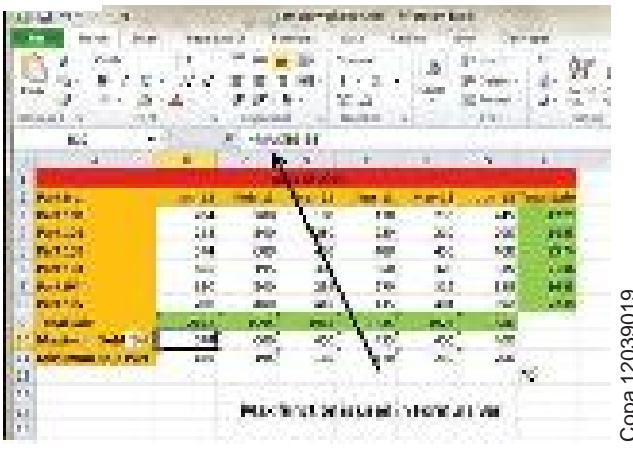
When type = sign and then type any alphabet the searched functions will show fig 2.

Fig 2



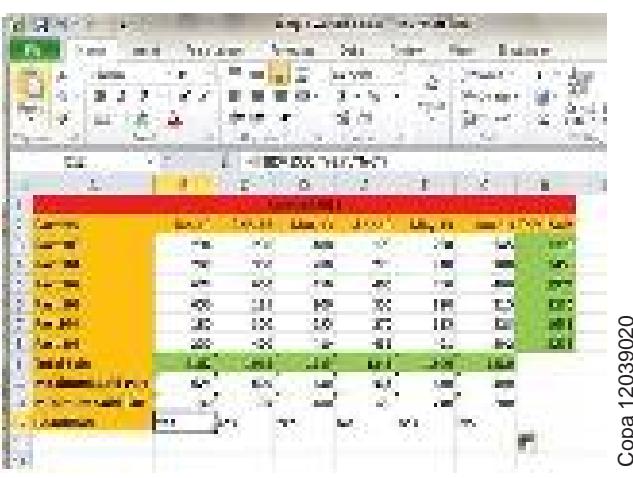
Suppose need to determine the largest value in a range. A formula can't tell the answer without using a function. We will use formula that uses the MAX function to return the largest value in the range B3:B8 as **=MAX(A1:D100)** as shown in fig 3.

Fig 3



Another example of functions. Suppose to find if the cell of month is greater than 1900 then we can give Bonus to Sales representative. The we can achieve it with writing formula with IF functions as **=IF(B9>1900,"Yes","No")** as shown in fig 4.

Fig 4



Function Arguments

In the above examples, notice that all the functions used parentheses. The information inside the parentheses is the list of arguments.

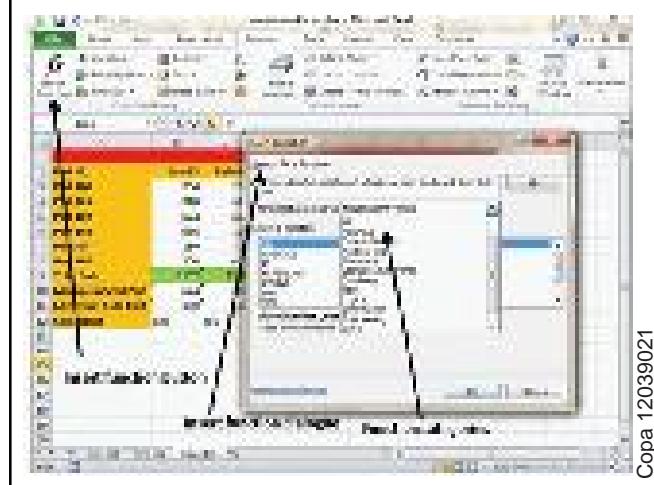
Functions vary in how they use arguments. Depending on what it has to do, a function may use.

- **No arguments** - Examples ? Now(), Date(), etc.
- **One argument** - UPPER(), LOWER(), etc.
- **A fixed number of arguments** - IF(), MAX(), MIN(), AVERAGE(), etc.
- **Infinite number of arguments**
- **Optional arguments**

Built In Functions

MS Excel has many built in functions, which we can use in our formula. To see all the functions by category, choose Formulas Tab "Insert Function" as shown in fig-5. Then Insert function Dialog appears from which we can choose the function.

Fig 5



Functions by Categories

Let us see some of the built in functions in MS Excel.

Text Functions

LOWER: Converts all characters in a supplied text string to lower case

UPPER: Converts all characters in a supplied text string to upper case

TRIM : Removes duplicate spaces, and spaces at the start and end of a text string

CONCATENATE : Joins together two or more text strings.
Fig 4

LEFT : Returns a specified number of characters from the start of a supplied text string.

MID : Returns a specified number of characters from the middle of a supplied text string

RIGHT : Returns a specified number of characters from the end of a supplied text string.

LEN: Returns the length of a supplied text string

FIND: Returns the position of a supplied character or text string from within a supplied text string (case-sensitive).

Date & Time

DATE: Returns a date, from a user-supplied year, month and day.

TIME: Returns a time, from a user-supplied hour, minute and second.

DATEVALUE: Converts a text string showing a date, to an integer that represents the date in Excel's date-time code.

TIMEVALUE: Converts a text string showing a time, to a decimal that represents the time in Excel.

NOW: Returns the current date & time.

TODAY: Returns today's date.

Statistical

MAX: Returns the largest value from a list of supplied numbers.

MIN: Returns the smallest value from a list of supplied numbers.

AVERAGE: Returns the Average of a list of supplied numbers.

COUNT: Returns the number of numerical values in a supplied set of cells or values.

COUNTIF: Returns the number of cells (of a supplied range), that satisfies a given criteria.

SUM: Returns the sum of a supplied list of numbers

Logical

AND: Tests a number of user-defined conditions and returns TRUE if ALL of the conditions evaluate to TRUE, or FALSE otherwise

OR: Tests a number of user-defined conditions and returns TRUE if ANY of the conditions evaluate to TRUE, or FALSE otherwise.

NOT: Returns a logical value that is the opposite of a user supplied logical value or expression i.e. returns FALSE if the supplied argument is TRUE and returns TRUE if the supplied argument is FALSE.

Math & Trig

ABS: Returns the absolute value (i.e. the modulus) of a supplied number.

SIGN: Returns the sign (+1, -1 or 0) of a supplied number.

SQRT: Returns the positive square root of a given number.

MOD: Returns the remainder from a division between

two supplied numbers.

Filters in MS Excel

Filtering data in MS Excel refers to displaying only the rows that meet certain conditions. (The other rows gets hidden.)

Using the store data, if user interested in seeing data where Shoe Size is 36, then set filter to do this. Follow the below mentioned steps to do this.

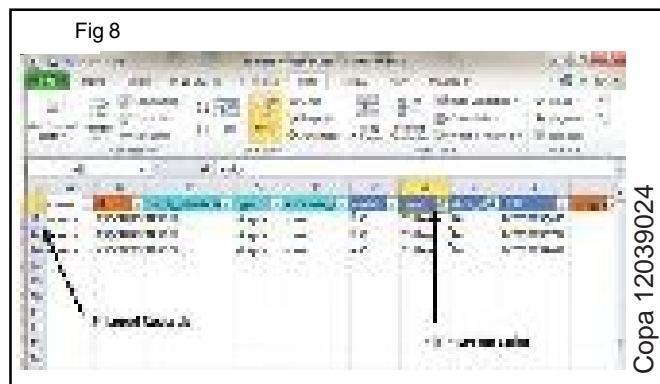
- Place a cursor on the Header Row.
- Choose **Data Tab > Filter** to set filter as shown in fig 6.

Fig 6

Shoe ID	Shoe Type	Color	Size	Quantity	Price
SHO101	Leather	Black	36	10	1200
SHO102	Leather	Black	36	10	1200
SHO103	Leather	Black	36	10	1200
SHO104	Leather	Black	36	10	1200
SHO105	Leather	Black	36	10	1200
SHO106	Leather	Black	36	10	1200
SHO107	Leather	Black	36	10	1200
SHO108	Leather	Black	36	10	1200
SHO109	Leather	Black	36	10	1200
SHO110	Leather	Black	36	10	1200
SHO111	Leather	Black	36	10	1200
SHO112	Leather	Black	36	10	1200
SHO113	Leather	Black	36	10	1200
SHO114	Leather	Black	36	10	1200
SHO115	Leather	Black	36	10	1200
SHO116	Leather	Black	36	10	1200
SHO117	Leather	Black	36	10	1200
SHO118	Leather	Black	36	10	1200
SHO119	Leather	Black	36	10	1200
SHO120	Leather	Black	36	10	1200
SHO121	Leather	Black	36	10	1200
SHO122	Leather	Black	36	10	1200
SHO123	Leather	Black	36	10	1200
SHO124	Leather	Black	36	10	1200
SHO125	Leather	Black	36	10	1200
SHO126	Leather	Black	36	10	1200
SHO127	Leather	Black	36	10	1200
SHO128	Leather	Black	36	10	1200
SHO129	Leather	Black	36	10	1200
SHO130	Leather	Black	36	10	1200
SHO131	Leather	Black	36	10	1200
SHO132	Leather	Black	36	10	1200
SHO133	Leather	Black	36	10	1200
SHO134	Leather	Black	36	10	1200
SHO135	Leather	Black	36	10	1200
SHO136	Leather	Black	36	10	1200
SHO137	Leather	Black	36	10	1200
SHO138	Leather	Black	36	10	1200
SHO139	Leather	Black	36	10	1200
SHO140	Leather	Black	36	10	1200
SHO141	Leather	Black	36	10	1200
SHO142	Leather	Black	36	10	1200
SHO143	Leather	Black	36	10	1200
SHO144	Leather	Black	36	10	1200
SHO145	Leather	Black	36	10	1200
SHO146	Leather	Black	36	10	1200
SHO147	Leather	Black	36	10	1200
SHO148	Leather	Black	36	10	1200
SHO149	Leather	Black	36	10	1200
SHO150	Leather	Black	36	10	1200
SHO151	Leather	Black	36	10	1200
SHO152	Leather	Black	36	10	1200
SHO153	Leather	Black	36	10	1200
SHO154	Leather	Black	36	10	1200
SHO155	Leather	Black	36	10	1200
SHO156	Leather	Black	36	10	1200
SHO157	Leather	Black	36	10	1200
SHO158	Leather	Black	36	10	1200
SHO159	Leather	Black	36	10	1200
SHO160	Leather	Black	36	10	1200
SHO161	Leather	Black	36	10	1200
SHO162	Leather	Black	36	10	1200
SHO163	Leather	Black	36	10	1200
SHO164	Leather	Black	36	10	1200
SHO165	Leather	Black	36	10	1200
SHO166	Leather	Black	36	10	1200
SHO167	Leather	Black	36	10	1200
SHO168	Leather	Black	36	10	1200
SHO169	Leather	Black	36	10	1200
SHO170	Leather	Black	36	10	1200
SHO171	Leather	Black	36	10	1200
SHO172	Leather	Black	36	10	1200
SHO173	Leather	Black	36	10	1200
SHO174	Leather	Black	36	10	1200
SHO175	Leather	Black	36	10	1200
SHO176	Leather	Black	36	10	1200
SHO177	Leather	Black	36	10	1200
SHO178	Leather	Black	36	10	1200
SHO179	Leather	Black	36	10	1200
SHO180	Leather	Black	36	10	1200
SHO181	Leather	Black	36	10	1200
SHO182	Leather	Black	36	10	1200
SHO183	Leather	Black	36	10	1200
SHO184	Leather	Black	36	10	1200
SHO185	Leather	Black	36	10	1200
SHO186	Leather	Black	36	10	1200
SHO187	Leather	Black	36	10	1200
SHO188	Leather	Black	36	10	1200
SHO189	Leather	Black	36	10	1200
SHO190	Leather	Black	36	10	1200
SHO191	Leather	Black	36	10	1200
SHO192	Leather	Black	36	10	1200
SHO193	Leather	Black	36	10	1200
SHO194	Leather	Black	36	10	1200
SHO195	Leather	Black	36	10	1200
SHO196	Leather	Black	36	10	1200
SHO197	Leather	Black	36	10	1200
SHO198	Leather	Black	36	10	1200
SHO199	Leather	Black	36	10	1200
SHO200	Leather	Black	36	10	1200
SHO201	Leather	Black	36	10	1200
SHO202	Leather	Black	36	10	1200
SHO203	Leather	Black	36	10	1200
SHO204	Leather	Black	36	10	1200
SHO205	Leather	Black	36	10	1200
SHO206	Leather	Black	36	10	1200
SHO207	Leather	Black	36	10	1200
SHO208	Leather	Black	36	10	1200
SHO209	Leather	Black	36	10	1200
SHO210	Leather	Black	36	10	1200
SHO211	Leather	Black	36	10	1200
SHO212	Leather	Black	36	10	1200
SHO213	Leather	Black	36	10	1200
SHO214	Leather	Black	36	10	1200
SHO215	Leather	Black	36	10	1200
SHO216	Leather	Black	36	10	1200
SHO217	Leather	Black	36	10	1200
SHO218	Leather	Black	36	10	1200
SHO219	Leather	Black	36	10	1200
SHO220	Leather	Black	36	10	1200
SHO221	Leather	Black	36	10	1200
SHO222	Leather	Black	36	10	1200
SHO223	Leather	Black	36	10	1200
SHO224	Leather	Black	36	10	1200
SHO225	Leather	Black	36	10	1200
SHO226	Leather	Black	36	10	1200
SHO227	Leather	Black	36	10	1200
SHO228	Leather	Black	36	10	1200
SHO229	Leather	Black	36	10	1200
SHO230	Leather	Black	36	10	1200
SHO231	Leather	Black	36	10	1200
SHO232	Leather	Black	36	10	1200
SHO233	Leather	Black	36	10	1200
SHO234	Leather	Black	36	10	1200
SHO235	Leather	Black	36	10	1200
SHO236	Leather	Black	36	10	1200
SHO237	Leather	Black	36	10	1200
SHO238	Leather	Black	36	10	1200
SHO239	Leather	Black	36	10	1200
SHO240	Leather	Black	36	10	1200
SHO241	Leather	Black	36	10	1200
SHO242	Leather	Black	36	10	1200
SHO243	Leather	Black	36	10	1200
SHO244	Leather	Black	36	10	1200
SHO245	Leather	Black	36	10	1200
SHO246	Leather	Black	36	10	1200
SHO247	Leather	Black	36	10	1200
SHO248	Leather	Black	36	10	1200
SHO249	Leather	Black	36	10	1200
SHO250	Leather	Black	36	10	1200
SHO251	Leather	Black	36	10	1200
SHO252	Leather	Black	36	10	1200
SHO253	Leather	Black	36	10	1200
SHO254	Leather	Black	36	10	1200
SHO255	Leather	Black	36	10	1200
SHO256	Leather	Black	36	10	1200
SHO257	Leather	Black	36	10	1200
SHO258	Leather	Black	36	10	1200
SHO259	Leather	Black	36	10	1200
SHO260	Leather	Black	36	10	1200
SHO261	Leather	Black	36	10	1200
SHO262	Leather	Black	36	10	1200
SHO263	Leather	Black	36	10	1200
SHO264	Leather	Black	36	10	1200
SHO265	Leather	Black	36	10	1200
SHO266	Leather	Black	36	10	1200
SHO267	Leather	Black	36	10	1200
SHO268	Leather	Black	36	10	1200
SHO269	Leather	Black	36	10	1200
SHO270	Leather	Black	36	10	1200
SHO271	Leather	Black	36	10	1200
SHO272	Leather	Black	36	10	1200
SHO273	Leather	Black	36	10	1200
SHO274	Leather	Black	36	10	1200
SHO275	Leather	Black	36	10	1200
SHO276	Leather	Black	36	10	1200
SHO277	Leather	Black	36	10	1200
SHO278	Leather	Black	36	10	1200
SHO279	Leather	Black	36	10	1200
SHO280	Leather	Black	36	10	1200
SHO281	Leather	Black	36	10	1200
SHO282	Leather	Black	36	10	1200
SHO283	Leather	Black	36	10	1200
SHO284	Leather	Black	36	10	1200
SHO285					

Using Multiple Filters(fig-24)

Filtering of records by multiple conditions i.e. by multiple column values. Suppose after size 36 is filtered, need to have the filter where color is equal to Coffee. After setting filter for Shoe Size, choose Color column and then set filter for color. (Fig 8)

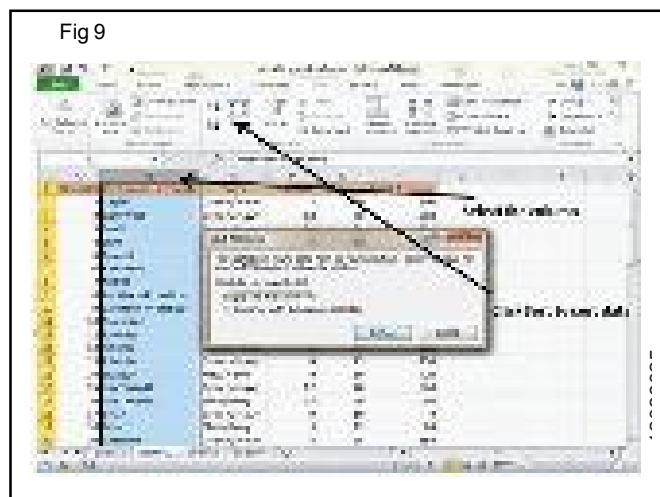


Sorting in MS Excel

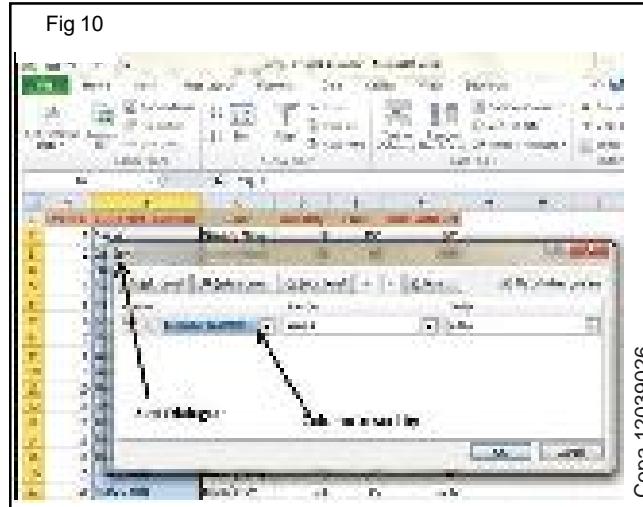
Sorting data in MS Excel rearranges the rows based on the contents of a particular column. sort a table to put names in alphabetical order Or sort data by Amount from smallest to largest or largest to smallest.

To Sort the data follow the steps mentioned below.

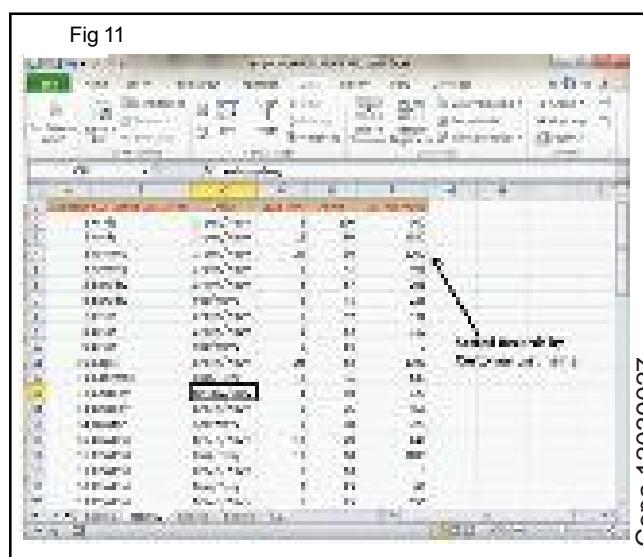
- Select the Column to sort data as on fig 9.



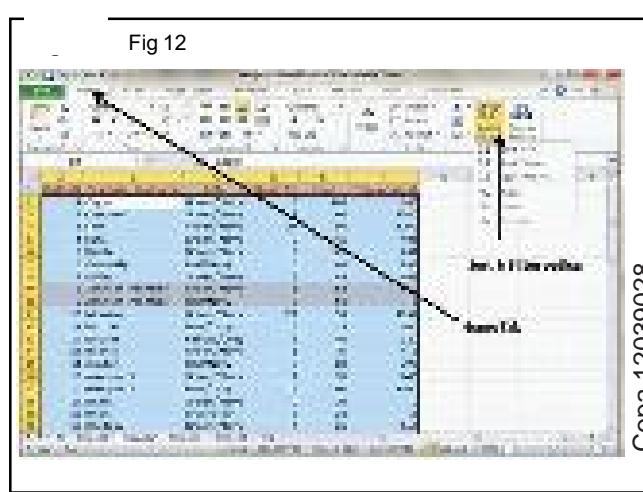
- Choose Data Tab " Sort Below dialog appears.
- If the user sort data based on a selected column, Choose Continue with the selection or if the data sorting based on other columns, choose Expand Selection.
- Sort the data based on the below Conditions as on fig 10.



- **Values** - alphabetically or numerically.
- **Cell Color** - Based on Color of Cell.
- **Font Color** - Based on Font color.
- **Cell Icon** - Based on Cell Icon.
- Clicking Ok will sort the data as on fig 11.



Sorting option is also available from the Home Tab. Choose Home Tab " Sort & Filter. You can see the same dialog to sort records as on fig 12.



Ranges in MS Excel:

A cell is a single element in a worksheet that can hold a value, some text, or a formula. A cell is identified by its address, which consists of its column letter and row number. For example, cell B1 is the cell in the second column and the first row.

A group of cells is called a range. You designate a range address by specifying its upper-left cell address and its lower-right cell address, separated by a colon.

Example of Ranges:

- C24** - A range that consists of a single cell.
- A1:B1** - Two cells that occupy one row and two columns.
- A1:A100** - 100 cells in column A.
- A1:D4** - 16 cells (four rows by four columns).

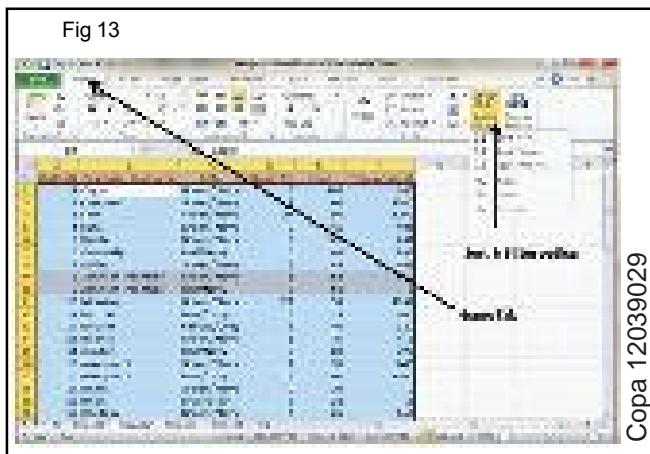
Selecting Ranges (Fig-29)

Selecting a range in several ways ?

- Press the left mouse button and drag, highlighting the range. Then release the mouse button. If drag to the end of the screen, the worksheet will scroll.
- Press the Shift key while uses the navigation keys to select a range.
- Press F8 and then move the cell pointer with the navigation keys to highlight the range. Press F8 again

to return the navigation keys to normal movement.

- Type the cell or range address into the Name box and press Enter. Excel selects the cell or range that specified. (Fig 13)



Selecting Complete Rows and Columns (Fig-30)

When user need to select an entire row or column.and can select entire rows and columns in much the same manner as select ranges:

- Click the row or column border to select a single row or column.
- To select multiple adjacent rows or columns, click a row or column border and drag to highlight additional rows or columns.
- To select multiple (nonadjacent) rows or columns, press Ctrl while click the row or column borders. (Fig 14)

Fig 14

Copa 12039030

SL	NAME	GRADE	MARKS	PERCENTAGE
1	Cagle	General Navy	100	100
2	Connie B	General Navy	100	100
3	Dorell	General Navy	90	90
4	Lori	General Navy	85	85
5	Reita	General Navy	85	85
6	Karenlynn	Family Navy	85	85
7	Melba	General Navy	85	85
8	Samatha Thompson	General Navy	85	85
9	Sara Smith	Family Navy	85	85

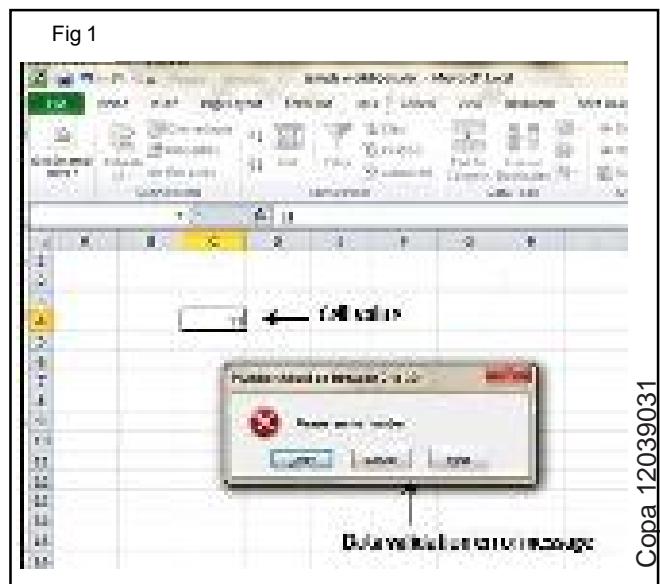
Data validations and Table management in MsExcel 2010

Objectives : At the end of this lesson you shall be able to

- data Validation
- data Table with Example
- charts and its types
- pivot table and pivot chart
- page setup and printing worksheet
- excel shortcut keys

Data Validation

MS Excel data validation feature allows to set up certain rules that dictate what can be entered into a cell. For example, user want to limit data entry in a particular cell to whole numbers between 0 and 10. If the user makes an invalid entry, and display a custom message as shown fig 1.



Validation Criteria

To specify the type of data allowable in a cell or range, follow the steps below, which shows all the three tabs of the Data Validation dialog box.

- Select the cell or range.
- Choose Data " Data Tools " Data Validation. Excel displays its Data Validation dialog box having 3 tabs settings, Input Message and Error alert.

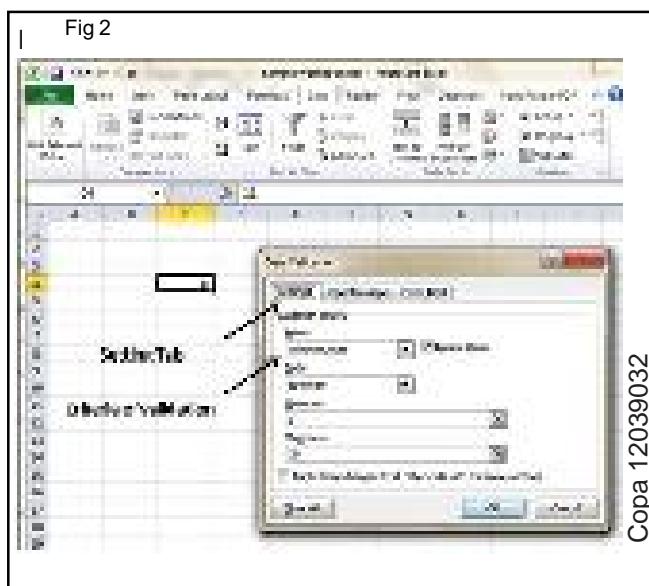
Settings Tab

Here user can set the type of validation. Choose an option from the Allow drop-down list. The contents of the Data Validation dialog box will change, displaying controls based on your choice.

- Any Value - Selecting this option removes any existing data validation.
- Whole Number - The user must enter a whole number. For example, you can specify that the entry must be a whole number greater than or equal to 50.

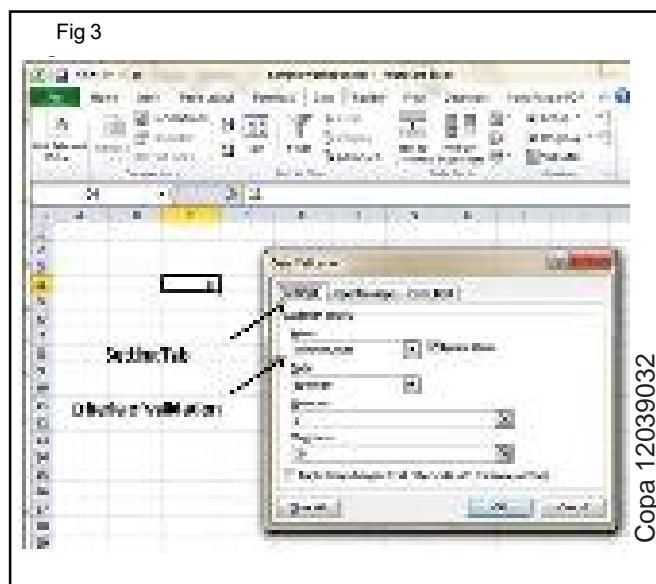
- Decimal - The user must enter a number. For example, you can specify that the entry must be greater than or equal to 10 and less than or equal to 20.
- List - The user must choose from a list of entries you provide. You will create drop-down list with this validation. You have to give input ranges then those values will appear in the drop-down.
- Date - The user must enter a date. You specify a valid date range from choices in the Data drop-down list. For example, you can specify that the entered data must be greater than or equal to January 1, 2013, and less than or equal to December 31, 2013.
- Time - The user must enter a time. Specify a valid time range from choices in the Data drop-down list. For example, user can specify that the entered data must be later than 12:00 p.m.
- Text Length - The length of the data (number of characters) is limited. specify a valid length by using the Data drop-down list. For example, that the length of the entered data be 1 (a single alphanumeric character).
- Custom - To use this option, must supply a logical formula that determines the validity of the user's entry (a logical formula returns either TRUE or FALSE).

Input Message Tab (fig 2)



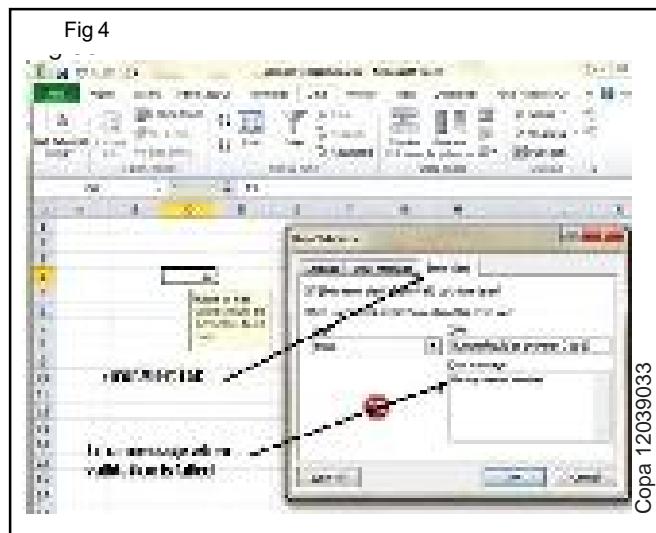
User can set the input help message with this tab. Fill the title and Input message of the Input message tab and the input message will appear when the cell is selected.

Error Alert Tab (fig 3)

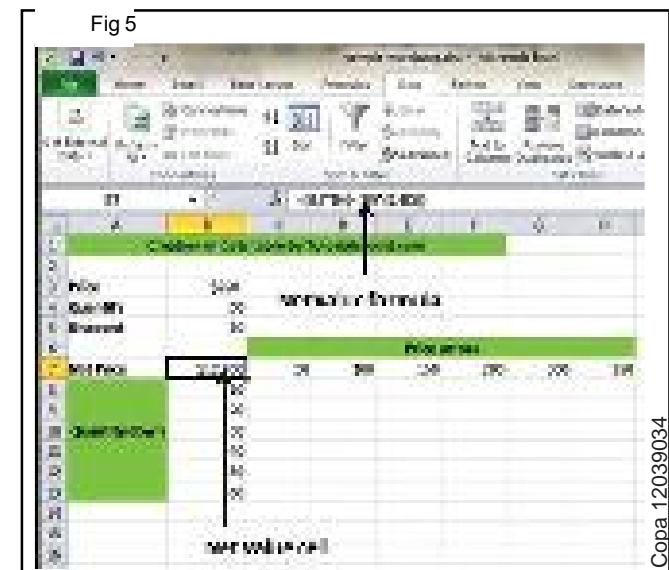


User specify an error message with this tab. Fill the title and error message. Select the style of the error as stop, warning or Information as per user need.

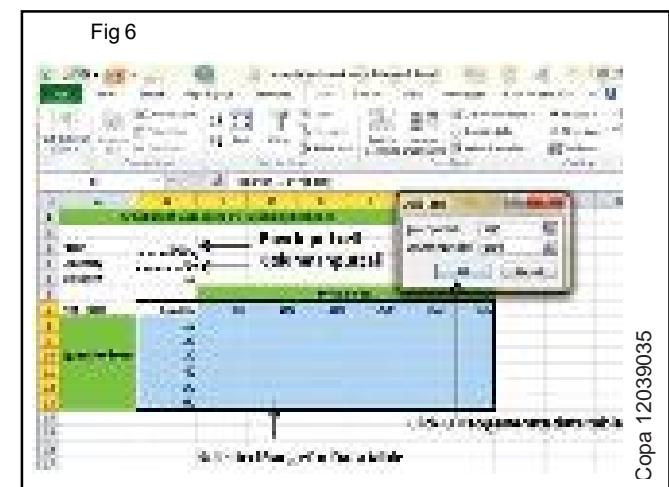
Data Table with Example (Fig 4)



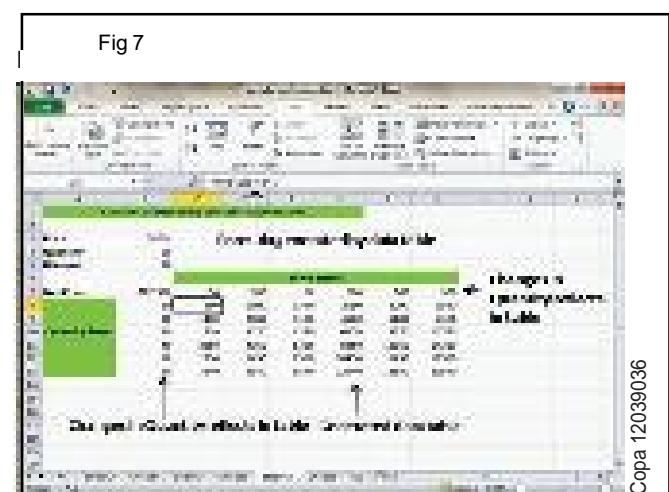
Here user have the Price and quantity of many values. Also, have the discount for that as third variable for calculating the Net Price. And can keep the Net Price value in the organized table format with the help of the data table. The Price runs horizontally to the right while quantity runs vertically down. We are using a formula to calculate the Net Price as Price multiplied by Quantity minus total discount (Quantity * Discount for each quantity) as shown in fig 5.



Now, for creation of data table select the range of data table. Choose Data Tab " What-If analysis dropdown " Data table. It will display dialogue asking for Input row and Input Column. Give the Input row as Price cell (In this case cell B3) and Input column as quantity cell (In this case cell B4) as shown in fig 6.



Clicking OK will generate data table as shown in fig 7. It will generate the table formula. And change the price horizontally or quantity vertically to see the change in the Net Price.



Charts

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets. Charts generated by early spreadsheet products were quite crude, but they have improved significantly over the years. Excel provides you with the tools to create a wide variety of highly customizable charts. Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships.

Types of Charts

There are various chart types available in MS Excel as shown in fig 8.



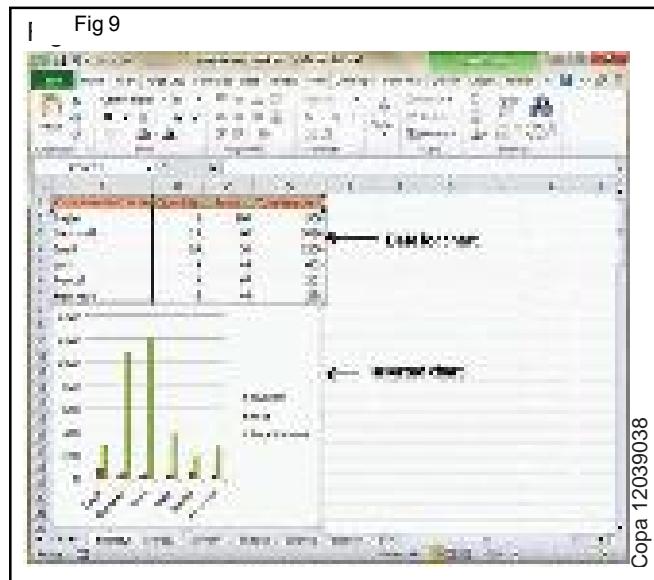
- **Column:** Column chart shows data changes over a period of time or illustrates comparisons among items.
 - **Bar:** A bar chart illustrates comparisons among individual items.
 - **Pie:** A pie chart shows the size of items that make up a data series, proportional to the sum of the items. It always shows only one data series and is useful to emphasize a significant element in the data.
 - **Line:** A line chart shows trends in data at equal intervals.
 - **Area:** An area chart emphasizes the magnitude of change over time.
 - **X Y Scatter:** An xy (scatter) chart shows the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.

- **Stock:** This chart type is most often used for stock price data, but can also be used for scientific data (for example, to indicate temperature changes).
 - **Surface:** A surface chart is useful to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.
 - **Doughnut:** Like a pie chart, a doughnut chart shows the relationship of parts to a whole; however, it can contain more than one data series.
 - **Bubble:** Data that is arranged in columns on a worksheet, so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.
 - **Radar:** A radar chart compares the aggregate values of a number of data series.

Creating Chart

To create charts for the data by below mentioned steps.

- Select the data for which you want to create the chart.
 - Choose Insert Tab " Select the chart or click on the Chart group to see various chart types.
 - Select the chart of the choice and click OK to generate the chart as shown in fig 9.



Editing Chart

You can edit the chart at any time after you have created it.

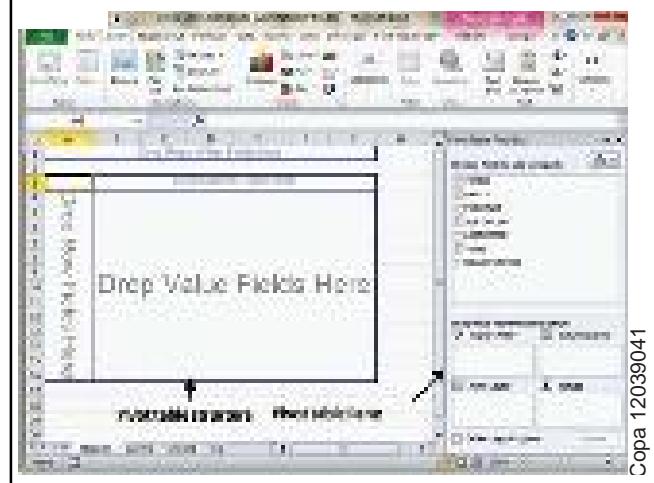
- select the different data for chart input with Right click on chart " Select data. Selecting new data will generate the chart as per the new data, as shown in fig 10.

Fig 10



This will generate the Pivot table pane as shown in fig-41. various options available in the Pivot table pane. And can select fields for the generated pivot table. (Fig 13)

Fig 12



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- change the X axis of the chart by giving different inputs to X-axis of chart.
- change the Y axis of chart by giving different inputs to Y-axis of chart.

Pivot Tables

A pivot table is essentially a dynamic summary report generated from a database. The database can reside in a worksheet (in the form of a table) or in an external data file. A pivot table can help transform endless rows and columns of numbers into a meaningful presentation of the data. Pivot tables are very powerful tool for summarized analysis of the data.

Pivot tables are available under Insert tab " PivotTable dropdown " PivotTable.

Pivot Table Example (Fig-40)

Now, let us see Pivot table with the help of example. Suppose huge data of voters and need to see the summarized data of voter Information per party, use the Pivot table for it. Choose Insert tab " Pivot Table to insert pivot table. MS Excel selects the data of the table. and select the pivot table location as existing sheet or new sheet. (Fig 11)

Fig 11

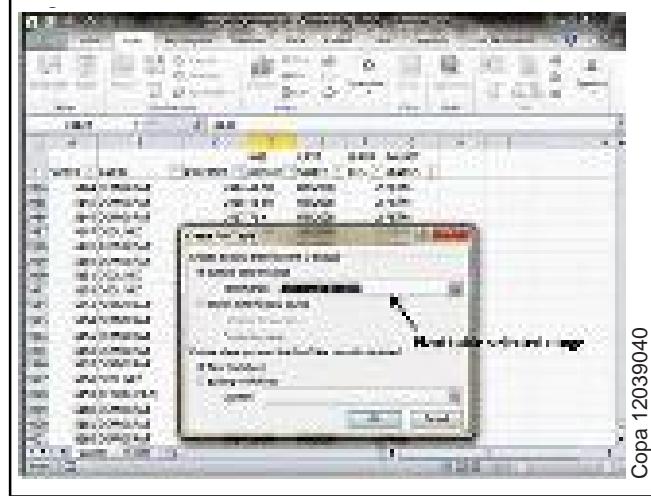
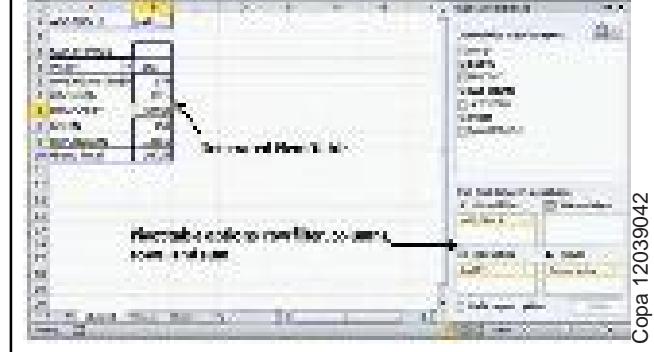


Fig 13



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Pivot Charts

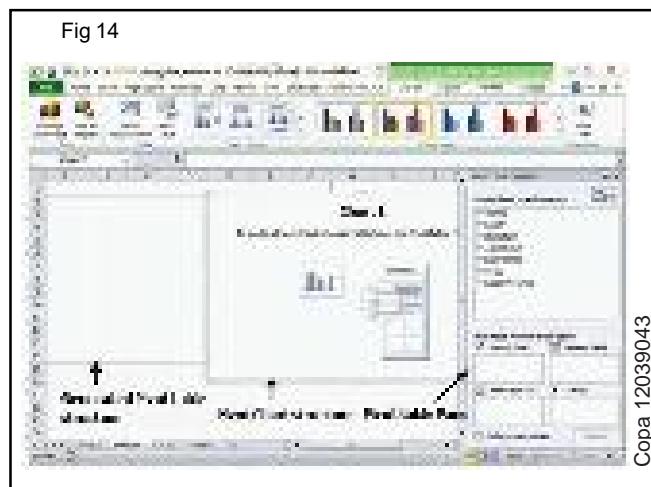
A pivot chart is a graphical representation of a data summary, displayed in a pivot table. A pivot chart is always based on a pivot table. Although Excel lets to create a pivot table and a pivot chart at the same time, user can't create a pivot chart without a pivot table. All Excel charting features are available in a pivot chart.

Pivot charts are available under **Insert tab > PivotTable dropdown > PivotChart**.

Pivot Chart Example

Suppose huge data of voters and need to see the summarized view of the data of voter

Information per party in the form of charts, then use the Pivot chart for it. Choose **Insert tab > Pivot Chart** to insert the pivot table. (Fig 14)



MS Excel selects the data of the table. And select the pivot chart location as an existing sheet or a new sheet. Pivot chart depends on automatically created pivot table by the MS Excel. generate the pivot chart in the below fig 15.



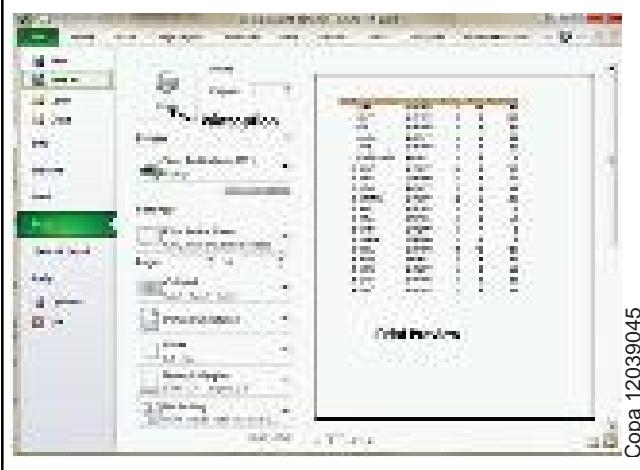
Quick Print

If user want to print a copy of a worksheet with no layout adjustment, use the Quick Print option. There are two ways in which we can use this option.

- Choose File " Print (which displays the Print pane), and then click the Print button as shown in fig 16.

- Press Ctrl+P and then click the Print button (or press Enter).

Fig 16



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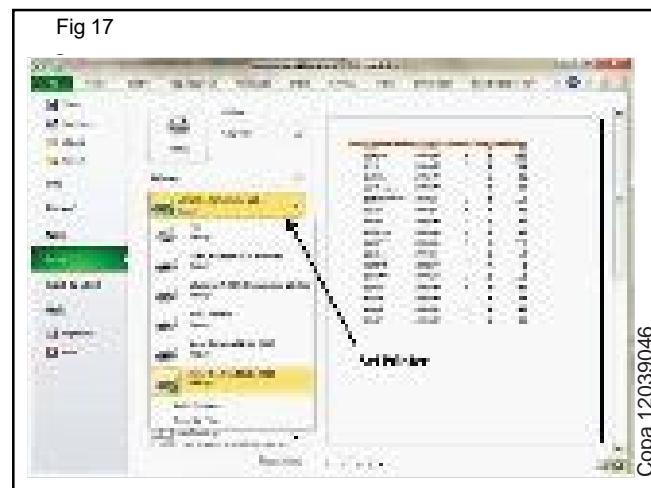
Adjusting Common Page Setup Settings

User can adjust the print settings available in the Page setup dialogue in different ways as discussed below. Page setup options include Page orientation, Page Size, Page Margins, etc.

- The Print screen in Backstage View, displayed when choose File " Print.
- The Page Layout tab of the Ribbon.

Choosing Your Printer(fig-46)

To switch to a different printer, choose **File > Print** and use the drop-down control in the Printer section to select any other installed printer. (Fig 17)



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Specifying What You Want to Print(Fig 18)

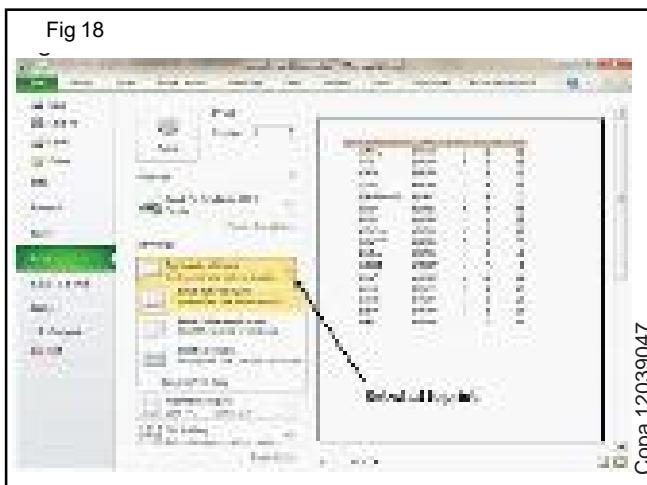
Sometimes print only a part of the worksheet rather than the entire active area. Choose **File > Print** and use the controls in the Settings section to specify what to print.

- Active Sheets:** Prints the active sheet or sheets that you selected.

- **Entire Workbook:** Prints the entire workbook, including chart sheets.
- **Selection:** Prints only the range that selected before choosing **File > Print**.

MS Excel Keyboard Short-cuts

MS Excel offers many keyboard short-cuts. Below is the list of all the major shortcut keys in Microsoft Excel. (Fig 18)



- **Ctrl + A** - Selects all contents of the worksheet.
- **Ctrl + B** - Bold highlighted selection.
- **Ctrl + I** - Italicizes the highlighted selection.
- **Ctrl + K** - Inserts link.
- **Ctrl + U** - Underlines the highlighted selection.
- **Ctrl + 1** - Changes the format of selected cells.
- **Ctrl + 5** - Strikethrough the highlighted selection.
- **Ctrl + P** - Brings up the print dialog box to begin printing.
- **Ctrl + Z** - Undo last action.
- **Ctrl + F3** - Opens Excel Name Manager.
- **Ctrl + F9** - Minimizes the current window.
- **Ctrl + F10** - Maximize currently selected window.
- **Ctrl + F6** - Switches between open workbooks or windows.
- **Ctrl + Page up** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Page down** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Tab** - Moves between Two or more open Excel files.
- **Alt + =** - Creates a formula to sum all of the above cells
- **Ctrl + '** - Inserts the value of the above cell into cell currently selected.
- **Ctrl + Shift + !** - Formats the number in comma format.
- **Ctrl + Shift + \$** - Formats the number in currency format.
- **Ctrl + Shift + #** - Formats the number in date format.
- **Ctrl + Shift + %** - Formats the number in percentage format.
- **Ctrl + Shift + ^** - Formats the number in scientific format.
- **Ctrl + Shift + @** - Formats the number in time format.
- **Ctrl + Arrow key** - Moves to the next section of text.

- **Ctrl + Space** - Selects the entire column.
- **Shift + Space** - Selects the entire row.
- **Ctrl + -** - Deletes the selected column or row.
- **Ctrl + Shift + =** - Inserts a new column or row.
- **Ctrl + Home** - Moves to cell A1.
- **Ctrl + ~** - Switches between showing Excel formulas or their values in cells.
- **F2** - Edits the selected cell.
- **F3** - After a name has been created F3 will paste names.
- **F4** - Repeat last action. For example, if you changed the color of text in another cell pressing F4 will change the text in cell to the same color.
- **F5** - Goes to a specific cell. For example, C6.
- **F7** - Spell checks the selected text or document.
- **F11** - Creates chart from the selected data.
- **Ctrl + Shift + ;** - Enters the current time.
- **Ctrl + ;** - Enters the current date.
- **Alt + Shift + F1** - Inserts New Worksheet.
- **Alt + Enter** - While typing text in a cell pressing Alt + Enter will move to the next line allowing for multiple lines of text in one cell.
- **Shift + F3** - Opens the Excel formula window.
- **Shift + F5** - Brings up the search box.

Image editing, presentations

Objectives : At the end of this lesson you shall be able to

- Introduction to Power Point and its advantages
- Creation of slide shows
- Fine tuning of presentations

Introduction

PowerPoint is a presentation graphics software program that is part of the Microsoft Office package. It uses a graphical approach for the presentations in the form of slide shows that accompany the oral delivery of the topic. This program is widely used in business and classrooms and is an effective tool when used for training purposes.

PowerPoint is one of the simplest computer programs to learn. It is the easiest program used worldwide for presentations that creates professional looking presentations. It is easy to customize presentations with company logo and has design templates that come with the programs. In addition to an on screen slide show, PowerPoint has printing options that allow the presenter to provide handouts and outlines for the audience as well as notes pages for the speaker to refer to during the presentation.

PowerPoint 2010 allows to create presentations for printing or online viewing using a variety of tools. These include wizards to help with the content and look and feel of the presentations to animation tools to create moving images.

Presentation

A presentation is a collection of data and information that is to be delivered to a specific audience. A PowerPoint presentation is a collection of electronic slides that can have text, pictures, graphics, tables, sound and video. This collection can run automatically or can be controlled by a presenter.

Advantage and application of PowerPoint 2010

- Professional looking presentations
- Animated presentations shown on a monitor or overhead screen
- Notes for the speaker
- Handouts for the audience
- Paper printouts of your slide
- Overhead projector transparencies
- Movies

Working with PowerPoint 2010

Step 1: Click the Start button.



Step 2: Click All Programs option from the menu.



Step 3: Search for Microsoft Office from the sub menu and click it.



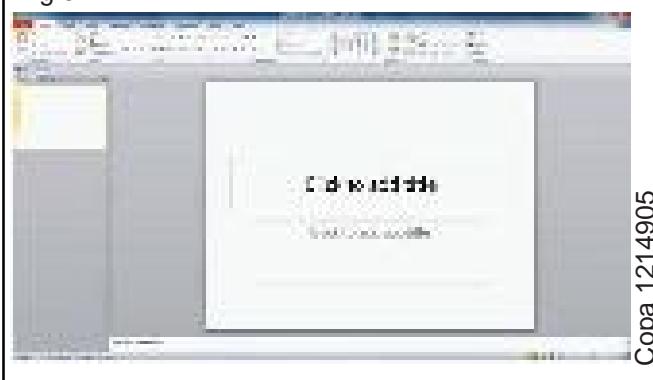
Step 4: Search for Microsoft PowerPoint 2010 from the submenu and click it.

Fig 4

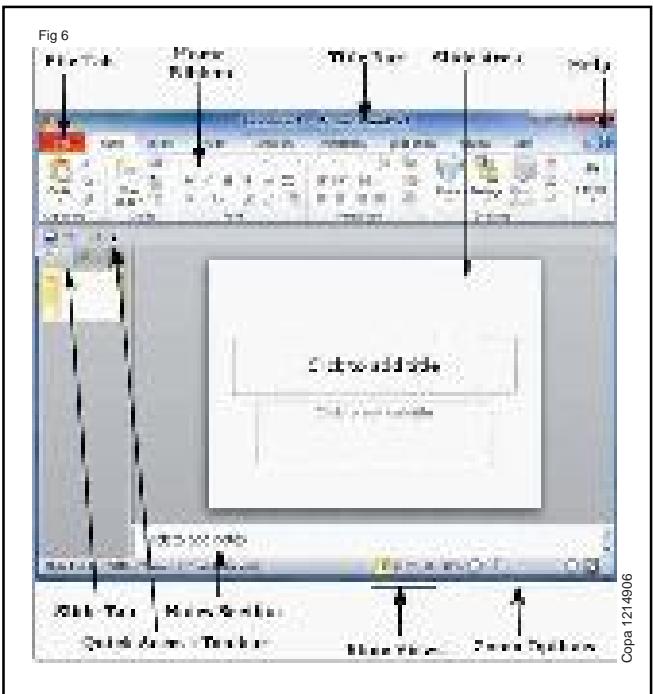


This will launch the Microsoft PowerPoint 2010 application and the following is the presentation window.

Fig 5



PowerPoint Screen



File Tab

This tab opens the Backstage view which basically allows to manage the file and settings in PowerPoint. This can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.

Ribbon

Fig 7



The ribbon contains three components:

- **Tabs:** They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.
- **Groups:** They organize related commands; each group name appears below the group on the Ribbon. For example, a group of commands related to fonts or a group of commands related to alignment, etc.
- **Commands:** Commands appear within each group as mentioned above.

Title Bar

This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

Slide Area

This is the area where the actual slide is created and edited. Add, edit and delete text, images, shapes and multimedia is supported in this section.

Help

The Help Icon can be used to get PowerPoint related help anytime. Clicking on the "?" opens the PowerPoint Help window where there is a list of common topics to browse from. Specific topics from the search bar at the top can also be used for searching.

Zoom Options

The zoom control zooms in for a closer look at the text. The zoom control consists of a slider that can slide left or right to zoom in or out, - and + buttons to can be used to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.

Slide Views

The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch between PowerPoint views.

- Normal Layout view: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows user to edit individual slides and also rearrange them.

- Slide Sorter view: This displays all the slides as a matrix. This view only allows the user to rearrange the slides but not edit the contents of each slide.
- Reading View: This view is like a slideshow with access to the Windows task bar in case the user need to switch windows. However, like the slideshow user cannot edit anything in this view.

Notes Section

This sections allows user to add notes for the presentation. These notes will not be displayed on the screen during the presentation; these are just quick reference for the presenter.

Quick Access Toolbar

The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint. User can customize this toolbar to suit their needs.

Slide Tab

This section is available only in the Normal view. It displays all the slides in sequence. User can add, delete and reorder slides from this section.

Backstage View in Powerpoint 2010

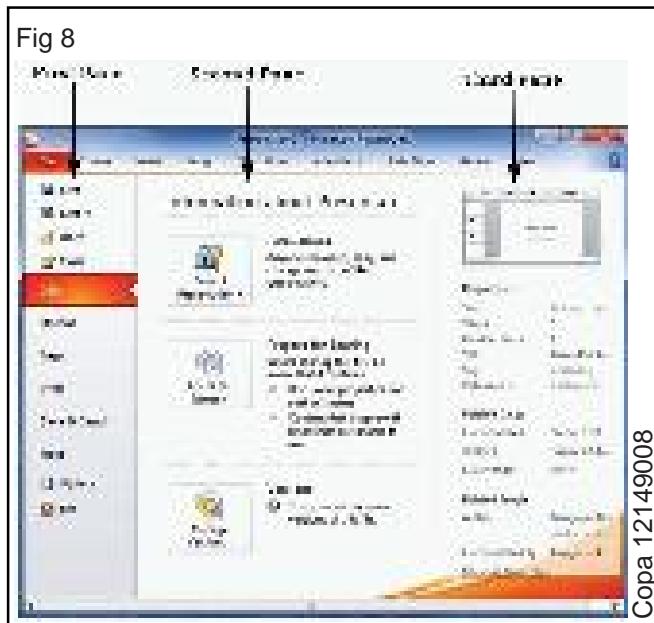
In Office 2010, Microsoft replaced the traditional file menu with the new Backstage view. This view not only offers all the menu items under the file menu, but additional details which makes management of files a lot easier.

Accessing Backstage View

User can access the Backstage view simply by clicking on the File tab. They can exit this view by clicking on any tab (including the File tab again). 'Esc' button on the keyboard can also be pressed for the same.

Organization of Backstage View

The backstage view has three sections or panes.



- First Pane ? This is the commands pane which consists of all the commands that would typically found in the file menu of older versions. it also has the Options menu which edits the options on the program like customizing the ribbon.

Various commands under the first pane are described in the table below ?

S.No	Command & Description
1	Save This allows user to save a new file or an existing file in standard format. If user is working on a previously saved file this will save the new changes in the same file format. If user is working on a new file, this command would be similar to the Save As command.
2	Save As Allows user to specify the file name and the file type before saving the file.
3	Open Allows user to open new PowerPoint files.
4	Close Allows user to close an existing file.
5	Info Displays the information about the current file.
6	Recent Lists series of recently viewed or edited PowerPoint files.
7	New Allows user to create a new file using blank or pre-defined templates.
8	Print Allows user to select the printer settings and print the presentation.
9	Save & Send Allows user to share your presentation with larger audience via emails, web, cloud services, etc.
10	Help Provides access to PowerPoint Help.
11	Options Allows user to set various options related to PowerPoint program.
12	Exit Closes the presentation and exits the program.
	• Second Pane ? This is the subcommands pane. This will list all the commands related to the main command chosen in the first pane. For example, if user selects Print in the first pane, user get to choose the printer and adjust the print settings in the second pane.

- Third Pane ? This is the preview or file information page. Depending on the command and the subcommand user select, this pane will either display the properties of the file or give a preview of the file.

Creating Presentation using Powerpoint 2010

PowerPoint offers a host of tools that will aid the user in creating a presentation. These tools are organized logically into various ribbons in PowerPoint. The table below describes the various commands that can be accessed from the different menus.

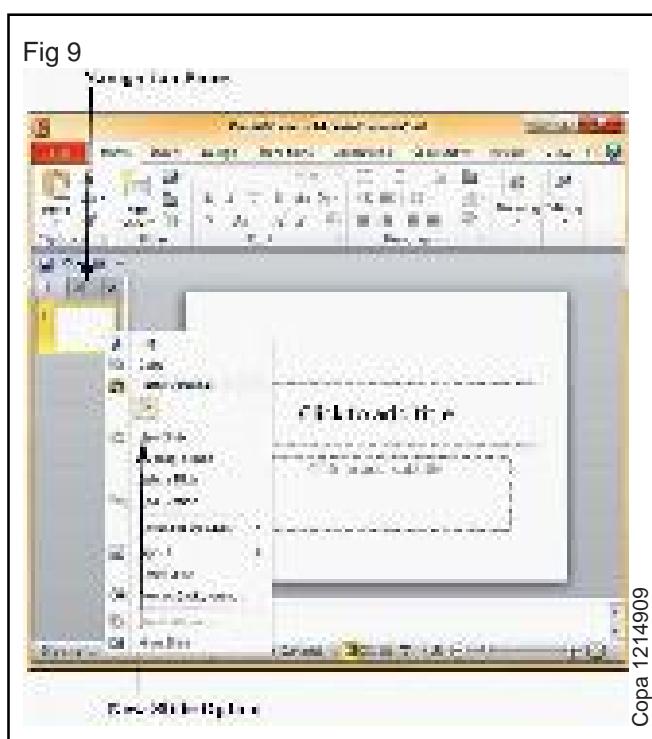
Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions.
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols.
Design	Slide setup, slide orientation, presentation themes and background.
Transitions	Commands related to slide transitions.
Animations	Commands related to animation within the individual slides.
Slide Show	Commands related to slideshow set up and previews.
Review	Proofing content, language selection, comments and comparing presentations.
View	Commands related to presentation views, Master slides, color settings and window arrangements.

Besides these depending on the objects selected in the slide, there are other menu tabs that get enabled.

Add New Slides in Powerpoint 2010

The following are the steps that allows the user to insert a new slide .

Step 1: Right-click in the Navigation Pane under any existing slide and click on the New Slide option.

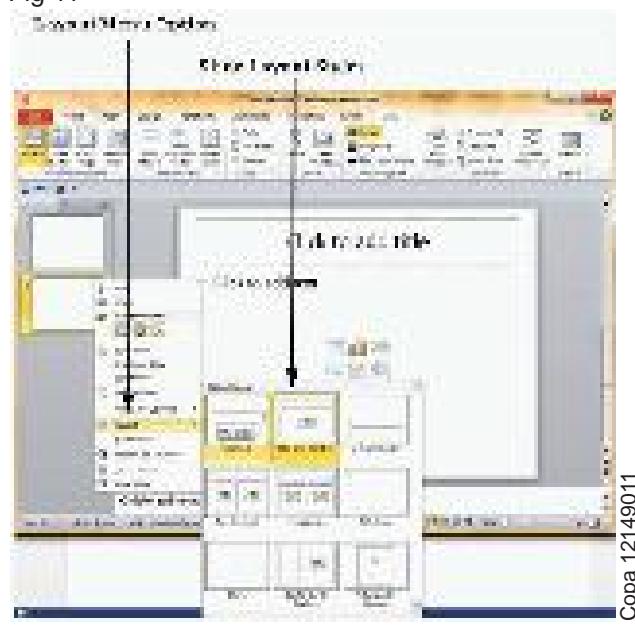


Step 2: The new slide is inserted. The layout of this slide can be changed to suit the design requirements.



Step 3: To change the slide layout, right-click on the newly inserted slide and go to the Layout option where user can choose from the existing layout styles available .

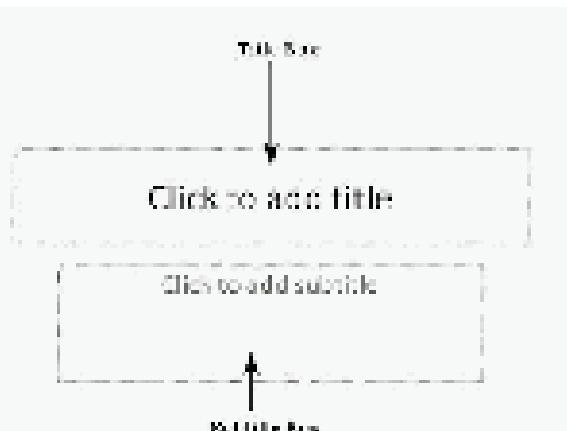
Fig 11



Subtitle Box

This is found only in slides with the Title layout. This is indicated by "Click to add subtitle"

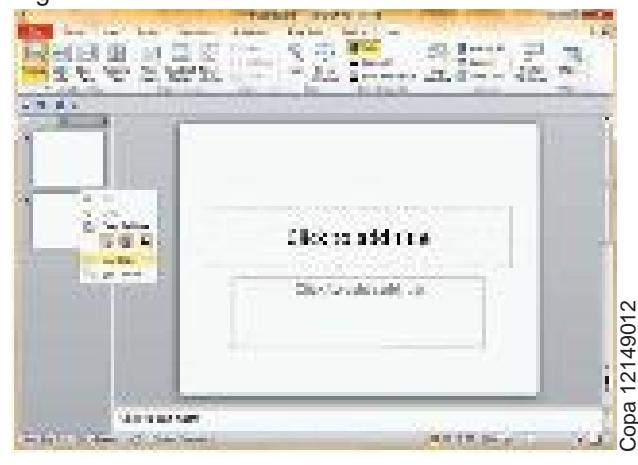
Fig 13



Same steps can be followed to insert a new slide in between existing slides or at the end on the slide list.

When we insert a new slide, it inherits the layout of its previous slide with one exception. If inserting a new slide after the first slide (Title slide), the subsequent slide will have the Title and Content layout.

Fig 12



Adding Text in Boxes in PowerPoint 2010

PowerPoint allows users to add text to the slide in a well-defined manner to ensure the content is well distributed and easy to read. The procedure to add the text in a PowerPoint slide is always the same - just click in the text box and start typing. The text will follow the default formatting set for the text box, although this formatting can be changed later as required.

The most common content blocks in PowerPoint are:

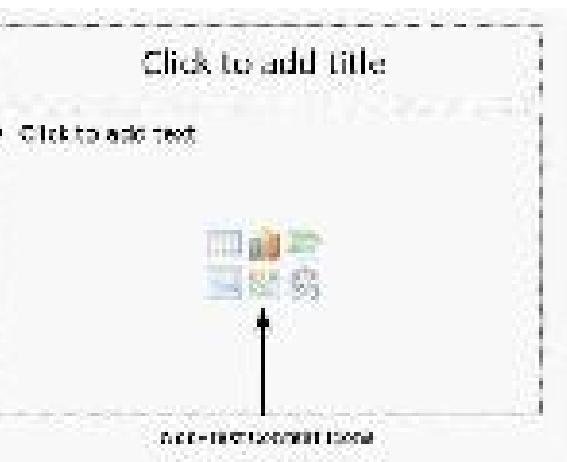
Title Box

This is typically found on slides with the title layout and in all the slides that have a title box in them. This box is indicated by "Click to add title".

Content Box

This is found in most of the slides that have a placeholder for adding content. This is indicated by "Click to add text". This box allows user to add text as well as non-text content. To add text to such a box, click anywhere on the box, except on one of the content icons in the center and start typing.

Fig 14



Text Only Box

This is not a default content box available in PowerPoint, but user can create it using Slide Master, if required. This is also indicated by "Click to add text". The only difference between the Text Only Box and the Content Box is that the former only supports text in the content area.

Fig 16



Adding New Text Boxes in Powerpoint 2010

Most of the standard layouts come with the text box option. As mentioned, text boxes will have "Click to add text" as the default text. Here are the steps to add new text boxes in slide.

Step 1: Click on the Text Box icon in the Home ribbon under the Drawing section.

Fig 16



Step 2 : User will get the insert text box cursor that looks like an inverted cross.

Fig 17



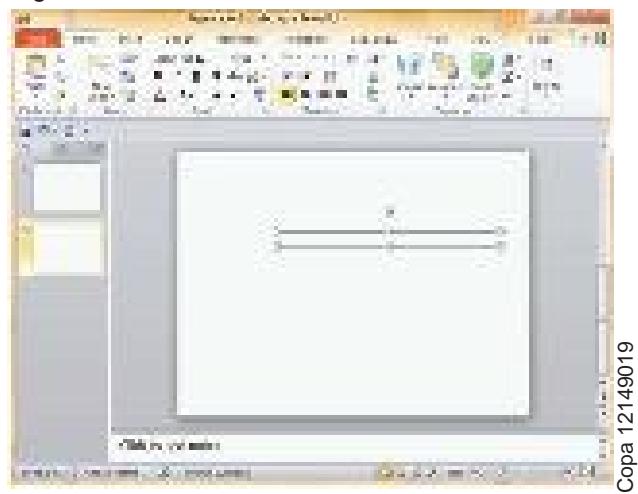
Step 3: Click to insert a text box. User can now start typing directly into the text box.

Fig 18



Step 4: Alternately, user can click and drag the cursor without releasing the click to create a text box.

Fig 19



The size of the text box can be adjusted by selecting one of the edges marked by squares or corners marked by circles.

Slide Show in Powerpoint 2010

Most PowerPoint presentations are created to be run as a slideshow. Most of these features of PowerPoint 2010 are really to help user create a good slideshow without having to go through the entire presentation over and over again after every minor change. Features related to running the slideshow are grouped under the Slideshow ribbon.

Fig 20



Section	Menu Item	Description
Start Slideshow	From Beginning From Current Slide Broadcast Slideshow Custom Slideshow	Starts slideshow from beginning Starts slideshow from the current slide Allows users to broadcast the slideshows using Microsoft's PowerPoint Broadcast Service Builds a custom slideshow by picking the slides you want to run
Set Up	Set Up Slideshow Hide Slide Rehearse Timing Record Slideshow Slideshow Checkboxes	Helps set up the slideshow including browser/ full screen display, show options with or without narration/ animation, pen and laser color during the slideshow and the slides to be presented during the show Helps mark/ unmark the slide as hidden, so it is skipped or shown during the slideshow respectively Allows users to rehearse the timing on each slide and the entire slideshow Records the slideshow including narration and animation Helps set or avoid the use of narrative audio and rehearsed timings during the show. Display media controls in the slideshow view
Monitors	Resolution Show Presentation on Use Presenter View	Defines resolution in slideshow view Picks the monitor to display the presentation one - in case of multiple monitors Run presentation in Presenter view rather than just slideshow view

Concepts of data and Databases

Objectives : At the end of this lesson you shall be able to

- explain database structure and control
- describe Ms access database utilities.

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

- Microsoft Access is just one part of Microsoft's overall data management product strategy.
- It stores data in its own format based on the Access Jet Database Engine.
- Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. However, Access 2013 also complements other database products because it has several powerful connectivity features.
- It can also import or link directly to data stored in other applications and databases.
- As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.
- Access can also understand and use a wide variety of other data formats, including many other database file structures.
- You can export data to and import data from word processing files, spreadsheets, or database files directly.
- Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.
- Software developers can use Microsoft Access to develop application software.

Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

- **Database Creation:** Create your Microsoft Access database and specify what kindof data you will be storing.
- **Data Input:** After your database is created, the data of every business day canbe entered into the Access database.
- **Query:** This is a fancy term to basically describe the process of retrievinginformation from the database.

- **Report (optional):** Information from the database is organized in a nicepresentation that can be printed in an Access Report.

Architecture

- Access calls anything that can have a name an object. Within an Access desktop database, the main objects are tables, queries, forms, reports, macros, data macros, and modules.
- If you have worked with other database systems on desktop computers, you might have seen the term database used to refer to only those files in which you store data.
- But, in Access, a desktop database (.accdb) also includes all the major objects related to the stored data, including objects you define to automate the use of your data.

RDBMS

In the computing system (web and business applications), there are enormous data that comes out every day from the web. A large section of these data is handled by Relational database management systems (RDBMS). The idea of relational model came with E.F.Codd's 1970 paper "A relational model of data for large shared data banks" which made data modeling and application programming much easier. Beyond the intended benefits, the relational model is well-suited to client-server programming and today it is predominant technology for storing structured data in web and business applications.

MS Access - RDBMS

Microsoft Access has the look and feel of other Microsoft Office products as far as its layout and navigational aspects are concerned, but MS Access is a database and, more specifically, a relational database.

- Before MS Access 2007, the file extension was ***.mdb**, but in MS Access 2007 the extension has been changed to ***.accdb** extension.
- Early versions of Access cannot read accdb extensions but MS Access 2007 and later versions can read and change earlier versions of Access.
- An Access desktop database (.accdb or .mdb) is a fully functional RDBMS.
- It provides all the data definition, data manipulation, and data control features that you need to manage large volumes of data.

- You can use an Access desktop database (.accdb or .mdb) either as a standalone RDBMS on a single workstation or in a shared client/server mode across a network.
- A desktop database can also act as the data source for data displayed on webpages on your company intranet.
- When you build an application with an Access desktop database, Access is the

RDBMS.

Data Definition

Let us now understand what Data Definition is:

- In document or a spreadsheet, you generally have complete freedom to define the contents of the document or each cell in the spreadsheet.
- In a document, you can include paragraphs of text, a table, a chart, or multiple columns of data displayed with multiple fonts.
- In spreadsheet, you can have text data at the top to define a column header for printing or display, and you might have various numeric formats within the same column, depending on the function of the row.
- An RDBMS allows you to define the kind of data you have and how the data should be stored.
- You can also usually define rules that the RDBMS can use to ensure the integrity of your data.
- For example, a validation rule might ensure that the user can't accidentally store alphabetic characters in a field that should contain a number.

Data Manipulation

Working with data in RDBMS is very different from working with data in a word processing or spreadsheet program.

- In a word processing document, you can include tabular data and perform a limited set of functions on the data in the document.
- You can also search for text strings in the original document and, with ActiveX controls, include tables, charts, or pictures from other applications.
- In a spreadsheet, some cells contain functions that determine the result you want, and in other cells, you enter the data that provides the source information for the functions.
- An RDBMS provides you many ways to work with your data. For example,
- You can search a single table for information or request a complex search across several related tables.
- You can update a single field or many records with a single command.

- You can write programs that use RDBMS commands to fetch data that you want to display and allow the user to update the data.

Access uses the powerful SQL database language to process data in your tables. Using SQL, you can define the set of information that you need to solve a particular problem, including data from perhaps many tables.

Data Control

Spreadsheets and word processing documents are great for solving single-user problems, but they are difficult to use when more than one person needs to share the data.

- When you need to share your information with others, RDBMS gives you the flexibility to allow multiple users to read or update your data.
- An RDBMS that is designed to allow data sharing also provides features to ensure that no two people can change the same data at the same time.
- The best systems also allow you to group changes (which is also known as transaction) so that either all the changes or none of the changes appear in your data.
- You might also want to be sure that no one else can view any part of the order until you have entered all of it.
- Because you can share your Access data with other users, you might need to set some restrictions on what various users are allowed to see or update.

Designing a Database

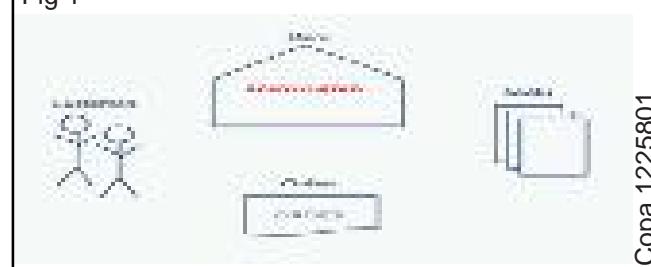
The first step in creating a database is to think about why you need it-what is its purpose? Once you know the answer, you can begin designing your own database. Ask yourself questions like What kinds of information will it store? How will I have to break down this information so it can be stored in my database? How will I use the data once it's in there?

The bookstore scenario

The best way to learn about designing a database is to jump right in to the process. Let's pretend we work for the bookstore, and we need to build a database for the store to use. Let's think about what we might need the database to do for us.

The following diagram shows that we have **customers** and sell **books** via **orders**, both in the store and online.

Fig 1



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The store needs a way to keep track of these things.

Determine the purpose of the database

The first step of designing a database is to determine the purpose of the database. What do we need it to do?

At Ready-2-Read, our customers will place orders for books. At the very least, we will want our database to track the books we sell, the customers we sell them to, and the date of each of the orders.

The database will also be able to tell us where our customers live when we need to send them books or coupons. Additionally, we can use it to track our sales or to make a bestseller list to post in the store.

Plan database tables

Once we've established its purpose, we can begin about how to break up the information into the tables the database will need to store data. Recall that a table is a collection of records, and each record is broken up into the smallest pieces of needed information, called fields.

Because we're planning a database to track our customers, the books we have, and the orders our customers place, we will need a table for each one of these.

- Customers
- Orders
- Books

Plan table fields

Once you know what tables you need, the next step is deciding what fields belong in each table. Remember that fields are the smallest chunk of information in any record.

Let's look at our Ready-2-Read bookstore example again. There will be several fields in our Customers table. We'll obviously want each customer's first name and last name. We'll also need an address if we need to send a customer his order. Email will be necessary if we need to contact the customer if there is an issue with the order.

Customers	Books	Orders
First Name	Title	Customer
Last Name	Author First	Book
Street	Author Last	Date
City	Price	
State	Category	
Pin/Zip Code		
Email		

We will also need several fields in the Books table. Title and Author make sense for books. We'll need a Price for each book. Category will help us know what type of books sell the best so we can order more books that fit into this category.

The Orders table will have fewer fields. We'll need this table to track the Customer who is placing the order, the

Book the customer is ordering, and the Date the order is placed.

Creating a new database with Access

When you launch Access 2007/2010, you will see the Getting Started window.

In the left pane, the template categories-including the featured local templates-are listed, as well as the categories on Office Online. Templates are prebuilt databases focused on a specific task that you can download and use immediately.

You will also see the New Blank Database option, which allows you to build your own database from scratch.

Fig 2



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When you choose the New Blank Database option at the top of the window, you will be prompted to rename the database from the default name, which is Database1.accdb. Rename the database whatever you want. In the example below, we named the database Ready2Read because it's the name of the store in our scenario.

Fig 3



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Click Create to finish naming the database.

Setting up tables

The new database opens with one table showing as a default. It also defaults to naming this table Table1 in both the navigation pane and the Table tab itself. You will want to name your tables based on your database design plan.

Fig 4



Copa 1225804

Naming a table

To give the table a unique name, you must first click on the Microsoft Office button in the upper-left corner of the application.

Fig 7



Copa 1225807

TIP: Give your tables logical, easy-to-understand names.

To rename a table:

With the table closed, right-click the Table you want to rename in the navigation pane. Select the Rename option that appears in the menu.

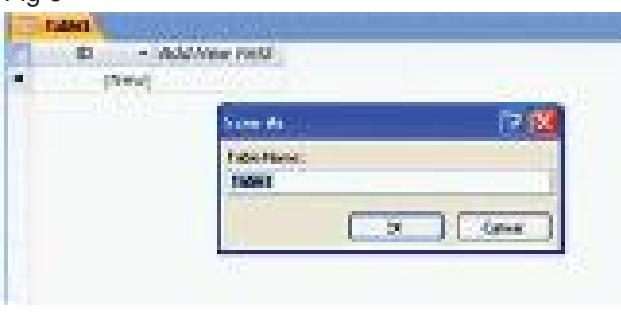
Fig 5



Copa 1225805

Next, select Save from the menu. The Save As dialog box will appear to let you save the table whatever name you want.

Fig 6



Copa 1225806

The new table names appear in both the navigation pane and the Table tab itself, as you can see in the picture below.

Fig 8



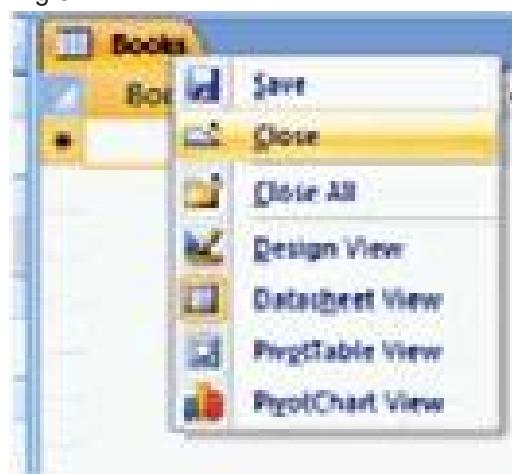
Copa 1225808

The table name will be highlighted and a cursor will appear, which means you can now type the new name right there. Left-click anywhere outside of the table name to make the change.

To close a table:

There are several ways to close an active table. You can right-click the Table tab and choose Close from the menu.

Fig 9



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A more common method is to click the X that appears in the top-right corner of the active database object window.

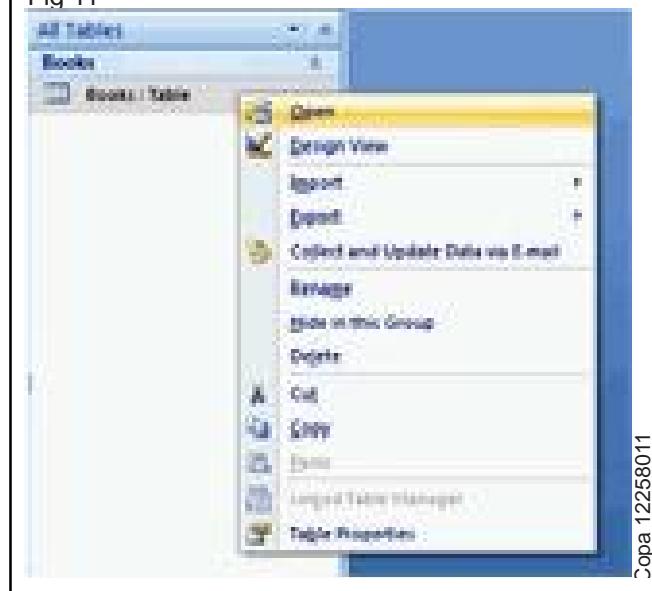
Fig 10



To open a table:

To open a table, right-click the Table name of the table you want to open in the navigation pane, then choose Open from the menu.

Fig 11



A more common method is to double-click the table name in the navigation pane. The selected table will open in the active database object window.

Adding more tables to the database

By default, Access 2007 starts out with one table. To add more tables to the database, click the Create tab on the Ribbon.

Fig 12



Next, select Table from the Tables command group. A new table will open in the active database object window. You must name your table using the Save command from Microsoft Office menu.

Adding fields to a table

Access 2007 allows you to add fields to tables when you are:

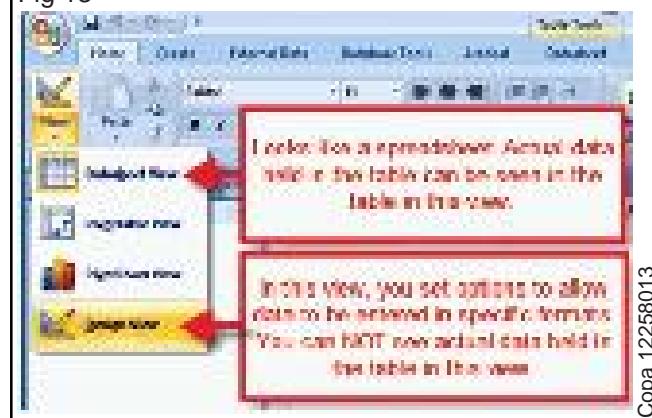
- Working in Datasheet view, which looks like a spreadsheet
- Working in Design view, where you are able to set more controls for your fields

Either way, you need to know how to switch between the two views.

To switch views:

Select the Views command group from either the Home tab (seen below) or the Datasheet tab on the Ribbon. Select the view option you want from the menu.

Fig 13



Adding fields in Datasheet view

By default, Access 2007 creates one field in each new table: the ID field. This field auto-numbers to give each record in the table a unique number identifier. Recall that records are the rows in a table. You may want to rename the ID field with a unique name because the ID field appears automatically in every table you create. While this is not necessary, it may help avoid confusion when setting up table relationships.

Fig 14



To add more fields to a table in Datasheet view, double-click the Add New Field header.

Fig 15

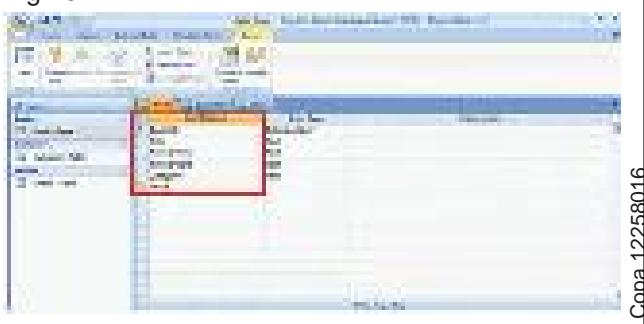


The Add New Field text will disappear from the header. Name the field by typing the name directly into the header. Press the Tab key on your keyboard to move to the next field.

Adding fields in Design view

In Design view, the field names are along the lefthand column instead of across the top like in Datasheet view, as seen below.

Fig 16



To add a new field to a table in Design view, click in the cell where you want the new field and type the field name. When you switch back to Datasheet view, your new field appears as its own column, as seen below.

Fig 17



Datatypes

Every field in a table has properties and these properties define the field's characteristics and behavior. The most important property for a field is its data type. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require characters. calculating (e.g. phone numbers).	Up to 255
Long Text	Lengthy text or combinations of text and numbers. characters.	Up to 63, 999
Number	Numeric data used in mathematical (16 bytes if set to calculations. Replication ID).	1, 2, 4, or 8 bytes
Date/Time	Date and time values for the years 100 through 9999.	8 bytes.
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes.
AutoNumber	A unique sequential (incremented by 1) number or random number assigned by set to Replication Microsoft Access whenever a new record is ID). added to a table.	4 bytes (16 bytes if
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or	1 bit.

Here are some of the other more specialized data types, you can choose from in Access.

Data Types	Description	Size
Attachment	Files, such as digital photos. Multiple files can be attached per record. This data type is not available in earlier versions of Access.	Up to about 2 GB.
OLE objects	OLE objects can store pictures, audio, video, or other BLOBS (Binary Large Objects)	Up to about 2 GB.
Hyperlink	Text or combinations of text and numbers stored as	Up to 8,192 (each part of a Hyperlink data type can contain up to 2048 characters).
Lookup	The Lookup Wizard entry in the Data Type column in the Design view is not actually a data type. When you choose this entry, a wizard starts to help you define either a simple or complex lookup field.	Dependent on the data type of the lookup field.
Wizard	A simple lookup field uses the contents of another table or a value list to validate the contents of a single value per row. A complex lookup field allows you to store multiple values of the same data type in each row.	
Calculated	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.

MS Access - Adding Data

Adding records to tables

When you enter records into your table, you are populating the database. In Access 2007, you can do this a few different ways.

To add records in the new record row:

- Click the record row with the asterisk that appears at the bottom of the table.

Fig 18



- Type the data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record navigation button:

- Click the New Record button in the navigation bar. The navigation bar is located in the bottom-left corner of the open object pane.

Fig 19



- Type data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record command:

- Click the New Record command in the Records group in the Ribbon.

Fig 20



- Type the data into the appropriate fields.
- Hit the Enter or the Tab key to move to the next field.

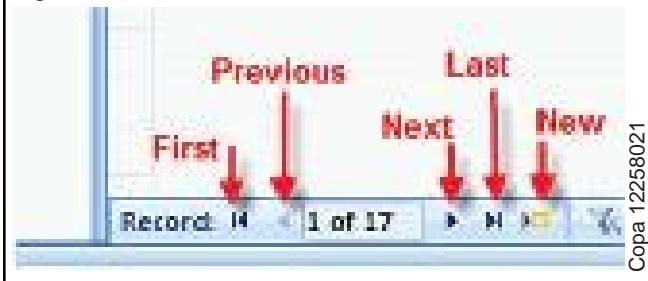
Editing records in tables

Sometimes it is necessary to edit records in the database. Like with every other task in Access 2007, this can be done several different ways.

To edit a record directly:

- Scroll through the records, or use the navigation buttons on the navigation bar to find the record to edit.

Fig 21



- Click the cell containing the information that must be edited. A pencil icon appears to indicate edit mode.

Fig 22



- Type the new information into the field.
- Click outside of the record row to apply the change.

To edit a record using Find and Replace:

- Click the Find command in the Find group on the Ribbon.

Fig 23



- The Find and Replace dialog box opens.

Fig 24



- Tell Access what to find by typing it into the Find What: area.
- Type the replace term in the Replace With: area.
- Tell Access where to look with the Look In: drop-down list. The first choice in the drop-down list is the field you were last in within the table.
- Tell Access what to Match: Any part of the field, the whole field, or just the start of the field.
- Tell Access how to Search: Up finds records above the cursor, Down finds records below the cursor, and All searches all records.
- Click one of the action options:
 - Find Next will find the next instance of the word in the table.

- Replace will put the new word into the table, overwriting what is currently there.
- Cancel stops the editing process.

CAUTION: DO NOT use Replace All because it will overwrite every instance of the Find term in the table, which can have a serious impact on your data.

To copy and paste a Record:

- Select the record you want to copy. Right-click, then select Copy.
- Select the new record row. Right-click and select Paste. The record information appears with a new record ID number.

To delete a record:

- Select the record you want to delete, then right-click and select Delete Record.
- A dialog box appears, telling you the action cannot be undone and asking if you are sure you want to delete the record.

Fig 25

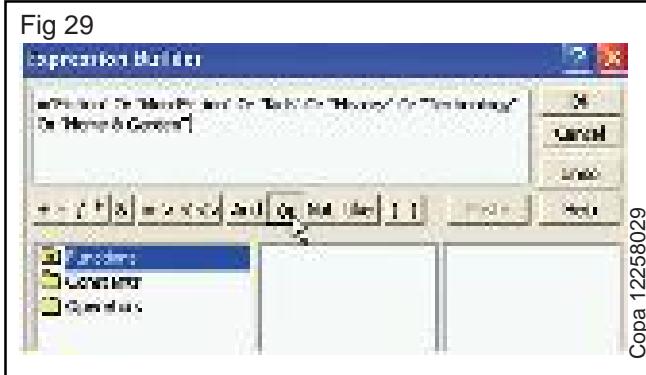


There may be other records that rely on the record you are trying to delete. DO NOT delete a record without knowing how it will impact the rest of your database.

Fig 26

	Record ID	Title	Author	Year Published	Genre
X	1	The Great Gatsby	F. Scott Fitzgerald	1925	Novel
X	2	The Catcher in the Rye	J. D. Salinger	1951	Novel
X	3	1984	George Orwell	1949	Science Fiction
X	4	Brave New World	George Orwell	1932	Science Fiction
X	5	Animal Farm	George Orwell	1945	Science Fiction
X	6	War and Peace	Lion Tolstoy	1869	Novel
X	7	Anna Karenina	Lion Tolstoy	1877	Novel
X	8	The Brothers Karamazov	Lion Tolstoy	1880	Novel
X	9	The Idiot	Lion Tolstoy	1868	Novel
X	10	The House on the Rock	John C. Maxwell	1990	Non-Fiction
X	11	The Seven Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	12	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	13	The Art of War	Sun Tzu	500 BC	Non-Fiction
X	14	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	15	The Alchemist	Paulo Coelho	1988	Novel
X	16	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	17	The 5 Love Languages	Brian L. Roberts	1995	Non-Fiction
X	18	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	19	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	20	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	21	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	22	The Alchemist	Paulo Coelho	1988	Novel
X	23	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	24	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	25	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	26	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	27	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	28	The Alchemist	Paulo Coelho	1988	Novel
X	29	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	30	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	31	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	32	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	33	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	34	The Alchemist	Paulo Coelho	1988	Novel
X	35	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	36	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	37	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	38	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	39	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	40	The Alchemist	Paulo Coelho	1988	Novel
X	41	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	42	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	43	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	44	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	45	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	46	The Alchemist	Paulo Coelho	1988	Novel
X	47	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	48	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	49	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	50	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	51	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	52	The Alchemist	Paulo Coelho	1988	Novel
X	53	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	54	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	55	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	56	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	57	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	58	The Alchemist	Paulo Coelho	1988	Novel
X	59	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	60	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	61	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	62	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	63	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	64	The Alchemist	Paulo Coelho	1988	Novel
X	65	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	66	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	67	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	68	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	69	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	70	The Alchemist	Paulo Coelho	1988	Novel
X	71	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	72	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	73	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	74	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	75	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	76	The Alchemist	Paulo Coelho	1988	Novel
X	77	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	78	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	79	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	80	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	81	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	82	The Alchemist	Paulo Coelho	1988	Novel
X	83	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	84	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	85	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	86	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	87	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	88	The Alchemist	Paulo Coelho	1988	Novel
X	89	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	90	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	91	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	92	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	93	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	94	The Alchemist	Paulo Coelho	1988	Novel
X	95	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	96	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	97	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	98	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	99	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	100	The Alchemist	Paulo Coelho	1988	Novel
X	101	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	102	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	103	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
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X	195	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	196	The Alchemist	Paulo Coelho	1988	Novel
X	197	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X					

Fig 29



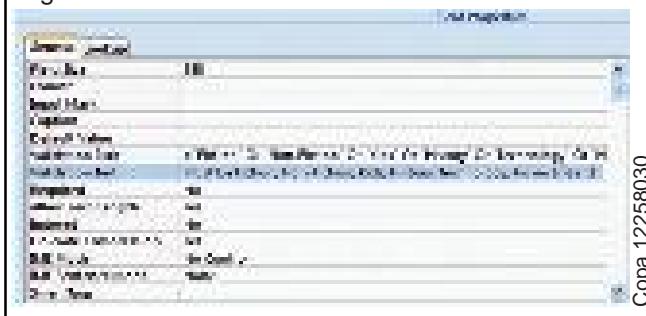
Validation rules work most easily with numerical fields. Rules for text fields require you to enclose each acceptable value inside its own quotation marks, separating them with Or, as seen above.

Validation text

Validation text is a specialized error message you can set to have Access tell the user entering data the specific way you want that person to enter it.

To set the validation text, enter the error message exactly as you want it to appear to users in the row directly beneath the Validation Rule row in the Field Properties section of Design view. For the validation rule we set for Category, you'd set the validation text like this:

Fig 30



The image below shows the resulting error message users would see when the Category validation rule has been broken.

Fig 31



Using field properties to ensure data integrity

Another way to ensure data integrity is by setting field properties such as Field Size, Format, and Required.

- Field Size can be set to hold a specific number of characters, up to as many as 255 for text fields. If you were using a text field to hold the two-letter state postal abbreviation, the field size could be set to 2 to ensure no one enters a full state name into this field.
- The Format field property can be set to display text or numbers in a standardized way. For example, text can be set to show as all uppercase, and numbers can be set to show scientific numbers, percentages, or decimals.
- Set the Required property to Yes if you want users entering data to be required to enter something in the field. Choose No if users are allowed to leave the field blank.

These are just some ways Access helps you ensure data being entered into your database is valid.

Forms, quires, and reports in access

Objectives : At the end of this lesson you shall be able to

- explain database relationship and forms
- explain quires and reports in as access

In a relational database (Access), the data in one table is related to the data in other tables. In general, tables can be related in one of three different ways: one-to-one, one-to-many or many-to-many. The relationship is used to cross reference information between tables.

One to One

In a one-to-one relationship each record in one table has at most one related record in another table.

In a one-to-one relationship, each record in Table A can have only one matching record in Table B, and each record in Table B can have only one matching record in Table A. This type of relationship is not common, because most information related in this way would be in one table. You might use a one-to-one relationship to divide a table with many fields, to isolate part of a table for security reasons, or to store information that applies only to a subset of the main table.

One to Many

A one-to-many relationship, often referred to as a "master-detail" or "parent-child" relationship.

A one-to-many relationship is the most common type of relationship. In a one-to-many relationship, a record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A.

Many to Many

In a many-to-many relationship, a record in Table A can have many matching records in Table B, and a record in Table B can have many matching records in Table A. This type of relationship is only possible by defining a third table (called a junction table) whose primary key consists of two fields the foreign keys from both Tables A and B. A many-to-many relationship is really two one-to-many relationships with a third table.

A many-to-many relationship means that for each record in one table there can be many records in another table and for each record in the second table there can be many in the first.

Many-to-many relationships can not be directly represented in relational database programs and have to be built by using two or more one-to-many relationships.

Defining relationships

You define a relationship by adding the tables that you want to relate to the Relationships window, and then dragging the key field from one table and dropping it on the key field in the other table.

- The kind of relationship that Microsoft Access creates depends on how the related fields are defined:
- A one-to-many relationship is created if only one of the related fields is a primary key or has a unique index.
- A one-to-one relationship is created if both of the related fields are primary keys or have unique indexes.
- A many-to-many relationship is really two one-to-many relationships with a third table whose primary key consists of two fields the foreign keys from the two other tables.

move a table that appears in the relationship map:

- Place your mouse over the table you want to move.
- Hold down the left mouse button, then drag the table to a new location.
- Release the mouse button to drop the table in its new place.

Understanding the relationship map

The relationship map lists all of the tables that were selected to relate, as well as all of the fields that were previously set up for that table. Notice that the first field has a key icon next to it. This is the primary key for the table.



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Primary and foreign keys

A primary key is the first field in each table of the database. You may recall that this field auto-numbers by default, so every record in the table has its own unique number to identify it. Access uses this number to quickly pull information together when you run queries or reports, which are covered later.

In the example above, the primary key for the Customers table is Customer ID, the primary key for the Orders table is Order ID, and the primary key for the Books table is Book ID.

A foreign key is a field that is the primary field in its own table but that shows up in another table. If you look closely at the Orders table, the fields Customer ID and Book ID appear there, as well as in their own respective tables. These fields are the primary key in their own tables, but in the Orders table, they are considered foreign keys.



Forms

A form is a database object that you can use to enter, edit, or display data from a table or a query. You can use forms to control access to data, such as which fields of data are displayed. For example, certain users may not need to see all of the fields in a table. Providing those users with a form that contains just the necessary fields makes it easier for them to use the database.

create a form with a single click,

1. Open the table or query upon which you want to base the form.
2. To create a form on which all fields from the underlying table or query are placed, displaying one record at a time, on the Create tab, click Form.



Forms in Access are like display cases in stores that make it easier to view or get the items that you want. Since forms are objects through which you or other users can add, edit, or display the data stored in your Access desktop database, the design of your form is an important aspect. There's a lot you can do design-wise with forms in Microsoft Access. You can create two basic types of forms -

- Bound forms
- Unbound forms

Bound Forms

- Let us now understand what Bound Forms are ?
- Bound forms are connected to some underlying data source such as a table, query, or SQL statement.
- Bound forms are what people typically think of when they think of the purpose of a form.
- Forms are to be filled out or used to enter or edit data in a database.
- Examples of bound forms will typically be what users use to enter, view or edit data in a database.

Unbound Forms

Let us look into Unbound Forms:

- These forms are not connected to an underlying record or data source.
- Unbound forms could be dialog boxes, switch boards, or navigation forms.
- In other words, unbound forms are typically used to navigate or interact with the database at large, as opposed to the data itself.

Types of Bound Forms

There are many types of bound forms you can create in Access. Let us understand the types ?

Single Item Form

This is the most popular one and this is where the records are displayed - one record at a time.

Multiple Item Form

This displays multiple records at a time from that bound data source.

Split Form

The form is divided into halves, either vertically or horizontally. One half displays a single item or record, and the other half displays a list or provides a datasheet view of multiple records from the underlying data source.

Form Controls

Every object on a form or report is a control and has its own set of properties (displayed in the Property list) that determine the characteristics of the data it contains. Some controls are linked to fields in the underlying table or query and some are merely text or graphical objects not related to any data source. Two of the most commonly used controls in a form or report are text boxes and labels.

- 1) Label: displays unchanging or informational text often times as headings or titles. Labels do not come from a source in the database such as a field or expression. This is called an unbound control because it is not bound to any data source.
- 2) Text Box: displays data as text and is a bound control. A bound control displays information that is stored in a field from the data. Text boxes are used to display, enter, and update values from fields in your database.

Form Sections

Forms consist of header, footer, and detail sections. In forms, there are two types of headers/footers. Form headers and footers are visible on every page of the form. Page headers/footers only appear on a printed copy of a form. There are never visible in Form View. Information about individual records appears in the detail sections.

Sizing Sections

Adjust the size of the area for any of the sections (headers, footers, detail), by dragging the horizontal border for that section with your mouse. To adjust line spacing in the detail section, drag the Detail border. There is no other line spacing control.

Working with Queries

Queries are questions you ask of your database. They allow you to select certain fields out of a table, or pull together data from various related tables and display it together. Queries can be used to perform calculations, and to edit the data in your tables. Queries can also form the basis of forms and reports.

Query Results

- If a query contains fields from two or more related tables, the results will only include records that have related records in all the tables. (In other words, in the query shown above, customers without records in the Orders table will not appear in the query results.) To display such records, use an outer join (see page 6) in your query.
- WARNING!** Any change you make in a query (adding, deleting or editing data) WILL BE CHANGED IN THE TABLES TOO!!!

Sort query results

In Design View, click the Sort row in the column you wish to sort by. A dropdown arrow appears; choose Ascending or Descending. If you sort by more than one column, the sorts will be done left-to-right.

Create a concatenated field in a query

Concatenated fields combine information from two or more fields into one. Ex: Combine first and last names into one field, called "FullName". In Design View, click in a blank column and type the following:

FullName:[FirstName]&" "&[LastName]

(Type a space between the two sets of quotation marks, and use square brackets around the field names.)

Create a calculated field in a query

In Design View, click in a blank column and type a mathematical expression, typing field names in square brackets. Any of the normal mathematical operators (+ - * / ^) can be used. If desired, give the expression a name as in the sample below. The following expression calculates a total cost by multiplying quantity times price:

Item Total:[Quantity]*[Price]

Use the Expression Builder to create calculated or concatenated fields

Fig 35



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You can simplify the process of creating concatenated fields and other expressions with the Expression Builder. Create a blank column in your query grid and then click the Builder button in the Query Setup group on the Query Design Ribbon. The Expression Builder opens.

Type the expression in the large box at the top. One advantage is that you have way more room to type and see your expression than you have at the top of a query grid column!

A second advantage is that you can add fields to the expression by double clicking them in the Expression Categories column rather than by typing them. This removes the possibility of typos.

Fig 36



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Specify criteria in a query (Filtering)

In Query Design View, click in the criteria row for the field you want to filter, and type the criteria (ex: type "OH" in the criteria row of the State field). When you run the query, only records matching the criteria.

Fig 37



Using Multiple Criteria

You can type criteria in more than one field.

- Criteria typed on the same line must all be met for a record to be displayed ("AND" logic). Ex: "OH" in the state field and "Smith" in the LastName field pulls up only Ohio-dwelling Smiths.
- If criteria are typed on different lines, records matching any of them will be retrieved ("OR" logic). Ex: "WA" and "OH" on different lines in the State field retrieves records for both states.

Criteria Ranges

Criteria ranges broaden and customize a search. Type a criteria range instead of a single value in the Criteria row of the query grid.

Criteria	Example	Description and Result
<	<14	Finds records where the field is less than a certain value. Records will have values under 14.
<=	<= #2/2/2006#	Finds records where the field is less than or equal to a certain value. Records will have dates on or before February 2, 2006 Note: dates are enclosed between # signs.
>	>100	Similar to above: Finds records where the value is
>=	>=100	greater than 100. The second expression displays records where the value is greater than or equal to 100.
=	="Diana"	Finds records where the value in the field is Diana. Note: text is enclosed in double quotes.

Expressions like these may be combined - for example, a criteria of <49 Or>=100 would return records with values below 49, or 100 or above, but not ones with values between 49 and 99.99.

Between __ And __	Between 1 and 4	Finds records where the field is between the endpoints.
Is Null	Is Null	Finds records where the field is empty.
Is Not Null	Is Not Null	Finds records where the field is not empty.
Like	Like U* Like "[U-X]**" Like **Korea**" Like "*ina" Like "Chi??" Like "*4.99"	Finds records where the criteria match parts of the field. The * wildcard stands for any number of characters, and the ? wildcard stands for a single character. The sample criteria will return records where the field 1) starts with U; 2) starts with U, V, W or X, 3) contains the letters 'Korea'; 4) ends in the letters 'ina' as in ballerina; 5) has five letters and begins with the letters 'Chi' as in Chile or China; 6) is a number and ends in the digits '4.99' as in 24.99.

Create a parameter query

Parameters make queries flexible by letting users choose their own criteria each time they run the query. In the criteria box, type a phrase in square brackets; Access will use this phrase to prompt the user for a value. Ex: In a State field, type [Enter a state]. If the user types CA, only California records will be retrieved.

Specify a range in a parameter query

In the criteria box, type the following:

Between [__] And [__]

Inside the brackets, type text telling the user what kind of information to enter.

Inner Joins vs. Outer Joins

Excel normally uses inner joins in its queries. These queries return only those rows from both tables in the join that match on the joining field (e.g., customers in the Customers table with corresponding orders in the Orders table.)

If you need to display all customers, with or without orders, as well as any available order information, you need to use an outer join.

In the query tray, double click the join line between two related tables. The Join Properties dialog box will appear:

Fig 38



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Select button 2 or 3 depending on which field's records you want to display completely.

Action Queries

Action queries modify groups of records in one fell swoop. Types of action queries include:

- Update Queries (modify all records in a table that meet specific criteria - ex: change the tax rate for all Ohio customers from 5.75% to 6%)
- Delete Queries (remove records from a table - ex: delete all customers whose last order date is more than 2 years ago)
- Append Queries (add records to an existing table - ex: at the end of the year, add the year's orders to the end of an archive table)

- Make-table Queries (create a new table - ex: extract a subset of records into a new table, for a subordinate who needs Ohio customers only)

Other Specialized Queries

Instructions for creating and running these special query types can be found in the Access help manual by clicking the Help button in the upper right corner of the screen (Internet connection required).

Find Duplicates query: Lets you locate duplicate records in a table by displaying a field containing duplicate values alongside other fields for comparison, to help you tell if the record is really a duplicate.

Find Unmatched query: Lets you compare two tables and identify records in one of the tables that have no corresponding records in the other table.

Crosstab query: This is a special type of Totals query that presents summary information in a compact format that is similar to a spreadsheet.

Union query: Lets you review all of the data that is returned by several similar select queries together, as a combined set.

Concepts of network and internet

Objectives : At the end of this lesson you shall be able to

- define computer network and its advantages and disadvantages
- name and explain the types of network and their characteristics
- explain the types of topologies
- state about the cables used for network system
- name and state about the various connectors used in network system
- explain about the hub, modem and internet
- describe about the internet protocols connection sharing (ICS) using windows.

Define computer network

A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes.

Advantages of Computer Networks

The following are some of the advantages of computer networks.

- **File Sharing:** Networks offer a quick and easy way to share files directly. Instead of using a disk or USB key to carry files from one computer or office to another, you can share files directly using a network.
- **Security:** Specific directories can be password protected to limit access to authorized users. Also, files and programs on a network can be designated as "copy inhibit" so you don't have to worry about the illegal copying of programs.
- **Resource Sharing:** All computers in the network can share resources such as printers, fax machines, modems, and scanners.
- **Communication:** Even outside of the internet, those on the network can communicate with each other via electronic mail over the network system. When connected to the internet, network users can communicate with people around the world via the network.
- **Flexible Access:** Networks allow their users to access files from computers throughout the network. This means that a user can begin work on a project on one computer and finish up on another. Multiple users can also collaborate on the same project through the network.

- **Workgroup Computing:** Workgroup software like Microsoft BackOffice enables many users to contribute to a document concurrently. This allows for interactive teamwork.
- **Error reduction and improve consistency:** One can reduce errors and improve consistency by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.

Network Application Areas

There is a long list of application areas, which can be benefited by establishing Computer Networks. Few of the potential applications of Computer Networks are:

- 1 Information retrieval systems which search for books, technical reports, papers and articles on particular topics
- 2 News access machines, which can search past news, stories or abstracts with given search criteria.
- 3 Airline reservation, hotel booking, railway-reservation, car-rental, etc.
- 4 A writer's aid: a dictionary, thesaurus, phrase generator, indexed dictionary of quotations, and encyclopaedias.
- 5 Stock market information systems which allow searches for stocks that meet certain criteria, performance comparisons, moving averages, and various forecasting techniques.
- 6 Electronic Fund Transfer (EFT) between banks and via cheque clearing house.
- 7 Games of the types that grow or change with various enthusiasts adding to the complexity or diversity.
- 8 Electronic Mail Messages Systems (EMMS).

- 9 Corporate information systems such as marketing information system, customer information system, product information system, personnel information system, etc.
- 10 Corporate systems of different systems such as Order-Entry System, Centralized Purchasing, Distributed Inventory Control, etc.
- 11 On-line systems for Investment Advice and Management, Tax Minimization, etc.
- 12 Resources of interest to a home user.
- 13 Sports results.
- 14 Theatre, movies, and community events information.
- 15 Shopping information, prices, and advertisements.
- 16 Restaurants; good food guide.
- 17 Household magazine, recipes, book reviews, film reviews.
- 18 Holidays, hotels, travel booking.
- 19 Radio and TV programmes.
- 20 Medical assistance service.
- 21 Insurance information.
- 22 Computer Assisted Instruction (CAI).
- 23 School homework, quizzes, tests.
- 24 Message sending service.
- 25 Directories.
- 26 Consumer reports.
- 27 Employment directories and Job opportunities.
- 28 Tax information and Tax assistance.
- 29 Journey planning assistance viz. Train, bus, plane etc.
- 30 Catalogue of Open University and Virtual University courses.

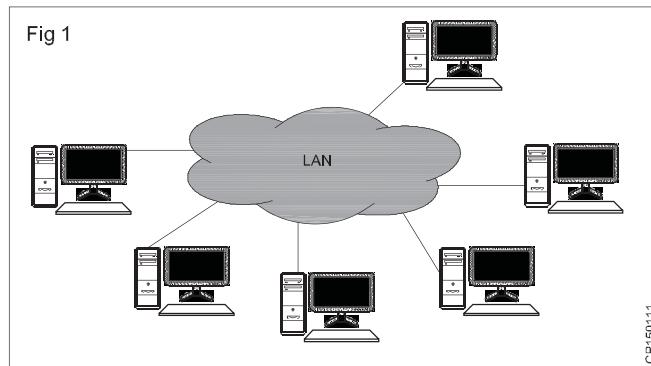
A classification of computer networks can be done to distance as in the table.

Interprocess (or) Distance	Network Type
0 to 1 Km	Local Area Network (LAN)
1 Km to 10 Km	Metropolitan Area Network (MAN)
10 Km to 1000 Km	Wide Area Network (WAN)
Above 1000 Km	Internet

Local Area Network (LAN)

Networks used to interconnect computers in a single room, rooms within a building or buildings on one site are called Local Area Network (LAN). LAN transmits data with a speed of several megabits per second (106 bits per second). The transmission medium is normally coaxial cables.

LAN (Fig 1) links computers, i.e., software and hardware, in the same area for the purpose of sharing information. Usually LAN links computers within a limited geographical area because they must be connected by a cable, which is quite expensive. People working in LAN get more capabilities in data processing, work processing and other information exchange compared to stand-alone computers. Because of this information exchange most of the business and government organisations are using LAN.



Major Characteristics of LAN

- every computer has the potential to communicate with any other computers of the network
- high degree of interconnection between computers
- easy physical connection of computers in a network
- inexpensive medium of data transmission
- high data transmission rate

Types of Connection

Peer to Peer: Peer to peer is an approach to computer networking where all computers share equivalent responsibility for processing data. Peer-to-peer

networking (also known simply as peer networking) differs from client-server networking, where certain devices have responsibility for providing or "serving" data and other devices consume or otherwise act as "clients" of those servers.

Client server: The term client-server refers to a popular model for computer networking that utilizes client and server devices each designed for specific purposes. The client-server model can be used on the Internet as well as LAN.

Advantages of LAN

- The reliability of network is high because the failure of one computer in the network does not affect the functioning for other computers.
- Addition of new computer to network is easy.
- High rate of data transmission is possible.
- Peripheral devices like magnetic disk and printer can be shared by other computers.

Disadvantages of LAN

If the communication line fails, the entire network system breaks down.

Use of LAN

Followings are the major areas where LAN is normally used

- File transfers and Access
- Word and text processing
- Electronic message handling
- Remote database access
- Personal computing
- Digital voice transmission and storage

Metropolitan Area Network (MAN)

A Data network designed for a town or city. In terms of geographic breadth, MANs are larger than, but smaller than. MANs (Fig 2) are usually characterized by very high-speed connections using optical fiber or other digital media.

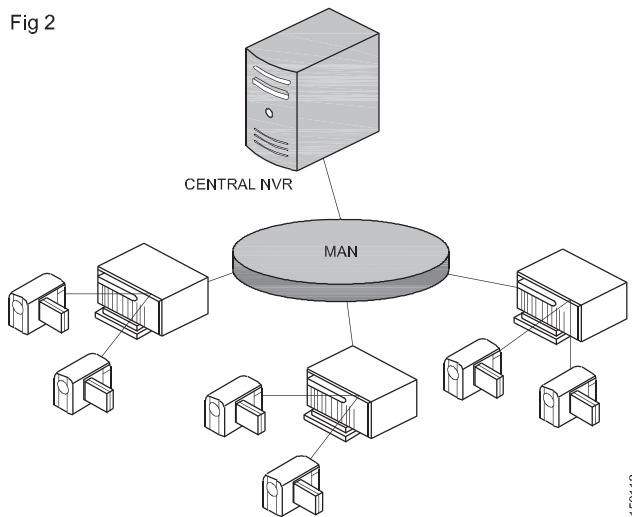
Characteristic of MAN

- 1 The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km range. Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings.
- 2 A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communications links and equipment are generally owned by either a consortium of users or by a network service provider

who sells the service to the users.

- 3 A MAN often acts as a high speed network to allow sharing of regional resources. It is also frequently used

Fig 2



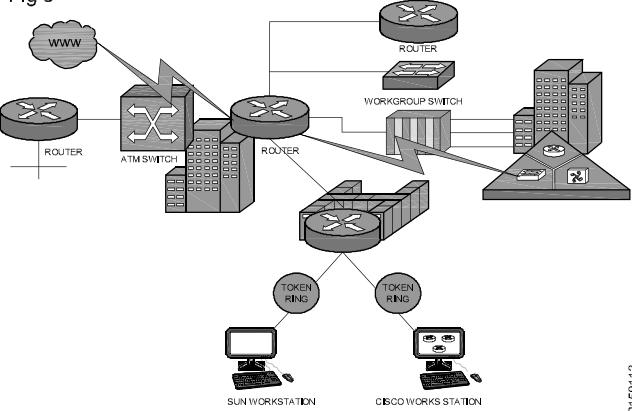
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to provide a shared connection to other networks using a link to a WAN.

Campus Area Network (CAN)

A Campus Area Network or Corporate Area Network (CAN) is a network made up of an interconnection of local area network within a limited geographical area. A

Fig 3



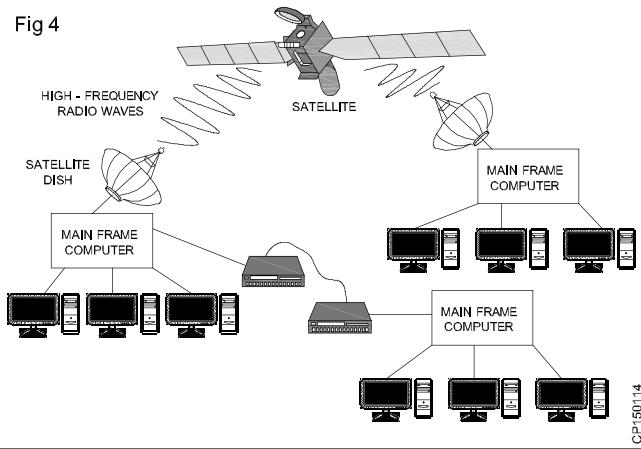
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CAN (Fig 3) is larger than a local area network but smaller than a Wide area Network

Wide Area Network (WAN)

The term Wide Area Network (Fig 4) is used to describe a computer network spanning a regional, national or global area. For example, for a large company the head quarters might be at Delhi and regional branches at Bombay, Madras, Bangalore and Calcutta. Here regional centres are connected to head quarters through WAN. The distance

Fig 4



between computers connected to WAN is larger. Therefore the transmission mediums used are normally telephone lines, microwaves and satellite links.

Characteristics of WAN

Followings are the major characteristics of WAN.

- Communication Facility:** For a big company spanning over different parts of the country the employees can save long distance phone calls and it overcomes the time lag in overseas communications. Computer conferencing is another use of WAN where users communicate with each other through their computer system.
- Remote Data Entry:** Remote data entry is possible in WAN. It means sitting at any location you can enter data, update data and query other information of any computer attached to the WAN but located in other cities.
- Centralised Information:** In modern computerised environment you will find that big organisations go for centralised data storage. This means if the organisation is spread over many cities, they keep their important business data in a single place. As the data are generated at different sites, WAN permits collection of this data from different sites and save at a single site.

Examples of WAN

- Ethernet:** Ethernet developed by Xerox Corporation is a famous example of WAN. This network uses coaxial cables for data transmission. Special integrated circuit chips called controllers are used to connect equipment to the cable.
- Arpanet:** The Arpanet is another example of WAN. It was developed at Advanced Research Projects Agency of U. S. Department. This Network connects more than 40 universities and institutions throughout USA and Europe.

Difference between LAN and WAN

- LAN is restricted to limited geographical area of few kilometers. But WAN covers great distance and op-

erate nationwide or even worldwide.

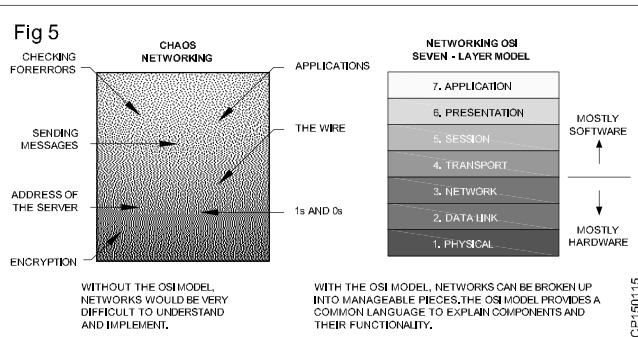
- In LAN, the computer terminals and peripheral devices are connected with wires and coaxial cables. In WAN there is no physical connection. Communication is done through telephone lines and satellite links.
- Cost of data transmission in LAN is less because the transmission medium is owned by a single organisation. In case of WAN the cost of data transmission is very high because the transmission medium used is hired either telephone lines or satellite links.
- The speed of data transmission is much higher in LAN than in WAN. The transmission speed in LAN varies from 0.1 to 100 megabits per second. In case of WAN the speed ranges from 1800 to 9600 bits per second (bps).
- Few data transmission errors occur in LAN compared to WAN. It is because in LAN the distance covered is negligible.

Open Systems Interconnection (OSI)

The Open Systems Interconnection (OSI) model is a reference tool for understanding data communications between any two networked systems. It divides the communications processes into seven layers. Each layer both performs specific functions to support the layers above it and offers services to the layers below it. The three lowest layers focus on passing traffic through the network to an end system. The top four layers come into play in the end system to complete the process.

An Overview of the OSI Model (Fig 5)

Application Layer (Layer 7): This layer interfaces directly to and performs common application services for the application processes. The common application services provide semantic conversion between associated application processes. Examples of common applica-



tion services include the virtual file, virtual terminal (for example, Telnet), and "Job transfer and Manipulation protocol" (JTM, standard ISO/IEC 8832)

Presentation Layer (Layer 6): The Presentation layer relieves the Application layer of concern regarding syntactical differences in data representation within the end-user systems. MIME encoding, encryption and similar manipulation of the presentation of data are done at this layer. An example of a presentation service would be

the conversion of an EBCDIC-coded text file to an ASCII-coded file.

Session Layer (Layer 5): The Session layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes check pointing, adjournment, termination, and restart procedures. This layer is responsible for setting up and tearing down TCP/IP sessions.

Transport Layer (Layer 4): The purpose of the Transport layer is to provide transparent transfer of data between end users, thus relieving the upper layers from any concern with providing reliable and cost-effective data transfer. The transport layer controls the reliability of a given link. Some protocols are stateful and connection oriented. This means that the transport layer can keep track of the packets and retransmit those that fail. The best known example of a layer 4 protocol is TCP.

Network Layer (Layer 3): The Network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service requested by the Transport layer. The Network layer performs network routing, flow control, segmentation/desegmentation, and error control functions. The router operates at this layer - sending data throughout the extended network and making the Internet possible, although there are layer 3 (or IP) switches. This is a logical addressing scheme - values are chosen by the network engineer. The addressing scheme is hierarchical.

Data Link Layer (Layer 2): The Data link layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical layer. The addressing scheme is physical which means that the addresses (MAC) are hard-coded into the network cards at the time of manufacture. The addressing scheme is flat.

Physical Layer (Layer 1): The physical layer defines all electrical and physical specifications for devices. This includes the layout of pins, voltages, and cable specifications. Hubs and repeaters are physical-layer devices. The major functions and services performed by the physical layer are:

- Establishment and termination of a connection to a communications medium.
- Participation in the process whereby the communication resources are effectively shared among multiple users. For example, contention resolution and flow control.
- Modulation or conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications

channel. These are signals operating over the physical cabling - copper and fiber optic, for example. SCSI operates at this level.

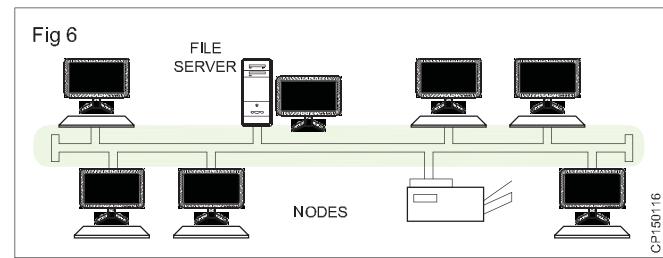
Network Topology

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations.

Main Types of Physical Topologies

- LINEAR BUS
- STAR
- RING
- TREE
- MESH

Linear Bus Topology



A linear bus topology (Fig 6) consists of a main run of cable with a terminator at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable.

Advantages of a Linear Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

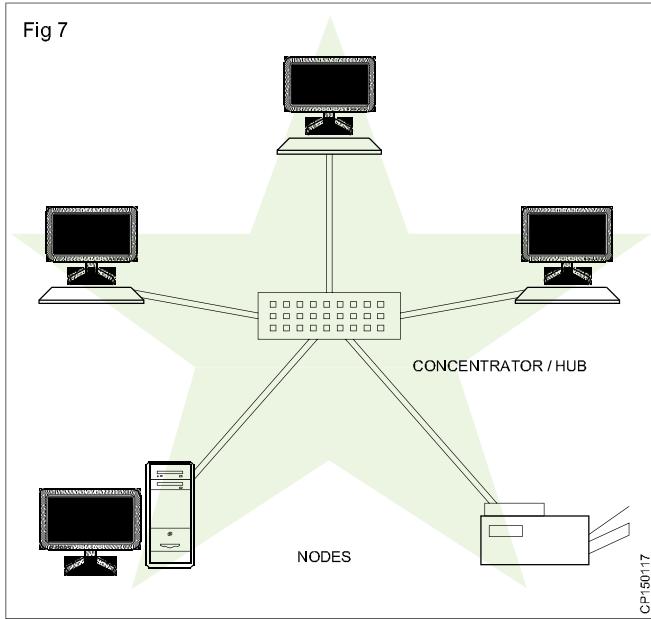
Disadvantages of a Linear Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star Topology

A star topology (Fig 7) is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub, switch, or concentrator

Fig 7



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Data on a star network passes through the hub, switch, or concentrator before continuing to its destination. The hub, switch, or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.

This configuration is common with twisted pair cable; however, it can also be used with coaxial cable or fiber optic cable.

Advantages of a Star Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

Disadvantages of a Star Topology

- Requires more cable length than a linear topology.
- If the hub, switch, or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the hubs, etc.

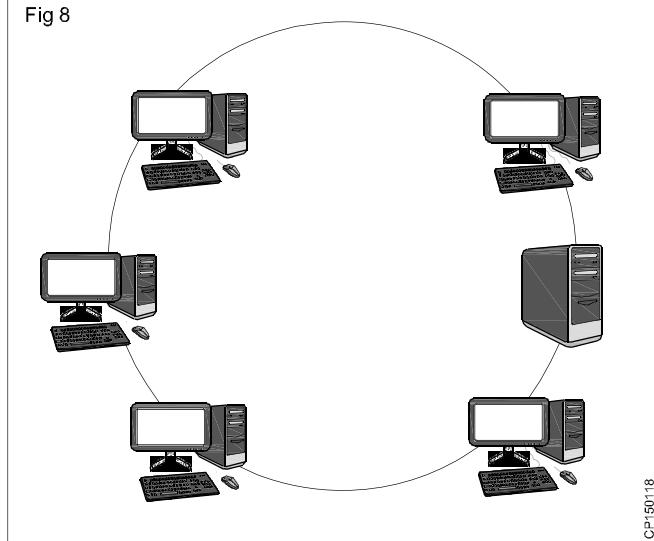
Ring Topology

The ring topology (Fig 8) is one which the network is a loop where data is passed from one workstation to another.

Advantages of Ring Topology

- This is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

Fig 8



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- There is no need for network server to control the connectivity between workstations.
- Additional components do not affect the performance of network.
- Each computer has equal access to resources.

Disadvantages of Ring Topology

- Each packet of data must pass through all the computers between source and destination.
- If one workstation or port goes down, the entire network gets affected.
- Network is highly dependent on the wire which connects different components.
- MAU's and network cards are expensive as compared to Ethernet cards and hubs.

Tree or Expanded Star

A tree topology (Fig 9) combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable. Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.

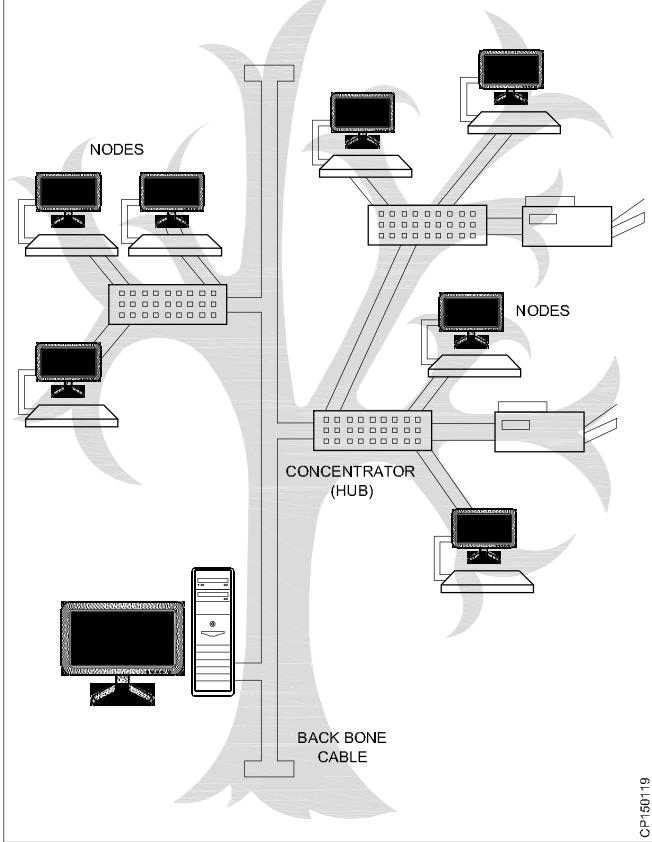
Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.

Disadvantages of a Tree Topology

- Overall length of each segment is limited by the type

Fig 9



of cabling used.

- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

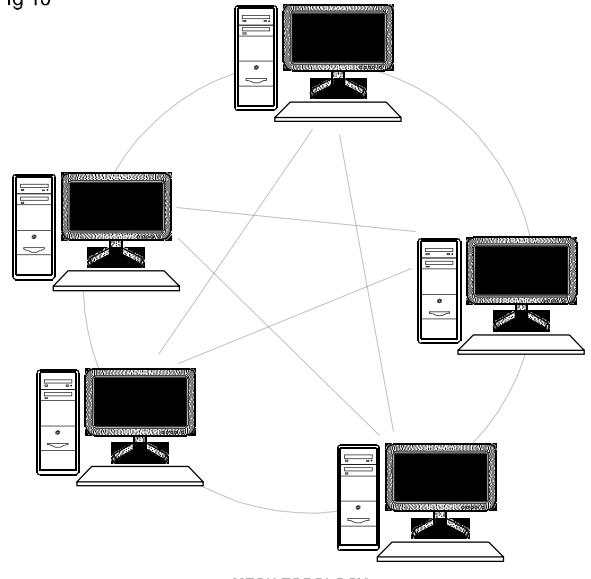
Mesh Topology

A network setup where each of the computers and network devices are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this topology is commonly used for wireless networks (Fig 10).

Advantages of Mesh topology

- Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected.
- Expansion and modification in topology can be done without disrupting other nodes.

Fig 10



Disadvantages of Mesh topology

- There are high chances of redundancy in many of the network connections.
- Overall cost of this network is way too high as compared to other network topologies.
- Set-up and maintenance of this topology is very difficult. Even administration of the network is tough.

PROTOCOLS

Network Protocol

A **network protocol** defines rules and conventions for communication between network devices. Protocols for computer networking all generally use packet switch techniques to send and receive messages in the form of packets. Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received. Some protocols also support message acknowledgement and data compression designed for reliable and/or high-performance network communication. Hundreds of different computer network protocols have been developed each designed for specific purposes and environments.

Parameters of Protocol

- 1 Physical cable or transmission media.
- 2 Number of bits transmitted on the media.
- 3 When to transmit the data on the network.
- 4 Volume of data to be transmitted.
- 5 Interact with a network with different cable type or topology.
- 6 Ensure that the message has been delivered intact

Network Topology Comparison

Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
Star Bus Each computer connects to a central connection device.	All information passes through the central network connection.	Each computer must be close to the central device. 100 meters maximum cable length. Up to 24 computers per network.	Add a new computer by plugging in a new cable from the computer to the connection device.	When one computer goes down, the rest of the network is unaffected. If the connection device goes down, then the network is down.	More expensive of the simple topologies, it requires costly connection device. Usually cheaper than a hybrid network.	Uses twisted pair cable. Requires large amounts of cable. No more than 100 meters from the computer to the connection device.
Bus Single cable connects everything.	One computer at a time sends information. Information goes along the cable and the computer accesses the information off the cable.	Connect the cable from one computer to the next and so on to the end. A terminator is placed at each end of the network.	To add a computer, you must shut down the network and disconnect the cable from the existing computers.	If one computer malfunctions, the entire network goes down.	A cheaper network since there is usually one continuous copper cable.	Single continuous cable connects the devices. Terminator is required at each end of the cable. Uses coaxial or twisted pair cabling.
Ring Single cable configured in a ring.	Information goes in one direction around the ring and passes along the ring until it reaches the correct computer.	Computers are located close to each other. Setup is easy. There is no connector. The ring has no beginning and no end.	Cable between the computers must be broken to add a new computer, so the network is down until the new device is back online.	If there's a break in the cable or an error in the network, information continues to transfer through the rest of the ring until reaching the point of the break. This makes troubleshooting easy.	One of the more expensive topologies due to high cable costs.	Requires more cabling than other topologies. Uses twisted pair.

Network Topology Comparison						
Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
H y b r i d Mesh Combines two or more different structures.	Often used across long distances. Information transfer can happen in different ways, depending on the other topologies.	Often created when expanding an existing network. Can use a variety of connection devices.	Connection devices make combining different networks and different topologies easy.	Troubleshooting is most difficult in this topology because of the variety of technologies.	Expensive, large, and usually complicated.	Cabling depends on the types of networks. Can use twisted pair and coaxial cable. Also incorporates fiber optic cabling over long distances.

and in a proper manner.

List of Network Protocols

1 TCP/IP: Transmission Control Protocol / Internet Protocol is an industry standard protocol widely used. It is used for inter operating among different types of computers. Almost all types of networks support TCP/IP. It is the protocol used by the Internet. It uses a 32 - bit addressing scheme.

IP Address

IP defines an addressing scheme that is independent of the underlying physical address (e.g. 48-bit MAC address). IP specifies a unique 32-bit number for each host on a network.

This number is known as the **Internet Protocol Address**, the **IP Address** or the **Internet Address**. These terms are interchangeable. Each packet sent across the internet contains the IP address of the source of the packet and the IP address of its destination.

2 UDP - User Datagram Protocol - is a simple OSI transport layer protocol for client/server network applications based on Internet Protocol (IP). UDP is the main alternative to TCP and one of the oldest network protocols in existence, introduced in 1980. UDP is often used in videoconferencing applications or computer games specially tuned for real-time performance.

3 FTP: File Transfer Protocol (**FTP**) is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet.

FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves using a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that hides (encrypts) the username and password, and encrypts the content, FTP is often secured with SSL/TLS ("FTPS"). **SSH File Transfer Protocol (SFTP)** is sometimes also used instead.

4 SMTP

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (**IP**) networks.

While electronic mail servers and other mail transfer agents use SMTP to send and receive mail messages, user-level client mail applications typically only use SMTP for sending messages to a mail server for relaying.

For receiving messages, client applications usually use either the **Post Office Protocol (POP)** or the **Internet Message Access Protocol (IMAP)** or a proprietary system (such as Microsoft Exchange or Lotus Notes/ Domino) to access their mail box accounts on a mail server.

5 Telnet

Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal

connection. User data is interspersed in-band with Telnet control information in an 8-bitbyte oriented data connection over the **Transmission Control Protocol (TCP)**.

Telnet provided access to a command-line interface (usually, of an operating system) on a remote host. Most network equipment and operating systems with a TCP/IP stack support a Telnet service for remote configuration (including systems based on Windows NT). Because of security issues with Telnet, its use for this purpose has waned in favour of SSH.

6 HTTP

The **Hypertext Transfer Protocol (HTTP)** is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

Hypertext is a multi-linear set of objects, building a network by using logical links (the so-called hyperlinks) between the nodes (e.g. text or words). HTTP is the protocol to exchange or transfer hypertext.

7 SSH File Transfer Protocol

In computing, the **SSH File Transfer Protocol** (also **Secure File Transfer Protocol**, **Secure FTP**, or **SFTP**) is a network protocol that provides file access, file transfer, and file management functionalities over any reliable data stream.

It was designed by the **Internet Engineering Task Force (IETF)** as an extension of the **Secure Shell Protocol (SSH)** version 2.0 to provide secure file transfer capability, but is also intended to be usable with other protocols.

The IETF of the Internet Draft states that even though this protocol is described in the context of the SSH-2 protocol, it could be used in a number of different applications, such as secure file transfer over **Transport Layer Security (TLS)** and transfer of management information in VPN applications.

This protocol assumes that it is run over a secure channel, such as SSH, that the server has already authenticated the client, and that the identity of the client user is available to the protocol.

8 Post Office Protocol

In computing, the **Post Office Protocol (POP)** is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection. POP and IMAP (Internet Message Access Protocol) are the two most prevalent Internet standard protocols for e-mail retrieval.

Virtually all modern e-mail clients and servers support both. The POP protocol has been developed through several versions, with version 3 (POP3) being the current standard. Most webmail service providers such as Hotmail, Gmail and Yahoo! Mail also provide IMAP and POP3 service.

Networking Components

- **Gateway:** A device sitting at a network node for interfacing with another network that uses different protocols. Works on OSI layers 4 to 7.
- **Router:** A specialized network device that determines the next network point to which it can forward a data packet towards the destination of the packet. Unlike a gateway, it cannot interface different protocols. Works on OSI layer 3.
- **Switch:** A device that allocates traffic from one network segment to certain lines (intended destination(s)) which connect the segment to another network segment. So unlike a hub a switch splits the network traffic and sends it to different destinations rather than to all systems on the network. Works on OSI layer 2.
- **Bridge:** A device that connects multiple network segments along the data link layer. Works on OSI layer 2.
- **Hub:** It connects multiple Ethernet segments together making them act as a single segment. When using a hub, every attached device shares the same broadcast domain and the same collision domain. Therefore, only one computer connected to the hub is able to transmit at a time.

Depending on the network topology, the hub provides a basic level 1 OSI model connection among the network objects (workstations, servers, etc.). It provides bandwidth which is shared among all the objects, compared to switches, which provide a connection between individual nodes.

- **Repeater:** A device to amplify or regenerate digital signals received while sending them from one part of a network into another. Works on OSI layer 1.
- **Modem (MoDem):** A device that modulates an analog "carrier" signal (such as sound), to encode digital information, and that also demodulates such a carrier signal to decode the transmitted information, as a computer communicating with another computer over the telephone network

Types of MODEM

External Modem: This is a modem separated from the system unit in the computer case. It is connected to the serial port of the computer by means of a cable. It is connected to the telephone wall jack by another cable.

Internal Modem: An internal modem is a circuit board (a modem card) that can be added to the system unit of the computer. It takes one of the expansion slots.

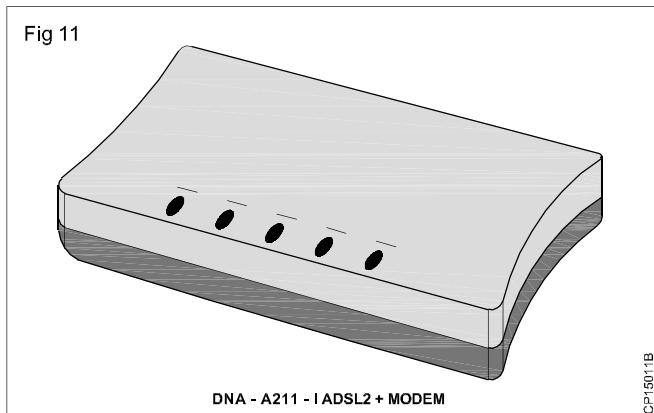
Wired Modem / Standard Modem

Most modem's used today are called standard modems. These modems are usually operated by commands entered from a microcomputer keyboard. Users control the functions (dialling, etc.) of a modem through the keyboard. Modems may use different command languages to control their functions,

Wireless Modems: Wireless modems transmit the data signals through the air instead of by using a cable. They sometimes are called a radiofrequency modem. This type of modem is designed to work with cellular technology, and wireless local area networks. Wireless modems are not yet perfected, but the technology is rapidly improving.

ADSL Modem

Asymmetric Digital Subscriber Line, ADSL (Fig 11) is a type of DSL broadband communications technology used for connecting to the Internet. ADSL allows more data to be sent over existing copper telephone lines POTS, when compared to traditional modem lines. A special filter, called a micro filter, is installed on a subscriber's telephone line to allow both ADSL and regular voice (telephone) services to be used at the same time. ADSL requires a special ADSL modem and subscribers must be in close geographical locations to the provider's central office to receive ADSL service. Typically this distance is within a radius of 2 to 2.5 miles. ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the up-stream rate).



Network Interface Card (NIC)

NIC (Fig. 12) provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card. Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or Wi-Fi wireless standards.



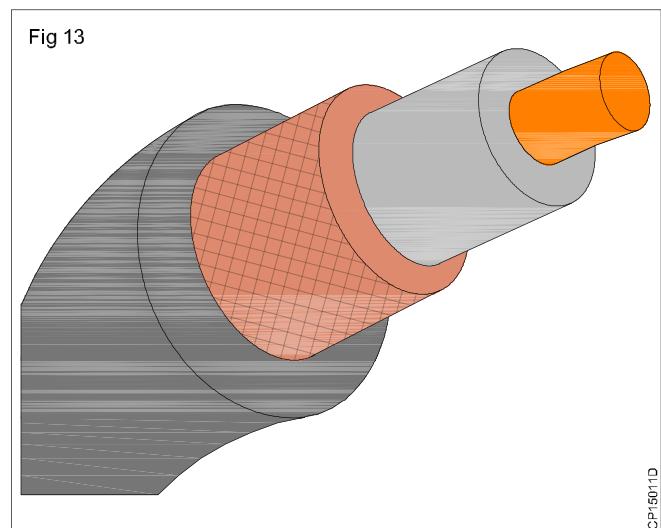
Ethernet NICs plug into the system bus of the PC and include jacks for network cables, while Wi-Fi NICs contain built-in transmitters / receivers (transceivers). In new computers, many NICs are now pre-installed by the manufacturer. All NICs feature a speed rating such as 11 Mbps, 54 Mbps or 100 Mbps that suggest the general performance of the unit.

Network Cables Standards

Cable is the medium through which information usually moves from one network device to another. There are several types of cable which are commonly used with LANs. In some cases, a network will utilize only one type of cable, other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol, and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

Cable standards

A wide range of cabling types are been used to run Ethernet systems. Therefore, different types of cabling standards are being used for the networks involved in connecting devices together using different types of cabling system.



Coaxial cable (Fig 13) is the kind of copper cable used by companies between the community antenna and user homes and businesses. Coaxial cable is sometimes used by telephone companies from their central office to the telephone poles near users. It is also widely installed for use in business and corporation and other types of.

Coaxial cable is called "coaxial" because it includes one physical that carries the signal surrounded (after a layer of insulation) by another concentric physical channel, both running along the same axis. The outer channel serves as a ground. Many of these cables or pairs of coaxial tubes can be placed in a single outer sheathing and, with repeaters, can carry information for a great distance.

10BASE-T Cable Standard: 10Base-T is one of the Ethernet standards for cabling in a network environment. 10BaseT uses a twisted pair cable with a maximum length

of 100 meters. Standard 10BaseT operates at 10 Mbps. It is commonly used in a star topology.

10BASE-FL Cable Standard: 10BaseFL is a fiber optic cable standard designed to run at 10 Mbps. It is similar to 10Base-T, though the media type is fiber. For use up to 2000 meters.

100BASE-TX Cable Standard: 100 Mbps Fast Ethernet over category 5 twisted pair cable. Maximum cable length of 100 meters.

100BASE-FX Cable Standard: 100 Mbps Fast Ethernet standard over fiber cable. Can transmit data up to 2000 meters.

1000BASE-T Cable Standard: Gigabit Ethernet over twisted pair copper wires. Transmit up to 1000 Mbps. 100 meter maximum cable length. Cat5 or better required (Cat6 cabling recommended).

1000BASE-CX Cable Standard: Gigabit Ethernet over a special copper twinax cable. Up to 25 meters in length. Typically used in a wiring closet or data center as a short jumper cable.

1000BASE-SX Cable Standard: Gigabit Ethernet using a short-wavelength laser device over multimode fiber optic cable. 50 μm core (max 300 meters) or 62.5 μm core (max 500 meters). 1000Mbps maximum transfer speed.

1000BASE-LX Cable Standard: Gigabit Ethernet using long-wavelength laser transmitters over fiber optic cable. Up to 3,000 meters. Uses single mode fiber and requires SC connectors for terminating the cable.

10 GBASE-SR Cable Standard: 802.3ae standard. 33 meters for 62.5 μm fiber optic cable, 300 meters for 50 μm cables. 10 Gbps (Gigabit per second) transfer rate.

10 GBASE-LR Standard: 10 Gbps transfer rate. 10 kilometres maximum distance. Fiber optic cable.

10 GBASE-ER Standard: 10 Gbps transfer rate. 40 kilometres maximum cable length. Fiber optic cable.

Media types

A cable is a device which contains a number of signal conductors usually in the form of separate wires. It is the medium through which information usually moves from one system to another through the network. There are several types of cable which are commonly used with the local area network. In some cases, a network utilizes only one type of cable, whereas other network uses a variety of cable types. The type of cable chosen for a network is related to network topology, protocol and size.

Twisted Pair

Twisted pair cable is the most common type of network medium used in LAN today. A transmission media consists of colour coded pairs of two shielded insulated copper wires which are arranged in a spiral pattern. The spiral pattern is an important aspect of twisted - pair cables in order to minimize cross talk of interference between

adjoining wires.

The advantage of using twisted pair cables are

- It is lighter, thinner and more flexible
- Easy to install
- It is inexpensive

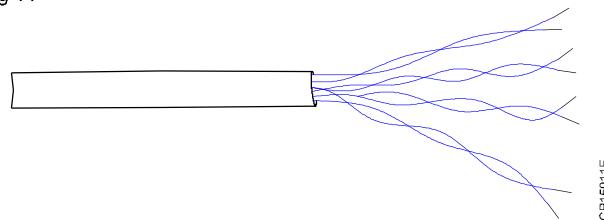
There are two varieties of twisted pair cabling, they are

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**

Unshielded twisted pair (UTP)

Unshielded twisted pair (Fig 14) cabling consists of two unshielded wires twisted around each other that contain no shielding. It is commonly used in the telephone wires and is common for computer networking because of high flexibility of the cables. It is a plastic connector that looks like a large telephone-style connector. The standard connector for unshielded twisted pair cabling is RJ-45 connector.

Fig 14



UTP has five categories of cable standards defined by the Electronic Industries Association and Telecommunications Industry Association (commonly known as EIA/TIA). The five categories of unshielded twisted pair are:

Categories of Unshielded Twisted Pair

In order to manage the network cabling, you need to be familiar with the standards that may be used on modern networks. The categories of the unshielded twisted pair cable are described below.

Category 1

- It is a form of UTP that contains two pairs of wire.
- CAT 1 is suitable for voice communications but not for data.
- It can carry up to 128 kilobits per second (Kbps) of data.
- It is usually used for telephone wire Data rate - 1 Mbps. This type of wire is not capable of supporting computer network traffic and is not twisted.

Category 2

- It contains four wire pairs and can carry up to 4 Mbps of data.
- CAT 2 is rarely found on modern networks.
- Category 2 or CAT 2 is capable of transmitting data up to 4 Mbps. This type of cable is seldom used.

Category 3

- CAT 3 made up of four twisted - pair wires, each twist is three times per foot. It is certified to transmit data up to 10 Mbps.
- CAT 3 has typically been used for 10 Mbps Ethernet or 4 Mbps Token Ring networks.
- The CAT 3 cabling is gradually replaced with CAT5 to accommodate higher throughput.

Category 4

- CAT 4 is made up of four twisted-pair wires, specialized to transmit data up to 16 Mbps and is rarely used in new installations.
- CAT 4 may be used for 16Mbps Token Ring or 10 Mbps Ethernet networks. It is guaranteed for signals as high as 20 MHz and Provides More protection against crosstalk and attenuation than CAT1, CAT2, orCAT 3.

Category 5

- CAT 5 is the most popular twisted pair Ethernet cabling designed for high signal integrity which is in common use today.
- CAT 5 contains four wire pairs and supports up to 100 Mbps throughout.
- It is the most popular form of UTP for new network installations and upgrades to Fast Ethernet.
- In addition to 100 Mbps Ethernet, CAT 5 wiring can support other fast networking technologies.
- It is popular because it is both affordable and high speed for today's local area networks Cat 5 cables are often used in structured cabling for computer networks such as fast Ethernet.

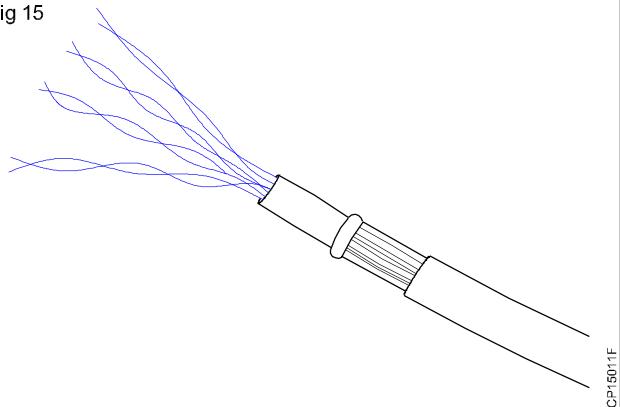
Category 6

- CAT 6 cable was originally designed to support gigabit Ethernet. It is similar to CAT 5 wire, but contains a physical separator between the four Twisted copper wires pairs to further reduce the electromagnetic interference.
- It is a twisted-pair cable that contains four wire pairs, each wrapped in foil insulation. Additional foil insulation covers the bundle of wire pairs, and a fire-resistant plastic sheet covers the second foil layer.
- The foil insulation provides excellent resistance to crosstalk and enables CAT 6 to support at least six times the throughput supported by regular CAT 5.
- When the CAT 6 is used as a patch cable, it is usually terminated in RJ-45 Electrical connectors.

Shield Twisted Pair (Fig 15)

A type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires.

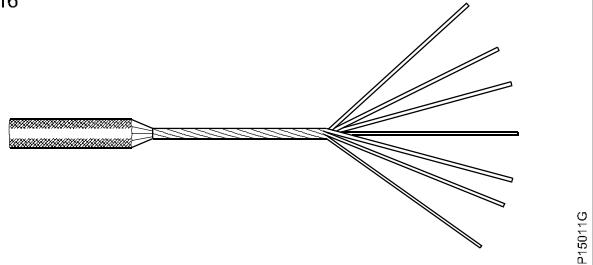
Fig 15



The extra covering in shielded twisted pair wiring protects the transmission line from leaking into or out of the cable. STP cabling often is used in networks, especially fast data rate Ethernets.

Fiber Optic Cable (Fig 16)

Fig 16



A technology that uses glass (or plastic) threads (fibers) to transmit. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages on to light waves.

Fibre optics has several advantages over traditional metal lines:

- Fibre optic cables have a much greater than metal cables. This means that they can carry more data.
- Fibre optic cables are less susceptible than metal cables to interference.
- Fibre optic cables are much thinner and lighter than metal wires.
- Data can be transmitted (the natural form for data) rather than analogically.

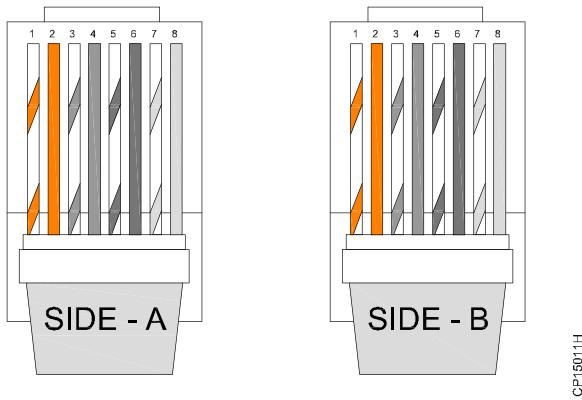
The main disadvantage of fibre optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

In addition, telephone companies are steadily replacing traditional telephone lines with fibre optic cables. In the future, almost all communications will employ fibre optics.

Straight Cable

A straight cable (Fig 17) is to connect different type of devices. This type of cable will be used most of the time and can be used to:

Fig 17



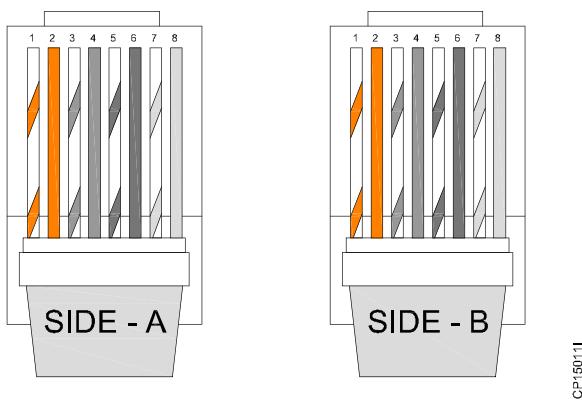
- 1 Connect a computer to a switch/hub's normal port.
- 2 Connect a computer to a cable/DSL modem's LAN port.
- 3 Connect a router's WAN port to a cable/DSL modem's LAN port.
- 4 Connect a router's LAN port to a switch/hub's uplink port. (Normally used for expanding network)
- 5 Connect 2 switches/hubs with one of the switch/hub using an uplink port and the other one using normal port.

If you need to check how straight cable looks like, it's easy. Both sides (side A and side B) of cable have wire arrangement with same colour.

Crossover Cable

A crossover cable (Fig 18), it's usually used to connect same type of devices. A crossover cable can be used to:

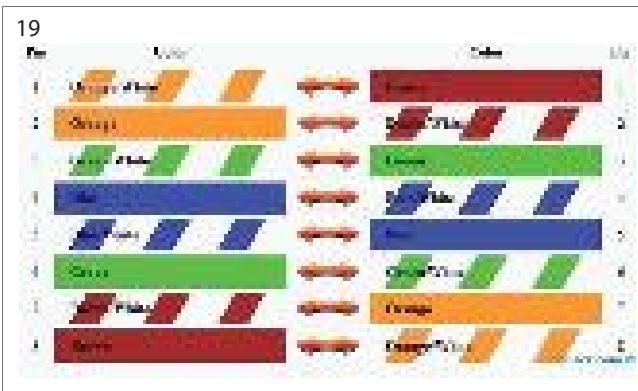
Fig 18



- 1 Connect 2 computers directly.
- 2 Connect a router's LAN port to a switch/hub's normal port. (Normally used for expanding network).
- 3 Connect 2 switches/hubs by using normal port in both switches/hubs.

If you need to check how crossover cable looks like, both side (side A and side B) of cable have wire arrangement with following different colour.

Rollover Cable (Fig 19)



Rollover cable (also known as **Cisco Console Cable** or a **Yost Cable**) is a type of cable that is often used to connect a computer terminal to a router's port. This cable is typically flat (and has a light blue colour) to help distinguish it from other types of network cabling. It gets the name rollover because the pin outs on one end are reversed from the other, as if the wire had been rolled over and you were viewing it from the other side.

Connectors

The media connectors are the physical devices that help to transfer the data between the systems.

RJ11: Registered Jack-11 (Fig 20) a four- or six-wire used primarily to connect telephone equipment. RJ-11 connectors are also used to connect some types of some types of Local area network.

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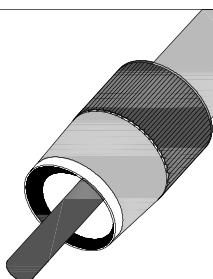
RJ45: RJ45 (Fig 21) connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable.

ST: ST stands for **Straight Tip** (Fig 22) - a quick release bayonet style developed by AT&T. STs were predominant in the late 80s and early 90s.

21



Fig 22



CP-5011M

ST Connectors are among the most commonly used fiber optic connectors in networking applications. They are cylindrical with twist lock coupling, 2.5mm keyed ferrule. ST connectors are used both short distance applications and long line systems.

SC: SC stands for **S**ubscriber **C**onnecto**r** (Fig 23) - a general purpose push/pull style Connector developed by NTT. SC has an advantage in keyed duplexility to support send/receive channels.

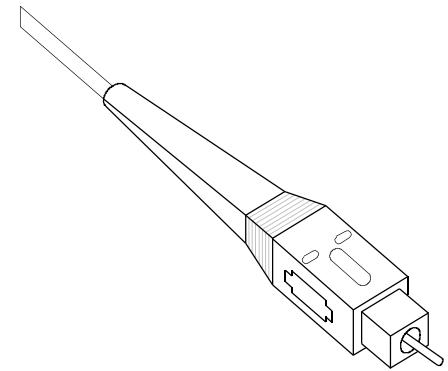
SC Connectors are frequently used for newer Network applications. The SC is a snap-in connector that is widely used in single mode systems for its performance. The SC connector is also available in a Duplex configuration. They offer low cost, simplicity, and durability. SC connectors provide for accurate alignment via their ceramic ferrules.

The square, snap-in connector latches with a simple push-pull motion and is keyed. They feature a 2.5mm Ferrule and molded housing for protection. Typical matched SC connectors are rated for 1000 mating cycles and have an Insertion Loss of 0.25 dB.

LC: LC stands for **L**ucent **C**onnecto**r** (Fig 24). The LC is a small form factor fiber optic connector.

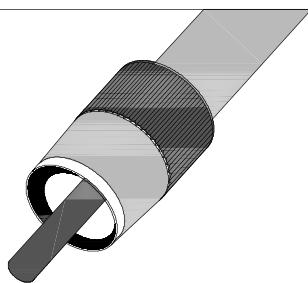
The LC Connector uses a 1.25 mm ferrule, half the size of the ST. Otherwise, it is a standard ceramic Ferrule connector. The LC has good performance and is highly favoured for single mode.

Fig 23



CP-5011N

Fig 22



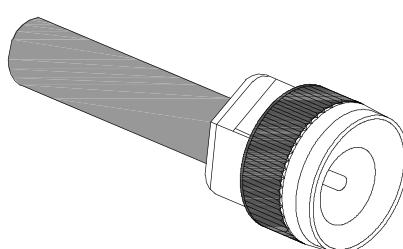
CP-5011M

USB: The USB 2.0 Standard-A type of USB plug is a flattened rectangle which inserts into a "downstream-port" receptacle on the USB host, or a hub, and carries both power and data. This plug is frequently seen on cables that are permanently attached to a device, such as one connecting a keyboard or mouse to the computer via USB connection.

A Standard-B plug-which has a square shape with bevelled exterior corners-typically plugs into an "upstream receptacle" on a device that uses a removable cable, e.g. a printer. A Type B plug delivers power in addition to carrying data. On some devices, the Type B receptacle has no data connections, being used solely for accepting power from the upstream device. This two-connector-type scheme (A/B) prevents a user from accidentally creating an Electrical loop.

BNC: **B**ayonet **N**eill **C**oncelman (Fig 25) connector, (sometimes erroneously called a British Naval Connector or Bayonet Nut Connector, a type of connector used with coaxial cable such as the RG-58 A/U cable used with the 10Base2. The basic BNC connector is a male type mounted at each end of a cable.

Fig 25



CP-5011P

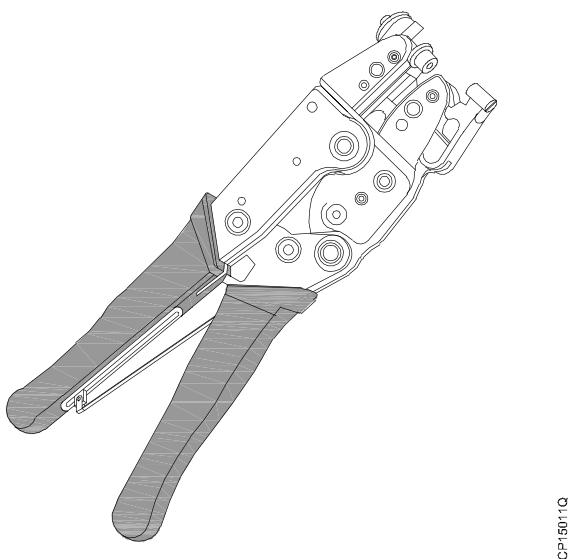
This connector has a center pin connected to the center cable conductor and a metal tube connected to the outer cable shield. A rotating ring outside the tube locks the cable to any female connector.

BNC T-connectors (used with the 10Base-2 system) are female devices for connecting two cables to a NIC. A BNC barrel connector allows connecting two cables together.

BNC connectors can also be used to connect some monitor, which increases the accuracy of the signals sent from the adapter.

Crimping Tool: A crimping tool (Fig 26) is a tool designed to crimp or connect a connector to the end of a cable. For example, network cables and phone cables are created using a crimping tool to connect the RJ45 and RJ11 connectors to the end of the cable. In the picture to the right, is an example of what a crimping tool looks like. This shows a tool capable of crimping both RJ-11 and RJ-45 connectors.

Fig 26



How to Crimp RJ45

1 Strip 1 to 2 inches (2.5 to 5.1 cm) of the outer skin at the end of the cable wire by making a shallow cut in the skin with a utility knife. Run the knife around the cable, and the jacket should slide off easily. There will be 4 pairs of twisted wires exposed, each of them a different color or colour combination.

Orange-white striped and solid orange

Green-white striped and solid green

Blue-white striped and solid blue

Brown-white striped and solid brown

2 Fold each pair of wires backwards to expose the core of the cable.

3 Cut off the core and discard.

4 Straighten the twisted wires using 2 pair of tweezers. Grasp a wire beneath a bend with 1 pair of tweezers, and use the other pair to gently straighten the bend. The straighter your wires, the easier your job will be

5 Arrange the untwisted wires in a row, placing them into the position, running from right to left, in which they will go into the RJ-45 connector:

- Orange with a white stripe
- Orange
- Green with a white stripe
- Blue
- Blue with a white strip
- Green
- Brown with a white stripe
- Brown

6 Trim the untwisted wires to a suitable length by holding the RJ-45 connector next to the wires. The insulation on the cable should be just inside the bottom of the RJ-45 connector. The wires should be trimmed so that they line up evenly with the top of the RJ-45 connector.

- Trim the wires in small increments, checking frequently to ensure a correct fit. It's better to cut the untwisted wires a few times than have to go back and start all over again because you trimmed off too much.

7 Insert the wires into the RJ-45 connector, making sure that they stay aligned and each color goes into its appropriate channel. Make sure that each wire goes all the way to the top of the RJ-45 connector. If you don't make these checks, you will find that your newly crimped RJ-45 connector is useless.

8 Use the crimping tool to crimp the RJ-45 connector to the cable by pressing the jacket and cable into the connector so that the wedge at the bottom of the connector is pressed into the jacket.

Re crimp the cable once more to ensure proper connection.

9 Follow the instructions above to crimp an RJ-45 connector to the opposite end of the cable

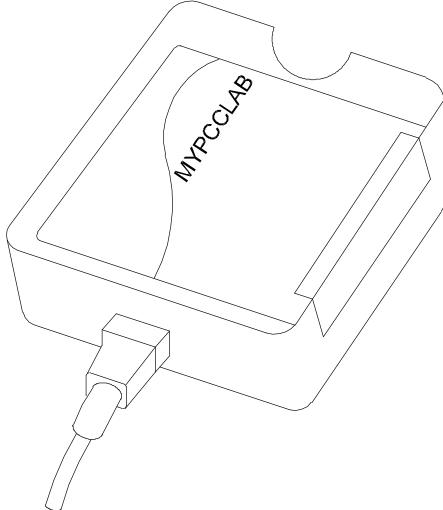
10 Use a cable tester to assure that your cable is working properly when both ends are crimped.

Cable Tester (Fig 27)

When connected to an Ethernet cable, a network cable tester tells if the cable is capable of carrying an Ethernet signal. If the cable carries the signal, this indicates that all the circuits are closed, meaning that electric current can move unimpeded through the wires, and that there are no short circuits, or unwanted connections, in the wire.

Network cable testers vary in complexity and price, but a basic tester consists of a source of electrical current, a measuring device that shows if the cable is good, and a connection between the two, usually the cable itself.

Fig 27



CP15011R

Computer networks use Ethernet cables to allow computers in the network to "talk" to each other. An Ethernet cable has eight wires that are arranged in four pairs. For current to flow correctly, the wire pairs must be connected in the proper order.

A network cable tester can identify if the wires are paired correctly. It can also show if there is a break in the insulation, a situation which allows crosstalk between two wires that should not be connected. The tester can also tell whether the cable has the proper level of resistance.

A network cable tester can be a simple apparatus that merely identifies whether current flows through the cable, or it may be a professional-level, complex device that gives additional information that helps identify the problem.

Professional-level network cable testers may not only tell if an open circuit exists, but may identify where the break is located. Some also identify the gauge of wire used and can generate their own signal to test for interference.

How to Check with the Tester

- 1 Turn on your network cable tester.
- 2 Plug one end of the Ethernet cable you are trying to test into the "IN" Ethernet input on the network cable tester.
- 3 Plug the other end of your Ethernet cable you are trying to test into the "OUT" input on the network cable tester.
- 4 Press the "Test" button. The network cable tester will send a signal across the Ethernet cable. If the signal gets from one end of the cable to the other, a green light will appear on the device, letting you know that the test was successful. If the signal does not get from one end of the cable to the other, a red light will appear on the device, letting you know that the test was not successful and that the cable is bad.

Switch

A **Network Switch** (Fig 28) is a small hardware device that joins multiple computers together within one Local Area Network. Technically, network switches operate at layer two (Data Link Layer) of the OSI.

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Network switches appear nearly identical to hub, but a switch generally contains more intelligence (and a slightly higher price tag) than a hub. Unlike hubs, network switches are capable of inspecting data packet as they are received, determining the source and destination device of each packet, and forwarding them appropriately.

By delivering messages only to the connected device intended, a network switch conserves bandwidth and offers generally better performance than a hub.

Availability of Switches

- 1 8 Port Switches
- 2 16 port switches
- 3 24 port switches
- 4 32 port switches

Hub: A Hub (Fig 29) is a small, simple, inexpensive device that joins multiple computers together. Many network hubs available today support the Ethernet standard. Other types including USB hubs also exist, but Ethernet is the type traditionally used in home networking.

To network a group of computers using an Ethernet hub,

29

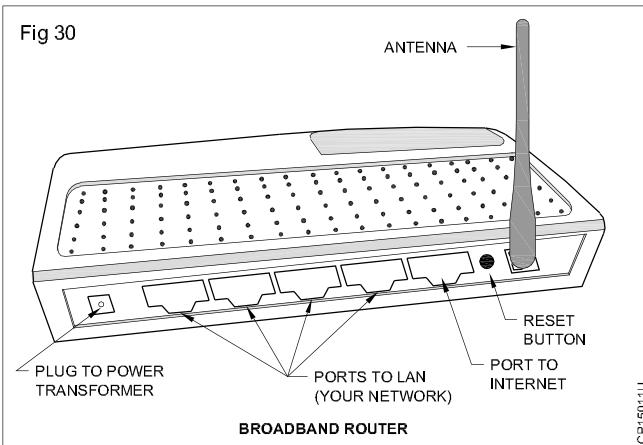


first connect an Ethernet cable into the unit, and then connect the other end of the cable to each computer's NIC. All Ethernet hubs accept the RJ45 connectors of standard Ethernet cables.

Ethernet hubs vary in the speed (network data rate or bandwidth they support. Some years ago, Ethernet hubs offered only 10 Kbps rated speeds. Newer types of hubs offer 100 Mbps Ethernet. Some support both 10 Mbps and 100 Mbps (so-called dual-speed or 10/100 hubs).

Routers

Routers (Fig 30) are physical devices that join multiple wired or wireless networks together. Technically, a wired or wireless router is a Layer 3 gateway, meaning that the wired/wireless router connects networks (as gateways do), and that the router operates at the network layer of the OSI model.



Home networkers often use an Internet Protocol (IP) wired or wireless router, IP being the most common OSI network layer protocol. An IP router such as a DSL or cable modem router joins the home's LAN to the WAN of the Internet.

Bridges

A bridge (Fig 31) device filters data traffic at a network boundary. Bridges reduce the amount of traffic on a LAN by dividing it into two segments.



Bridges operate at the data link layer (Layer 2) of the OSI model. Bridges inspect incoming traffic and decide whether to forward or discard it. An Ethernet bridge, for example, inspects each incoming Ethernet frame - including the source and destination MAC addresses, and sometimes the frame size - in making individual forwarding decisions.

ISP: Internet Service Provider, it refers to a company that provides Internet services, including personal and business access to the internet. For a monthly fee, the service provider usually provides a software package, Username, password and access phone number.

Equipped with a modem you can then log on to the Internet and browse the world wide web and USENET and send and receive email. For broadband access you typically receive the broadband modem hardware or pay a

monthly fee for this equipment that is added to your ISP account billing.

In addition to serving individuals, ISPs also serve large companies, providing a direct connection from the company's networks to the Internet. ISPs themselves are connected to one another through Network Access Point (NAPs). ISPs may also be called IAPs (Internet Access Provider).

State Owned ISP's

- **BSNL** - Servicing all of India except Mumbai and Delhi. Triple-play Broadband Services provided by ADSL and VDSL. Also providing internet services over GPRS, 3G, as well as WiMax
- **MTNL** - Servicing Mumbai and Delhi. Triple-play Broadband Services provided by ADSL under the "Tri-Band" brand. Also providing GPRS and 3G internet services.

Private Owned nationwide ISP's

- Airtel - ADSL, GPRS, 3G & 4G LTE
- Skynet Broadband - Internet Service Provider
- Aircel - GPRS & 3G
- Hathway - Broadband over Cable
- Idea - GPRS & 3G
- MTS India - CDMA/EV-DO
- O-Zone Networks Private Limited - Pan - India Public Wi-Fi hotspot provider
- Reliance Communications - ADSL, GPRS & 3G, Metro-Ethernet, CDMA/EV-DO, Wimax
- Reliance Industries - LTE (to be launched)
- Sify - Broadband over cable
- Tata DoCoMo - GPRS & 3G
- Tata Indicom - ADSL, CDMA/EV-DO, Metro-Ethernet, WiMax
- Vodafone - GPRS & 3G

NSP: Network Service Providers (**NSP**) is a business or organization that sells bandwidth or network access by providing direct Internet backbone access to the Internet and usually access to its **Network Access Point (NAPs)**.

Network service providers may consist of Telecommunications companies, data carriers, wireless communications providers, Internet service provider, and Cable television operators offering high-speed Internet access.

Dial up: Dial-up access is really just like a phone connection, except that the parties at the two ends are computer devices rather than people. Because dial-up access uses normal telephone lines, the quality of the connection is not always good and data rate are limited.

In the past, the maximum data rate with dial-up access was 56 Kbps (56,000 bits per second), but new technologies such as ISDN are providing faster rates.

Broadband: The term broadband refers to a telecommunications signal or device of greater Bandwidth (signal processing), in some sense, than another standard or usual signal or device (and the broader the band, the greater the capacity for traffic).

Wireless (Wi-Fi): Wireless broadband is high-speed Internet service via wireless technology. Wireless broadband is available in Internet cafés, local "hot spots" within many cities, private businesses and many homes.

The advantage of wireless broadband is that the computer receiving the Internet signal need not be tethered by an Ethernet or network cable to the broadband modem or router.

A wireless broadband modem receives the service and transmits it via radio waves to the immediate surrounding area. Any computer equipped with wireless capacity within receiving distance can pick up the signal, making the Internet 'portable.' The most common way to take advantage of wireless broadband is by using a laptop computer.

Mobile Broadband: The term mobile broadband refers to high-speed wireless Internet connections and services designed to be used from arbitrary locations.

Cellular networks normally provide broadband connections suitable for mobile access. The technologies in use today fall into two categories -3G (third generation cell networks) and 4G (fourth generation).

Introduction to TCP/IP

Objectives : At the end of this lesson you shall be able to

- explain TCP/IP, addresses and subnets.

Introduction to TCP/IP : TCP and IP were developed by Department of Defense (DOD) research project to connect a number different networks designed by different vendors into a network of networks (the “Internet”). It was initially unsuccessful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems. Several computers in a small department can use TCP/IP (along with other protocols) on a single LAN. The IP component provides routing from the department to the enterprise network, then to regional networks, and finally to the global internet. On the battlefield a communications network will sustain damage, so the DOD designed TCP/IP to be robust and automatically recover from any node or phone failure. This design allows the construction of very large networks with less central management. However, because of the automatic recovery, network problems can go undiagnosed and uncorrected for long periods of time.

As with all other communications protocol, TCP/IP is composed of layers:

IP is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organisations. The organisations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organisation to region and then around the world.

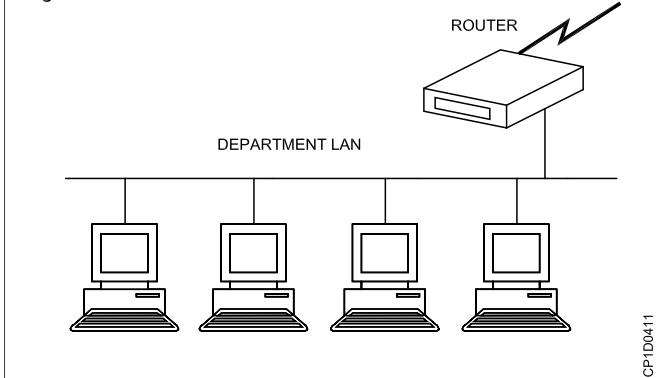
TCP is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

Sockets is a name given to the package of subroutines that provide access to TCP/IP on most systems.

The Internet Protocol was developed to create a Network of Networks (the “Internet”). Individual machines are first connected to a LAN (Ethernet or Token Ring). TCP/IP shares the LAN with other users (a Novell file server, Windows for Workgroups peer systems). One device provides the TCP/IP connection between the LAN and the rest of the world. (Refer Fig 1)

To insure that all types of systems from all vendors can communicate, TCP/IP is absolutely standardised on the LAN. However, larger networks based on long distances and phone lines are more volatile. In US, many large corporations would wish to reuse large internal networks based on IBM's SNA. In Europe, the national phone

Fig 1



companies traditionally standardize on X.25. However, the sudden explosion of high speed microprocessors, fiber optics and digital phone systems has created a burst of new options: ISDN, frame relay, FDDI, Asynchronous Transfer Mode (ATM). New technologies arise and become obsolete within a few years. With cable TV and phone companies competing to built the National Information Superhighway, no single standard can govern citywide, nationwide, or worldwide communications.

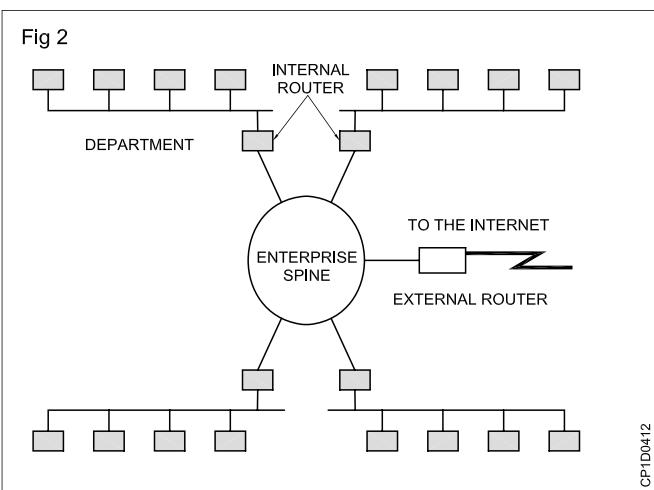
The original design of TCP/IP as a Network of Networks fits nicely within the current technological uncertainty. TCP/IP data can be sent across a LAN or it can be carried within an internal corporate SNA network or it can piggyback on the cable TV service. Furthermore, machines connected to any of these networks can communicate to any other network through gateways supplied by the network vendor.

Addresses : Each technology has its own convention for transmission messages between two machines within the same network. On a LAN, messages are sent between machines by supplying the six byte unique identifier (the “MAC” address). In an SNA network, every machine has Logical Units with their own network address. DECNET, Appletalk and Novell IPX all have a scheme for assigning numbers to each local network and to each workstation attached to the network.

On top of these local or vendor specific network addresses, TCP/IP assigns a unique number to every workstation in the world. This “IP number” is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. For example, a server IP is like 130.132.59.234

Subnets: Although the individual subscribers do not need to tabulate network numbers or provide explicit routing, it is convenient for most Class B networks to be internally manage as much smaller and simpler version

of the larger network organisations. It is common to subdivide the two bytes available for internal assignment into a one byte department number and a one byte workstation ID. (Refer Fig 2)



The enterprise network is built using commercially available TCP/IP router boxes. Each router has small tables with 255 entries to translate the one byte department number into selection of a destination Ethernet connected to one of the routers.

TCP treats the data as a stream of bytes. It logically assigns a sequence number to each byte. The TCP packet has a header that says, in effect, "This packet starts with byte 379642 and contains 200 bytes of data." The receiver can detect missing or incorrectly sequenced packets. TCP acknowledges data that has been received and retransmits data that has been lost. The TCP design means that error recovery is done end-to-end between the Client and Server machine. There is no formal standard for tracking problems in the middle of the network, though each network has adopted some adhoc tools.

There are three levels of TCP/IP knowledge. Those who administer a regional or national network must design a system of long distance phone lines, dedicated routing devices and very large configuration files. They must know the IP numbers and physical locations of thousands of subscriber networks. They must also have a formal network monitor strategy to detect problems and respond quickly.

Each large company or university that subscribes to the Internet must have an intermediate level of network organisation and expertise. A half dozen routers might be configured to connect several dozen departmental LANs in several buildings. All traffic outside the organisation would typically be routed to a single connection to a regional network provider.

However, the end user can install TCP/IP on a personal computer without any knowledge of either the corporate or regional network. Three pieces of information are required:

- 1 The IP address assigned to this personal computer.
- 2 The part of the IP address (the subnet mask) that distinguishes other machines on the same LAN (messages can be sent to them directly) from machines in other departments or elsewhere in the world (which are sent to a router machine)
- 3 The IP address of the router machine that connects this LAN to the rest of the world.

Transmission media and network components

Objectives : At the end of this lesson you shall be able to

- explain cable media, wireless media and network adapter.

Network media : Media are what the message is transmitted over. Different media have different properties and are most effectively used in different environments for different purposes.

In computer networking, the medium affects nearly every aspect of communication. Most important, it determines how quickly and to whom a computer can talk and how expensive the process is.

Cable media : Cables have a central conductor that consists of a wire or fiber surrounded by a plastic jacket. Three types of cable media are twisted-pair, coaxial and fiber-optic cable. Two types of twisted-pair cable are used in networks: unshielded (UTP) and shielded (STP).

Table summarizes the characteristics of these types of cable media, which are discussed in the following sections.

Factor	UTP	STP	Coaxial	Fiber-optic
Cost	Lowest	Moderate	Moderate	Highest
Installation	Easy	Fairly easy	Fairly easy	Difficult
Bandwidth capacity	1- to 155 Mbps (typically 10 Mbps)	1- to 155Mbps (typically 16 Mbps)	Typically 10 Mbps	2 Gbps (typically 100 Mbps)
Node capacity per segment	2	2	30 (10base 2) 100 (10 base 5)	2
Attenuation	High (range of hundreds of meters)	High (range of hundreds of meters)	Lower (range of a few kilometers)	Lowest (range of tens of kilometers)
EMI	Most vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Not affected by EMI or eavesdropping

Twisted-pair cable : Twisted-pair cable uses one or more pairs of two twisted copper wires to transmit signals. It is commonly used as telecommunications cable.

When copper wires that are close together conduct electric signals, there is a tendency for each wire to produce interference in the other. One wire interfering with another in this way is called crosstalk. To decrease the amount of crosstalk and outside interference, the wires are twisted. Twisting the wires allows the emitted signals from one wire to cancel out the emitted signals from the other and protects them from outside noise.

Twisted pairs are two color-coded, insulated copper wires that are twisted around each other. A twisted-pair cable consists of one or more twisted pairs in a common jacket. Fig 1 shows a twisted-pair cable.

The two types of twisted-pair cable are unshielded and shielded.

Fig 1

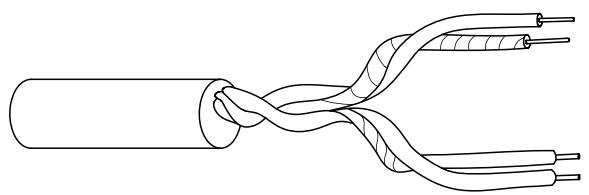


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Unshielded twisted-pair cable : Unshielded twisted-pair (UTP) cable consists of a number of twisted pairs with a simple plastic casing. UTP is commonly used in telephone systems. Fig 2 shows a UTP cable.

The Electrical Industries Association (EIA) divides UTP into different categories by quality grade. The rating for each category refers to conductor size, electrical characteristics and twists per foot. The following categories are defined.

Fig 2

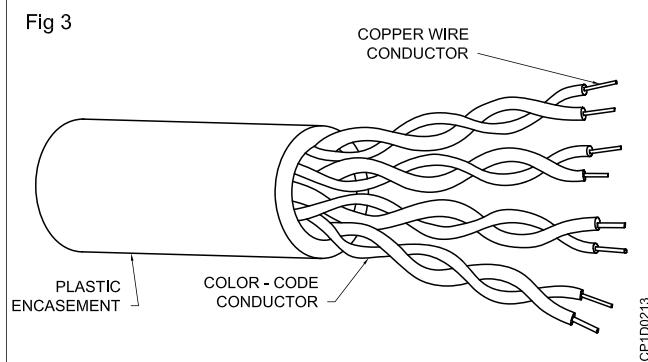


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- Categories 1 and 2 were originally meant for voice communication and can support only low data rates, less than 4 megabits per second (Mbps). These cannot be used for high-speed data communications. Older telephone networks used Category 1 cable.
- Category 3 is suitable for most computer networks. Some innovations can allow data rates much higher, but generally Category 3 offers data rates up to 16 Mbps. This category of cable is the kind currently used in most telephone installations.
- Category 4 offers data rates upto 20 Mbps.
- Category 5 offers enhancements over Category 3, such as support for Fast Ethernet, more insulation and more twists per foot, but Category 5 requires compatible equipment and more stringent installation. In a Category 5 installation, all media, connectors and connecting equipment must support Category 5 or performance will be affected.

Data-grade UTP cable (Categories 3,4 and 5) consists of either four or eight wires. A UTP cable with four wires is called a two-pair. Network topologies that use UTP require atleast two-pair wire. You may want to include an extra pair for future expansion. Fig 3 shows a four-pair cable.

Fig 3



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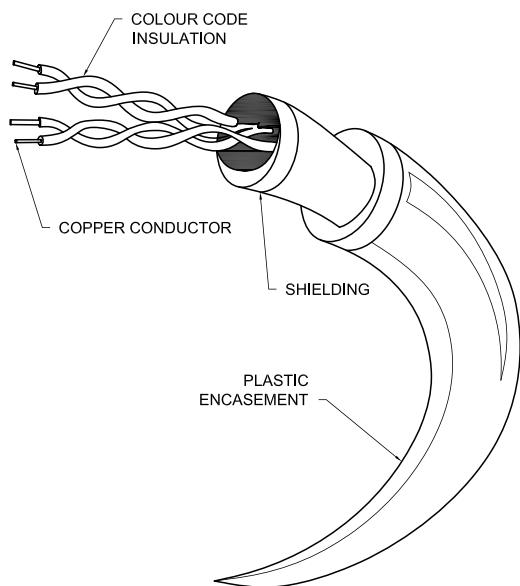
Because UTP cable was originally used in telephone systems, UTP installations are often similar to telephone installations. For a four-pair cable, you need a modular RJ-45 telephone connector. For a two-pair cable, you need a modular RJ-11 telephone connector. These connectors are attached to both ends of a patch cable. One end of the patch cable is then inserted into a computer or other device, and the other end is inserted into a wall jack. The wall jack connects the UTP drop cable (another length of cable) to a punch-down block.

The other side of the punch-down block is wired to a patch panel. The patch panel provides connectivity through patch cables to other user devices and connectivity devices.

UTP's popularity is partly due to the, first usage of the same in telephone systems. In many cases a network can be run over the already existing wires installed for the phone system, at a great savings in installation cost.

Shielded twisted-pair cable : The only difference between shielded twisted pair (STP) and UTP is that STP cable has a shielded usually aluminium/polyester between the outer jacket or casing and the wires. Fig 4 shows STP cable.

Fig 4



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The shield makes STP less vulnerable to EMI because the shield is electrically grounded. If a shield is grounded correctly, it tends to prevent signals from getting into or out of the cable. It is a more reliable cable for LAN environments. STP was the first twisted-pair cable to be used in LANs. Although many LANs now use UTP, STP is still used.

Transmission media specifications from IBM and Apple Computer use STP cable. IBM's Token Ring network uses STP and IBM has its own specifications for different qualities and configurations of STP. A completely different type of STP is the standard for Apple's Apple Talk networks. Networks that conform to each vendor's specifications have their own special requirements, including connector types and limits on cable length.

STP has the following characteristics

Cost : Bulk STP is fairly expensive. STP costs more than UTP and thin coaxial cable but less than thick coaxial or fiber-optic cabling.

Installation : The requirement for special connectors can make STP more difficult to install than UTP. An electrical ground must be created with the connectors. To simplify installation, use standardised and prewired cables.

Because STP is rigid and thick (up to 1.5 inches in diameter), it can be difficult to handle.

Bandwidth capacity : With the outside interference reduced by the shielding, STP can theoretically run at 500 Mbps for a 100 meter cable length. Few installations run at data rates higher than 155 Mbps. Currently, most STP installations have data rates of 16 Mbps.

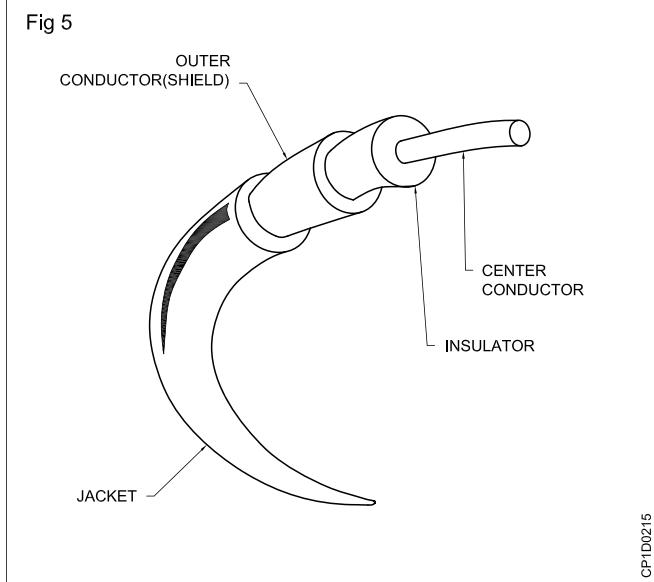
Node capacity : Since only two computers can be connected together by an STP cable, the number of computers in an STP network is not limited by the cable. Rather, it is limited by the hub or hubs that connect the cables together. In a Token Ring network, which is the most common type of STP network, the useful upper limit is around 200 nodes in a single ring, but it depends on the type of data traffic in your network. There is a specified maximum limit of 270, but you will probably never reach this limit.

Attenuation : STP does not outperform UTP by much in terms of attenuation. The most common limit is 100 meters.

EMI : The biggest difference between STP and UTP is the reduction of EMI. The shielding blocks a considerable amount of the interference. However, since it is copper wire, STP still suffers from EMI and is vulnerable to eavesdropping.

Coaxial cable : Coaxial cable commonly called coax has two conductors that share the same axis. A solid copper wire or stranded wire runs down the center of the cable and this wire is surrounded by plastic foam insulation. The form is surrounded by a second conductor, a wire mesh tube, metallic foil or both. The wire mesh protects the wire from EMI. It is often called the shield. A tough plastic jacket forms the cover of the cable, providing protection and insulation. Fig 5 shows a coaxial cable.

Fig 5



Coaxial cable comes in different sizes. It is classified by size (RG) and by the cable's resistance to direct or alternating electric currents (measured in ohms also called impedance)

The following are some coaxial cables commonly used in networking:

50 ohm, RG-8 and RG-11 used for thick ethernet.

50 ohm, RG-58 used for thin ethernet.

75 ohm, RG-59 used for cable TV.

93 ohm, RG-62 used for ARCnet.

PVC and plenum cable : Polyvinyl chloride (PVC) is commonly used in coaxial cabling because it is a flexible, inexpensive plastic well suited for use as insulation and cable jacketing. PVC is often used in the exposed areas of an office.

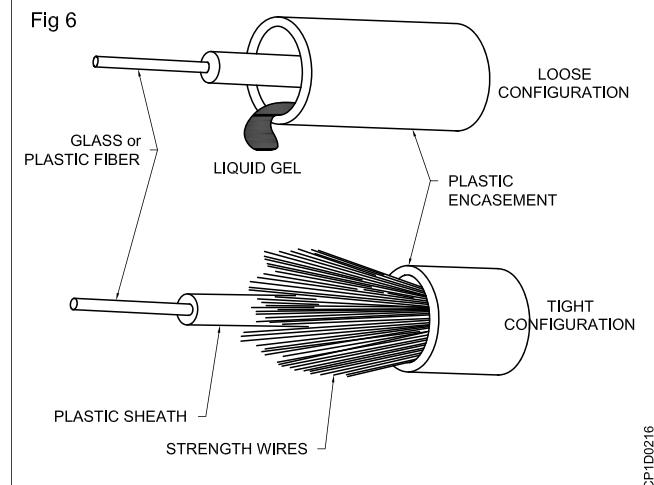
A plenum is the space between the false ceiling of an office and the floor above. The air in the plenum circulates with the air in the rest of the building, and there are strict fire codes about what can be placed in a plenum environment.

Because PVC gives off poisonous gases when burned, you cannot use it in a plenum environment. You must use plenum grade cable instead. Plenum grade cable is certified to be fire resistant to produce a minimum amount of smoke. Plenum cable is also used in vertical runs (walls) without conduit (a tube to hold the cable). Plenum cable is more expensive and less flexible than PVC.

Fiber-optic cable : Fiber-optic cable transmits light signals rather than electrical signals. It is enormously more efficient than the other network transmission media. As soon as it comes down in price (both in terms of the cable and installation costs) fibre optic will be the choice for network cabling.

Each fiber has an inner core of glass or plastic that conducts light. The inner core is surrounded by cladding, a layer of glass that reflects the light back into the core. Each fiber is surrounded by a plastic sheath. The sheath can be either tight or loose. Fig 6 shows examples of these two types of fiber optic cables.

Fig 6

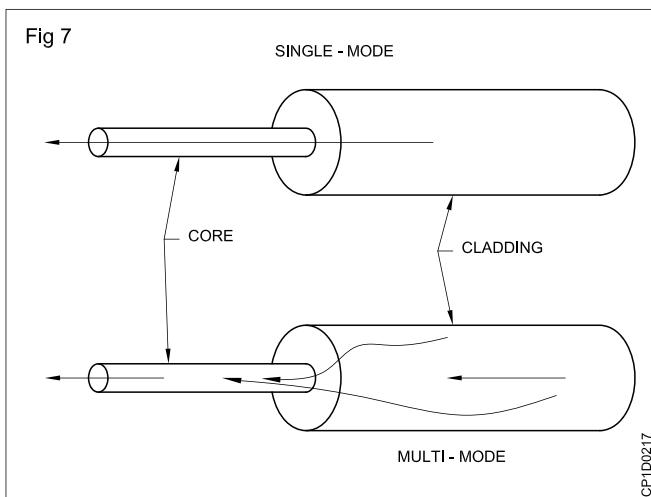


Tight configurations completely surround the fibers with a plastic sheath and sometimes include wires to strengthen the cable (although these wires are not required). Loose configurations leave a space between the sheath and the

outer jacket, which is filled with a gel or other material. The sheath provides the strength necessary to protect against breaking or extreme heat or cold. The gel, strength wires and outer jacket provide extra protection.

A cable may contain a single fiber, but often fibers are bundled together in the center of the cable. Optical fibers are smaller and lighter than copper wire. One optical fiber is approximately the same diameter as a human hair.

Optical fibers may be multimode or single mode. Single mode fibers allow a single light path and are typically used with laser signaling. Single mode fiber can allow greater bandwidth and cable runs than multimode but is more expensive. Multimode fibers use multiple light paths. The physical characteristics of the multimode fiber make all parts of the signal (those from the various paths) arrive at the same time, appearing to the receiver as though they were one pulse. If you want to save money, look into multimode, since it can be used with LEDs (light emitting diodes) which are a more affordable light source than lasers. Fig 7 shows single mode and multi mode fibers.



Optical fibers are differentiated by core/cladding size and mode. The size and purity of the core determine the amount of light that can be transmitted. The following are the common types of fiber-optic cable.

8.3 micron core/125 micron cladding, single mode

62.5 micron core/125 micron cladding, multimode

50 micron core/125 micron cladding, multimode

100 micron core/140 micron cladding, multimode

A typical LAN installation starts at a computer or network device that has a fiber-optic network interface and (NIC). This NIC has an incoming interface and an outgoing interface. The interfaces are directly connected to fiber-optic cables with special fibre-optic connectors. The opposite ends of the cables are attached to a connectivity device or splice center.

Wireless media : Wireless media do not use an electrical or optical conductor. In most cases, the earth's atmosphere is the physical path for the data. Wireless media is therefore useful when distance or obstructions make

bounded media difficult. There are three main types of wireless media: radio wave, micro wave and infrared.

Radio wave transmission systems : Radio waves have frequencies between 10 kilohertz (KHz) and 1 gigahertz (GHz). The range of the electromagnetic spectrum between 10 KHz and 1 GHz is called radio frequency (RF).

Radio wave include the following types.

Short wave

Very high frequency (VHF) television and FM radio

Ultra-high frequency (UHF) radio and television

Radio waves can be broadcast omnidirectionally or directionally. Various kinds of antennas can be used to broadcast radio signals.

Microwave transmission systems : Microwave communication makes use of the lower gigahertz frequencies of the electromagnetic spectrum. These frequencies, which are higher than radio frequencies, produce better throughout and performance. There are two types of microwave data communication systems: terrestrial and satellite.

Terrestrial microwave : Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz range. The signals are highly focused and the physical path must be line-of-sight. Relay towers are used to extend signals. Terrestrial microwave systems are typically used when using cabling is cost prohibitive.

Because terrestrial microwave equipment often uses licensed frequencies, additional costs and time constraints may be imposed by licensing commissions or government agencies (the FCC, in the United States).

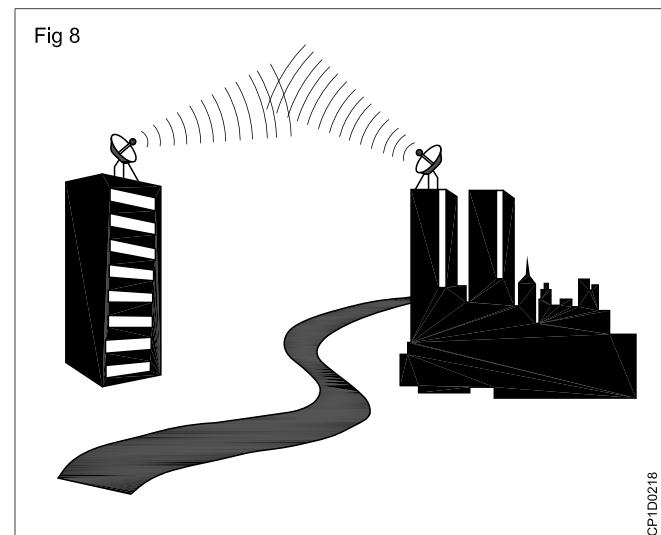


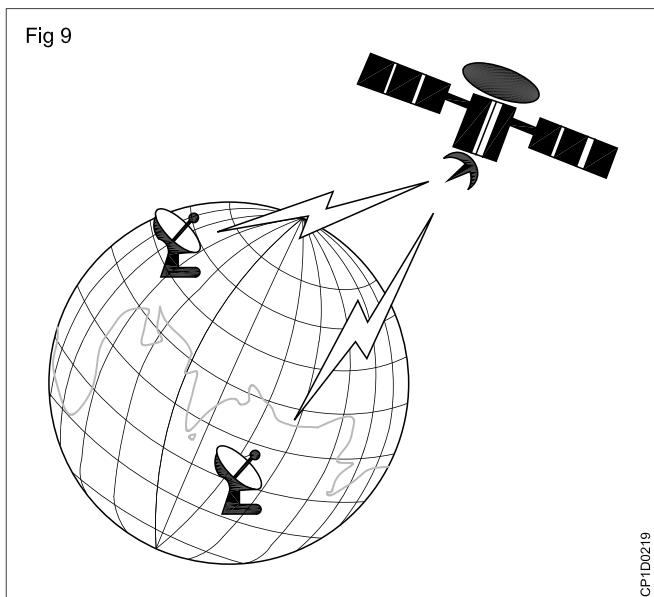
Fig 8 shows a microwave system connecting separate buildings. Smaller terrestrial microwave systems can be used within a building, as well. Microwave LANs operate at low power, using small transmitters that communicate with omnidirectional hubs. Hubs can then be connected to form an entire network.

Satellite : Satellite microwave systems transmit signals between directional parabolic antennas. Like terrestrial microwave systems, they use low gigahertz frequencies and must be in line-of-sight. The main difference with satellite system is that one antenna is on a satellite in geosynchronous orbit about 50,000 kilometers (22,300 miles) above the earth. Because of this, satellite microwave systems can reach the most remote places on earth and communicate with mobile devices.

Here's how it usually works: a LAN sends a signal through cable media to an antenna (commonly known as a satellite dish), which beams the signal to the satellite in orbit above the earth. The orbiting antenna then transmits the signal to the another location on the earth or, if the destination is on the opposite side of the earth, to another satellite, which then transmits to a location on earth.

Fig 9 shows a transmission being learned from a satellite dish on earth to an orbiting satellite and then back to earth.

Fig 9



Because the signal must be transmitted 50,000 kilometers to the satellite and 50,000 kilometers back to earth, satellite microwave transmissions take about as long to cover a few kilometers as they do to span continents. Because the transmission must travel long distances, satellite microwave systems experience delays between the transmission of a signal and its reception. These delays are called propagation delays. Propagation delays range from .5 to 5 seconds.

Infrared transmission systems : Infrared media use infrared light to transmit signals. LEDs or ILDs transmit the signals and photodiodes receive the signals. Infrared media use the tera-hertz range of the electromagnetic spectrum. The remote controls we use for television, VCR and CD players use infrared technology to send and receive signals.

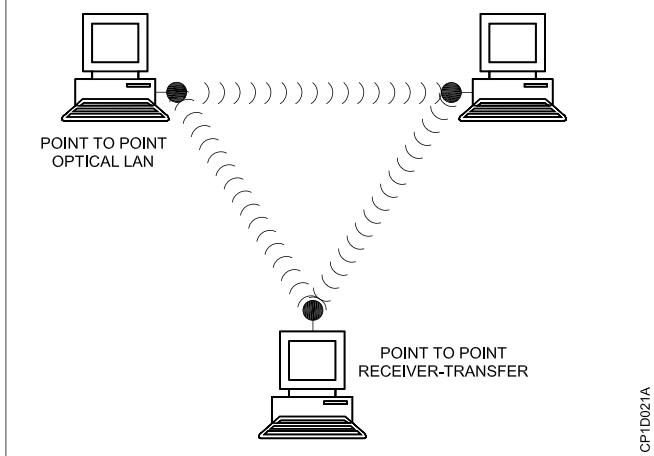
Because infrared signals are in the terahertz (higher-frequency) range, they have good throughout. Infrared signals do have a downside: the signals cannot penetrate walls or other objects and they are diluted by strong light sources.

Infrared media use pure light, normally containing only electromagnetic waves or photons from a small range of the electromagnetic spectrum. Infrared light is transmitted either line-of-sight (point-to-point) or broadcast omnidirectionally, allowing it to reflect off walls and ceilings. Point-to-point transmission allows for better data rates, but devices must remain in their locations. Broadcast, on the other hand, allows for more flexibility but with lower data rates. (Part of the signal strength is lost with each reflection.)

Point-to-point : Infrared beams can be tightly focused and directed at a specific target. Laser transmitters can transmit line-of-sight across several thousand meters.

One advantage of infrared is that an FCC license is not required to use it. Also, using point-to-point infrared media reduces attenuation and makes eavesdropping difficult. Typical point-to-point infrared computer equipment is similar to that used for consumer product with remote controls. Careful alignment of transmitter and receiver is required. Fig 10 shows how a network might use point-to-point infrared transmission.

Fig 10



Broadcast : Broadcast infrared systems spread the signal to cover a wider area and allow reception of the signal by several receivers. One of the major advantage is mobility; the workstations or other devices can be moved more easily than with point-to-point infrared media. Fig 11 shows how a broadcast infrared system might be used.

Because broadcast infrared signals are not as focussed as point-to-point, this type of system cannot offer the same throughout. Broadcast infrared is typically limited to less than 1 Mbps, making it too slow for most network needs.

Network adapters, sometimes called Network Interface Cards (NICs) are peripheral cards that plug into the motherboard of your computer and into a network cable. It is through the network adapter that your computer communicates on the network. Many newer IBM-compatible computers have built-in networking adapters for Ethernet.

Network adapters perform all the functions required to communicate on a network. They convert data from the

form stored in the computer to the form transmitted or received (or transceived) on the cable and provide a physical connection to the network.

Fig 11

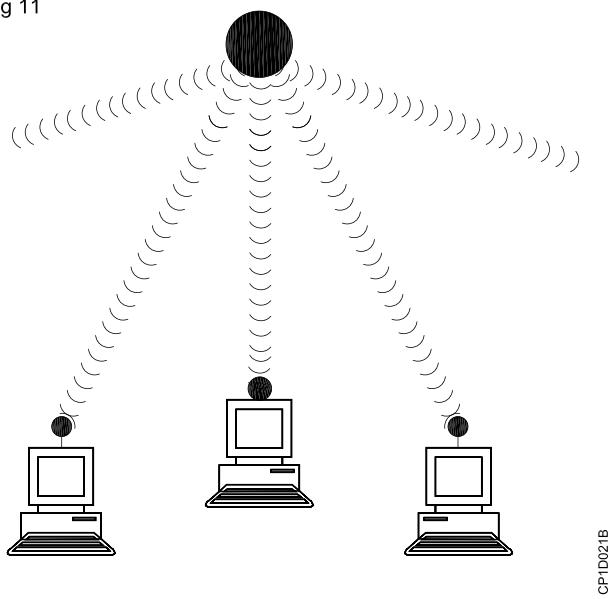
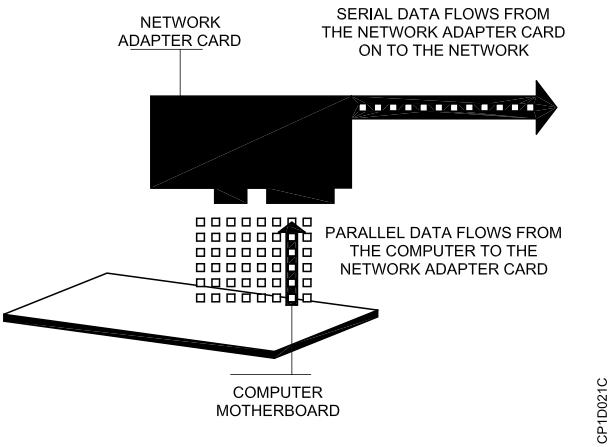


Fig 12 shows how an adapter plugs into a computer and attaches to a network cable.

Fig 12



Adapters in Abstract: Your computer software does not have to be aware of how the network adapter performs its function because the network driver software handles all the specifics for your computer. The applications running on your computer need only address data and hand it to the adapter card.

This is much the way the post office or a parcel delivery service works. You don't care about the details of postal delivery; you simply address your parcel and hand it to the delivery driver. The postal service manages the process of delivering it for you.

This abstraction allows your computer to use a microwave radio transmitter just as easily as a fiber-optic network adapter or an adapter that works over coaxial cable.

Everything in your computer remains the same except for the actual network adapter and the driver software for that adapter.

How network adapters work : Network adapters receive the data to be transmitted from the motherboard of your computer into a small amount of RAM called a buffer. The data in the buffer is moved into a chip that calculates a checksum value for the chunk and adds address information, which includes the address of the destination card and its own address, which indicates where the data is from. Ethernet adapter addresses are permanently assigned when the adapter is made at the factory. This chunk is now referred to as a frame.

For example, in Ethernet, the adapter listens for silence on the network when no other adapters are transmitting. It then begins transmitting the frame one bit at a time, starting with the address information, then the chunk of data and then the checksum.

The network adapter must still convert the serial bits of data to the appropriate media in use on the network. For instance, if the data is being transmitted over optical fiber, the bits are used to light up an infrared LED (light emitting diode) or laser diode, which transmits light pulses down the fiber to the receiving device's APD (avalanche photo diode) or photo-transistor. If the data is being sent over twisted-pair cable, the adapter must convert the bits of data from the 5-volt logic used in computers to the differential logic used for digital twisted-pair transmission.

The circuitry used to perform this media conversion is called a transceiver. Ethernet is the same no matter what type of media you use only the transceiver changes. Transceivers can be external devices attached through the AUI port on an Ethernet adapter, or they can be internal on the card. Some cards (usually called combo cards) have more than one type of transceiver built in so you can use them with your choice of media. AUI interfaces on Ethernet adapters are not transceivers—they are where you attach a transceiver for the different media types.

Because a network signal travels through copper and optical fiber at about 66 percent as fast as the speed of light, there's a chance that one of two adapters far away from each other could still be hearing silence when the other has in fact started transmitting. In this case, they could transmit simultaneously and garble their data. This is referred to as a collision.

While adapters transmit, they listen to the wire to make sure the data on the line matches the data being transmitted. As long as it does, everything is fine. If another adapter has interrupted, the data being, "heard" by the transmitting network adapter will not match the data being transmitted. If this happens, the adapter ceases transmitting and transmits a solid on state instead, which indicates to all computers that it has detected a collision and that they should discard the current frame because it has been corrupted. The network adapter waits a random amount of time and then again attempts to transmit the frame.

Configuring network adapters : Because network adapters have not been around since computers were invented, there is no assigned place for cards to be set to. Most adapter cards require their own interrupt, port address and upper memory range. PCI motherboards automatically assign IRQ and port settings to your PCI card, so you don't need to worry about it.

Unfortunately, network adapters in computers with ISA buses can conflict with other devices, since no two devices

should share the same interrupt or port. No software that comes with your computer will tell you every interrupt and port in use unless your computer is already running Windows NT, so you must be somewhat familiar with the hardware in your computer or use a program that can probe for free resources to find one. Many adapters have test programs that can tell you whether the adapter is working correctly with the settings you've assigned.

Computer name and workgroup - Client server

Objectives : At the end of this lesson you shall be able to

- define computer name
- define workgroup
- explain client-server model, centralised computing and client computing with central file storage
- explain web server.

Computer Name: In network computers are identified by its IP Address, but a name can also be given to identify it easily as remembering IP address is difficult comparing remembering a alphanumeric name.

Client-Server : The term Client-Server can describe hardware, in which case it is referring to network servers and client computers, or it can refer to a way of organising software applications and services on a network. Client-server computing is a powerful way of constructing programs on a network. In order to describe its advantage and how it works, we will first describe two alternatives to client-server computing:

- Centralised computing
- Client computing with central file storage

Centralized computing : Centralized computing originated with mainframe computers and time-sharing. The principle behind centralized computing is that a central computer executes a program, such as a database or a transaction-processing program (for instance, an airline reservations system or a bank records program) and remote terminals merely display data on a screen and convey keyboard data back to the central computer.

In modern networks, personal computers can perform the role of dumb terminals. With Windows software, the PC can appear to the central computer as many terminals, each virtual terminal accessing different data or performing a separate transaction on the mainframe.

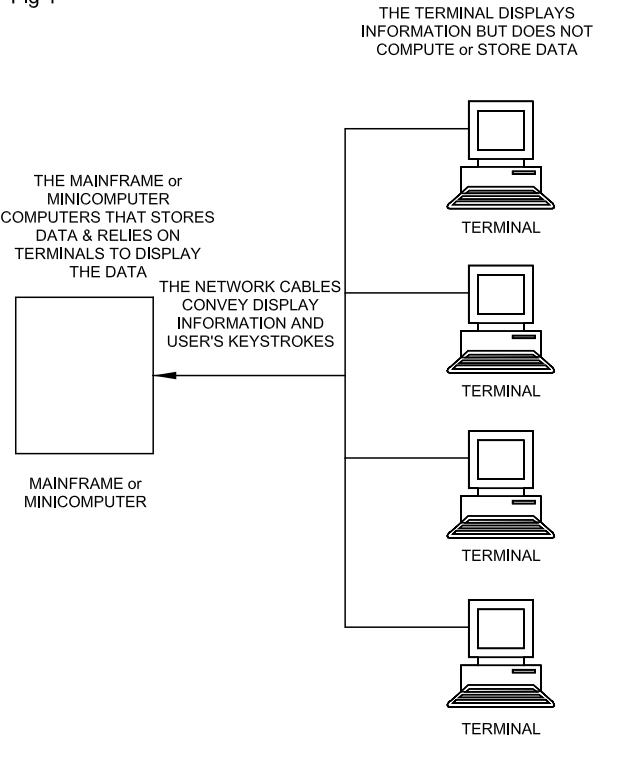
In centralized computing it is the central computer that does all the work. The data resides on the central computer and the program executes on the central computer. The personal computer or dumb terminal only display screen data and accepts keystrokes for the central computer to process. Centralized computing does not fully use the capabilities of today's powerful network clients. Fig 1 illustrates centralized computing.

Client computing with Central file storage : At the opposite end of the spectrum from centralized computing is client computing with central file storage (see Fig 2). In this way of organizing an application, the client computer does all the work. A central file server stores, but that is all.

Workgroup: In a network computers can be grouped together by using workgroup feature. Computers in a particular workgroup will show together when you open a workgroup. Though a computer of one workgroup can access other workgroup computers also.

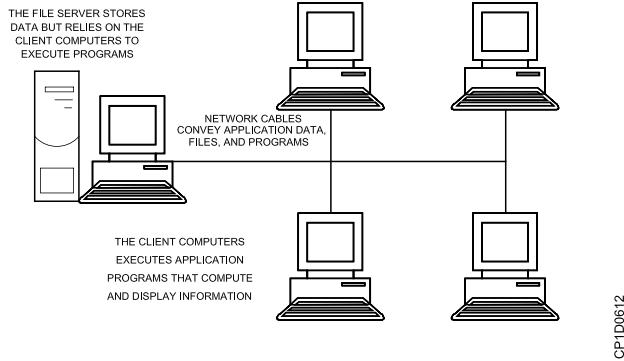
Client computers cooperate to ensure that central files are not corrupted by attempts by several computers to access them at the same time. When a client computer needs to perform an operation, the file is transferred to the client computer to perform the operation. Two examples of this type of application are networked database programs that do not use a SQL. (Structured Query Language) server and any network-aware application that does not communicate with a special program executing on the server, such as network scheduling programs and groupware.

Fig 1



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Fig 2



While it is fully exploits the capabilities of client computers and provides a richer and more customizable environment for the user, this type of program can place heavy demands on the network if the data files in which program works with are large. It also takes time to transmit data from the server to the client, process the data, and transfer it back to the server so other network programs can access the data.

The Client-Server Model : The client-server model combines the advantages of both the centralized computing model and the client model of computing. It does this by performing the operations that are best executed by a central computer on the file server and performing those operations that are best done close to the user on the client computer (see Fig 3). The client-server model works best when many people need access to large amounts of data. Simply stated, a client-server system is any system in which the client computer makes a request over a network to a server computer that then satisfies the request.

The Client : When you use a client-server system, what you see is the client, or front end. It presents the interface to manipulate or search for data. The request you make by manipulating windows, menu, check boxes and so on, is translated into a compact form that the client transmits over the network for the server to perform.

One example of a front end is Microsoft Access when it is used with a SQL back end. (You can also use Access without a SQL back end.) Access displays tables in windows or in forms you can browse. It allows you to modify and search the tables in an easy-to-use graphical environment. All the actual data manipulation, however, occurs on the SQL server. Access translates all the database operations into SQL for the server to perform. The results of the operations are transmitted back to Access to display in an intuitive, graphical form.

SQL is not limited to database programs such as Microsoft Access. User programs such as Microsoft Excel can use SQL to query the back-end data-base server for values to use in spreadsheet calculations. Program tools allow custom programs to store and retrieve data in server-based databases. Query tools provide direct access to the SQL data.

The Server : The server is where data operations in a client-server system occur. The central computer can service many client requests quickly and efficiently, which is the traditional advantage of centralized computing. The central computer can also provide enhanced security by performing only authorized operations on the data.

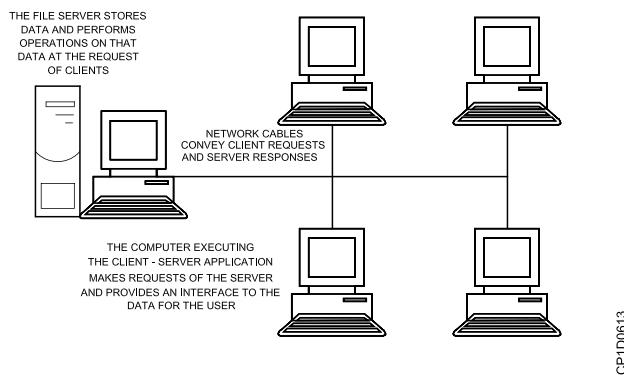
Back-end database software is optimized to perform searches and sorts and the back-end computer is often more powerful than the front-end computer.

Web server : A web server is a program using the client/server model and the World Wide Web's Hyper Text Transfer Protocol (HTTP) serves the files that form web pages to web users.

Every computer on the internet that contains a web site must have a web server program. The most popular web servers are: The Microsoft's Internet Information Server (IIS) which comes with the Microsoft's Windows NT Server; Netscape Fast Track and Enterprises Servers and Apache, a web server for Unix-based operating systems. Other web servers include Novell's Web Server for users of its Netware Operating System and IBM's family of Lotus Domino Servers. Primarily for IBM's OS/390 and AS/400 customers.

Web servers often come as a part of a larger package of Internet related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files and building and publishing web pages. Consideration in choosing a web server include how well it works with the operating system and other servers, its ability to handle server side programming and publishing, search engine and site building tools that may come with it.

Fig 3



DHCP

Objectives : At the end of this lesson you shall be able to

- define DHCP
 - explain DHCP.
-

DHCP: Dynamic Host Control Protocol allows server computers to distribute dynamic IP address when the client establish connection to server. The server maintains a IP address pool and it offer some IP which is not already allotted to some other client. When client disconnects from server its IP then becomes free again and can be given to other client.

It is dynamic as same client can get different IP in different times. It is beneficial as requirement of IP address is less as all the clients are not always connected to server and its saves the time to allocate IP to each client manually.

Dynamic Host Configuration Protocol (DHCP) is a standard protocol defined by RFC 1541 (which is

superseded by RFC 2131) that allows a server to dynamically distribute IP addressing and configuration information to clients. Normally the DHCP server provides the client with at least this basic information:

- IP Address
- Subnet Mask
- Default Gateway

Other information can be provided as well, such as Domain Name Service (DNS) server addresses and Windows Internet Name Service (WINS) server addresses. The system administrator configures the DHCP server with the options that are parsed out to the client.

Concept of proxy server

Objectives : At the end of this lesson you shall be able to

- explain the meaning of proxy server
- explain common connection point
- explain packet filtering, domain filtering and control user access by service
- explain logging and web publishing.

What is a proxy server? To be a “proxy” means to act on behalf of another. This is exactly what a proxy server does; it acts on behalf of its proxy clients to interact with other servers. You could say that a proxy server is a “mediator” for computer communications.

Placing a proxy server on your network gives you several advantages, including security enhancements, caching enhancements and greater control over your network users. The advantages of using Microsoft Proxy Server (MPS) is listed below:

- Common connection point
- Caching
- Packet filtering
- Domain filtering
- Control user access by service
- Logging
- Web publishing

Common connection point : MPS was designed to connect two networks, rather like a gateway. Typically, MPS connects an internal network and the Internet. This configuration gives the internal computers a common connection point to the Internet-through MPS.

When used to provide a common connection, MPS lets clients share a single connection to the Internet. Instead of giving each user on a Local Area Network (LAN) a separate modem, phone line and dial-up account to the Internet, MPS can function as a gateway to the Internet using a single connection. Instead of using separate standard phone line connections, users can share a single higher-speed connection through the proxy server. The net effect is usually an overall cost savings and reduction in administrative overhead. One connection is usually cheaper and easier to maintain than several separate connections.

Caching : Since you can use MPS as a common connection point to the Internet, you can also use it to cache frequently accessed resources. MPS allocates a portion of the server's hard disk space to store frequently accessed objects.

Caching can either be passive or active. Passive caching just stores objects as they are requested so the cache is updated only when users request information. Active caching directs the server to refresh objects in the cache automatically.

You can selectively control MPS caching so that you can limit the size of cached objects, change the expiration limits (control the freshness of objects) and determine whether MPS always caches or always excludes from cache certain content.

Caching only works with the Web Proxy Service in MPS. You will learn more about the Web Proxy Service later in this chapter.

Packet Filtering : To protect internal users from the outside world (in other words to protect the network from outsiders), MPS provides packet-filtering services. A packet filter prevents unauthorized access from the outside by limiting the available connection points coming into the network. To that end, packet filters stop various types of protocols from entering the network.

MPS supports both static and dynamic packet filters. A static filter keeps all traffic of a certain description or type from passing through MPSServer. A dynamic packet filter automatically determines which type of traffic is allowed in or out. With a static filter the administrator defines the port, the protocol and maybe the IP address. With a dynamic filter the administrator just defines the service to be allowed or filtered.

Domain Filtering : MPS also lets you limit the access of your internal clients to the Internet. You can configure filters for a single computer, a group of computers or a domain name. Many companies prefer to have this type of control over their users because they can block access to Internet sites that they believe reduce employee productivity or contain offensive material. Some popular examples of domain filtering are blocking access to Internet game servers or Web sites that contain pornographic material.

You can configure domain filters for a specific IP address, IP address and subnet mask or domain name. IP address filters prevent users from contacting a single computer. Using the IP address and subnet mask as a filter limits access to an entire group (a subnet) of computers. Domain name filters can apply to an entire Web site or to subsections of that site.

Control user access by Protocol or Service : You can also selectively enable and disable ports, services and protocols through MPS. MPS lets you control access to Internet services at the user level. You can also enable or restrict access to protocols on a user or group basis. Many protocols are predefined in the default MPS configuration.

If the protocol or service you would like to enable or disable is not defined in the MPS property sheets, you can create a new sheet. You can define a protocol by TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) port number or range. This gives you the ability to control access by port.

Logging : Because all traffic between networks passes through MPS, MPS has the unique opportunity to log and track communication. You can track the information your internal clients get from other networks or the Internet and monitor inbound communication. You can use this information to help you secure your internal network from attack and unauthorized access. Plus, you can monitor where your users spend their time on the Internet and what information they are downloading.

Web publishing : MPS can also act as a Web server. MPS can service requests from cache on behalf of a Web server, pass requests to the Web server on the local system or pass requests to another Web server on the internal network. The terms "reverse proxying" and "reverse hosting" describe the Web Publishing services that MPS provides.

As a reverse proxy, MPS listens to incoming Web requests for a single Web server on the local network. The incoming requests are simply forwarded to another Web server. Web hosting requires more work on the part of MPS. As a reverse host, MPS can send requests to one of many Web servers. In this case, MPS responds as if the entire site were contained locally, even though the actual data may be coming from several different Web servers.

The main difference between reverse proxying and reverse hosting is that in performing reverse proxying, MPS forwards all requests to the Web server. In performing reverse hosting, MPS selectively forwards requests to multiple Web servers on the internal network. In reverse hosting, the Microsoft Proxy Server routes an external request for a resource (that specifies an Internet domain name) to one or more internal Web servers. For instance, requests for <http://www.hudlogic.com/bios> might be routed to an internal server named "business" (<http://business>), while requests for <http://www.hudlogic.com/pictures> could be sent to a different Web server named "server1" (<http://server1>).

Services : Microsoft Proxy Server 2.0 supports Hypertext Transfer Protocol (HTTP) version 1.1, Windows Sockets version 1.1, SOCKS version 4.3a and Secure Sockets Layer (SSL) 3.0. The MPS services that provide this support are the Web Proxy service, WinSock Proxy service and the SOCKS Proxy service, respectively.

Web Proxy Service : The Web Proxy service provides support for HTTP (a.k.a. Web publishing), FTP, Gopher and secure (SSL) communications. The Web Proxy service works with any CERN-compliant Web browser, such as Internet Explorer or Netscape Navigator. Because the Web Proxy supports only these widely adopted Internet standard communication methods, it isn't operating system dependent. Clients running Unix, Macintosh or Windows operating systems can communicate with the Web Proxy service as long as they're configured with a CERN-compliant Web browser.

Any operating system using a CERN-compliant Web browser can communicate through the Web Proxy server, regardless of its underlying operating system.

WinSock Proxy Service : The WinSock Proxy service supports Microsoft Windows operating systems using Windows Sockets. This support is available for both Transmission Control Protocol/internet Protocol (TCP/IP) and Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocols. The WinSock Proxy service applies mainly to Windows clients including Windows 3.x, Windows 95 and Windows NT.

Windows Sockets is an interprocess communication mechanism derived from the Berkeley Sockets interface (originally designed for Unix systems). The Sockets interface was extended to support Windows-based clients running Microsoft implementations of TCP/IP. The name given to this Sockets interface for Windows was WinSock (for Windows Sockets).

The WinSock Proxy Service doesn't support 16-bit IPX/SPX clients such as the Windows 3.x 16-bit Netware clients.

SOCKS Proxy Service : The SOCKS Proxy service supports SOCKS version 4.3a client applications such as FTP, Gopher and Telnet. Operating systems like Macintosh and Unix can run SOCKS 4.3a and access the SOCKS Proxy service when communicating through the Microsoft Proxy Server. One limitation of the SOCKS proxy service on MPS is that it does not support UDP-based protocols.

UDP-based protocols aren't supported through the SOCKS Proxy service, but the WinSock Proxy service does support UDP for Windows clients.

Video conferencing

Objectives: At the end of this lesson you shall be able to

- define video conferencing
- list the advantages of video conferencing
- list the disadvantages of video conferencing.

Video Conferencing

Definition: Videoconferencing is the conduct of a conference by a set of telecommunication technologies which allow two or more remotely located teams to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Video conferencing is a very useful technique to cut down various costs as well as travel time when meetings and conferences are concerned. Video conferencing connects individuals in real time through audio and video communication over broadband networks. It enables visual meetings and collaboration on digital documents and shared presentations. New technologies allow participants to connect remotely over a network through multiple devices like laptops, desktops, smartphones and tablets.

Advantages

- 1 Significant Travel Savings
- 2 Not only is video conferencing a direct replacement for many in-person business trips, but because there is virtually no cost to add additional key employees to a virtual meeting, it is a cost effective solution.
- 3 Improved Communication
- 4 Audio conferencing and e-mail may be used for communication but there is a lack of visual connection

and eye contact in these. Video conferencing allows users to successfully convey, creating essential social bonds and shared understandings.

- 5 Increased Productivity
- 6 Important meetings are shorter and more effective. But it is a well-known fact that many meetings take longer than the necessary time of the participants. Video conferencing users can save a minimum of two hours a week with the technology. The interactivity of group collaboration and document sharing greatly increases productivity.
- 7 Conferencing Quality
- 8 The present day state-of-the-art technology delivers excellent, reliable audio and video quality, making conferencing very effective and interesting too.

Disadvantages

- 1 Absence of Physical Presence
- 2 Initial installation costs
- 3 Not yet popular with a large size of users.

Network security

Objectives: At the end of this lesson you shall be able to

- **define network security**
- **explain network security concepts.**

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator.

Network security concepts

Network security refers to any activities designed to protect your network. Specifically, these activities protect the usability, reliability, integrity, and safety of your network and data. Effective network security targets a variety of threats and stops them from entering or spreading on your network.

Network security starts with authenticating, commonly with a username and a password. Since this requires just one detail authenticating the user name -i.e. the password- this is sometimes termed one-factor authentication. With two-factor authentication, something the user needs a 'dongle', an ATM card, or a mobile phone, and with three-factor authentication, something the user needs a fingerprint or retinal scan.

Once authenticated, a firewall decides what services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component may fail to check potentially harmful content such as computer worms or Trojans being transmitted over the network.

Anti-virus software or an intrusion prevention system (IPS) helps detect and inhibit the action of such malware.

Encrypting the communication between two hosts using a network helps maintain privacy.

Surveillance and early-warning tools sometimes referred to as Honeypots can be employed.

Honeypot is a trap set to detect, deflect, or, in some manner, counteract attempts at unauthorized use of information systems. Generally, a honeypot consists of a computer, data, or a network site that appears to be part of a network, but is actually isolated and monitored, and which seems to contain information or a resource of value to attackers. This is similar to the police baiting a criminal and then conducting undercover surveillance.

The Foundations of Security

Security relies on the following elements:

- **Authentication**

Authentication addresses the question: who are you? It is the process of uniquely identifying the clients of your applications and services. These might be end users, other services, processes, or computers. In security parlance, authenticated clients are referred to as principals.

- **Authorization**

Authorization addresses the question: what can you do? It is the process that governs the resources and operations that the authenticated client is permitted to access. Resources include files, databases, tables, rows, and so on, together with system-level resources such as registry keys and configuration data. Operations include performing transactions such as purchasing a product, transferring money from one account to another, or increasing a customer's credit rating.

- **Auditing**

Effective auditing and logging is the key to non-repudiation. Non-repudiation guarantees that a user cannot deny performing an operation or initiating a transaction. For example, in an e-commerce system, non-repudiation mechanisms are required to make sure that a consumer cannot deny ordering 100 copies of a particular book.

- **Confidentiality**

Confidentiality, also referred to as privacy, is the process of making sure that data remains private and confidential, and that it cannot be viewed by unauthorized users or eavesdroppers who monitor the flow of traffic across a network. Encryption is frequently used to enforce confidentiality. Access control lists (ACLs) are another means of enforcing confidentiality.

- **Integrity**

Integrity is the guarantee that data is protected from accidental or deliberate (malicious) modification. Like privacy, integrity is a key concern, particularly for data passed across networks. Integrity for data in transit is typically provided by using hashing techniques and message authentication codes.

- **Availability**

From a security perspective, availability means that systems remain available for legitimate users. The goal for many attackers with denial of service attacks is to crash an application or to make sure that it is sufficiently overwhelmed so that other users cannot access the application. Threats, Vulnerabilities, and Attacks Defined

A threat is any potential occurrence, malicious or otherwise, that could harm an asset. In other words, a threat is any bad thing that can happen to your assets.

A vulnerability is a weakness that makes a threat possible. This may be because of poor design, configuration mistakes, or inappropriate and insecure coding techniques. Weak input validation is an example of an application layer vulnerability, which can result in input attacks.

An attack is an action that exploits a vulnerability or enacts a threat. Examples of attacks include sending malicious input to an application or flooding a network in an attempt to deny service.

How Do You Build a Secure Web Application?

It is not possible to design and build a secure Web application until you know your threats. An increasingly important knowledge needed is about threat modeling. The purpose of threat modeling is to analyze your application's architecture and design and identify potentially vulnerable areas that may allow a user, perhaps mistakenly, or an attacker with malicious intent, to compromise your system's security.

After you know your threats, design with security in mind by applying proven security principles. You must follow secure coding techniques to develop secure, robust, and hack-resilient solutions. The design and development of application layer software must be supported by a secure network, host, and application configuration on the servers where the application software is to be deployed.

E-mail

Objectives : At the end of this lesson you shall be able to

- state the hotmail services offered
- explain MSN outlook express and its tools
- explain popular search engines
- state the FAQs about hotmail.

Hotmail: MSN Hotmail is the world's largest provider of free Web-based e-mail. Hotmail is based on the premise that e-mail access should be easy and possible from any computer connected to the World Wide Web.

By adhering to the universal HyperText Transfer Protocol (HTTP) standard, Hotmail eliminates the disparities that exist between different e-mail programs. Sending and receiving e-mail from Hotmail is as easy as going to the Hotmail web site at <http://www.hotmail.com>, or by clicking on the Hotmail link at <http://www.msn.com>, signing in, and sending an e-mail message.

Hotmail is the web-based e-mail provider, which means you can send and receive messages from any computer connected to the Internet. You can use Hotmail from home, work, school, an Internet cafe, a friend's house or any other computer in the world with an Internet connection. Your messages are stored in a central location, so your Inbox will always be up to date. This is great for people who use more than one computer, travel frequently, or don't even own a computer.

Advantages of Hotmail

Get a permanent e-mail address: When you create a Hotmail account, you choose a permanent e-mail address that will never change as long as you continue to use Hotmail. This is great for people who: Want to switch Internet Service Providers. Your Hotmail address will be the same no matter how you access the Internet, so you don't have to worry about retrieving messages from your old address or notifying friends, family and associates of a new e-mail address. You are free to select any Internet Service Provider that suits your needs.

When you leave town for travel, you may no longer have access to your ISP's e-mail account. But with Hotmail, your friends will always know where to reach you.

Your e-mail is private and secure: When you sign up for Hotmail, you choose your personal ID and password. The only way you can access your account is by using the password you selected. This means that only you will have access to your Hotmail account, even if you use a computer at a public terminal or a friend's house. Because the messages in your Hotmail account are stored securely at a central location, you don't have to worry about losing important information if something happens to your computer. Hotmail is strongly committed to keeping your personal information confidential.

Hotmail is fast and easy to use: Hotmail is recognized world wide as the best Web-based e-mail service. It is also stated that 'while others provide similar services, none can match Hotmail's general ease of use'. If everything is fine, it takes less than a minute to get started on Hotmail and its pages are so worked out to load quickly knowing that the users time is valuable.

Get an additional e-mail account for FREE: Hotmail offers everyone the opportunity to get a free e-mail account. Hotmail can offer e-mail accounts for free because it places banner advertising on some of its pages. Some Internet Service Providers charge a monthly fee for additional e-mail accounts. Hotmail lets an unlimited number of people use a single Internet Service Provider account and have a free, personal e-mail account.

Keep your personal e-mail separate from your work e-mail: People who use e-mail for work will find it convenient to keep their personal messages separate from their work messages. You can use Hotmail for your personal correspondence and your company's e-mail system only for business messages. Additionally, you don't have to store personal e-mail on your company's servers. All messages in your Hotmail account are securely stored in a central location that you access via the Internet with the password you select.

Outlook Express

Microsoft Outlook Express puts the world of online communication on your desktop. Whether you want to exchange e-mail with colleagues and friends or join newsgroups to trade ideas and information. Some of the tools offered by outlook express are;

Manage multiple mail and news accounts: If you have several mail or news accounts, you can use them all from one window. You can also create multiple users, or identities, for the same computer. Each identity gets its own mail folders and Address Book. The ability to create multiple accounts and identities makes it easy for you to keep work separate from personal mail and also between individual users.

Browse through messages quickly & easily: Using the message list and preview pane, you can view a list of messages and read individual messages at the same time. The Folders list contains mail folders, news servers, and newsgroups, and you can easily switch between them. You can also create new folders to organize and sort messages, and then set up message rules so that

incoming mail that meets your criteria automatically goes to a specific folder. You can also create your own views to customize the way you look at your mail.

Keep your mail on a server so you can view it from more than one computer: If your ISP uses an IMAP mail server for incoming mail, you can read, store, and organize your messages in folders on the server without downloading the messages to your computer. That way, you can view messages from any computer that can connect to that server.

Use the Address Book to store and retrieve e-mail addresses: You can save names and addresses in your Address Book automatically by simply replying to a message or by importing them from other programs, by typing them in, by adding them from e-mail messages you receive, or by searching popular Internet directory services (white pages). The Address Book supports Lightweight Directory Access Protocol (LDAP) for accessing Internet directory services.

Add a personal signature or stationery to your messages: You can insert essential information into outgoing messages as part of your personal signature, and you can create multiple signatures to use for different purposes. For more detailed information, you can include a business card. To make your messages look more attractive, you can add stationery patterns and backgrounds, and you can change the color and style of the text.

Send and receive secure messages: You can digitally sign and encrypt messages by using digital IDs. Digitally signing your message assures recipients that the message is really from you. Encryption ensures that only intended recipients can read a message.

Find newsgroups that interest you: Looking for a newsgroup that matches your interests? You can search for newsgroups that contain keywords or browse through all of the newsgroups available from your Usenet provider. When you find a newsgroup you want to view regularly, add it to your Subscribed list so you can find it again easily.

View newsgroup conversations efficiently: You can view a newsgroup message and all of the responses without reading an entire message list. When you view the list of messages, you can expand and collapse conversations to make it easier to find what interests you. You can also use views to display only the messages you want to read.

Download newsgroup messages for offline reading: To use your online time efficiently, you can download messages or entire newsgroups, so you don't have to be connected to your ISP to read messages. You can also download message headers only for offline viewing and then mark the headers of the messages you want to read; then the next time you are connected, Outlook Express downloads the message text. You can also compose messages offline and send them the next time you reconnect.

Some important (Top 8) recommendations for staying safe and secure when you're online are listed below;

- Change your password often. The quick act of changing your password can ensure your e-mail remains private. In addition, passwords that use both letters and numbers are harder to break.
- Don't share your password. Most e-mail administrators will not ask for your password. Do not be duped by malicious e-mails asking you for your password. This is a well-known, although not-too-common trick designed to fool you into sharing your password. As a rule, never share it with anyone.
- Never open attachments from unknown sources. They may contain what are known as "letterbombs" or "viruses," which can damage your PC.
- Always remember to sign out when you are done. It's quick, easy and may save your account from unwanted trespassers. If you are using a public terminal, at an internet cafe for example, it is advised that you close the browser you were using when you are ready to end your Internet session.
- Don't reply to unsolicited messages ("spam") mail, or other harassing or offensive mail. By responding, you only confirm that you are a person with an active e-mail address who can be plagued with constant unwanted e-mail solicitations. Instead, forward the unsolicited message to the customer service department of the source's e-mail (usually of a form similar to abuse@[implicateddomain].com). To help control spam, Hotmail provides members with "filters" for incoming mail. These can easily be set up to send certain messages (such as those that include certain words) directly to your online trash can.
- Make sure that you are using the most up-to-date Internet software (e.g. browsers such as Microsoft Internet Explorer or Netscape Navigator). More recent versions often offer enhanced security protection.
- Always use a secure network. Most corporate networks and Internet service providers are protected by administrators who watch for potential security problems and act to protect users from "hackers" (malicious users) who may try to steal personal information that is transferred through the network. Although the risk is small, use caution when on any unfamiliar network.
- Use stations maintained by sources you trust, or ask if the Internet terminal you are using is protected against security break-ins.

A SMALL LIST OF Search Engines

Yahoo.com (<http://www.Yahoo.com>)

Search.com (<http://search.com>)

EasySearcher (<http://www.easysearcher.com>)

AltaVista (<http://www.altavista.com>)

Excite (<http://www.excite.com>)

Google (<http://www.google.com>)
Hotbot (<http://www.hotbot.com>)
Infoseek (<http://www.infoseek.com>)
Lycos (<http://www.lycos.com>)
WebCrawler (<http://www.webcrawler.com>)
www.all4one.com (This useful tool queries four search engines at once)
www.av.com (Very powerful search engine which gives plenty of results)
www.askjeeves.com (Instead of entering words to search for, just type in your question)
www.rediff.com (Search for anything)
www.bigfoot.com (Looking for someone's email address ? Try here)
www.sawaal.com (All your questions answered)
www.hotbot.com (Useful search engine which helps to find pictures, video or music)
www.indiainfo.com (Info lets you search the web easily)
www.yahoo.com (Search engine which is also the most popular)
mp3.lycos.com (The place to start if you're after music files in the mp3 format)
www.metacrawler.com (Metacrawler puts your search through a host different engines)
www.mirago.co.uk (A search engine with an excellent selection of shopping links)
www.webferret.com (One of the easiest way to search the web)
www.indiatimes.com (The portal's search engine)
www.webcrawler.com (Let the webcrawler spider to do the searching for you)
www.indonet.net (Excellent Indian search engine with loads of useful search categories)
www.satyamonline.com (On ISP's site and has good search options)

COMPILED LIST OF INTERESTING FAQ's about HOTMAIL

1 How much e-mail storage space do I get with Hotmail?

Hotmail offers 2MB of storage space. If you do not keep your account below this limit, Hotmail may remove some messages, which cannot be recovered.

If you need additional storage space, there are a few options. You can use the latest version of Microsoft Internet Explorer v5 or above, which includes Outlook Express, which offers you the ability to store e-mails locally. You can send a blank e-mail message to hmoex@hotmail.com for more information on how to use the beta (pre-release) process to store Hotmail messages on your local PC, using Outlook Express.

Also, MSN has introduced Preview 2 of MSN Explorer as an integrated client for MSN services, such as MSN Hotmail. This client allows you to also store Hotmail locally on your machine. This too reduces the amount of storage that you need on hotmail.

2 Can I get Hotmail in different languages?

MSN Hotmail can now be viewed in a variety of languages.

You can make the language of a Hotmail session match the language of the Sign In page used to begin that session. You have your choice of the following languages: English, French, German, Italian, Japanese, Portuguese (Brazilian), and Spanish, and more to come.

3 Can I use Hotmail as a business address?

No. You may not use your Hotmail address as your primary business address. If, however, you work for a company with which you have an e-mail address and you want to use your Hotmail account to send and receive e-mail while away from your computer at work, you are encouraged to do so.

Example of Prohibited Use:

You are an individual who runs a business. You and your employees want to use Hotmail accounts rather than registering and administering your account through a paid ISP.

Example of Allowed Use:

You are a businessperson who travels. You have an account with your company (**yourname@yourcompany.com**). You use your Hotmail account to read and send solicited messages while you are traveling.

Hotmail prohibits account sharing. Since Hotmail is accessible from everywhere in the world, each individual is able to sign up for his or her own personal account. You are encouraged to sign up for an account of your own, to which only you have access. Sharing an account compromises the privacy and security of your e-mail. Each Hotmail user must have his or her individual e-mail account.

4 Is my e-mail really private and secure? (SSL)?

Secure connections (often called SSL, or Secure Sockets Layer) is the industry standard in Web security. It is used primarily for transmitting sensitive information over the Internet. When you have a secure connection between your browser and a Web site, no one else can easily access the data that you send across the connection. Hotmail uses SSL to encrypt your sign-in name, and password, when you log in to give you a high level of security.

It is Hotmail's policy to respect the privacy of its users. Therefore, Hotmail will not monitor, edit, or disclose the contents of a user's private communications unless required to do so by law or in the good faith belief that such action is necessary to:

- conform to the edicts of the law or comply with legal process served on Hotmail;
- protect and defend the rights or property of Hotmail; or
- act under exigent circumstances to protect the personal safety of its users or the public.

5 Can Hotmail protect its users from e-mail viruses?

MSN Hotmail is pleased to offer users McAfee VirusScan for free. Whenever you receive attachments in your Hotmail account, it will automatically scan them with McAfee's popular VirusScan before downloading.

MSN Hotmail recently added the ability to have all attachments you want to send scanned before they can be attached to your outgoing e-mail. So before you upload file to send to another user, it will also be scanned for viruses before you send it, reducing the spread of viruses to Hotmail users and the other recipients of your e-mail.

Remember, to ensure safety, Hotmail recommends that you never open attachments from unknown sources.

6 How do I send images and use e-mail stationery to make e-mail I send more colorful and fun?

(Emoticons/Stationery/RTF)

MSN Hotmail offers users stationery to send fun, colorful messages to family and friends! Always capture the right mood for your messages by selecting one of the many different stationery templates. Use the Stationery Chooser button on the Compose page to view the available stationery choices.

You can also accent your messages by using Rich Text Formatting. The Rich Text Formatting option, also allows you to add emoticons to your e-mail. This new feature allows you to add selected symbols or emoticons to your message. These icons help you convey emotion or add flair within a message.

7 What does it mean when my account is marked "inactive"?

Currently, if you do not sign in to your Hotmail account for 60 days, or if you do not sign-in within the first 10 days, your account will be marked "inactive." Stored e-mail and addresses will be deleted, and inbound mail will be refused. Your Passport will still function, and your Hotmail e-mail name will be reserved. To re-activate your account, simply go to <http://www.hotmail.com> and enter your Sign-In name and password. You will then be able to once again send and receive e-mail using hotmail. If your account stays "inactive" for over a period of 90 days, it may be permanently deleted.

8 Can I send and receive attachments on Hotmail?

Yes, you can send and receive as many files as you want to a message - up to 1MB (1024K) of attachments.

Attachments sent to your Hotmail account can be downloaded to your personal computer by clicking them. GIF and JPEG images and HTML files are automatically displayed in the browser window.

Chatting, video chatting and using social network sites

Objectives : At the end of this lesson you shall be able to

- explain chating process
- explain video chating process
- explain social network services.

Chatting Process

A web chat is a system that allows users to communicate in real time using easily accessible web interfaces. It is a type of internet online chat distinguished by its simplicity and accessibility to users who do not wish to take the time to install and learn to use specialized chat software. This trait allows users instantaneous access and only a web browser is required to chat. Users will always get the latest version of a chat service because no software installation or updates are required.

Video Chat

In video chat video of both caller and receiver can be seen on screen of both user along with audio. So it gives an impression of face to face interaction though the caller and receiver can be thousands of mile apart.

Social Networking services

A social networking service is a platform to build social networks or social relations among people who, share interests, activities, backgrounds or real-life connections. A social network service consists of a representation of each user (often a profile), his social links, and a variety of additional services. Social networking is web-based services that allow individuals to create a public profile, to create a list of users with whom to share connection, and view and cross the connections within the system. Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Social network sites are varied and they incorporate new information and communication tools such as, mobile connectivity, photo/video/sharing and blogging. Online community services

are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, pictures, posts, activities, events, interests with people in their network.

The main types of social networking services are those that contain category places (such as former school year or classmates), means to connect with friends (usually with self-description pages), and a recommendation system linked to trust. Popular methods now combine many of these, with American-based services such as Facebook, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr and Twitter widely used worldwide; Nexopia in Canada; Badoo, Bebo, Vkontakte (Russia), Delphi (also called Delphi Forums), Draugiem.lv (mostly in Latvia), Hi5 (Europe), Hyves (mostly in The Netherlands), iWiW (mostly in Hungary), Nasza-Klasa, Soup (mostly in Poland), Glocals in Switzerland, Skyrock, The Sphere, StudiVZ (mostly in Germany), Tagged, Tuenti (mostly in Spain), and XING in parts of Europe; Hi5 and Orkut in South America and Central America; Mxit in Africa; and Cyworld, Mixi, Orkut, renren, weibo and Wretch in Asia and the Pacific Islands.

There have been attempts to standardize these services to avoid the need to duplicate entries of friends and interests (see the FOAF standard and the Open Source Initiative). According to experts, the largest social networking users are Asian-Pacific regions with 615,9 million people. A 2013 survey found that 73% U.S adults use social networking sites.

Explaining threats to computers connected to Internet & process of protecting computers from it.

Objectives : At the end of this lesson you shall be able to

- **explain threats to computers connected to Internet**
- **process of Protecting computers from Internet.**

A web threat is any threat that uses the World Wide Web to facilitate cybercrime. Web threats use multiple types of malware and fraud, all of which utilize HTTP or HTTPS protocols, but may also employ other protocols and components, such as links in email or IM, or malware attachments or on servers that access the Web. They benefit cybercriminals by stealing information for subsequent sale and help absorb infected PCs into botnets.

Web threats pose a broad range of risks, including financial damages, identity theft, loss of confidential information/data, theft of network resources, damaged brand/personal reputation, and erosion of consumer confidence in e-commerce and online banking.

It is a type of threat related to information technology (IT). The IT risk, i.e. risk affecting has gained and increasing impact on society due to the spread of IT processes.

Web threats can be divided into two primary categories, based on delivery method - push and pull. Push-based threats use spam, phishing, or other fraudulent means to lure a user to a malicious (often spoofed) website which then collects information and/or injects malware. Push attacks use phishing, DNS poisoning (or pharming), and other means to appear to originate from a trusted source.

Precisely-targeted push-based web threats are often referred to as spear phishing to reflect the focus of their data gathering attack. Spear phishing typically targets specific individuals and groups for financial gain. In other push-based web threats, malware authors use social engineering such as enticing subject lines that reference holidays, popular personalities, sports, pornography, world events and other hot topics to persuade recipients to open the email and follow links to malicious websites or open attachments with malware that accesses the Web.

Pull-based web threats are often referred to as "drive-by" threats by experts (and more commonly as "drive-by downloads" by journalists and the general public), since they can affect any website visitor. Cybercriminals infect legitimate websites, which unknowingly transmit malware to visitors or alter search results to take users to malicious websites. Upon loading the page, the user's browser passively runs a malware downloader in a hidden HTML frame (IFRAME) without any user interaction.

Internet security

Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet. The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing. Different methods have been used to protect the transfer of data, including encryption.

Types of security

Network layer security

TCP/IP which stands for Transmission Control Protocol (TCP) and Internet Protocol (IP) aka Internet protocol suite can be made secure with the help of cryptographic methods and protocols. These protocols include Secure Sockets Layer (SSL), succeeded by Transport Layer Security (TLS) for web traffic, Pretty Good Privacy (PGP) for email, and IPsec for the network layer security.

Internet Protocol Security (IPsec)

This protocol is designed to protect communication in a secure manner using TCP/IP aka Internet protocol suite. It is a set of security extensions developed by the Internet Task force IETF, and it provides security and authentication at the IP layer by transforming data using encryption. Two main types of transformation that form the basis of IPsec: the Authentication Header (AH) and ESP. These two protocols provide data integrity, data origin authentication, and anti-replay service. These protocols can be used alone or in combination to provide the desired set of security services for the Internet Protocol (IP) layer.

The basic components of the IPsec security architecture are described in terms of the following functionalities:

- Security protocols for AH and ESP
- Security association for policy management and traffic processing
- Manual and automatic key management for the internet key exchange (IKE)
- Algorithms for authentication and encryption

The set of security services provided at the IP layer includes access control, data origin integrity, protection against replays, and confidentiality. The algorithm allows these sets to work independently without affecting other parts of the implementation. The IPsec implementation is operated in a host or security gateway environment giving protection to IP traffic.

Security token

Some online sites offer customers the ability to use a six-digit code which randomly changes every 30-60 seconds on a security token. The keys on the security token have built in mathematical computations and manipulate numbers based on the current time built into the device. This means that every thirty seconds there is only a certain array of numbers possible which would be correct to validate access to the online account. The website that the user is logging into would be made aware of that devices' serial number and would know the computation and correct time built into the device to verify that the number given is indeed one of the handful of six-digit numbers that works in that given 30-60 second cycle. After 30-60 seconds the device will present a new random six-digit number which can log into the website.

Electronic mail security (E-mail)

Background

Email messages are composed, delivered, and stored in a multiple step process, which starts with the message's composition. When the user finishes composing the message and sends it, the message is transformed into a standard format: an RFC 2822 formatted message. Afterwards, the message can be transmitted. Using a network connection, the mail client, referred to as a mail user agent (MUA), connects to a mail transfer agent (MTA) operating on the mail server. The mail client then provides the sender's identity to the server. Next, using the mail server commands, the client sends the recipient list to the mail server. The client then supplies the message. Once the mail server receives and processes the message, several events occur: recipient server identification, connection establishment, and message transmission. Using Domain Name System (DNS) services, the sender's mail server determines the mail server(s) for the recipient(s). Then, the server opens up a connection(s) to the recipient mail server(s) and sends the message employing a process similar to that used by the originating client, delivering the message to the recipient(s).

Pretty Good Privacy (PGP)

Pretty Good Privacy provides confidentiality by encrypting messages to be transmitted or data files to be stored using an encryption algorithm such Triple DES or CAST-128. Email messages can be protected by using cryptography in various ways, such as the following:

- Signing an email message to ensure its integrity and confirm the identity of its sender.
- Encrypting the body of an email message to ensure its confidentiality.

- Encrypting the communications between mail servers to protect the confidentiality of both message body and message header.

The first two methods, message signing and message body encryption, are often used together; however, encrypting the transmissions between mail servers is typically used only when two organizations want to protect emails regularly sent between each other. For example, the organizations could establish a virtual private network (VPN) to encrypt the communications between their mail servers over the Internet. Unlike methods that can only encrypt a message body, a VPN can encrypt entire messages, including email header information such as senders, recipients, and subjects. In some cases, organizations may need to protect header information. However, a VPN solution alone cannot provide a message signing mechanism, nor can it provide protection for email messages along the entire route from sender to recipient.

Multipurpose Internet Mail Extensions (MIME)

MIME transforms non-ASCII data at the sender's site to Network Virtual Terminal (NVT) ASCII data and delivers it to client's Simple Mail Transfer Protocol (SMTP) to be sent through the Internet. The server SMTP at the receiver's side receives the NVTASCII data and delivers it to MIME to be transformed back to the original non-ASCII data.

Message Authentication Code

A Message authentication code (MAC) is a cryptography method that uses a secret key to encrypt a message. This method outputs a MAC value that can be decrypted by the receiver, using the same secret key used by the sender. The Message Authentication Code protects both a message's data integrity as well as its authenticity.

Firewalls

A firewall (computing) controls access between networks. It generally consists of gateways and filters which vary from one firewall to another. Firewalls also screen network traffic and are able to block traffic that is dangerous. Firewalls act as the intermediate server between SMTP and Hypertext Transfer Protocol (HTTP) connections.

Role of firewalls in web security

Firewalls impose restrictions on incoming and outgoing Network packets to and from private networks. Incoming or outgoing traffic must pass through the firewall; only authorized traffic is allowed to pass through it. Firewalls create checkpoints between an internal private network and the public Internet, also known as choke points(borrowed from the identical military term of a combat limiting geographical feature). Firewalls can create choke points based on IP source and TCP port number. They can also serve as the platform for IPsec. Using tunnel mode capability, firewall can be used to implement VPNs. Firewalls can also limit network

exposure by hiding the internal network system and information from the public Internet. Also, WE HAVE A LOT OF BIG WAYE to deal with it.

Types of firewalls

Packet filter

A packet filter is a first generation firewall that processes network traffic on a packet-by-packet basis. Its main job is to filter traffic from a remote IP host, so a router is needed to connect the internal network to the Internet. The router is known as a screening router, which screens packets leaving and entering the network.

Stateful packet inspection

In a stateful firewall the circuit-level gateway is a proxy server that operates at the network level of an Open Systems Interconnection (OSI) model and statically defines what traffic will be allowed. Circuit proxies will forward Network packets (formatted unit of data) containing a given port number, if the port is permitted by the algorithm. The main advantage of a proxy server is its ability to provide Network Address Translation (NAT), which can hide the user's IP address from the Internet, effectively protecting all internal information from the Internet.

Application-level gateway

An application-level firewall is a third generation firewall where a proxy server operates at the very top of the OSI model, the IP suite application level. A network packet is forwarded only if a connection is established using a known protocol. Application-level gateways are notable for analyzing entire messages rather than individual packets of data when the data are being sent or received.

Malicious software

Malware

A computer user can be tricked or forced into downloading software onto a computer that is of malicious intent. Such programs are known as malware and come in many forms, such as viruses, Trojan horses, spyware, and worms. Malicious software is sometimes used to form botnets.

Viruses

Computer Viruses are programs that can replicate their structures or effects by infecting other files or structures on a computer. The common use of a virus is to take over a computer to steal data.

Worms

Computer worms are programs that can replicate themselves throughout a computer network, performing malicious tasks throughout.

Trojan horse

A Trojan horse commonly known as a Trojan is a general term for malicious software that pretends to be harmless, so that a user willingly allows it to be downloaded onto the computer.

Ransomware and Scareware

Botnet

A botnet is a network of zombie computers that have been taken over by a robot or bot that performs large-scale malicious acts for the creator of the botnet.

Spyware

The term spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

Denial-of-service attack

A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of the concerted efforts to prevent an Internet site or service from functioning efficiently or at all, temporarily or indefinitely.

Browser choice

Web browser statistics tend to affect the amount a Web browser is exploited. For example, Internet Explorer 6, which used to own a majority of the Web browser market share, is considered extremely insecure because vulnerabilities were exploited due to its former popularity. Since browser choice is more evenly distributed (Internet Explorer at 28.5%, Firefox at 18.4%, Google Chrome at 40.8%, and so on) and vulnerabilities are exploited in many different browsers.

Application vulnerabilities

Applications used to access Internet resources may contain security vulnerabilities such as memory safety bugs or flawed authentication checks. The most severe of these bugs can give network attackers full control over the computer. Most security applications and suites are incapable of adequate defense against these kinds of attacks.

Internet security products

Antivirus

Antivirus programs and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Before 2000 a user would pay for antivirus software, 10 years later however, computer users can choose from a host of free security applications on the Internet.

Security Suites

So called "security suites" were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more. They may now offer theft protection, portable storage device safety check, private internet browsing, cloud anti-spam, a file shredder or make security-related decisions (answering popup windows) and several were free of charge as of at least 2012.

Outlook Express & Google+

Objectives : At the end of this lesson you shall be able to

- explain outlook express
 - explain Google+
-

Microsoft Outlook

Microsoft Outlook is a personal information manager from Microsoft, available as a part of the Microsoft Officesuite. Although often used mainly as an email application, it also includes a calendar, task manager, contact manager, note taking, journal, and web browsing. It can be used as a stand-alone application, or can work with Microsoft Exchange Server and Microsoft SharePoint Server for multiple users in an organization, such as shared mailboxes and calendars, Exchange public folders, SharePoint lists, and meeting schedules. There are third-party add-on applications that integrate Outlook with devices such as BlackBerry mobile phones and with other software such as Office and Skype internet communication. Developers can also create their own custom software that works with Outlook and Office components using Microsoft Visual Studio. In addition, Windows Mobile devices can synchronize almost all Outlook data to Outlook Mobile.

Google+

Google+ (pronounced and sometimes written as Google Plus) is a social networking and identity service that is owned and operated by Google Inc. Google has described Google+ as a "social layer" that enhances many of its online properties, and that it is not simply a social networking website, but also an authorship tool that associates web-content directly with its owner/author. It is the second-largest social networking site in the world after Facebook. 540 million monthly active users are part of the Identity service site, by interacting socially with Google+'s enhanced properties, like Gmail, +1 button, and YouTube comments. In October 2013, Google counted 540 million active users who used at least one Google+ service, of which 300 million users are active in "the stream".

Creation

Google launched the Google+ service as an invitation-only "field test" on June 28, 2011, but soon suspended early invites due to an "insane demand" for new accounts. On August 6, each Google+ member had 150 invitations to give out until September 20, 2011, when Google+ opened to everyone 18 years of age or older without the need for an invitation. It was opened for a younger age group (13 years or older in US and most countries, 14 or older in South Korea and Spain, 16 or older in the Netherlands) on January 26, 2012. Google+ is available as a website and on mobile devices.

Before the launch, Google referred to Google+ as Google Circles, a name alluding to its emphasis on organising friendship information. Google+ is considered the company's fourth foray into social networking, following Google Buzz (launched 2010, retired in 2011), Google Friend Connect (launched 2008, retired by March 1, 2012) and Orkut (launched in 2004, as of 2013 operated entirely by subsidiary Google Brazil). Sources such as The New York Times have declared it Google's biggest attempt to rival the social network Facebook, which has over 1 billion users.

Web designing

Objectives : At the end of this lesson you shall be able to

- explain web sites and web pages
 - explain static and dynamic web pages
 - explain HTML, DHTML and XML
 - explain the concept of web hosting, web server, application server and database server.
-

Introduction

The World Wide Web (WWW) was created in 1990 by CERN physicist Tim Berners-Lee. On 30 April 1993, CERN announced that the World Wide Web would be free to use for anyone. Before the introduction of HTML and HTTP, other protocols such as File Transfer Protocol and the Gopher Protocol were used to retrieve individual files from a server. These protocols offer a simple directory structure which the user navigates and chooses files to download. Documents were most often presented as plain text files without formatting, or were encoded in word processors formats.

Websites

A website, also written as Web site, web site, or simply site, is a set of related web page containing content (media) such as written language, Image, video, sound, etc. A website is hosted on at least one web server, accessible via a network such as the internet or a private local area network through an Internet address known as a uniform resource locator. All publicly accessible websites collectively constitute the world wide web.

A webpage is a document, typically written in plain text interspersed with formatting instructions of Hypertext Mark-up Language (HTML) XHTML. A webpage may incorporate elements from other websites with suitable HTML anchor.

Web pages are accessed and transported with the Hypertext Transfer Protocol (HTTP), which may optionally employ encryption secure, HTTPS to provide security and privacy for the user of the webpage content. The user's application, often a web browser, renders the page content according to its HTML Mark-up instructions onto a Computer monitor.

The pages of a website can usually be accessed from a simple Uniform Resource Locator (URL) called the web address. The URLs of the pages organize them into a hierarchy, although hyperlink between them conveys the reader's perceived sitemap and guides the reader's navigation of the site which generally includes a Home page with most of the links to the site's web content, and a supplementary about page, contact page and link page.

Some websites require a subscription to access some or all of their content. Examples of subscription websites include many business sites, parts of news websites, Academic journal websites, gaming websites, file-sharing websites, Internet forum, web-based Email, Social networking websites, websites providing real-time Stock market data, and websites providing various other services (e.g., websites offering storing and/or sharing of images, files and so forth).

A website may be

- Personal website
- Commercial website
- E-Government
- Non-profit organization website.

Static Website

A static website is one that has web pages stored on the server in the format that is sent to a client web browser. It is primarily coded in Hypertext Markup Language (HTML).

Simple forms or marketing examples of websites, such as classic website, a five-page website or a brochure website are often static websites, because they present pre-defined, static information to the user. This may include information about a company and its products and services through text, photos, animations, audio/video and interactive menus and navigation.

This type of website usually displays the same information to all visitors. Similar to handing out a printed brochure to customers or clients, a static website will generally provide consistent, standard information for an extended period of time. Although the website owner may make updates periodically, it is a manual process to edit the text, photos and other content and may require basic website design skills and software.

Advantages

- Static Websites are easier to develop
- Can be developed quickly
- They are indexed easily by search engines as all the web pages actually exist on the server, which is not the case with dynamic websites.

Disadvantages

- Static websites cannot do complex tasks required by many online services.
- Updating a whole site can be cumbersome and time consuming.
- An isolation of Data and Design is not provided in static websites.

Dynamic Website

A dynamic website is one that changes or customizes itself frequently and automatically, based on certain criteria.

Dynamic websites can have two types of dynamic activity: Code and Content. Dynamic code is invisible or behind the scenes and dynamic content is visible or fully displayed

Advantages

- Can do more complex task required by online services.
- They are easier to update.
- Isolation of data and design allows programmers and content writers to work independently.

Disadvantages

- Can take more time to build.
- Can be difficult to build.
- Dynamic websites are not indexed by search engines easily, since they do not have actual web pages present on the web server. With continuous improvements in search engine technology, this problem is now very much eliminated and you can find that many dynamic websites are very well indexed by search engines now a days.

A few such classifications are:

- Affiliate: enabled portal that renders not only its custom CMS but also syndicated content from other content providers for an agreed fee. There are usually three relationship tiers. Affiliate Agencies (e.g., Commission Junction), Advertisers (e.g., eBay) and consumer (e.g., Yahoo!).
- Archive site: used to preserve valuable electronic contents that are on verge of extinction. For examples: Internet Archive, which since 1996 has preserved billions of old and new web pages; and Google Groups, which in early 2005 had preserved over 845,000,000 messages posted to Usenet news/discussion groups.
- Blog Site: sites generally used to post online diaries, comments or views that may include discussion forums (e.g., blogger, Xanga).

- Content Site: these sites create and sell of original content to end-user. (e.g., Slate, About.com).
- Corporate website: used to provide information regarding business, organization, or service.
- Commerce site (or eCommerce site): these sites are designed for purchasing or selling goods, such as Amazon.com, CSN Stores, and Overstock.com.
- Community site: sites where persons with similar interests communicate to each other through chatting and messaging or through soci message boards, such as MySpace or Facebook.
- City Site: A site that shows information about a certain city or town and events that takes place in that town. Usually created by the city council. For example, Richmond.com is the geodomain for Richmond, Virginia.
- Information site: contains content that is intended to inform visitors, but not necessarily for commercial purposes, such as: RateMyProfessors.com, Free Internet Lexicon and Encyclopaedia. Most government, educational and non-profit institutions have an informational site.
- Mirror site: A complete reproduction of a website.
- News site: similar to an information site, but dedicated to dispensing news and commentary.
- Personal homepage: run by an individual or a small group such as a family that contains information or any content that the individual wishes to include. These are usually uploaded using a web hosting service such as Geocities.
- Phish Site: a website created to fraudulently acquire sensitive information, such as passwords and credit card details, by disguising as a trustworthy person or business (such as Social Security Administration, PayPal) in an electronic communication.
- Political site: A site on which people may voice political views.
- Rating site: A site on which people can praise or disparage what is featured.
- Review site: A site on which people can post reviews for products or services.
- School site: a site on which teachers, students, or administrators can post information about current events at or involving their school.
- Video sharing: A site that enables user to upload videos, such as YouTube and Google Video.
- Search engine site: a site that provides general information and is intended as a gateway for retrieving other sites. Google, Yahoo and MSN are the most widely known search engines.
- Shock site: includes images or other material that is intended to be offensive to most viewers (e.g. rotten.com).

- Warez: a site designed to host and let users download copyrighted materials illegally.
- Web portal: a site is vehicle that provides a gateway to other resources on the Internet or an intranet.

Web Pages

A web page or webpage is a Document or information resource that is suitable for the world wide Web and can be accessed through a web browser and displayed on a computer display or mobile device. This information is usually in HTML or XHTML format, and may provide navigation bar to other web pages via Hyper text Hyper link. Web pages frequently subsume other resources such as Cascading Style Sheet, Client-side-scripting and Images into their final presentation.

Web pages may be retrieved from a local computer or from a remote Web server. The web server may restrict access only to a private network, e.g. a corporate Intranet or it may publish pages on the World Wide Web. Web pages are requested and served from web. Web server using Hypertext Transfer Protocol (HTTP).

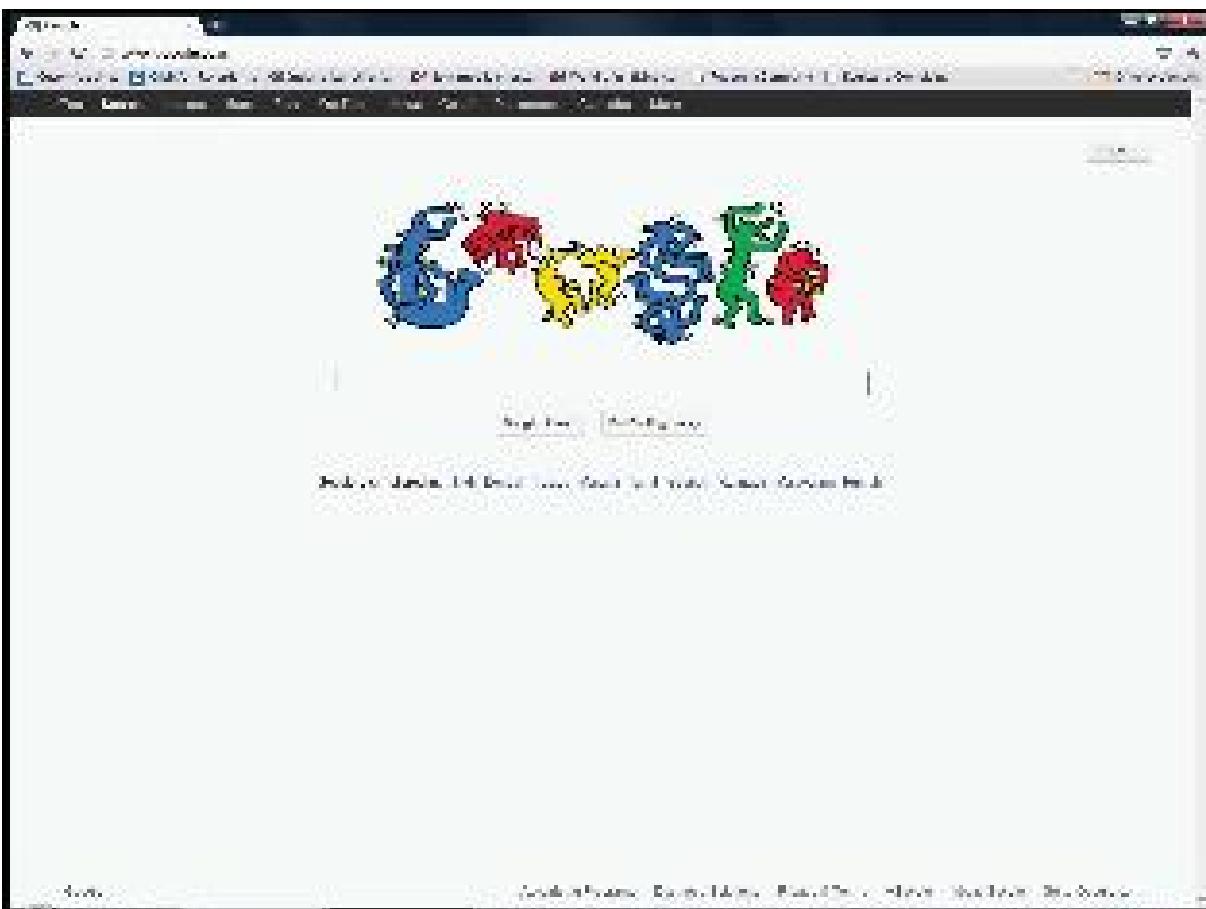
Web pages may consist of files of static text and other Web content stored within the Web server's file system(Static Web page), or may be constructed by Server-side scripting when they are requested (Dynamic web page). Client-side scripting can make web pages more responsive to user input once on the client browser.

Web Browser

A Web browser can have a Graphical User Interface, like Internet Explorer, Mozilla Firefox, Google Chrome and Opera (web browser), or can be Command Line Interface, like Lynx (web browser) (Fig 1) or Links (web browser). Web users with disabilities often use assistive technologies and adaptive strategies to Web accessibility web pages. Users may be colour blind, may or may not want to use a mouse perhaps due to repetitive stress injury or motor-neurone problems, may be deaf and require audio to be captioned, may be blind and using a Screen reader or display, may need screen magnification, etc. Disabled and able-bodied users may disable the download and viewing of images and other media, to save time, network bandwidth or merely to simplify their browsing experience.

Users of mobile devices often have restricted displays and bandwidth. Anyone may prefer not to use the fonts, font sizes, styles and colour schemes selected by the web page designer and may apply their own CSS styling to the page. The World Wide Web Consortium (W3C) and Web Accessibility Initiative (WAI) recommend that all web pages should be designed with all of these options in mind.

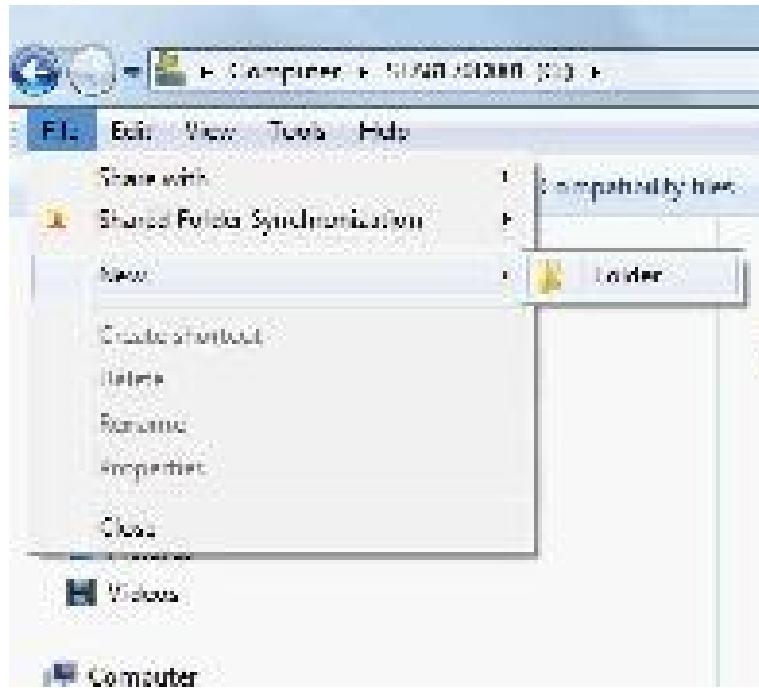
Fig 1



Downloading a Software from Internet

- 1 Create a Temporary Files folder by opening My Computer, double click on your hard drive (typically the C: drive), then select File/New/Folder as on Fig 2.

Fig 2



- 2 Type "Temporary File" and name it as on Fig 3.
- 3 Type "My SQL 5. 1 free download " from freeware software website on internet.

Note: As an example Choose "<http://dev.mysql.com/downloads/>" select "My SQL Community server" in download from the opened site as on Fig 4

Fig 3

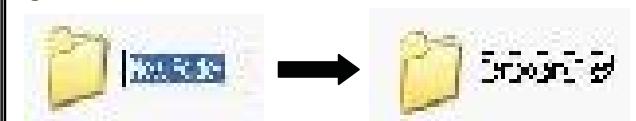


Fig 4



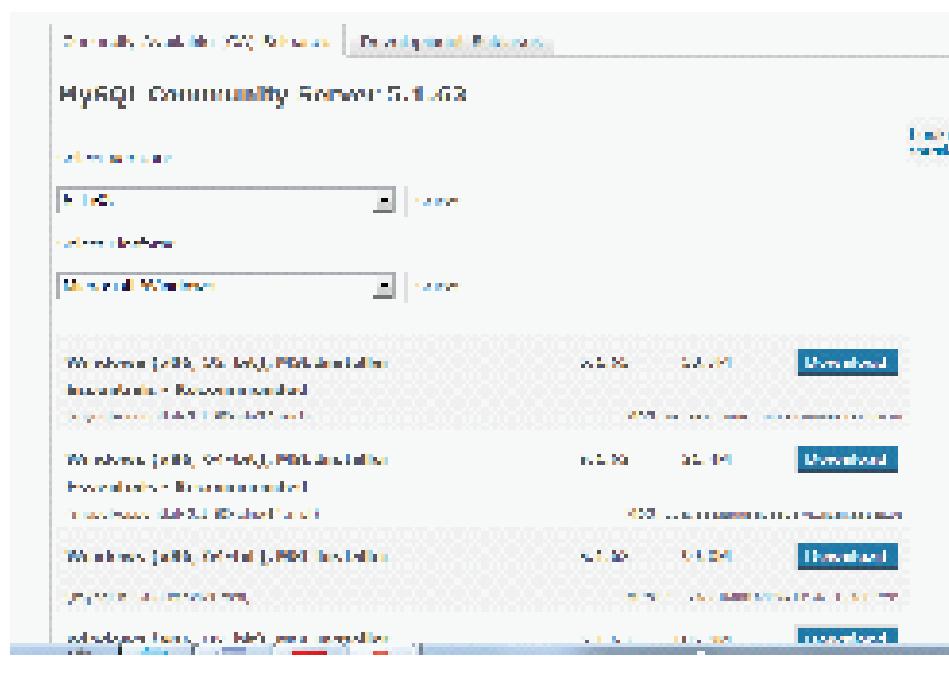
4 Click "MySQL Community Server 5.1 " from looking for previous version option as on Fig 5

Fig 5

A screenshot of the MySQL Community Server 5.1 download page. The title is 'Download MySQL Community Server'. It features two main download options: 'Recommended: MySQL Community Server 5.1' and 'Alternative: MySQL Community Server 5.0'. Below these are sections for 'Windows (x86, 32-bit), MSI Installer Essentials - Recommended' and 'Windows (x86, 32-bit), ZIP Archive - Alternative'. There is also a 'Source code' section with links to 'MySQL Community Server 5.1' and 'MySQL Community Server 5.0'.

5 Choose "Windows (x86, 32-bit), MSI Installer Essentials - Recommended" and click download (Fig.6).

Fig 6



Note: Save the "My SQL 5.1.63" in the created Folder name " Temporary Folder"

- 6 Burn the Downloaded "My SQL 5.1.63" in a CD ROM for Installation.

WEB LANGUAGES

Web languages are called as Markup languages are designed for the processing, definition and presentation of text. The language specifies code for formatting, both the layout and style, within a text file. The code used to specify the formatting are called tags

Four Types of Markup languages

- 1 BML
- 2 HTML
- 3 DHTML
- 4 XML

BML (Better markup language)

BML is essentially a simple macro language. Macros are called blocks in BML. Blocks are defined in look files, and are invoked in BML files. Blocks accept parameters and are divided into several types, according to how parameters are transmitted and how the definition of the block is able to make use of them.

HTML (Hyper text markup Language)

HTML or HyperText Markup Language is the language of the web. All web pages are written in HTML. HTML defines the way that images, multimedia, and text are displayed in web browsers. It includes elements to connect the

documents (hypertext) and make web documents interactive (such as with forms).

HTML is a defined standard markup language. That standard was developed by the World Wide Web Consortium (W3C). It is based upon SGML (Standard Generalized Markup Language). It is a language that uses tags to define the structure of your text. Elements and tags are defined by the < and > characters.

DHTML

Dynamic HTML is not really a new specification of HTML, but rather a new way of looking at and controlling the standard HTML codes and commands.

When thinking of dynamic HTML, we need to remember the qualities of standard HTML, especially that once a page is loaded from the server, it will not change until another request comes to the server. Dynamic HTML give more control over the HTML elements and allows them to change at any time, without returning to the Web server.

There are four parts to DHTML:

- Document Object Model (DOM) (definition)
- Scripts
- Cascading Style Sheets (CSS)
- XHTML

DOM

The DOM is allows to access any part of Web page to change it with DHTML. Every part of a Web page is specified by the DOM and using its consistent naming conventions can access them and change their properties.

Scripts

Scripts written in either JavaScript or ActiveX are the two most common scripting languages used to activate DHTML. You use a scripting language to control the objects specified in the DOM.

Cascading Style Sheets

CSS is used in DHTML to control the look and feel of the Web page. Style sheets define the colors and fonts of text, the background colors and images, and the placement of objects on the page. Using scripting and the DOM, we can change the style of various elements.

XHTML

XHTML or HTML 4.x is used to create the page itself and build the elements for the CSS and the DOM to work on. There is nothing special about XHTML for DHTML - but having valid XHTML is even more important, as there are more things working from it than just the browser.

Features of DHTML

There are four primary features of DHTML:

- 1 Changing the tags and properties
- 2 Real-time positioning
- 3 Dynamic fonts (Netscape Communicator)
- 4 Data binding (Internet Explorer)

Changing the tags and properties

This is one of the most common uses of DHTML. It allows to change the qualities of an HTML tag depending on an event outside of the browser (such as a mouse click, time, or date, and so on). we can use this to preload information onto a page, and not display it unless the reader clicks on a specific link.

Real-time positioning

Objects, images, and text moving around the Web page. This can allow we to play interactive games with the readers or animate portions of the screen.

Dynamic Fonts

This is a Netscape only feature. Netscape developed this to get around the problem designers had with not knowing what fonts would be on a reader's system. With dynamic fonts, the fonts are encoded and downloaded with the page, so that the page always looks how the designer intended it to.

Data binding

This is an IE only feature. Microsoft developed this to allow easier access to databases from Web sites. It is very similar to using a CGI to access a database, but uses an ActiveX control to function.

XML

Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services

Creating an HTML document

Before start writing code to write a web page, it is a good practice to plan ahead the appearance of the web page. An HTML document has two elements:

- 1 Document Content
- 2 Tags

Document content is the information on a web page that the user will see. That information could be text or graphics.

Tags are the HTML codes that control how the document content will appear. The tags, in other words, will determine whether the text will be bold, black or blue, or of font type Time New Roman or Arial.

Start Notepad

To start Notepad go to:

Start

All Programs

Accessories

Notepad

Edit Your HTML with Notepad (Fig 7)

Type your HTML code into your Notepad:

Save Your HTML

Fig 7



```
Untitled - Notepad
File Edit Format View Help
<!DOCTYPE html>
<html>
<body>
<h1>My First Heading</h1>
<p>My first paragraph.</p>
</body>
</html>
```

Select Save as.. in Notepad's file menu.

When you save an HTML file, you can use either the .htm or the .html file extension.

Save the file in a folder that is easy to remember

Run the HTML in Your Browser

Start your web browser and open your html file from the File, Open menu, or just browse the folder and double-click your HTML file.

The result should look much like this: (Fig 8)

Fig 8



Structure of Markup Language

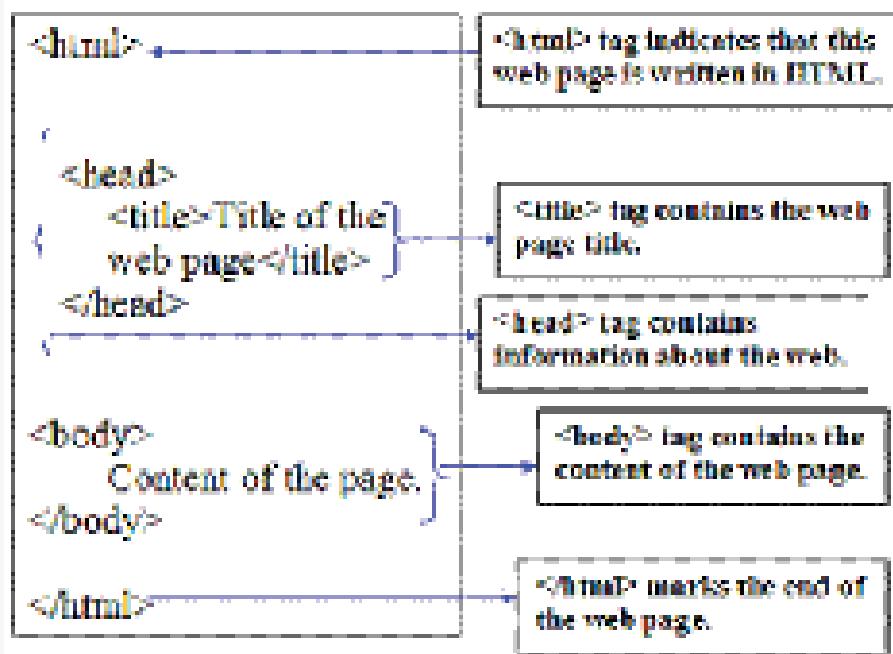
An HTML document has two* main parts:

- 1 head. The head element contains title and meta data of a web document.
- 2 body. The body element contains the information that you want to display on a web page.

To make your web pages compatible with HTML 4, you need to add a document type declaration (DTD) before the HTML element. Many web authoring software add DTD and basic tags automatically when you create a new web page.

In a web page, the first tag (specifically, <html>) indicates the markup language that is being used for the document. The <head> tag contains information about the web page. Lastly, the content appears in the <body> tag. (Fig 9)

Fig 9



The <!DOCTYPE> Declaration

There are many different documents on the web. A browser can only display a document correctly, if it knows what kind of document it is.

There are also many different versions of HTML, and a browser can only display an HTML page 100% correctly if it knows the exact HTML version used in the page. This is what <!DOCTYPE> is used for.

<!DOCTYPE> is not an HTML tag. It is an information (a declaration) to the browser about what version the HTML is written in.

The HTML <head> Element

The <head> element is a container for all the head elements. Elements inside <head> can include scripts, instruct the browser where to find style sheets, provide meta information, and more.

The following tags can be added to the head section: <title>, <base>, <link>, <meta>, <script>, and <style>.

The HTML <title> Element

The <title> tag defines the title of the document.

The title element is required in all HTML/XHTML documents.

The title element:

- Defines a title in the browser toolbar.

- Provides a title for the page when it is added to favorites.
- Displays a title for the page in search-engine results.

HTML Element Syntax

- An HTML element starts with a start tag / opening tag
- An HTML element ends with an end tag / closing tag
- The element content is everything between the start and the end tag
- Some HTML elements have empty content
- Empty elements are closed in the start tag
- Most HTML elements can have attributes

HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

Examples

```

<html>
<body>
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
<h4>This is heading 4</h4>
<h5>This is heading 5</h5>
<h6>This is heading 6</h6>
</body>
</html>

```

Result

This is heading 1

This is heading 2

This is heading 3

This is heading 4

This is heading 5

This is heading 6

HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag.

```
<html>
<body>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
</body>
</html>
```

Examples

This is a paragraph.

This is a paragraph.

This is a paragraph.

HTML Links

HTML links are defined with the `<a>` tag.

```
<html>
<body>
<a href="http://www.facebook.com">
This is a link</a>
</body>
</html>
```

Result

This is a link

By clicking the link it shows the facebook login page

HTML Images

HTML images are defined with the `` tag.

```
<html>
<body>

</body>
</html>
```

Result (Fig 10)

Fig 10



HTML Attributes

- HTML elements can have attributes
- Attributes provide additional information about an element
- Attributes are always specified in the start tag
- Attributes come in name/value pairs like: `name="value"`

Attribute Example

HTML links are defined with the `<a>` tag. The link address is specified in the `href` attribute:

```
<html>
<body>
<a href="http://www.yahoo.com">
This is a link</a>
</body>
</html>
```

Result

This is the link

By clicking the link yahoo home page appears (Fig 11).

Formatting

Create Line Breaks - The `
` Element:

Whenever the `
` element, anything following it starts on the next line. This tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Fig 11



Example:

```
Hello<br/>  
You come most carefully upon your hour.<br/>  
Thanks<br/>  
Mahnaz
```

Result

```
Hello  
You come most carefully upon your hour.  
Thanks  
Mahnaz
```

To Become

Centring Content - The <center> Element:

You can use <center> tag to put any content in the center of the page or any table cell.

Example:

```
<p>This is not in the center.</p>  
<center>  
<p>This is in the center.</p>  
</center>
```

This will produce following result:

```
This is not in the center.  
This is in the center.
```

Soft Hyphens:

Occasionally, you will want to allow a browser to hyphenate long words to better justify a paragraph. For example, consider the following code and its resulting output.

```
<p style="text-align: justify;"> The morbid fear of  
the number 13, or triskaidekaphobia, has plagued  
some important historic figures like Mahamiya and  
Nanao.</p>
```

This will produce following result:

```
Example for soft hyphen - The morbid fear of the  
number 13, or triskaidekaphobia, has plagued some  
important historic figures like Mahamiya and Nanao.
```

Preserve Formatting - The <pre> Element:

Sometimes you want your text to follow the exact format of how it is written in the HTML document. In those cases, you can use the preformatted tag (<pre>).

Any text between the opening <pre> tag and the closing </pre> tag will preserve the formatting of the source document.

```
<pre>  
function testFunction( strText ){  
    alert (strText)  
}  
</pre>
```

This will produce following result:

```
function testFunction( strText ){  
    alert (strText)  
}
```

Horizontal Rules - The `<hr />` Element

Horizontal rules are used to visually break up sections of a document. The `<hr>` tag creates a line from the current position in the document to the right margin and breaks the line accordingly.

For example you may want to give a line between two paragraphs as follows:

```
<p>This is paragraph one and should be on top</p>
<hr />
```

```
<p>This is paragraph two and should be at bottom</p>
```

This will produce following result:

This is paragraph one and should be on top

This is paragraph two and should be at bottom

Again `<hr />` tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Note: The `<hr />` element has a space between the characters hr and the forward slash. If you omit this space, older browsers will have trouble rendering the line break, while if you miss the forward slash character and just use `<hr>` it is not valid XHTML

Presentational Tags:

If you use a word processor, you are familiar with the ability to make text bold, italicized, or underlined; these are just three of the ten options available to indicate how text can appear in HTML and XHTML.

Bold Text - The `` Element:

Anything that appears in a `...` element is displayed in bold, like the word bold here:

```
<p>The following word uses a <b>bold</b>
typeface.</p>
```

This will produce following result:

The following word uses a bold typeface.

Italic Text - The `<i>` Element:

Anything that appears in a `<i>...</i>` element is displayed in italicized, like the word italicized here:

```
<p>The following word uses a <i>italicized</i>
typeface.</p>
```

This will produce following result:

The following word uses a italicized typeface.

Underlined Text - The `<u>` Element:

Anything that appears in a `<u>...</u>` element is displayed with underline, like the word underlined here:

```
<p>The following word uses a <u>underlined</u>
typeface.</p>
```

This will produce following result:

The following word uses a underlined typeface.

Strike Text - The `<strike>` Element:

Anything that appears in a `<strike>...</strike>` element is displayed with strikethrough, which is a thin line through the text:

```
<p>The following word uses a
<strike>strikethrough</strike> typeface.</p>
```

This will produce following result:

The following word uses a strikethrough typeface.

Monospaced font - The `<tt>` Element:

The content of a `<tt>` element is written in monospaced font. Most fonts are known as variable-width fonts because different letters are of different widths (for example, the letter m is wider than the letter i). In a monospaced font, however, each letter is the same width.

```
<p>The following word uses a
<tt>monospaced</tt> typeface.</p>
```

This will produce following result:

The following word uses a monospaced typeface.

Superscript Text - The `<sup>` Element:

The content of a `<sup>` element is written in superscript; the font size used is the same size as the characters surrounding it but is displayed half a character's height above the other characters.

```
<p>The following word uses a
<sup>superscript</sup> typeface.</p>
```

This will produce following result:

The following word uses a superscript typeface.

Subscript Text - The `<sub>` Element:

The content of a `<sub>` element is written in subscript; the font size used is the same as the characters surrounding it, but is displayed half a character's height beneath the other characters.

```
<p>The following word uses a
<sub>subscript</sub> typeface.</p>
```

This will produce following result:

The following word uses a subscript typeface.

Larger Text - The **<big>** Element:

The content of the **<big>** element is displayed one font size larger than the rest of the text surrounding it.

```
<p>The following word uses a <big>big</big>  
typeface.</p>
```

This will produce following result:

The following word uses a big typeface.

Smaller Text - The **<small>** Element:

The content of the **<small>** element is displayed one font size smaller than the rest of the text surrounding it.

```
<p>The following word uses a <small>small</  
small> typeface.</p>
```

This will produce following result:

The following word uses a small typeface.

Styling HTML with CSS

CSS was introduced together with HTML 4, to provide a better way to style HTML elements.

CSS can be added to HTML in the following ways:

- Inline - using the **style** attribute in HTML elements
- Internal - using the **<style>** element in the **<head>** section
- External - using an external CSS file

```
<html>  
<body style="background-color:PowderBlue;">  
<h1>Look! Styles and colors</h1>  
<p style="font-family:verdana;color:red;">  
This text is in Verdana and red</p>  
<p style="font-family:times;color:green;">  
This text is in Times and green</p>  
<p style="font-size:30px;">This text is 30 pixels high</p>  
</body>  
</html>
```

Result:

Look! Styles and colors

This text is in Verdana and red

This text is in Times and green

This text is 30 pixels high

HTML Hyperlinks (Links)

A hyperlink (or link) is a word, group of words, or image that you can click on to jump to a new document or a new section within the current document.

When you move the cursor over a link in a Web page, the arrow will turn into a little hand.

Links are specified in HTML using the **<a>** tag.

The **<a>** tag can be used in two ways:

- 1 To create a link to another document, by using the **href** attribute
- 2 To create a bookmark inside a document, by using the **name** attribute

The HTML code for a link is simple. It looks like this:

```
<a href="url">Link text</a>
```

The **href** attribute specifies the destination of a link.

```
<a href="http://www.yahoo.com/">Visit yahoo</a>
```

which will display like this: Visit yahoo.com

Clicking on this hyperlink will send the user to Yahoo homepage.

The "Link text" doesn't have to be text. It can be an image or any other HTML element.

HTML Links - The target Attribute

The target attribute specifies where to open the linked document.

The example below will open the linked document in a new browser window or a new tab:

Example

```
<a href="http://www.yahoo.com/" target="_blank">Visit  
yahoo !</a>  
<html>  
<body>  
<a href="http://www.yahoo.com" target="_blank">Visit  
yahoo.com!</a>  
<p>If you set the target attribute to "_blank", the link will  
open in a new browser window/tab.</p>  
</body>  
</html>
```

Result

Visit yahoo.com!

If you set the target attribute to "_blank", the link will open in a new browser window/tab.

HTML Images - The Tag and the Src Attribute

In HTML, images are defined with the tag.

The tag is empty, which means that it contains attributes only, and has no closing tag.

To display an image on a page, you need to use the src attribute. Src stands for "source". The value of the src attribute is the URL of the image you want to display.

Syntax for defining an image:

```

```

The URL points to the location where the image is stored. An image named "bamboo.gif", located in the "images" directory on "www.w3schools.com" has the URL: <http://www.backgrounlabs.com/index.php?search=bamboo>.

The browser displays the image where the tag occurs in the document. If you put an image tag between two paragraphs, the browser shows the first paragraph, then the image, and then the second paragraph.

HTML Images - The Alt Attribute

The required alt attribute specifies an alternate text for an image, if the image cannot be displayed.

The value of the alt attribute is an author-defined text:

```

```

The alt attribute provides alternative information for an image if a user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader).

HTML Images - Set Height and Width of an Image

The height and width attributes are used to specify the height and width of an image.

The attribute values are specified in pixels by default:

```

```

Note: It is a good practice to specify both the height and width attributes for an image. If these attributes are set, the space required for the image is reserved when the page is loaded. However, without these attributes, the browser does not know the size of the image. The effect will be that the page layout will change during loading (while the images load).

If an HTML file contains ten images - eleven files are required to display the page right. Loading images takes time, so my best advice is: Use images carefully.

When a web page is loaded, it is the browser, at that moment, that actually gets the image from a web server and inserts it into the page. (Fig 12) Therefore, make sure that the images actually stay in the same spot in relation to the web page, otherwise your visitors will get a broken link icon. The broken link icon is shown if the browser cannot find the image.

Fig 12



```

<html>
<body>
<h2>Friendship Card</h2>

</body>
</html>

```

HTML Tables

Tables are defined with the `<table>` tag.

A table is divided into rows (with the `<tr>` tag), and each row is divided into data cells (with the `<td>` tag). `td` stands for "table data," and holds the content of a data cell. A `<td>` tag can contain text, links, images, lists, forms, other tables, etc.

Table Example

```

<table border="1">
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in a browser:

row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Tables and the Border Attribute

If you do not specify a border attribute, the table will be displayed without borders. Sometimes this can be useful, but most of the time, we want the borders to show.

To display a table with borders, specify the border attribute:

```

<table border="1">
<tr>
<td>Row 1, cell 1</td>
<td>Row 1, cell 2</td>
</tr>
</table>

```

HTML Table Headers

Header information in a table are defined with the `<th>` tag.

All major browsers display the text in the `<th>` element as bold and centered.

```

<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in your browser:

Header 1	Header 2
row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Unordered Lists

An unordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with bullets (typically small black circles).

```

<ul>
<li>Coffee</li>
<li>Milk</li>
</ul>

```

How the HTML code above looks in a browser:

- Coffee
- Milk

HTML Ordered Lists

An ordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with numbers.

```

<ol>
<li>Coffee</li>
<li>Milk</li>
</ol>

```

How the HTML code above looks in a browser:

- 1 Coffee
- 2 Milk

HTML Definition Lists

A definition list is a list of items, with a description of each item.

The `<dl>` tag defines a definition list.

The `<dl>` tag is used in conjunction with `<dt>` (defines the item in the list) and `<dd>` (describes the item in the list):

```
<dl>
<dt>Coffee</dt>
<dd>- black hot drink</dd>
<dt>Milk</dt>
<dd>- white cold drink</dd>
</dl>
```

How the HTML code above looks in a browser:

Coffee - black hot drink
Milk- white cold drink

Note : Inside a list item you can put text, line breaks, images, links, other lists, etc.

HTML List Tags

Tag	Description
<code></code>	Defines an ordered list
<code></code>	Defines an unordered list
<code></code>	Defines a list item
<code><dl></code>	Defines a definition list
<code><dt></code>	Defines an item in a definition list
<code><dd></code>	Defines a description of an item in a definition list

HTML elements can be grouped together with `<div>` and ``

HTML Block Elements

Most HTML elements are defined as block level elements or as inline elements.

Block level elements normally start (and end) with a new line when displayed in a browser.

Examples: `<h1>`, `<p>`, ``, `<table>`

HTML Inline Elements

Inline elements are normally displayed without starting a new line.

Examples: ``, `<td>`, `<a>`, ``

The HTML `<div>` Element

The HTML `<div>` element is a block level element that can be used as a container for grouping other HTML elements.

The `<div>` element has no special meaning. Except that, because it is a block level element, the browser will display a line break before and after it.

When used together with CSS, the `<div>` element can be used to set style attributes to large blocks of content.

Another common use of the `<div>` element, is for document layout. It replaces the "old way" of defining layout using tables. Using tables is not the correct use of the `<table>` element. The purpose of the `<table>` element is to display tabular data.

The HTML `` Element

The HTML `` element is an inline element that can be used as a container for text.

The `` element has no special meaning.

When used together with CSS, the `` element can be used to set style attributes to parts of the text.

HTML Grouping Tags

Tag	Description
<code><div></code>	Defines a div
<code></code>	Defines a span

HTML Layout

Website Layouts

Most websites have put their content in multiple columns (formatted like a magazine or newspaper).

Multiple columns are created by using `<div>` or `<table>` elements. CSS are used to position elements, or to create backgrounds or colorful look for the pages.

HTML Layouts - Using `<div>` Elements

The `div` element is a block level element used for grouping HTML elements.

The following example uses five `div` elements to create a multiple column layout, creating the same result as in the previous example:

Example

```
<div>
<!DOCTYPE html>
<html>
<body>
<div id="container" style="width:500px">
<div id="header" style="background-color:#FFA500;">
<h1 style="margin-bottom:0;">Main Title of Web Page</h1></div>
<div id="menu" style="float:left; width:100px; height:200px; background-color:#FFD700; margin-right:10px;">
<b>Menu</b><br />
</div>
<div id="content" style="float:left; width:300px; height:200px; background-color:#FFFFE0;">
<h2>Content Area</h2>
</div>
</div>
<script>
document.getElementById("header").style.backgroundColor = "#FFA500";
document.getElementById("menu").style.backgroundColor = "#FFD700";
document.getElementById("content").style.backgroundColor = "#FFFFE0";
</script>

```

```

<div id="content" style="background-color:#EEEEEE;height:200px;width:400px;float:left;">
Content goes here</div>
<div id="footer" style="background-color:#FFA500;clear:both;text-align:center;">

```

```

</div>
</div>
</body>
</html>

```

Result (Fig 13)

Fig 13



HTML Forms

HTML forms are used to pass data to a server.

A form can contain input elements like text fields, checkboxes, radio-buttons, submit buttons and more. A form can also contain select lists, textarea, fieldset, legend, and label elements.

The <form> tag is used to create an HTML form:

<form>

input elements.

</form>

HTML Forms - The Input Element

The most important form element is the input element.

The input element is used to select user information.

An input element can vary in many ways, depending on the type attribute. An input element can be of type text field, checkbox, password, radio button, submit button, and more.

The most used input types are described below.

Text Fields

<input type="text" /> defines a one-line input field that a user can enter text into:

<form>

First name: <input type="text" name="firstname" />

Last name: <input type="text" name="lastname" />
</form>

How the HTML code above looks in a browser:

First name:

Last name:

Note: The form itself is not visible. Also note that the default width of a text field is 20 characters.

Password Field

<input type="password" /> defines a password field:

<form>

Password: <input type="password" name="pwd" />

</form>

How the HTML code above looks in a browser:

Password:

Note: The characters in a password field are masked (shown as asterisks or circles)

Radio Buttons

<input type="radio" /> defines a radio button. Radio buttons let a user select ONLY ONE of a limited number of choices:

```
<form>
<input type="radio" name="sex" value="male" /> Male<br/>
<input type="radio" name="sex" value="female" /> Female
</form>
```

How the HTML code above looks in a browser:

- Male
- Female

Checkboxes

<input type="checkbox" /> defines a checkbox. Checkboxes let a user select ONE or MORE options of a limited number of choices.

```
<form>
<input type="checkbox" name="vehicle" value="Bike" />
I have a bike<br />
<input type="checkbox" name="vehicle" value="Car" /> I
have a car
</form>
```

How the HTML code above looks in a browser:

- I have a bike
- I have a car

Submit Button

<input type="submit" /> defines a submit button.

A submit button is used to send form data to a server. The data is sent to the page specified in the form's action attribute. The file defined in the action attribute usually does something with the received input:

```
<form name="input" action="html_form_action.asp"
method="get">
```

Username: <input type="text" name="user" />

```
<input type="submit" value="Submit" />
</form>
```

How the HTML code above looks in a browser:

Username: Submit

If you type some characters in the text field above, and click the "Submit" button, the browser will send your input to a page called "html_form_action.asp". The page will show you the received input.

HTML Iframes

Syntax for adding an iframe:

```
<iframe src="URL"></iframe>
```

The URL points to the location of the separate page.

Iframe - Set Height and Width

The height and width attributes are used to specify the height and width of the iframe.

The attribute values are specified in pixels by default, but they can also be in percent (like "80%").

Example

```
<!DOCTYPE html>
<html>
<body>
<iframe src="demo_iframe.htm" width="200"
height="200"></iframe>
</body>
</html>
```

It will appear as shown in Fig 14.

Iframe - Remove the Border

The frameborder attribute specifies whether or not to display a border around the iframe.

Set the attribute value to "0" to remove the border:

Example

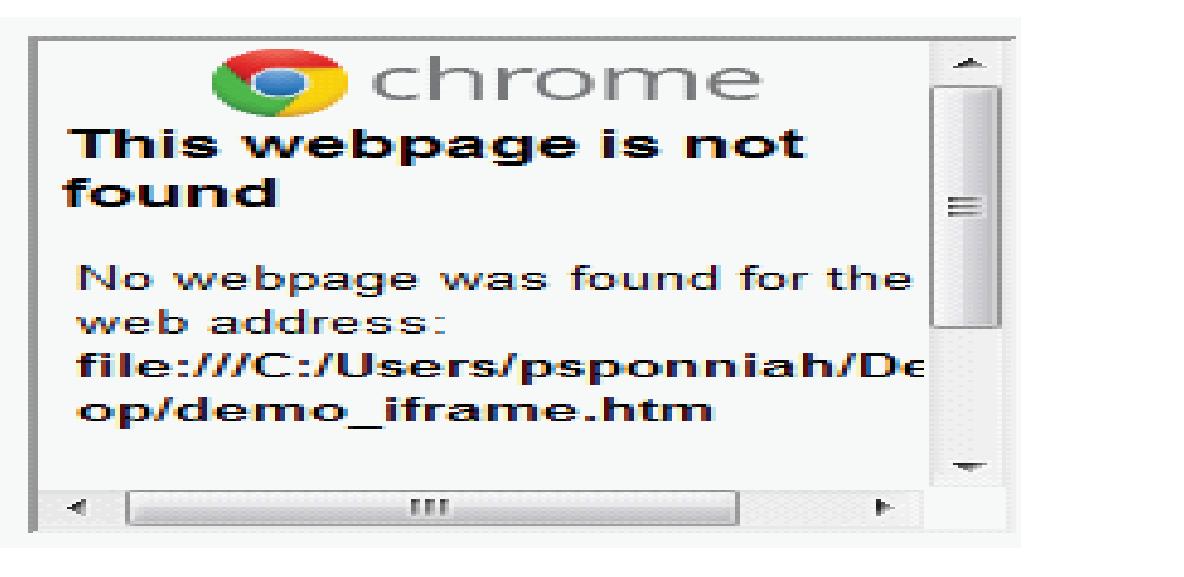
```
<iframe src="demo_iframe.htm" frameborder="0"></
iframe>
```

Use iframe as a Target for a Link

An iframe can be used as the target frame for a link.

The target attribute of a link must refer to the name attribute of the iframe:

Fig 14



Example

```
<iframe src="demo_iframe.htm" name="iframe_a"></iframe>  
<p><a href = "http://www.yahoo.com" target="iframe_a">yahoo.com</a></p>
```

HTML iframe Tag

Tag	Description
<iframe>	Defines an inline sub window (frame)

HTML Colour

Color Values

HTML colors are defined using a hexadecimal notation (HEX) for the combination of Red, Green, and Blue color values (RGB).

The lowest value that can be given to one of the light sources is 0 (in HEX: 00). The highest value is 255 (in HEX: FF).

HEX values are specified as 3 pairs of two-digit numbers, starting with a # sign.

Color Values (Fig 15)

Fig 15

Color	Color HEX	Color RGB
Black	#000000	rgb(0,0,0)
Red	#FF0000	rgb(255,0,0)
Green	#00FF00	rgb(0,255,0)
Blue	#0000FF	rgb(0,0,255)
Yellow	#FFFF00	rgb(255,255,0)
Cyan	#00FFFF	rgb(0,255,255)
Magenta	#FF00FF	rgb(255,0,255)
Grey	#C0C0C0	rgb(192,192,192)
White	#FFFFFF	rgb(255,255,255)

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<p style="background-color:#FFFF00">
```

Color set by using hex value

```
</p>
```

```
<p style="background-color:rgb(255,255,0)">
```

Color set by using rgb value

```
</p>
```

```

<p style="background-color:yellow">
Color set by using color name
</p>
</body>
</html>

```

Result

Color set by using hex value
 Color set by using rgb value
 Color set by using color name

DHTML

The HTML script Element

The <script> tag is used to define a client-side script, such as a JavaScript.

The script element either contains scripting statements or it points to an external script file through the src attribute.

The required type attribute specifies the MIME type of the script.

Common uses for JavaScript are image manipulation, form validation, and dynamic changes of content.

The script below writes Hello World! to the HTML output:

Example

```

<script type="text/javascript">
document.write("Hello World!")
</script>

```

The HTML noscript Element

The <noscript> tag is used to provide an alternate content for users that have disabled scripts in their browser or have a browser that doesn't support client-side scripting.

The noscript element can contain all the elements that you can find inside the body element of a normal HTML page.

The content inside the noscript element will only be displayed if scripts are not supported, or are disabled in the user's browser:

Example

```

<!DOCTYPE html>
<html>
<body>
<script type="text/javascript">
document.write("Hello World!")
</script>

```

<noscript>Sorry, your browser does not support JavaScript!</noscript>

<p>A browser without support for JavaScript will show the text in the noscript element.</p>

</body>

</html>

Result

Hello World!

A browser without support for JavaScript will show the text in the noscript element.

HTML Script Tags

Tag	Description
<script>	Defines a client-side script
<noscript>	Defines an alternate content for users that do not support client-side scripts

HTML Entities

Some characters are reserved in HTML.

It is not possible to use the less than (<) or greater than (>) signs in your text, because the browser will mix them with tags.

To actually display reserved characters, we must use character entities in the HTML source code.

A character entity looks like this:

&entity_name;

OR

&#entity_number;

Non-breaking Space

A common character entity used in HTML is the non-breaking space ().

Browsers will always truncate spaces in HTML pages. If you write 10 spaces in your text, the browser will remove 9 of them, before displaying the page. To add spaces to your text, you can use the character entity.

HTML Useful Character Entities

Note: Entity names are case sensitive!

HTML Uniform Resource Locators

A **URL** is another word for a web address.

Result	Description	Entity Name	Entity Number
	non-breaking space	 	
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
•	euro	€	€
§	section	§	§
©	copyright	©	©
®	registered trademark	®	®
™	trademark	™	™

A URL can be composed of words, such as "w3schools.com", or an Internet Protocol (IP) address: 192.68.20.50. Most people enter the name of the website when surfing, because names are easier to remember than numbers.

Scheme	Short for....	Which pages will the scheme be used for...
http	HyperText Transfer Protocol	Common web pages starts with http://. Not encrypted
https	Secure HyperText Transfer Protocol	Secure web pages. All information exchanged are encrypted
ftp	File Transfer Protocol	For downloading or uploading files to a website. Useful for domain maintenance
file		A file on your computer

URL Encoding

URLs can only be sent over the Internet using the ASCII character-set.

Since URLs often contain characters outside the ASCII set, the URL has to be converted into a valid ASCII format.

URL encoding replaces non ASCII characters with a "%" followed by two hexadecimal digits.

URLs cannot contain spaces. URL encoding normally replaces a space with a + sign.

URL - Uniform Resource Locator

When you click on a link in an HTML page, an underlying <a> tag points to an address on the world wide web.

A Uniform Resource Locator (URL) is used to address a document (or other data) on the world wide web.

Explanation:

- **Scheme** - defines the **type** of Internet service. The most common type is http
- **Host** - defines the **domain host** (the default host for http is www)
- **Domain** - defines the Internet **domain name**, like w3schools.com
- **Port** - defines the **port number** at the host (the default port number for http is 80)
- **Path** - defines a **path** at the server (If omitted, the document must be stored at the root directory of the web site)
- **Filename** - defines the name of a document/resource

Common URL Schemes

The table below lists some common schemes:

XML Structure

The XML structure including the document parts, the prologue, and provides a simple XML example document.

Document Parts

- Prolog
- Document Element (root element)

The Prologue

The prologue, equivalent to the header in HTML, may include the following:

- An XML declaration (optional) such as:

```
<?xml version="1.0"?>
```
- A DTD or reference to one (optional). An example reference to an external DTD file:

```
<!DOCTYPE LANGLIST SYSTEM "langlist.dtd">
```
- Processing instructions - An example processing instruction that causes style to be determined by a style sheet:

```
<?xml-stylesheet type="text/css" href="xmlstyle.css"?>
```

An XML Example

Therefore a complete well formed XML document may look like:

```
<?xml version="1.0"?>

<LAND>
  <FOREST>
    <TREE>Oak</TREE>
    <TREE>Pine</TREE>
    <TREE>Maple</TREE>
  </FOREST>
  <MEADOW>
    <GRASS>Bluegrass</GRASS>
    <GRASS>Fescue</GRASS>
    <GRASS>Rye</GRASS>
  </MEADOW>
</LAND>
```

The LAND element, above, is the root element.

Result

Oak Pine Maple Bluegrass Fescue Rye

Web Elements

A web page, as an information set, can contain numerous types of information, which is able to be seen, heard or interact by the End-user

Web Hosting

A web hosting service is a type of Internet hosting service that allows individuals and organizations to make their Website accessible via the World Wide Web. Web hosts are companies that provide space on a Server (computing) owned or leased for use by clients, as well as providing Internet connectivity, typically in a data centre. Web hosts can also provide data centre space and connectivity to the Internet for other servers located in their data centre, called Collocation.

TYPES OF Web Hosting

There are four types of Web hosting

- 1 Free hosting
- 2 Dedicated hosting
- 3 Shared (Virtual) hosting
- 4 Collocated Hosting

Free hosting

Free web hosting is best suited for small sites with low traffic, like personal sites. It is not recommended for high traffic or for real business. Technical support is often limited, and technical options are few.

Dedicated Hosting

With dedicated hosting, your web site is hosted on a dedicated server. Dedicated hosting is the most expensive option. This option is best suited for large web sites with high traffic, and web sites that use special software. Dedicated hosting to be very powerful and secure, with almost unlimited software solutions.

Shared (Virtual) Hosting

Shared hosting is very cost effective.

With shared hosting, your web site gets its own domain name, and is hosted on a powerful server along with maybe 100 other web sites. Shared solutions often offer multiple software solutions like e-mail, database, and different editing options. Technical support tends to be good.

Collocated Hosting

Collocation means "co-location". Collocated hosting lets place own web server on the premises (locations) of a service provider. This is pretty much the same as running own server in your own office, only that it is located at a place better designed for it. Most likely an ISP will have dedicated resources like high-security against fire and vandalism, regulated backup power, dedicated Internet connections and more.

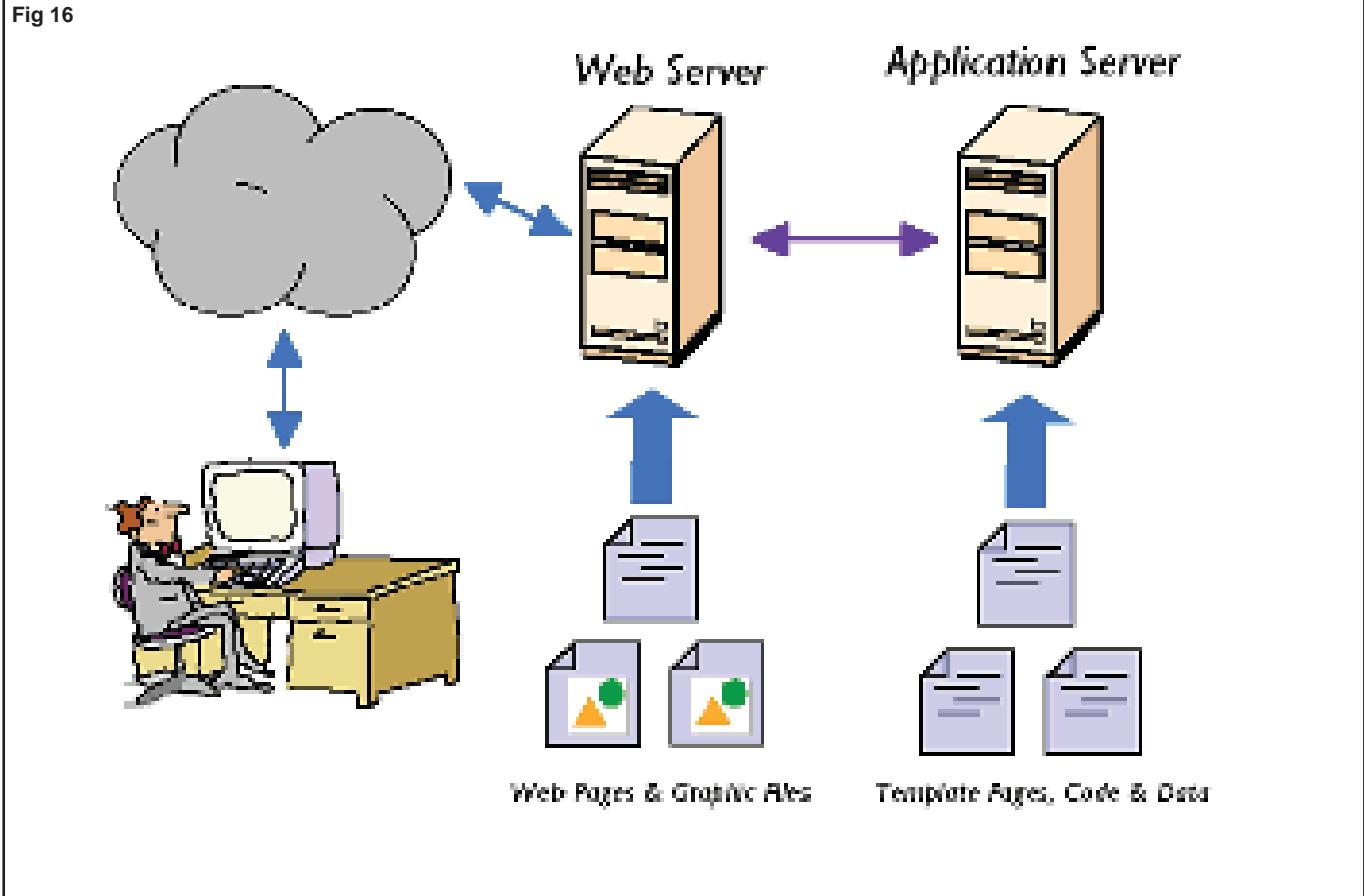
Web Server

A Web server is a program that, using the client server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web servers are Apache, the most widely-installed Web server, and Microsoft's Internet Information Server (IIS). Other Web servers include Novell's Web Server for users of its Netware operating system and IBM's family of Lotus Domino servers, primarily for IBM's OS390 and AS-400 customers.

Web servers often come as part of a larger package of Internet- and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, security characteristics, and publishing, search engine, and site building tools that may come with it.

Application Server

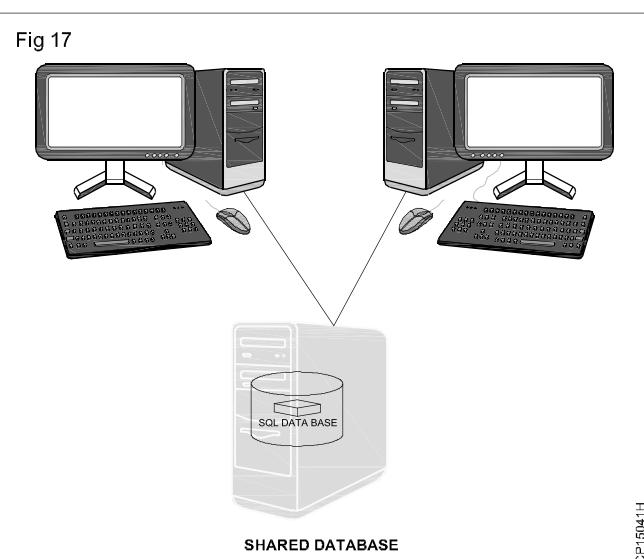
Also called an appserver, and application server (Fig 16) is a program that handles all application operations between users and an organization's backend business applications or database. An application server is typically used for complex transaction-based applications. To support high-end needs, an application server has to have built-in redundant, monitor for high-availability, high-performance distributed application services and support for complex database access.



Database Server

Database server (Fig 17) is the term used to refer to the back-end system of a database application using client-

server architecture. The back-end, sometimes called a database server, performs tasks such as data analysis, storage, data manipulation, archiving, and other non-user specific tasks.



Introduction to CMS and web authoring tools

Objectives: At the end of this lesson you shall be able to

- explain the meaning of content management System.
 - list some of the popular CMSes.
 - explain the use and main features of kompozer web authoring tool.
-

Definition of CMS:

CMS Stands for "Content Management System." A CMS is a software tool that allows you to create, edit, and publish content.

Description of CMS:

The goal of a CMS is to provide an intuitive user interface for building and modifying webpage content. Each CMS also provides a web publishing tool that allows one or more users to publish updates live on the Web. The editing component is called the content management application (CMA), while the publishing tool is called the content delivery application (CDA). These two components are integrated together in a CMS to streamline the web development process.

In terms of web publishing, content can be simple text, photos, music, video, documents, or just about anything you can think of. While early CMS software was used to manage documents and local computer files, most CMS systems are now designed exclusively to manage content on the Web. A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage.

Content management systems are available as installable applications and web-based user interfaces. The use of a web interface simplifies the website updating process. Additionally, most web-based CMSes are updated automatically, ensuring all users have the latest tools to manage their content.

A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage. Since the CMS manages all your content, you don't have to.

There are several web-based CMS tools available today. The following are some of the most popular ones:

- WordPress - free web software designed for creating template-based websites or blogs
- Blogger - Google's blogging tool designed specifically for maintaining a blog
- Joomla - a flexible web publishing tool that supports custom databases and extensions
- Drupal - an open source platform often used for developing community-based sites

- Weebly - a web-based platform for building simple personal and business websites
- Wix - a collection of web publishing tools for creating a highly customizable website

Introduction to WYSIWYG web authoring tools

WYSIWYG stands for "What You See Is What You Get". In such editors you edit not directly the source code of your documents, but its presentation as it will appear in the final document. So instead of writing blocks of code manually (as you e.g. would do it in Word or Notepad), you manipulate with design components using an editor window. This means that you view something very similar to the final result while the document or image is being created.

There are many easy-to-use WYSIWYG programs having all the tools needed to create a complex and fully functional websites, even by beginners. These sites even have options to work with HTML code be it design or editing. It is easier to create a Web site with an HTML editor, as software developers continue to add tools that let you develop advanced features with style. Many WYSIWYG web authoring tools offer advanced features to integrate Dynamic HTML or many other features into a site with an elegant and consistent design.

Introduction to Kompozer

KompoZer is a complete Web Authoring System that combines web file management and easy-to-use WYSIWYG web page editing capabilities found in Microsoft FrontPage, Adobe DreamWeaver and other high end programs. With kompozer you can create web pages and manage a website with no technical expertise or knowledge of HTML.

A useful feature of Kompozer is that you can use it to publish your web pages to a web hosting server. You just need to know your FTP account username and password as well as the site URL and Kompozer will log in and place your web pages on the server.

KompoZer's File Menu contains menu items for all major operations possible while using it. KompoZer's tool bar user interface consists of:

- Composition Toolbar
- Format Toolbar
- Tab Browser Toolbar
- Edit Mode Toolbar
- Status Toolbar

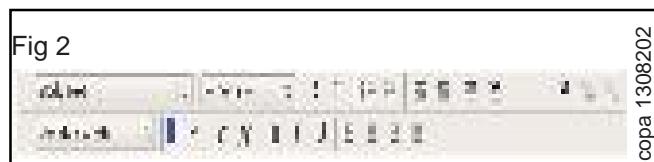
Composition Toolbar

The Composition Toolbar consists of buttons for the most used major operations. Below is the a snapshot of the default Composition Toolbar with text below each button indicating the respective button's function. (Refer Fig.1)



Format Toolbar(Refer Fig.2)

The Format Toolbar is a very useful tool while editing web pages with KompoZer. With the Format Toolbar you can apply paragraph format, choose a font, change foreground or background colour, increase or decrease size, and emphasize a block of text. You can also create ordered or unordered lists and justify a block of text to left, right or centre. To know which button does what just hover your mouse over the button and a tool tip will appear indicating the function of the button.



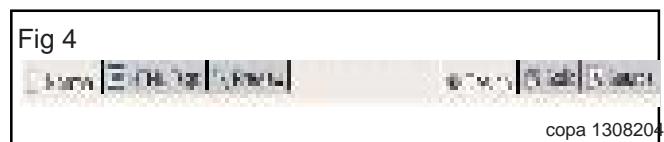
Tab Browser Toolbar(Refer Fig.3)

KompoZer allows you to simultaneously edit multiple web documents using different tabs for each opened document. Having multiple tabs gives a cleaner look to your desktop as it is not cluttered when multiple windows are used for each document. As a visual indicator a "red floppy icon" icon appears for pages which have been edited but not saved yet.



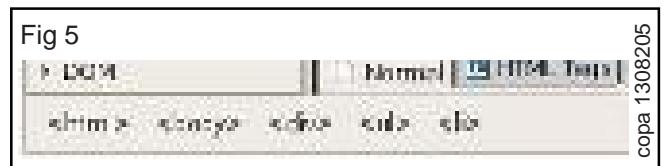
Edit Mode Toolbar(Refer Fig.4)

The Edit Mode Toolbar indicates the viewing mode which is presently active for the current document. Available viewing modes are the Normal view, HTML Tags view, HTML source view and the Preview mode. You can easily change your viewing mode by simply clicking any of the other three with the mouse.



Status Toolbar(Refer Fig.5)

KompoZer's status bar shows the position of the cursor with respect to the HTML tag hierarchy. You can easily edit/assign the properties of any particular tag in the status bar just by right clicking and choosing the desired option. Simple left-click of the mouse on a tag in status bar selects the text surrounded by that tag.



Sector : IT & ITES

Duration : 1 - Year

**Trade : Computer Operator and Programming Assistant 1st Semester - Trade Theory
NSQF level 4**

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FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Computer Operator and Programming Assistant Trade Theory 1st Semester in IT & ITES Sector**. The NSQF Level - 4 Trade Theory will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 4 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 4 the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

RAJESH AGGARWAL

Director General/ Addl. Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

New Delhi - 110 001

PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

R. P. DHINGRA
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ACKNOWLEDGEMENT

National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisations to bring out this **Instructional Material (Trade Theory)** for the trade of **Computer Operator and Programming Assistant** under the IT & ITES Sector

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NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

TRADE THEORY

The manual of trade theory consists of theoretical information for the First Semester course of the COPA Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade Theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise atleast one class before performing the related skills in the system lab. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.

TRADE PRACTICAL

The trade practical manual is intended to be used in workshop . It consists of a series of practical exercises to be completed by the trainees during the First Semester course of the COPA trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered.

The manual is divided into twelve modules to maintain completeness of learning process in a stipulated time basis.

The skill training in the computer lab is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

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LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

- **Install and setup operating system and related software in a computer.**
- **Create, format and edit document using word processing application software.**
- **Create, edit and develop a workbook by using spreadsheet application software.**
- **Create and customize slides for presentation.**
- **Create and manage database file by using MS Access**
- **Install, setup/ configure, troubleshoot and secure computer network including Internet.**
- **Develop static webpages using HTML.**

SYLLABUS

First Semester

Duration: Six Month

Week No.	Ref. Learning Outcome	Professional Skills (Trade Practical) with Indicative hours	Professional Knowledge (Trade Theory)
1.	<ul style="list-style-type: none"> • Apply safe working practices • Install and setup operating system and related software in a computer. 	<p>Safe working practices</p> <ol style="list-style-type: none"> 1. Visit COPA Lab. of the institutes and locate the electrical connections with computer system setup (6 hrs) 2. Identifying safety symbols and hazard identification.(4 Hrs) 3. Practice safe methods of fire fighting in case of electrical fire. (4 hrs) 4. Use of fire extinguishers. (4 Hrs) <p>Computer components</p> <ol style="list-style-type: none"> 5. Identify computer peripherals and internal components of a disassembled desktop computer. (6 Hrs) 6. Assemble components of desktop computer. (6 Hrs) 	<p>Safe working practices</p> <ul style="list-style-type: none"> • Scope of the COPA trade. • Safety rules and safety signs. • Types and working of fire extinguishers. <p>Introduction to Computer components</p> <ul style="list-style-type: none"> • Introduction to computer system. Concepts of hardware and Software. • Function of motherboard components and various processors. • Various Input / Output devices in use and their features.
2.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Using Windows Operating System</p> <ol style="list-style-type: none"> 7. Practice on Windows interface and navigating windows. (9 Hrs) 8. Practice on managing files and folders using removable drives. (6 Hrs) 9. Customize the desktop settings and manage user accounts. (6 Hrs) 10. View system properties and control panel details. (6 Hrs) 11. Work with keyboard shortcut commands. (6 Hrs) 12. Print and scan document using different commands.(3 Hrs) 	<p>Introduction Windows Operating System</p> <ul style="list-style-type: none"> • Introduction to operating System • Main features of Windows OS • Concept of various shortcut commands.
3.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Computer basics and Software Installation</p> <ol style="list-style-type: none"> 13. View the BIOS settings and their modifications. (3 Hrs) 14. Install Windows OS (5 Hrs) 15. Format Hard Disk and create partition (3 Hrs) 16. Identify and rectify common hardware and software issues during OS installation. (4 Hrs) 17. Install necessary application software for Windows i.e. Office Package, PDF Reader, Media Player etc. (5 Hrs) 18. Configure Bluetooth and wi-fi settings. (3 Hrs) 19. Install Drivers for printer, scanner, webcam and DVD etc. (4 Hrs) 20. Burn data, video and audio files on CD/DVD using application software. (3 Hrs) 	<p>Computer basics and Software Installation</p> <ul style="list-style-type: none"> • Introduction to the booting process. • Introduction to various types of memories and their features. • Basic Hardware and software issues and their solutions. • Usage of Application software and Antivirus.

4 - 5	<ul style="list-style-type: none"> Install and setup OS and related software in a computer. 	<p>DOS Command Line Interface & Linux Operating Systems</p> <p>21. Use basic DOS commands for directory listing (10 hrs) 22. Manage files and folders using DOS commands (6 hrs) 23. Install Linux operating system.(6 Hrs) 24. Install necessary application software for Linux i.e. Office Package, PDF Reader, MediaPlayer etc. (6 Hrs) 25. Use Basic Linux commands for directory listing, file and folder management, password etc. (10Hrs) 26. Use the Linux GUI for file and folder management, exploring the system etc. (10 Hrs) 27. Customize desktop settings and manage user accounts in Linux. (6 Hrs) 28. View system properties and manage system setting in Linux (6 Hrs)</p>	<p>Introduction to DOS Command Line Interface & Linux Operating Systems</p> <ul style="list-style-type: none"> Introduction to basic DOS Internal and External Commands. Introduction to Open Source Software. Introduction to Linux Operating System features, structure, files and processes. Basic Linux commands.
6 - 8	Create, format and edit document using word processing application software.	<p>Using Word Processing Software</p> <p>29. Open MS Word and familiarise with basic word components. (3 Hrs) 30. Practice creating, saving and renaming of word documents.(3 Hrs) 31. Edit document using basic formatting tools. (8 Hrs) 32. Practice Inserting and formatting tables and other objects. (12 Hrs) 33. Work with Page layout settings and printing documents. (6 Hrs) 34. Use templates, autocorrect tools, and record and execute a macro. (6 Hrs) 35. Use Mail merge tool. Use conditional Mail Merge, External Data Source. Practice Letters, Label & Envelop printing using Mail Merge (10 Hrs). 36. Use Table of Context, Indexing, Hyperlink, Bookmark, Comment, equation,symbols,citation, crossreference, footnote, translate, synonyms, thesaurus, spell check & grammer, compare etc. (6 Hrs) 37. Practice Typing using open source tutor. (24 Hrs) 38. Practice of using shortcut keys and use Open Office as word processor. (12 Hrs)</p>	<p>Word Processing Software</p> <ul style="list-style-type: none"> Introduction to the various applications in MS office. Introduction to Word features, Office button, toolbars. Creating, saving and formatting and printing documents using Word. Working with objects, macro, mail merge, templates and other tools in Word.
9 - 11	<ul style="list-style-type: none"> Create, format, edit and develop a workbook by using spreadsheet application software. 	<p>Using Spread Sheet Application</p> <p>39. Open MS Excel and familiarise with basic application components. (4 Hrs) 40. Practice create, save and format excel sheets. (9 Hrs) 41. Use absolute and relative referencing, linking sheets, conditional formatting etc. (9 Hrs) 42. Practice Excel functions of all major categories i.e. Financial, Logical, Text, date & time, Lookup, Math, Statistical etc. (12 Hrs) 43. Use various data types in Excel, sorting, filtering and validating data. (8 Hrs) 44. Create and format various static and dynamic charts. (10 Hrs) 45. Practice Importing & exporting excel data. (4 Hrs) 46. Perform data analysis using "what if" tools and Pivot Table and record and execute a macro. (10 Hrs) 47. Modify Excel page setup and printing and use open office as Spreadsheet application. (4 Hrs) 48. Execute simple projects using Excel & Word. (20 Hrs)</p>	<p>Spread Sheet Application</p> <ul style="list-style-type: none"> Introduction to Excel features and Data Types. Cell referencing and linking Sheets. Introduction to various functions in all categories of Excel. Concepts of sorting, filtering and validating data. Analyzing data using charts, data tables, pivot tables, goal seek and scenarios.

12 - 13	Create and customize slides for presentation.	<p>Image editing and creating Presentations</p> <p>49. Use Windows Paint or image editing software like Open Office Draw, GIMP, IrfanView or a similar tool. (6 Hrs)</p> <p>50. Perform Image editing using open source applications. (12 Hrs)</p> <p>51. Open power point presentation and familiarise with basic application components. (6 Hrs)</p> <p>52. Create Slide shows, Insert picture and theme. (6 Hrs)</p> <p>53. Add new slide, format text, link with word and excel documents. (5 Hrs)</p> <p>54. Practice animating slide transitions and objects. (4 Hrs)</p> <p>55. Create slide shows by inserting audio & video and sync with presentation. (6 Hrs)</p> <p>56. Modify slide page setup and print the slides. (3 Hrs)</p> <p>57. Create a simple presentation project using open office. (12 Hrs)</p>	<p>Image editing, Presentations</p> <ul style="list-style-type: none"> • Introduction to Open Office. • Introduction to the properties and editing of images. • Introduction to different formats of images and their uses. • Introduction to Power Point and its advantages. • Creating Slide Shows. • Fine tuning the presentation and good presentation technique.
14 - 15	Create and manage database file by using MS Access.	<p>Database Management with MS Access</p> <p>58. Create database and design a simple tables in Access. (6 Hrs)</p> <p>59. Practice enforcing integrity constraints and modify properties of tables and fields. (6 Hrs)</p> <p>60. Create relationships and join tables. (6 Hrs)</p> <p>61. Create and format Forms. (6 Hrs)</p> <p>62. Create simple queries with various criteria and calculations. (12 Hrs)</p> <p>63. Create Simple update, append, make table, delete and crosstab queries. (9 Hrs)</p> <p>64. Modify form design with controls, macros and events. (6 Hrs)</p> <p>65. Import and export data to/from Access and create and format types of reports. (6 Hrs)</p> <p>66. Compress and Encrypt databases. (3 Hrs)</p>	<p>Database Management Systems</p> <ul style="list-style-type: none"> • Concepts of Data and Databases. • Overview of popular databases, RDBMS, OODB and NOSQL. • Rules for designing good tables. Integrity rules and constraints in a table. • Relationships in tables. • Introduction to various types of Queries and their uses. • Designing Access Reports and Forms. • Introduction to macros, designer objects controls, their properties and behaviour.
16 - 17	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Configuring and using Network</p> <p>67. View Network connections. (3 Hrs)</p> <p>68. Connect a computer to a n/w and share Devices i.e. Printers, files, folders and drives. (6 Hrs)</p> <p>69. Work with various Network devices, connectors/cables. Create straight/cross cable and punch a UTP cable in the patch socket and test the connectivity. (6 Hrs)</p> <p>70. Practice IP Addressing and Subnet masking for IPV4/ IPV6 and pinging to test networks. (6 Hrs)</p> <p>71. Configure Hub and Switch. (6 Hrs)</p> <p>72. Set up and configure wired and wireless LAN in a Computer Lab within at least three computers. Use patch panel & I/O Box for wired LAN and installing & configuring Internet connection in a single PC and in a LAN. (12 Hrs)</p>	<p>Networking Concepts</p> <ul style="list-style-type: none"> • Introduction to Computer Networks, Necessity and Advantages. • Client Server and peer to Peer networking concepts. • Concept of Proxy Server and proxy firewall server. • Concept of DHCP Server. • Introduction to LAN, WAN and MAN. • Network topologies. Network components, viz. Modem, Hub, Switch, Router, Bridge, Gateway etc. • Network Cables, Wireless networks and Blue Tooth technology. • Concept of ISO - OSI 7 Layer Model. • Overview of Network protocols Viz.TCP/IP, FTP, Telnet etc.

		<p>73. Setup a proxy server/DHCP Server with firewall.(9 Hrs)</p> <p>74. Setup video conferencing using open source s/w(6 Hrs)</p> <p>75. Use various tools (by open source /free) for network troubleshooting, maintenance and security for both Wired and Wireless(6 Hrs)</p>	<ul style="list-style-type: none"> • Concept of Logical and Physical Addresses, Subnetting and Classes of Networks.
18	Install, setup/ configure, troubleshoot and secure computer network including Internet.	<p>Using Internet</p> <p>76. Browse the Internet for information (use at least 3 popular browsers). (3 Hrs)</p> <p>77. Create and use e-mail for communication with attachment, priority setting, address book. (3 Hrs)</p> <p>78. Communicate with text, video chatting and social networking sites. (6 Hrs)</p> <p>79. Use online dictionary, translation software, storage space, share files with e-mail links, download manager, download & upload YouTube files, google map & earth etc. Update windows & other software. (6 Hrs)</p> <p>80. Configure Outlook, mail service in mobile phones. Use tools like Skype, Google+ etc. (6 Hrs)</p> <p>81. Browser setting for Bookmark, cookies, favourites and pop ups, default website, trusted site, restricted site, content, history and advanced setup. (6 Hrs)</p>	<p>Internet Concepts</p> <ul style="list-style-type: none"> • Introduction to www, Concept of Internet, Web Browsers, internet servers and search engines. • Concepts of Domain naming Systems and E mail communication. • Introduction to video chatting tools and Social Networking concepts.
19-21	Develop static web pages using HTML.	<p>Designing Static Web Pages</p> <p>82. Practice with basic HTML elements (e.g. head, title, body), tag and attributes. (3 Hrs)</p> <p>83. Design simple web page with text, paragraph and line break usingHTML tags. (5 Hrs)</p> <p>84. Format text, change background colour and insert pictures in web page. (6 Hrs)</p> <p>85. Design simple web page with tables and lists. (6 Hrs)</p> <p>86. Use marquees, hyperlinks and mailto link in designing web pages.(6 Hrs)</p> <p>87. Create frames, add style and design layout. (10 Hrs)</p> <p>88. Insert text, check and combo box in web page. (6 Hrs)</p> <p>89. Design web page using password field, submit button, reset button and radio button etc. (6 Hrs)</p> <p>90. Design a web page adding flash file, audio and video files. (10 Hrs)</p> <p>91. Design web page with forms and form controls using HTML tags.(8 Hrs)</p> <p>92. Create web page using Cascading Style Sheet (CSS). (12 Hrs)</p> <p>93. Use WYSIWYG (Kompozer) web design tools to design and edit web pages with various styles. (12Hrs)</p>	<p>Web Design Concepts</p> <ul style="list-style-type: none"> • Concepts of Static and Dynamic Web pages. • Introduction to HTML and various tags in HTML. • Concepts of different controls used in Web Pages. • Concepts of CSS and applying CSS to HTML. • Introduction to open source CMS viz, Joomla, Word press etc. and Web authoring tools viz. Kompozer, Front Page etc. • Concept of good web page designing techniques.
22-23	Industrial Visit/Project work	<p>1. Create a simple web site of at least 5 web pages which will include Images, tables, charts, lists and hyperlink on any topic like Student Information System, Book Store, and Organisations etc.</p> <p style="text-align: center;">OR</p> <p>2. Setup and configure a LAN using at least 3 computers connected with wire and 3 computers connected with wireless and secure it.)</p>	
24-25		Revision	
26		Examination	

Electrical safety

Objective : At the end of this lesson you shall be able to

- explain how to rescue a person who is in contact with a live wire.

The severity of an electric shock will depend on the level of current which passes through the body and the length of time of contact. Do not delay, act at once. Make sure that the electric current has been disconnected.

If the casualty is still in contact with the supply - break the contact either by switching off the power, removing the plug or wrenching the cable free. If not, stand on some insulating material such as dry wood, rubber or plastic, or using whatever is at hand to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)

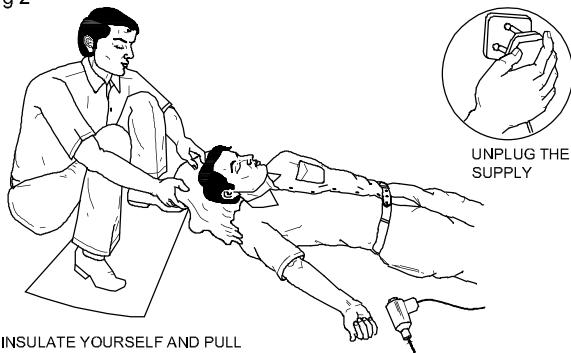
If you remain un-insulated, do not touch the victim with your bare hands until the circuit is made dead or person is moved away from the equipment.

Fig 1



EL110421

Fig 2



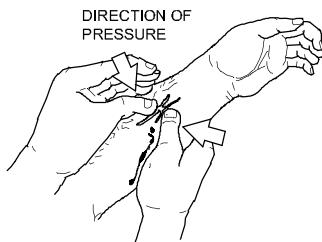
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If the victim is aloft, measures must be taken to prevent him from falling or atleast make him fall safe.

Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

If the casualty is unconscious but is breathing, loosen the clothing about the neck, chest and waist and place the casualty in the recovery position.(Fig 3)

Fig 3



EL110433

Keep a constant check on the breathing and pulse rate.

Keep the casualty warm and comfortable. (Fig 4)

Send for help.

Do not give an unconscious person anything by mouth.

Do not leave an unconscious person unattended.

If the casualty is not breathing - Act at once - don't waste

Fig 4



EL110424

Safety practice - fire extinguishers

Objectives : At the end of this lesson you shall be able to

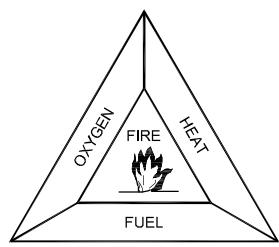
- explain how to rescue a person who is in contact with a live wire
- distinguish the different types of fire extinguishers
- determine the correct type of fire extinguisher to be used based on the class of fire
- describe the general procedure to be adopted in the event of a fire.

Fire is the burning of combustible material. A fire in an unwanted place and on an unwanted occasion and in an uncontrollable quantity can cause damage or destroy property and materials. It might injure people, and sometimes cause loss of life as well. Hence, every effort must be made to prevent fire. When a fire outbreak is discovered, it must be controlled and extinguished by immediate corrective action.

Is it possible to prevent fire? Yes, fire can be prevented by eliminating anyone of the three factors that causes fire.

The following are the three factors that must be present in combination for a fire to continue to burn. (Fig 1)

Fig 1



Accumulation of combustible refuse (cotton waste soaked with oil, scrap wood, paper, etc.) in odd corners are a fire risk. Refuse should be removed to collection points.

The cause of fire in electrical equipment is misuse or neglect. Loose connections, wrongly rated fuses, overloaded circuits cause overheating which may in turn lead to a fire. Damage to insulation between conductors in cables causes fire.

Clothing and anything else which might catch fire should be kept well away from heaters. Make sure that the heater is shut off at the end of the working day.

Highly flammable liquids and petroleum mixtures (thinner, adhesive solutions, solvents, kerosene, spirit, LPG gas etc.) should be stored in the flammable material storage area.

Blowlamps and torches must not be left burning when they are not in use.

Extinguishing fires: Fires are classified into four types in terms of the nature of fuel.

Different types of fires (Fig 2, Fig 3 Fig 4 & Fig 5) have to be dealt with in different ways and with different extinguishing agents.

An extinguishing agent is the material or substance used to put out the fire, and is usually (but not always) contained in a fire extinguisher with a release mechanism for spraying into the fire.

It is important to know the right type of agent for extinguishing a particular type of fire; using a wrong agent can make things worse. There is no classification for 'electrical fires' as such, since these are only fires in materials where electricity is present.

Fuel: Any substance, liquid, solid or gas will burn, if there is oxygen and high enough temperatures.

Heat: Every fuel will begin to burn at a certain temperature. It varies and depends on the fuel. Solids and liquids give off vapour when heated, and it is this vapour which ignites. Some liquids do not have to be heated as they give off vapour at normal room temperature say 15°C, eg. petrol.

Oxygen: Usually exists in sufficient quantity in air to keep a fire burning.

Extinguishing of fire: Isolating or removing any of these factors from the combination will extinguish the fire. There are three basic ways of achieving this.

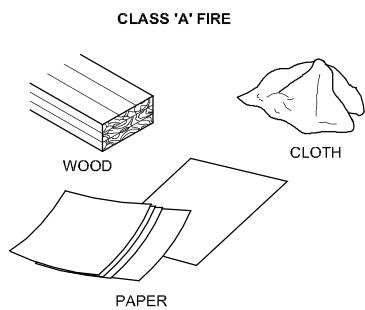
- **Starving** the fire of fuel removes this element.
- **Smothering** - ie. isolate the fire from the supply of oxygen by blanketing it with foam, sand etc.
- **Cooling** - use water to lower the temperature. Removing any one of these factors will extinguish the fire.

Preventing fires: The majority of fires begin with small outbreaks which burn unnoticed until they have a secure hold. Most fires could be prevented with more care and by following some simple common sense rules.

Fuel

Extinguishing

Fig 2

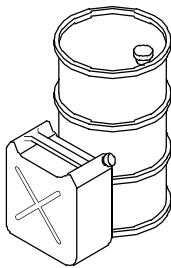


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Most effective ie. cooling with water. Jets of water should be sprayed on the base of the fire and then gradually upwards.

Fig 3

CLASS 'B' FIRE



FLAMMABLE LIQUIDS AND LIQUIFIABLE SOLIDS

EL110313

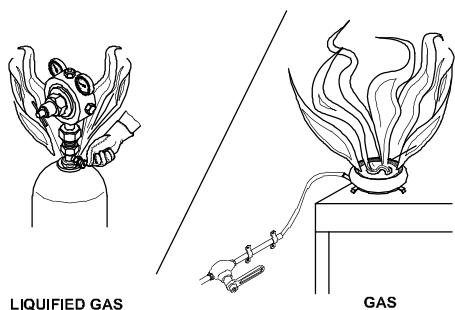
Should be smothered. The aim is to cover the entire surface of the burning liquid. This has the effect of cutting off the supply of oxygen to the fire.

Water should never be used on burning liquids.

Foam, dry powder or CO₂ may be used on this type of fire.

Fig 4

CLASS 'C' FIRE



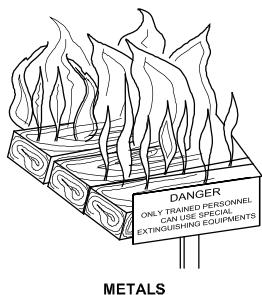
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Extreme caution is necessary in dealing with liquefied gases. There is a risk of explosion and sudden outbreak of fire in the entire vicinity. If an appliance fed from a cylinder catches fire - shut off the supply of gas. The safest course is to raise an alarm and leave the fire to be dealt with by trained personnel.

Dry powder extinguishers are used on this type of fire.

Fig 5

CLASS 'D' FIRE



EL110315

Special powders have now been developed which are capable of controlling and/or extinguishing this type of fire.

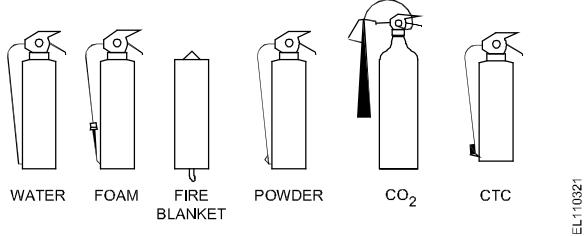
The standard range of fire extinguishing agents is inadequate or dangerous when dealing with metal fires.

Fire on electrical equipment.

Halon, Carbon dioxide, dry powder and vapourising liquid (CTC) extinguishers can be used to deal with fires in electrical equipment. Foam or liquid (eg. water) extinguishers must not be used on electrical equipment under any circumstances.

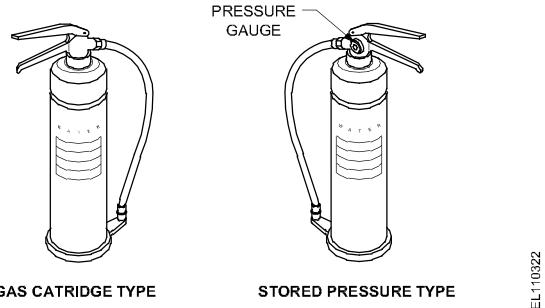
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)

Fig 1



Water-filled extinguishers: There are two methods of operation. (Fig 2)

Fig 2

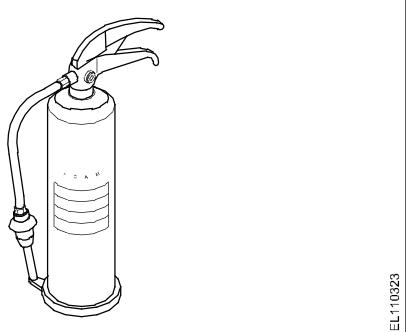


- Gas cartridge type
- Stored pressure type

With both methods of operation the discharge can be interrupted as required, conserving the contents and preventing unnecessary water damage.

Foam extinguishers (Fig 3): These may be of stored pressure or gas cartridge types. Always check the operating instructions on the extinguisher before use.

Fig 3



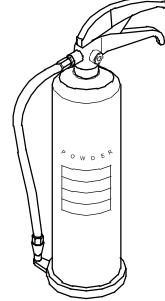
Most suitable for

- flammable liquid fires
- running liquid fires.

Must not be used on fires where electrical equipment is involved.

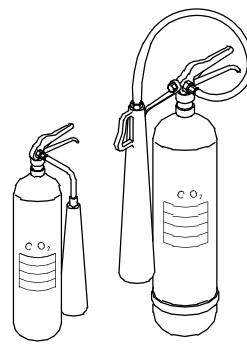
Dry powder extinguishers (Fig 4): Extinguishers fitted with dry powder may be of the gas cartridge or stored pressure type. Appearance and method of operation is the same as that of the water-filled one. The main distinguishing feature is the fork shaped nozzle. Powders have been developed to deal with class D fires.

Fig 4



Carbon dioxide (CO₂): This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5).

Fig 5

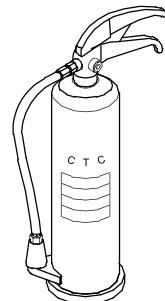


Suitable for Class B fires. Best suited where contamination by deposits must be avoided. Not generally effective in open air.

Always check the operating instructions on the container before use. Available with different gadgets of operation such as - plunger, lever, trigger etc.

Halon extinguishers (Fig 6): These extinguishers may be filled with carbon-tetrachloride and Bromochlorodifluoro methene (BCF). They may be either gas cartridge or stored pressure type.

Fig 6



They are more effective in extinguishing small fires involving pouring liquids. These extinguishers are particularly suitable and safe to use on electrical equipment as the chemicals are electrically non-conductive.

The fumes given off by these extinguishers are dangerous, especially in confined space.

The general procedure in the event of a fire:

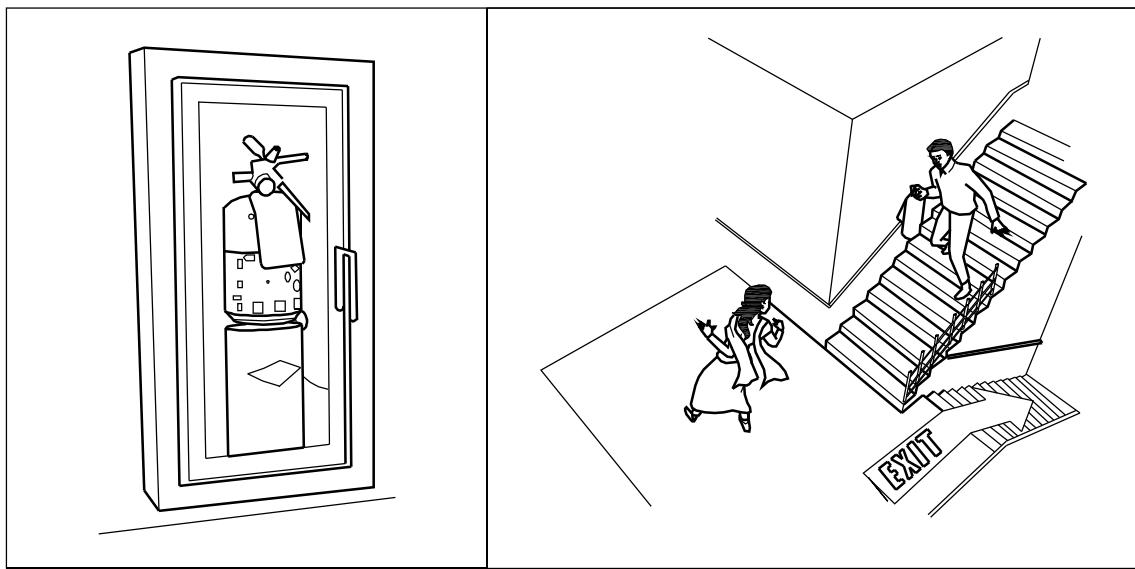
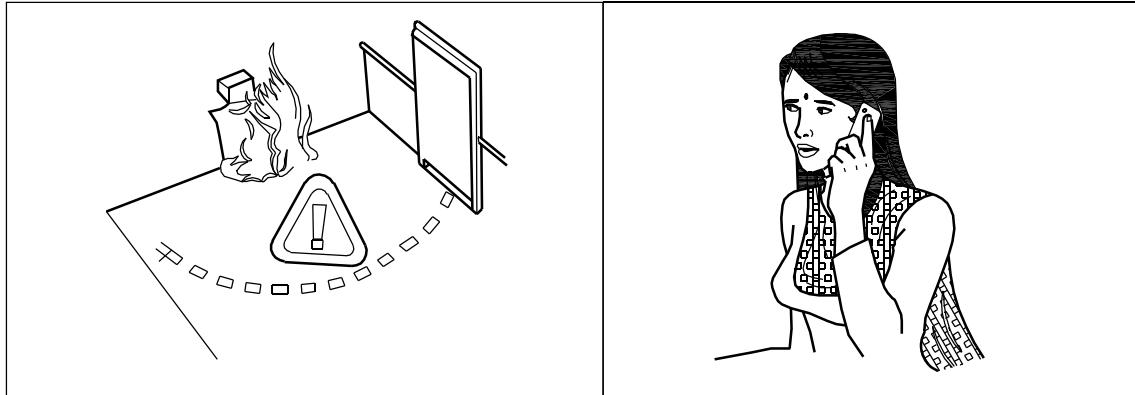
- Raise an alarm.
- Turn off all machinery and power (gas and electricity).

- Close the doors and windows, but do not lock or bolt them. This will limit the oxygen fed to the fire and prevent its spreading.
- Try to deal with the fire if you can do so safely. Do not risk getting trapped.
- Anybody not involved in fighting the fire should leave calmly using the emergency exits and go to the designated assembly point. Failure to do this may mean that some person being unaccounted for and others may have to put themselves to the trouble of searching for him or her at risk to themselves.

Practice on fire extinguishers

Objectives: At the end of this lesson you shall be able to

- state about the selection of the fire extinguishers according to the type of fire
- state the method of operation of the fire extinguisher
- explain how to extinguish the fire.



F1104E1

PROCEDURE (Fig 1)

- Alert people surrounding by shouting fire, fire, fire when observe the fire.
- Inform fire service or arrange to inform immediately.
- Open emergency exist and ask them to go away.
- Put "off" electrical power supply.

Don't allow people to go nearer to the fire

- Analyze and identify the type of fire. Refer Table1.

Table-1

Class 'A'	Wood, paper, cloth, solid material
Class 'B'	Oil based fire (grease, gasoline, oil) liquefiable gases
Class 'C'	Gas and liquefiable gases
Class 'D'	Metals and electrical equipment

Assume the fire is 'B' type (flammable liquefiable solids)

- Select CO₂ (Carbon di oxide) fire extinguisher.
- Locate and pickup, CO₂ fire extinguisher. Click for its expiry date.
- Break the seal (Fig 2)

Fig 2

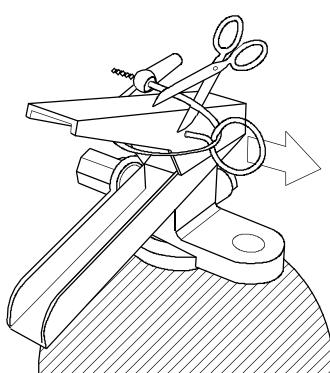


Fig104-H2

- Pull the safety pin from the handle (Pin located at the top of the fire extinguisher) (Fig 3)

Fig 3

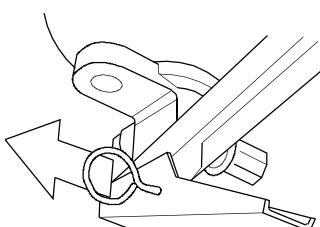


Fig104-H3

- Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 4)

Fig 4

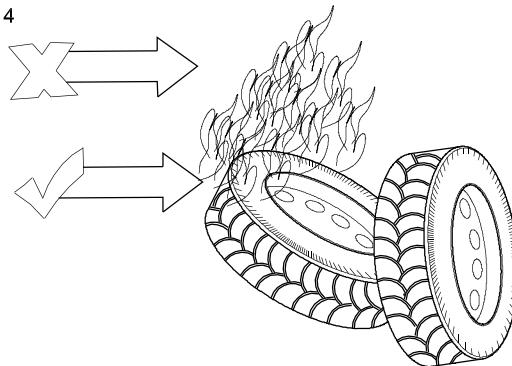


Fig104-H4

Keep your self low

- Squeeze the handle lever slowly to discharge the agent (Fig 5)
- Sweep side to side approximately 15 cm over the fuel fire until the fire is put off (Fig 5)

Fig 5

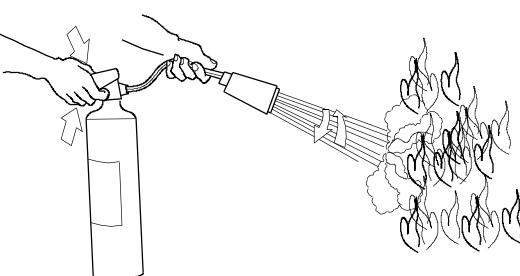


Fig104-H5

Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up
- Do not be panick belong as it put off promptly.
- If the fire doesn't respond well after you have used up the fire extinguisher move away yourself away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke leave it for the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of the extinguisher. Remember P.A.S.S. This will help you to use the fire extinguisher.

P for Pull

A for Aim

S for Squeeze

S for Sweep

Introduction to computers

Objectives : At the end of this lesson you shall be able to

- define and classify computers
- list the advantages and limitations of computers
- list the applications of computer
- describe the voltages and currents in the computer.

Computer - Definitions

A computer is an electronic machine, operating under the control of instructions stored in its own memory that can accept data (input), manipulate the data according to specified rules (process), produce results (output), and store the results for future use.

Technically, a computer is a programmable machine. This means it can execute a list of programmed instructions and respond to new instructions that it is given.

History of Computer

Charles babbage's machine

The working principles of today's computers were provided by an English mathematician Charles Babbage around 1833's invented a machine called the "Analytical Engine". A machine which could calculate and print tables of functions using limited techniques.

The Analytical Engine had four parts. A mill, which was the section which did the calculations, essentially the CPU; the store, where the information was kept recorded, essentially the memory; the reader, which would allow data to be entered using punched cards, essentially the keyboard, and the printer.

Hence, Charles Babbage is considered as the "Father of the Computer" as in fig-1.

The generations of computers are characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices. The various generations of computers are listed below:

First Generation (1946-1954): In 1946 the digital computer using **electronic valves** (Vacuum tubes) are known as first generation computers. The first '**computer**' to use electronic valves i.e. vacuum tubes. The high cost of vacuum tubes prevented their use for main memory. They stored information in the form of propagating sound waves.

The vacuum tube consumes a lot of power. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

Fig 1



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Mark I :The IBM Automatic Sequence Controlled Calculator (ASCC), called the Mark I by **Harvard University**, was an **electro-mechanical computer**. Mark I is the first machine to successfully perform a long series of **arithmetic and logical operation**. Mark I is the **First Generation Computer**.

ENIAC: It was the first electronic computer built in 1946 at University of Pennsylvania, USA by John Eckert and John Mauchy. It was named Electronic Numerical Integrator and Calculator (ENIAC). The ENIAC was 30-50 feet long, weighted 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors and required 150,000 watts of electricity. Today computer is many times as powerful as ENIAC, still size is very small.

EDVAC: It stands for **Electronic Discrete Variable Automatic Computer** and was developed in 1950. The concept of storing data and instructions inside the computer was introduced here. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantage of storing instruction was that computer could do logical decision internally. The EDVAC was a **binary serial computer** with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.

EDSAC: It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes at Cambridge University in 1949.** The **EDSAC** is the first **stored-program computer.** The EDSAC performed computations in the three millisecond range. It performed arithmetic and logical operations without human intervention. The key to the success was in the stored instructions which it depended upon solely for its operation.

This machine marked the beginning of the computer age.

UNIVAC-1: It stands for **Universal Automatic computer** and it was the First commercial computer developed by United States In 1951. The machine was 25 feet by 50 feet in length, contained 5,600 tubes, 18,000 crystal diodes, and 300 relays. It utilized serial circuitry, 2.25 MHz bit rate, and had an internal storage capacity 1,000 words or 12,000 characters.

The UNIVAC was used for **general purpose computing** with large amounts of input and output. The UNIVAC was also the first computer to come equipped with a magnetic tape unit and was the **first computer to use buffer memory.**

Limitations of First Generation Computer

Followings are the major drawbacks of First generation computers.

- They used valves or vacuum tubes as their main electronic component.
- They were large in size, slow in processing and had less storage capacity.
- They consumed lots of electricity and produced lots of heat.
- Their computing capabilities were limited.
- They were not so accurate and reliable.
- They used machine level language for programming.
- They were very expensive.

Second Generation (1955-1964): The second-generation computer used **transistors** for CPU components and **ferrite cores for main memory&magnetic disks** for secondary memory. They used high-level languages such as **FORTRAN (1956), ALGOL (1960) & COBOL (1960 - 1961).** Input Output (I/O)processor was included to control I/O operations.

Manufacturing cost was also very low. Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. Some of the second generation computers are IBM 1620, IBM 1401,CDC 3600.

- Transistors were used instead of Vacuum Tube.
- Processing speed is faster than First Generation Computers (Micro Second)
- Smaller in Size (51 square feet)
- The input and output devices were faster.

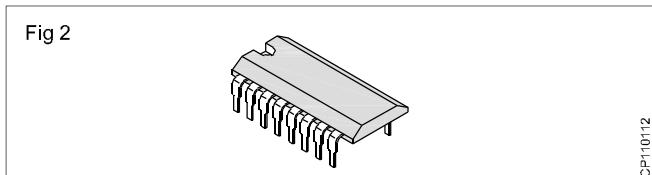
Third Generation (1964-1977): By the development of a small chip consisting of the capacity of the **300 transistors.** These Integrated Circuits (IC)s are popularly known as **Chips.**

A single IC has many transistors, registers and capacitors built on a single thin slice of silicon. So it is quite obvious that the size of the computer got further reduced. Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750.** Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high. Very soon ICs were replaced by **LSI (Large Scale Integration)**, which consisted about 100 components.

An IC containing about 100 components is called LSI as in (Fig 2).

Features



CP10112

- They used Integrated Circuit (IC) chips in place of the transistors.
- Semi conductor memory devices were used.
- The size was greatly reduced, the speed of processing was high, and they were more accurate and reliable.
- Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) were also developed.
- The mini computers were introduced in this generation.
- They used high level language for programming.

Fourth Generation (1978 - present): An IC containing about 100 components is called LSI (Large Scale Integration) and the one, which has more than 1000 such components, is called as VLSI (Very Large Scale Integration).

It uses large scale Integrated Circuits(LSIC) built on a single silicon chip called microprocessors. Due to the development of microprocessor it is possible to place computer's central processing unit(CPU) on single chip. These computers are called microcomputers.

Later very large scale Integrated Circuits(VLSIC) replaced LSICs. Thus the computer which was occupying a very large room in earlier days can now be placed on a table. The personal computer (PC) that you see in your school is a Fourth Generation Computer Main memory used fast semiconductors chips up to 4 M bits size. Some of the Fourth generation computers are IBM PC, Apple-Macintosh, etc.

Hard disks were used as secondary memory. Keyboards, dot matrix printers etc. were developed. Operating System (OS)-such as MS-DOS, UNIX, Apple's Macintosh were available. Object oriented language, C++ etc were developed.

Features

- They used Microprocessor (VLSI) as their main switching element.
- They are also called as micro computers or personal computers.
- Their size varies from desktop to laptop or palmtop.
- They have very high speed of processing; they are 100% accurate, reliable, diligent and versatile.
- They have very large storage capacity.

Fifth Generation (PRESENT AND FUTURE): 5th generation computers use ULSI (Ultra-Large Scale Integration) chips. Millions of transistors are placed in a single IC in ULSI chips.

64 bit microprocessors have been developed during this period.. Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed (fig. 3).

Fig 3



Fifth generation computing devices, based on Artificial Intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. Artificial intelligence includes:

- **Games Playing:** Programming computers to play games such as chess and checkers
- **Expert Systems:** Programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms)
- **Natural Language:** Programming computers to understand natural human languages
- **Neural Networks:** Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains
- **Robotics:** programming computers to see and hear and react to other sensory stimuli

Table - 1

GENERATION	ELECTRONIC COMPONENT	ADVANTAGES	DISADVANTAGES
First	Vaccum tube	Helped in calculation and computational work	1.Big size 2.Very costly 3.Slow speed 4.Low accuracy 5.Low storage 6.High power requirements 7.High heat generation 8.High failure rate 9.Used machine language 10.No operating system
Second	Transistor	1.Smaller size 2.Less cost 3.Better speed 4.Low power consumption and less heat generation 5.Better storage capacity 6.Better accuracy and more reliability	1.Need air conditioning 2.Constant maintenance 3.No operating systems 4.Later stage computers used assembly languages
Third	Integrated Circuits(IC) small & medium scale	1.Better in all aspects compared to I & II 2.Used operating systems and high level language	1.Initial problem with manufacturers 2.No insight obtained into internal working
Fourth	VLSI or Microprocessor	1.Low cost 2.Excellent speed and reliability 3.Computers close to man	1.Less powerful than main frame computers
Fifth (Knowledge Information Processing Systems)	ULSI or Bio-Chips	1.Very cheap 2.super speeds 3.Very high storage capacity 4.Highly sophisticated OS 5.posses intelligence and decision making ability	1.New low level language needed

Classification of computers

Computers are classified according to the following criteria:

- Principle of Operation
- Computing Power, Memory Capacity and cost
- Technological Development
- Principle of operation
 - Analog computer
 - Digital Computer
 - Hybrid Computer

It is a computer that measures continuously changing physical quantities such as current, temperature, pressure etc. and converts them into quantities which can be used as data for computation. As these computers deal with continuously varying quantities they will give only approximate results. Its output is usually displayed on a meter or scale. Analog computer has low memory and fewer functions. These are used for engineering and scientific applications.

- Thermometer
- Speedometer
- Analog clock

Analog Computer

Digital Computer

A digital computer works with digital data. Digital computer uses binary number system. Binary number system consists of only two digits '0' and '1'. A digital computer represents data in digital signals. A '0' represents OFF and a '1' represents ON. Digital computer performs arithmetic and logical operations on data. It gives output in digital form.

Digital computers are very fast. These computers can

store results. They have large Memory (that is data storing capacity). Today most of the computers used in offices and homes are Digital computers.

The digital computers are further divided into the following two groups:

- Special purpose computers
- General purpose computers

Table 2

Analog Computers	Digital Computers
<p>1. Analog Computers Work on continuous values.</p> <p>2 Analog Computers have low memory.</p> <p>3 Analog computers have Slow speed.</p> <p>4 Analog computers are less reliable.</p> <p>5 Analog computers used in engineering</p> <p>6 Analog computers are used to calculate / measure analog quantities like speed and temperature.</p> <p>7 Analog computers provide less accurate results.</p> <p>8 Normally Analog Computers are specific purpose</p> <p>9 Normally Analog Computers are specific purpose</p> <p>10 Examples of Analog computers are: thermometer, analog clock, speedometer etc.</p>	<p>Digital computers Work on discrete values.</p> <p>Digital computers have a very large memory</p> <p>Digital computers have fast speed.</p> <p>Digital computers are more reliable.</p> <p>Digital computers are used in all fields of life, science and medical fields.</p> <p>Digital computers are used to calculate mathematical and logical operations. It can solve addition, subtraction, division, multiplication and other mathematical and statistical operations.</p> <p>Digital computers provide 100% accurate results.</p> <p>Digital Computers are general purpose</p> <p>Digital Computers are general purpose</p> <p>Examples of digital computers are:</p> <p>Personal Computer, laptops, smart phones etc.</p>

Special Purpose Computers

It is a computer designed to solve specific type of problem. The computers used in ships and aircrafts, etc.

General Purpose computers

It is a computer designed to solve a wide variety of problems. A General purpose Computer can store different programs and process them.

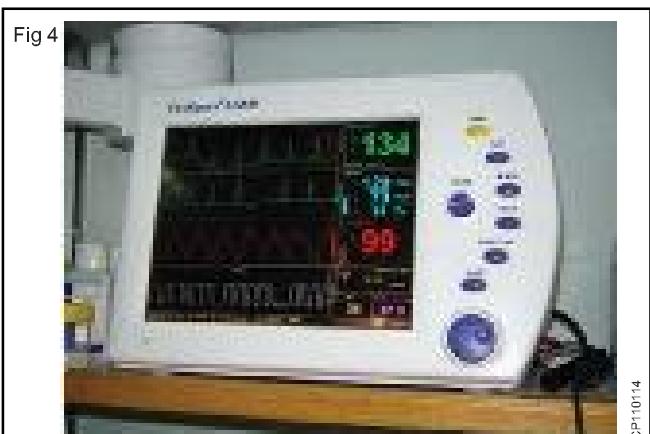
The differences between analog and digital computers are listed in table 2

Hybrid Computer (Fig. 4)

A hybrid computer is a combination of both analog and digital computer. Hybrid computer can handle both analog and digital data. A hybrid computer combines the best characteristics of both the analog and digital computer. It can accept data in both analog and digital form.

Applications

Hybrid computer devices are used in hospitals that may calculate patient's heart function, temperature and blood pressure etc. This calculation may be converted into



numbers and shown in digital form. For example, The Vital Signs Monitoring unit also called (VSM) in short. It has Blood Pressure monitor, ECG monitor, respiratory monitor, and is also used for monitoring anesthesia.

- Hybrid computers are also used in spaceships and missile system.

- Hybrid Computer Machines are generally used in scientific applications
- Hybrid computers are used for controlling industrial processes.

Computers are classified on the basis of computing power, memory capacity and cost.

- Microcomputer or Personal Computer.
- Mini Computer.
- Mainframe Computer.
- Super Computer.

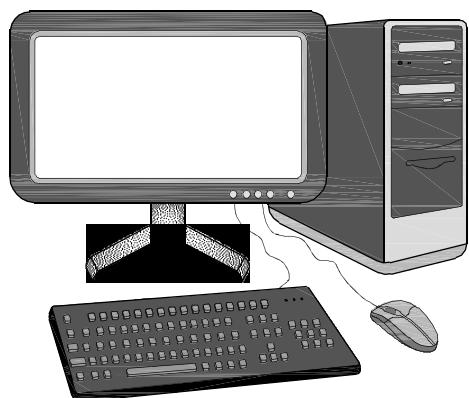
Micro Computers

Micro computer is also called personal computer. It was introduced in 1970. Examples of personal computers are PC and Apple Macintosh. The major types of personal computers are desktop computer and portable computer.

Desktop Computer

These computers can easily fit on a table or desktop, hence the name. These computers come in two models or casings. In Desktop model, the system unit is placed on the desktop or table. Monitor is placed on the system unit. In Tower model, both monitor and system unit are placed on the table as in (Fig 5).

Fig 5



TOWER MODEL COMPUTER

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Portable computer

Portable is a personal computer that can be carried from one place to other easily. Notebook computer and handheld computer (smart phone) are examples of portable computers. Notebook computer is also called laptop computer. Laptop computers are very small in size and can be placed easily on lap.

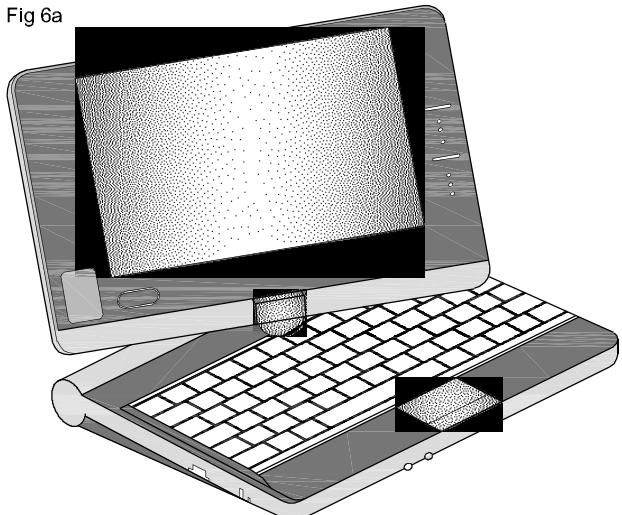
Lap top computer or notebook computer

The laptop computer or notebook computer will be as shown in fig 6a and fig 6b. It is also called as tower model computer.

Palmtop Computer/Digital Diary /Notebook /PDAs:

A handheld computer (like smart phone) is also portable. Hand held computer is known as palmtop computer.

Fig 6a



LAP TOP COMPUTER OR NOTE BOOK COMPUTER

CP110116a

Fig 6



CP110116B

Palmtops have no keyboard but the screen serves both as an input and output device. It easily fits in the hand of the user.

Uses of Micro Computer

The PC is the most common type of computer used in the office. It is now widely used in many homes. These are also used for business and engineering application.

Mini Computer

Mini computers were introduced in the 1960s. Minicomputer is larger and more powerful computer than personal computer. It can execute five million instructions per second. It generally consists of two or more processors.

Minicomputer can serve up to 4000 connected users simultaneously. It is normally accessed by users via personal computer or terminal. A device with a monitor and keyboard is called terminal. It is also known as dumb terminal. It has no processing power and cannot work as stand-alone computer. Some of the minicomputers models are VAX-8800, AS400

Uses of Mini Computer

Mini computers are often used by small and medium-sized companies to provide centralized store of information.

Mainframe Computer

Mainframe computers were introduced in 1975. A mainframe computer is a very large computer in size. It is processors. It is designed to perform multiple tasks for multiple users at the same time. Mainframe computers can serve up to 50,000 users at the same time.

The users access a mainframe computer through terminal or personal computer. A typical mainframe computer can execute 16 million instructions per second. Some of the main computers models are

- NEC 610
- DEC 10

Uses of Mainframe Computer

Mainframe computers are used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, and transaction processing.

Super computer

Super computers were introduced in 1980s. Super computer is the fastest computer. Super computer is the biggest in size and the most expensive in price than any other computers.

It is the most sophisticated, complex and advanced computer. It has a very large storage capacity. It can process trillions of instructions in one second. Super Computer is the fastest and most powerful computer of a time. Supercomputers are very expensive. Supercomputers are used for highly calculation-intensive tasks. Super computers are also used for specialized applications that require immense amounts of mathematical calculations.

Applications of Super Computer

- Weather forecasting,
- Animated graphics like in Hollywood movies,
- Fluid dynamic calculations
- Nuclear energy research
- Space science
- Weapon and missile design
- Petroleum exploration, and etc.

Today, supercomputers are produced by traditional companies such as Cray, IBM and Hewlett- Packard. Since October 2010, the Tianhe-1A supercomputer has been the fastest in the world; it is located in China.

The main difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a single program as fast as possible, whereas a mainframe uses its power to execute many

programs concurrently. The modern super computer consists of thousands of microprocessors. Super computer uses high-speed facilities such as satellite for online processing.

Sum of the super computers models are CRAY-XP, ETA-10, Param and Deep Blue .

Advantages of computers

- A computer has a very high processing speed with high reliability.
- Large volume of information can be stored in the memory any particular data/program can be retrieved immediately.
- Solution to a complicated problem is possible at a very high speed.
- Processing of large volume of data saves a lot of clerical work which reduces the processing cost.
- Computers perform operations efficiently at environments where presence of human being is not possible such as furnace, poisonous atmosphere, vacuum, unmanned satellite, etc.

Limitation of computers

- High initial cost.
- Input information has to be prepared in the form of statements called program which requires a considerable amount of knowledge.
- usage of computers will be economical only when there is clerical data processing for large volume of data and are repetitive in nature
- It is a merely a machine it cannot correct errors on its own.

Functions of Computers

All computers are made up of following basic units as shown in fig (7). They are as follows:-

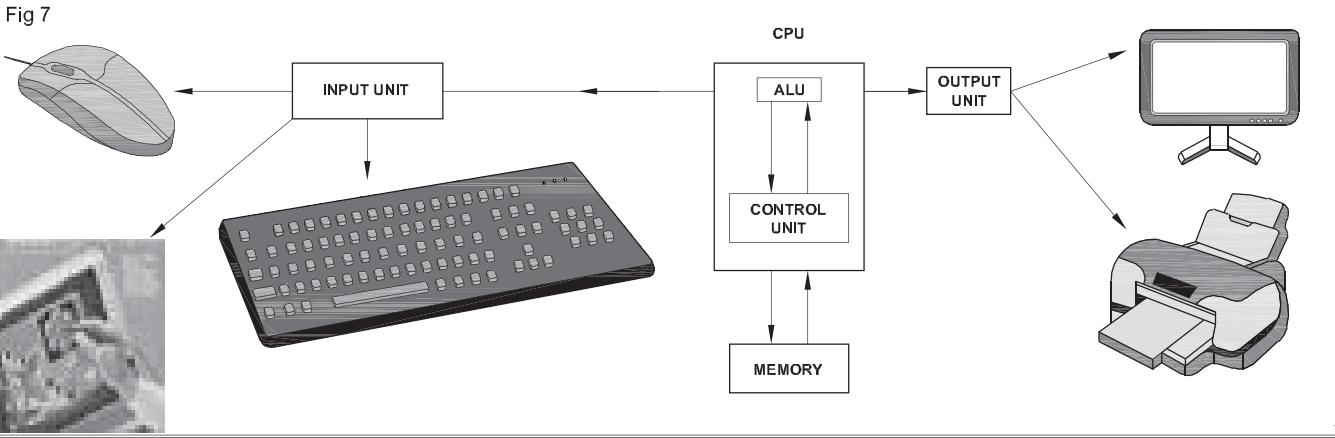
- 1 Input Unit
- 2 Central processing Unit (CPU)
 - a) Arithmetic Logic Unit(ALU)
 - b) Control Unit (CU)
- 3 Memory
- 4 Output Unit

Input Unit

Computers need to receive data and instruction in order to solve any problem. Therefore we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Some of the input devices are listed in table 1.

Input devices perform the following functions.

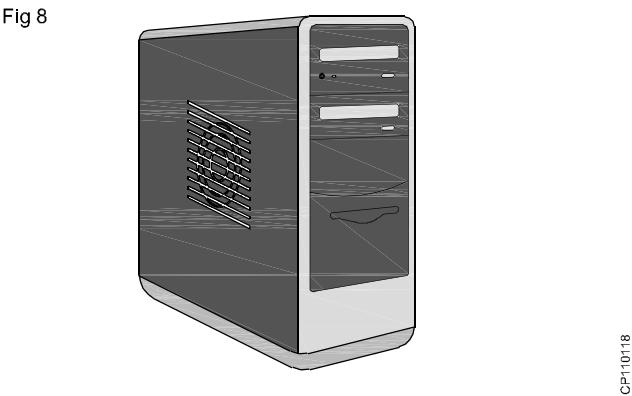
- Accept the data and instructions from the outside world.



- Convert it to a form that the computer can understand.
- Supply the converted data to the computer system for further processing.

Central Processing Unit (CPU) (Fig. 8)

The central processing unit (CPU) is the electronic brain



of the computer as in fig-8. The CPU in a personal computer is usually a single chip. It organizes and carries out instructions that come from either the user or from the software. The processor is made up of many components. CPU performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

Two typical components of a **CPU** are the following:

The arithmetic logic unit (ALU), which performs arithmetic and logical operations.

The control unit (CU), which extracts instructions from memory and decodes and executes them, calling on the ALU when necessary.

Memory

Memory refers to the physical device used to store the program or data on the temporary or permanent basis for

use in a computer or other digital electronic device. There are two types of memory in computer.

- Primary Memory
- Secondary Memory

Output Unit

Output unit receive the informations from the processing unit and provide the results in human readable form.

Output Devices

The some of the output devices are

- Monitor
- Printer
- Plotter
- Speaker

Applications of computers

Science: Scientists have been using computers to develop theories and to analyse and test the data. The high speed and accuracy of the computer allow different scientific analyses to be carried out. They can be used to generate detailed studies of how earthquakes affect buildings or pollution affects weather pattern. Satellite-based applications have not been possible without the use of computers. Moreover, it would not be possible to get the information of the solar system and the cosmos without computers.

Education: Computers have also revolutionized the whole process of education. Currently, the classrooms, libraries and museums are efficiently utilizing computers to make the education much more interesting. Unlike recorded television shows, computer-aided education (CAE) and computer-based training (CBT) packages are making learning much more interactive.

Medicine and Health Care: There has been an increasing use of computers in the field of medicine. Now, doctors are using computers right from diagnosing the illness to monitoring a patient's status during complex surgery. By using automated imaging techniques, doctors are able to look inside a person's body and can study



each organ in detail (e.g. CT scans or MRI scans), which was not possible few years ago. There are several examples of special-purpose computers that can operate within the human body such as cochlear implant, a special kind of hearing aid that makes it possible for deaf people to hear.

Engineering/Architecture/Manufacturing: The architects and engineers are extensively using computers in designing and drawings. Computers can create objects

that can be viewed from all the three dimensions. By using techniques like virtual reality, architects can explore houses that have been designed but not built. The manufacturing factories are using computerized robotic arms to perform hazardous jobs. Besides, computer-aided manufacturing (CAM) can be used in designing the product, ordering the parts and planning production. Thus, computers help in coordinating the entire manufacturing process.

Entertainment: Computers are finding greater use in entertainment industry. They are used to control the images and sounds. The special effects, which mesmerize the audience, would not have been possible without the computers. In addition, computerized animation and colourful graphics have modernized the film industry.

Communication: E-mail or electronic mail is one of the communication media in which computer is used. Through e-mail, messages and reports are passed from one person to one or more persons with the aid of computer and telephone line. The advantage of this service is that while transferring the messages it saves time, avoids wastage of paper and so on. Moreover, the person who is receiving the messages can read the messages whenever he is free and can save it, reply it, forward it or delete it from the computer.

Business Application: This is one of the important uses of the computer. Initially, computers were used for batch-processing jobs, where one does not require the immediate response from the computer. Currently, computers are mainly used for real-time applications (like at the sales counter) that require immediate response from the computer. There are various concerns where computers are used such as in business forecasting, to prepare pay bills and personal records, in banking operations and data storage, in various types of life insurance business and as an aid to management. Businesses are also using the networking of computers, where a number of computers are connected together to share the data and the information. Use of e-mail and the Internet has changed the ways of doing business.

Publishing: Computers have created a field known as desktop publishing (DTP). In DTP, with the help of computer and a laser printer one can perform the publishing job all by oneself. Many of the tasks requiring long manual hours such as making table of contents and index can be automatically performed using the computers and DTP software.

Banking: Computers are extensively used in the field of banking and finance. People can use the ATM (automated teller machine) services 24 hours a day to deposit and withdraw cash. When different branches of the bank are connected through computer networks, the inter branch transactions such as cheque and draft can be performed without any delay.

Railway Reservation System

Using this system, the user can perform following operations through online. (web site: www.irctc.co.in)

- search the train and its timings
- check seats and birth availability
- booking and cancelling tickets
- status of PNR (Passenger Name Record)

Telephone / Electricity Board Billing:

The users can do the following operations through online by using this system. (Web site: portal.bsnl.in - BSNL)

- Register the telephone / electricity board number
- Check and pay the bill amount
- Register the complaints

E-Governance

E-Governance implies technology driven governance. E-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between Government-to-Citizens (G2C), Government-to-Business(G2B),Government-to-Government(G2G) as well as back office processes and interactions within the entire government frame work.

E-Governance covers all the sectors with a view to providing hassle free, transparent and efficient service to the common man (both in urban and rural areas).

Introduction to CPU architecture and motherboard

Objectives: At the end of this lesson you shall be able to

- state what is hardware and test the internal and external hardware
- brief the listed hardware
- state what is partitions and their types
- explain the booting and its procedures.

Computer Hardware

The physical units of a computer are called as the hardware of a computer.

Internal hardware examples

- Blu-Ray, CD-ROM, and DVD
- CPU
- Hard drive
- Motherboard
- RAM
- Sound card
- Video card
- SMPS

External hardware examples

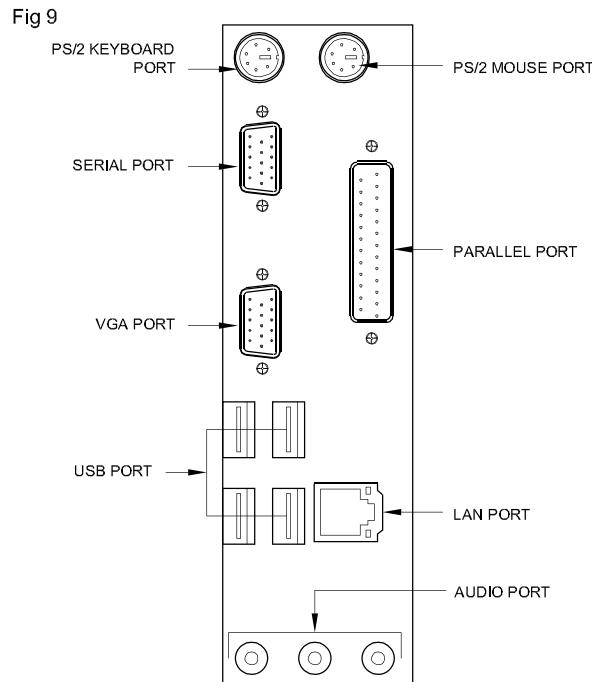
- Flat-panel, Monitor, and LCD
- Keyboard
- Mouse
- Printer
- Scanner

CPU & ALU

Central Processing Unit (CPU) is the heart of the Computer. It is the hardware that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system.

CPU Ports and Connectors

A port is a connector at the back of a Computer cabinet where you plug in an external device such as a printer, keyboard, scanner, modem etc. This allows instructions and data to flow between the computer and the device. The computer ports are also commonly referred to as the Input/output ports (I/O ports). These ports can be either serial or parallel. Fig 1 shows the commonly available ports on a personal computer.



Most connectors are separated, permitting the cable to be plugged in only in the correct direction. The keyboard and mouse use "PS2" (Personal System 2) connectors. The PS2 connectors are color-coded. The purple connector is for the keyboard. The green connector is for the mouse.

- **PS/2 Ports:** Standard keyboards and mouse often connect to the computer via the PS/2 ports. To plug in a keyboard or mouse cable, first match the cable to the connector. Then push the cable into the connector. Be sure not to force the connector because you will end up bending the pins
- **Serial & Parallel Ports:** The serial port and parallel port allow connections to printers and other external devices. To transfer a byte through a serial port, eight bits are queued and sent bit by bit. However, in a parallel port, all the eight bits are transferred simultaneously
- The parallel port, serial port, and video port all use "D" type connectors (DB-25M, DB-9M and DB-15F respectively). These are called D connectors because of their shape, which permits the cables to be plugged in only one way.

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USB (Universal serial bus) Ports

Devices like digital cameras, scanners and printers often connect to the motherboard via the USB ports. A USB connector's distinctive rectangular shape makes it easily recognizable.

USB has a number of features that makes it particularly popular on PCs. First, USB devices are hot swappable. You can insert or remove them without restarting your system

LAN(Local Area Network) Port: The LAN port is used to connect the PC to a local network or to high speed Internet services.

VGA (Video Graphics Array) Ports: The VGA port provides access to integrated video.

Audio ports: It provides access to integrated audio.

The audio jacks are the most confusing connectors on the back panel. Although the jacks are sometimes color-coded, the devices that plug into them rarely.

CPU front Panel shown Fig 2.

Fig 2



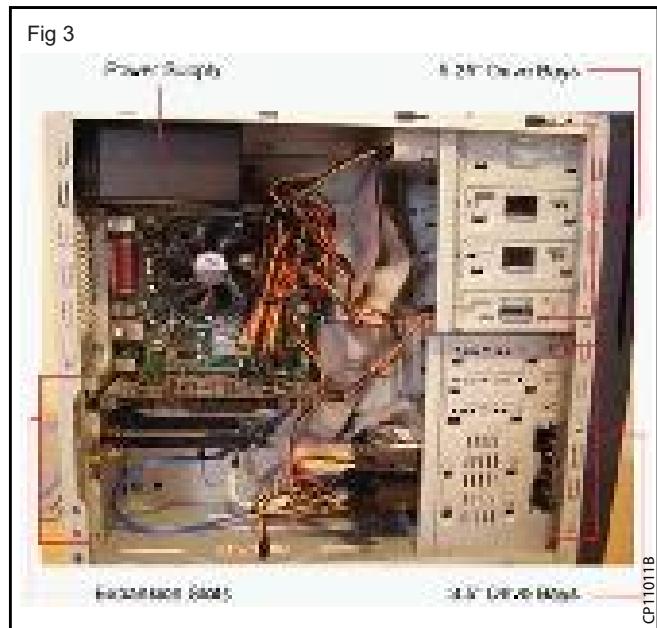
It may contain the following parts.

- Power On/Off Switch
- Power Indicator
- CD/DVD Drive
- CD/DVD Drive Open/Close Button
- CD/DVD Drive indicator
- Floppy Disk Drive
- Floppy Disk Drive Indicator
- USB Ports
- Audio and Mic connectors

Design of CPU Cabinets may vary based on the manufacturer.

The System Unit and Its Components

The system unit is a box-like unit filled with a number of useful components, each performing a discrete function. These components work together to accomplish the main function of the computer, viz. accept and process input and deliver output. This section will elaborate on these components one by one. Fig 3 shows the various components of the system unit.



Power Supply

The power supply connects to nearly every device in the PC to provide power. It is located at the rear of the case. The system unit draws power from the AC mains through a power protection device.

This power is not directly supplied to the internal components. Instead, one of the components, called the internal power supply, converts the AC input into DC output of 5 and 12 volts. Normally, the **internal power supply** is referred to as **Switched Mode Power Supply (SMPS)**.

The SMPS provides cable connectors to supply the required voltage to the other internal components like the floppy drives, the hard disk drive, the motherboard and external device such as the keyboard. The ON/OFF switch of the system unit is actually a part of the SMPS.

Fan

The **SMPS** has a small fan, called the exhaust fan, attached to **SMPS(Fig. 4)**. This fan rotates as long as the computer is switched on. Its function is to cool the **SMPS** unit.

Drive Bays: The 5.25" and 3.5" drive bays house the many kinds of storage devices a computer might contain.

Expansion Slots: An expansion slot is a slot located inside a computer mother board that allow additional peripherals to be connected to it.

Fig 4



Power Port: Power is delivered to drives via cables that plug into the power port on the drives.

Peripheral cards slot

The peripheral cards are the spare expansion slots available on the mother board on which peripheral cards can be inserted.

The following are the peripheral cards

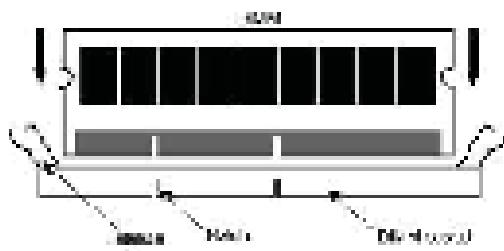
- Sound card
 - Video card
 - Modem
 - Wireless network

Fig. 7 shows the peripheral card, designed with a PCI (Peripheral component interconnect) connector.

Memory Slot

Memory Slot is used to insert a Random Access Memory(RAM) shown in fig 5

Fig 5



CP11011C



CP11011F

Storage Drivers

Storage drivers such as hard drives, optical drives and floppy drives all connect to the motherboard via cables and is mounted inside the computer.

IDE & SATA Cables: Fig 6 shows two hard disk drives that connect in different ways to the motherboard. One uses the older IDE cable connection while the other uses SATA(Serial Advanced Technology Attachment) cable which provides for faster hard drive access.

Fig 6

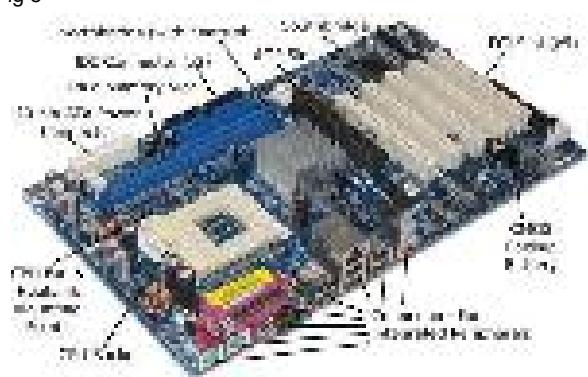


CP11C

Motherboard

The motherboard is a printed circuit that is the foundation of a computer and allows the CPU, RAM, and all other computer hardware components to function with each other as on fig 8.

Fig 8



CP11011G

The motherboard is the primary component of the entire system. A mother board is a large board containing a number of tiny electronic circuits and other components are visible. All peripheral devices are connected to the motherboard. The components of the motherboard are:

- Keyboard / mouse port
- Parallel and Serial port
- Processor Socket
- AGP Slot
- PCI Slots
- ISA Slot
- CMOS Battery
- Data Card Connector
- Memory Slots
- Floppy Port
- Fan Header
- Main Power Connector

Floppy Port :The floppy drive connects to the computer via a 34-pin ribbon cable, which in turn connects to the motherboard. A floppy controller is one that is used to control the floppy drive.

RAM slots: Random-Access Memory (RAM) stores programs and data currently being used by the CPU.

RAM is measured in units called bytes. RAM has been packaged in many different ways

- SIMM-Single inline memory module -32 or 72 Pin
- DIMM- Dual Inline Memory module -168 pin.

In most of the PC's uses of the DIMM module

ROM BIOS Chip: This means Read Only Memory Basic Input-Output System.

The built-in software that determines what a computer can do without accessing programs from a disk. On PCs, the **BIOS** contains all the code required to control the keyboard, display screen, disk drives, serialcommunications, and a number of miscellaneous functions.

The BIOS is typically placed in a **ROM** chip that comes with the computer (it is often called a **ROM BIOS**). This ensures that the **BIOS** will always be available and will not be damaged by disk failures.

It also makes it possible for a computer to boot itself. Because RAM is faster than **ROM**, though, many computer manufacturers design systems so that the BIOS is copied from **ROM** to **RAM** each time the computer is booted. This is known as shadowing.

Many modern PCs have flash **BIOS**, which means that the **BIOS** have been recorded on a flash memory chip, which can be updated if necessary. The PC **BIOS** is fairly standardized, so all PCs are similar at this level (although there are different **BIOS** versions). Additional **DOS** functions are usually added through software modules.

This means you can upgrade to a newer version of DOS without changing the **BIOS**. PC **BIOS** that can handle Plug-and-Play (PnP) devices are known as PnPBIOS. These BIOS are always implemented with flash memory rather than ROM.

CMOS Battery

CMOS (Complementary Metal-Oxide-Semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the **BIOS** settings.

Most **CMOS** batteries will last the lifetime of a motherboard (up to 10 years in most cases) but will sometimes need to be replaced. Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery.

ISA slot: (Industry Standard Architecture) It is the standard architecture of the Expansion bus. Motherboard may contain some slots to connect ISA compatible cards.

PCI slot : Intel introduced the Peripheral Component Interconnect bus protocol. The PCI bus is used to connect I/O devices to the main logic of the computer. **PCI** bus has replaced the ISA bus. PC motherboards have one PCI slot but generally more than one.

The **PCI** bus architecture is a processor-independent bus specification that allows peripherals to access system memory directly without using the CPU.

AGP slot: The Accelerated Graphics Port (AGP) is a high-speed point-to-point channel for attaching a video card to a computer's motherboard.

Power supply plug in

The Power supply, as its name implies, provides the necessary electrical power to make the PC (Personal Computer) operate. The power supply takes standard 110-V AC power and converts into +/-12-Volt, +/-5-Volt, and 3.3-Volt DC power. The power supply connector has 20-pins, and the connector can go in only one direction.

Hard Disk and Partitions

Partitioning is a process of dividing the Hard disk into several chunks, and uses any one of the portion or partition to install OS or use two or more partitions to install multiple OS..

But it can always have one partition, and use up the entire Hard disk space to install a single OS, but this will become data management nightmare for users of large Hard disks.

Now, because of the structure of the Master Boot Record (MBR), has only four partitions, and these four partitions are called **Primary Partitions**.

Extended Partition is not a usable partition by itself, but it's like a "container" and it is used to hold **Logical Drives**! That is this Extended Partition can be subdivided into multiple logical partitions.

In order to boot into a Partition, **it must be designated as bootable partition** or Active Partition. Active Partition is that partition which is flagged as bootable or which contains OS, this is generally a Primary Partition.

Types of Partitions:

- Master
- Partition
- Extended and
- Logical Extended

Master Boot Record (MBR): MBR is a small 512 bytes partition which is at the first physical sector of the hard disk. The location is denoted as CHS 0,0,1 meaning 0th Cylinder, 0th Head and 1st Sector.

MBR contains a small program known as bootstrap program which is responsible for booting into any OS. MBR also contains a table known as Partition Table.

This Partition Table is a table which lists the available Primary Partitions in the hard disk. Partition table considers whole Extended Partition as one Primary partition and lists it in the table!

So a Partition table can have two possible entries:-

- Up to 4 Primary Partitions.
- Up to 3 Primary Partitions and 1 Extended Partition.(Total not exceeding 4) .

Partition Boot Sector (PBR): This is the logical first sector, that is sector at the start of a Primary Partition. This is also 512 byte area, which contains some programs to initialize or run OS files. All Primary Partitions have its own PBRs.

Extended Boot Sector (EBR): This is the logical first sector, that is the sector at the start of the Extended Partition. This EBR contains a Partition Table, which lists the available Logical Partitions inside Extended Partition. That is it contains the Starting addresses of each Logical Partitions.

Logical Extended Boot Sector (LEBR): This is the logical first sector residing at the start of each Logical Partition. This is similar to PBR for Primary Partitions.

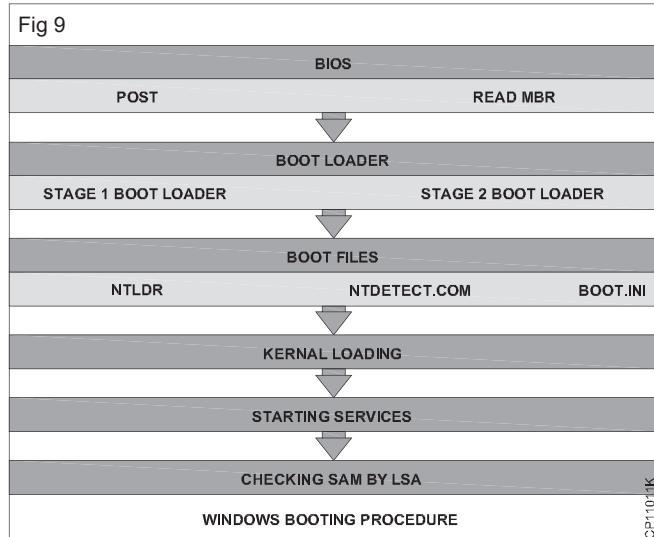
Booting

Booting is a process of loading the operating system (OS) and checking all the system software and hardware those are installed in the computer.

Booting procedure of Windows operating system

Functions of BIOS

The first process starts, when the computer switched on Basic Input Output System (BIOS) perform two functions, to conduct POST and read MBR (Fig 9).



POST - POST stands for Power On Self Test. POST checks all the hardware devices connected to a computer like RAM, hard disk etc and make sure that the system can run smoothly with those hardware devices. If the POST is a failure the system halts with a beep sound.

Now BIOS checks the **boot priority**. We can set the boot priority as CD drive, hard disk or floppy drive.

MBR - The next duty of BIOS is to read the MBR. MBR stands for Master Boot Record and it's the first sector on a hard disk. MBR contains the partition table and boot loader.

Functions of Boot loader

Now BIOS has passed the control to boot loader and boot loader is a small program which loads kernel to computers memory. Actually there are two stages of boot loaders, stage 1 boot loader and stage 2 boot loader.

The stage 1 boot loader is a link to the stage 2 boot loader. The stage 2 boot loader resides in the boot partition and it loads the kernel to memory.

Boot files and functions

There are three boot files in a Windows operating system and they are NTLDR, NTDETECT.COM and Boot.ini. The boot files are found in the active partition of hard disk and its normally C drive in a Windows machine.

NTLDR - NTLDR stands for NT Loader and it's the second stage boot loader. The path of NTLDR is C:\Windows\i386\NTLDR.

Boot.ini - Boot.ini contains the configuration files of NTLDR. When the operating system is loaded we cannot pass any arguments to kernel, so those arguments are passed through boot.ini. You can edit boot.ini by opening through notepad. The path of Boot.ini is C:\boot.ini.

NTDETECT.COM

This file detects hardware's and passes information to NTLDR. Using the collected information the NTLDR creates a hardware key and this key is used to detect hardware's.

A new hardware key is generated after each reboot of the operating system and that's why system asks to reboot after installation of a new hardware. The hardware keys created by NTLD.R can be found in Windows registry at HKEY_LOCAL_MACHINE\HARDWARES.

Kernel and its functions

After executing the functions of boot files the control is passed to Kernel. ntoskrnl.exe is the kernel file in a Windows machine and its path is C:\Windows\system32\ntoskrnl.exe.

Kernel acts as a layer between software and hardware. The library file hal.dll (C:\Windows\system32\hal.dll) helps Kernel to interact with hardware's. HAL stands for Hardware Abstraction Layer and this hal.dll file is machine specific.

Now the drivers for hardware's are loaded from the file C:\Windows\system32\config\system and the Kernel is loaded to primary memory.

Services and log in procedure

When kernel is loaded in the primary memory, services for each process is started and the registry entry for those services can be found at HKEY_LOCAL_MACHINE\System - Current control set - Services.

Winlogon.exe (C:\Windows\system32\winlogon.exe) is the last service started during this process. Winlogon.exe starts the log in procedures of windows machine. It first calls the library file msgina.dll (C:\Windows\system32\msgina.dll).

MSGINA stands for Microsoft Graphics Identification and Authentication and it provides the log in window. Now msginal.dll passes the control to LSA (Local Security Authority), it verifies the username and password from the SAM file. SAM (Security Accounts Manager) contains the information about all users created in a Windows operating system.

Now the booting procedure is over and it has reached the desktop of Windows operating system.

Voltage: Every electric charge is capable of doing work by moving another charge either by attraction or by repulsion. This ability of a charge to do work represents its potential. Voltage is generated by the separation of charges. Voltage or electric potential is the state of separated charges striving to neutralize each other. The unit of electric potential is volt. Potential difference is necessary to cause flow of electric current.

Methods of voltage generation: Voltage can be generated by several ways. Some methods of generating voltage are:

- Voltage from friction
- Voltage from moving magnets or coils
- Voltage from pressure or tension in crystals
- Voltage from heat
- Voltage from light

- Voltage from chemical reactions

Measuring voltage: Voltage exists between any two points with different levels of charge. Voltage between any two points can be measured using an instrument called VOLTMETER. Meters used to measure current is called Ammeter. There are meters which can be used to measure voltage and current and a few other electrical parameters like resistance. Such meters are called MULTIMETERS.

Types of voltage: As discussed in above paragraphs there are several sources by which voltage can be developed. Depending upon the voltage source, the voltage developed can be,

Direct voltage: It is of constant magnitude. It remains at the same amplitude from the moment it is switched ON till the moment it is switched - OFF.

Alternating voltage: In this type, voltage source changes its polarity regularly and therefore the direction of developed voltage.

A mixed voltage is a combination of direct voltage and alternating voltage. The level of voltage is not constant. It varies around a mean value.

Electric Current: Electric current is produced when electric charges move in a definite direction. This movement is not only of negative charges but also of positive charges. The strength of electric current is the quantity of charge which flows across a given cross section of a conductor every second. The unit of current strength is Ampere.

$$\text{Current strength} = \frac{\text{Quantity of charge}}{\text{time}}$$

Measuring current: Electric current is the flow of charge, in a conductor. So, to measure current must pass through the measuring device. The current measuring instrument is called the ammeter or the current meter. There are different types of ammeters used for measuring different quantities of current.

Types of current: Voltage causes electrical current to flow. If the cause of current flow is a direct voltage source, then the current caused by it is called direct current (d.c.). On the other hand, then the current caused is referred as the alternating current. If a mixed voltage AC and DC is applied to an electrical circuit, a mixed current (AC and DC) will flow through the circuit.

Types of power supply: Irrespective of how the electricity is generated, electricity can be classified into two types.

- Alternating current, generally known as AC supply.
- Direct current, generally known as DC supply.

AC supply: The term alternating current supply is given to a supply source that makes current to flow through a circuit which reverses or alternates its direction periodically.

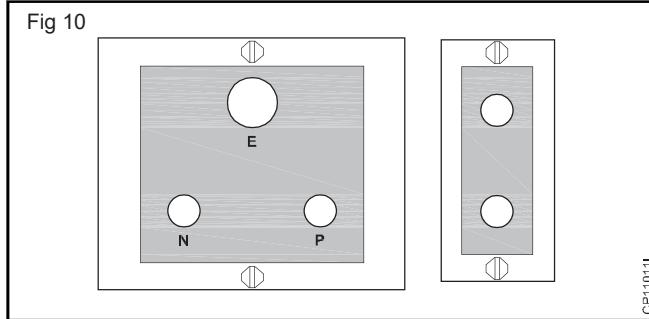
Advantages of AC supply

- Reduced transmission loss over long distances.
- Voltage levels can be changed using simple devices called transformers.
- Reduced severity of electrical shock.
- Generating equipments are simple and cheaper
- Can be easily converted to DC supply.

DC supply: The term direct current supply is given to a supply source that makes current to flow through a circuit in one direction only. Example of DC supply is batteries. Some types of generators are also designed to give d.c. supply. Such generators are called DC generators.

Low tension (LT) voltage: The domestic voltage of 240 volts AC (generated and supplied by hydro or Thermal or Nuclear generating stations) is called the low tension (LT) voltage. LT lines enters residential buildings from electricity poles called as service connection. This 240 volts is used to light up the lamps, run fans etc in homes. To connect electrical appliances at home, 240V AC is available in either two-pin or three - pin sockets. This LT voltage of 240 volts, 50Hz is also used to supply electrical and electronic gadgets such as Iron box, washing machine, personal computer etc.

Phase, Neutral and Earth points of LT supply: The domestic AC mains supply of 240V, 50Hz, is available at consumers residence either in a 2-pin outlet (Phase - Neutral) or in a 3-pin outlet (phase -Neutral and Ground). These are commercially referred to as 2/3 pin sockets. These sockets look similar to the ones shown in Fig. 10.



Phase: The line or phase point in a socket, can be termed as the point from where the electricity starts flowing into a closed circuit.

Neutral: The neutral point in the socket, can be termed as the point which receives electricity from the closed circuit.

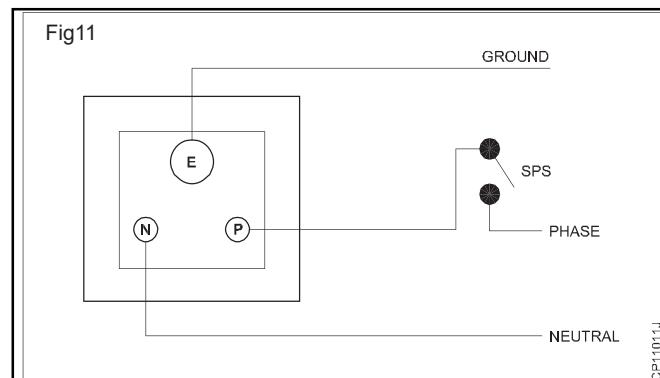
Earth / Ground: The ground (some call it Earth) point in an electrical socket provides the easiest path for the leakage current and other minor electrical defect currents of appliances.

Two pin mains sockets are used to supply main to such equipments or apparatus or gadgets generally having its cabinets/chassis made of plastic such as radio, tape

recorders etc., Hence such gadgets does not need earth pin/point on the socket.

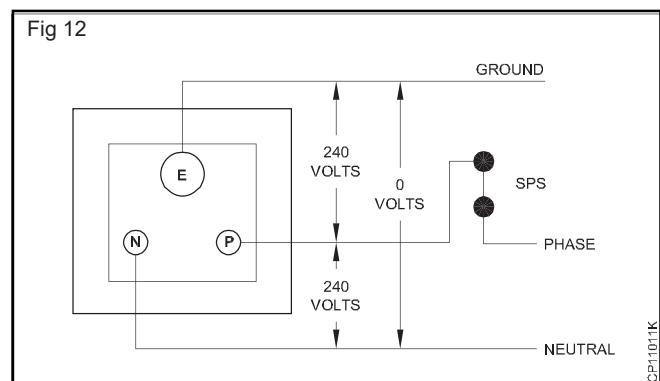
Iron box, washing machines, drill guns, Desk top computer invariably need sockets with provision of earth pin, because of the possibility of shock while using these equipments. Hence such equipments/gadgets make use of AC mains socket with earth.

Connection of 3-pin AC mains socket: Fig 11 shows how the main supply is connected to the socket.



Note that in a AC outlet be it a 2-pin or a 3-pin phase is always connected to the socket through a switch. This prevents the users from getting electrical shock when the switch is put in off position.

The standard voltage appearing across the 3-pin terminals is shown in Fig12



The voltages across the pins of the socket can be measured using an AC voltmeter or a multimeter in AC volts range.

As a quick test to find out whether or not a socket is delivering the AC supply as required, a simple instrument called line tester which looks similar to a small screw driver can be used. This instrument will have a small bulb in it which glows if it is touched to the phase pin in the socket. Ask your instructor to demonstrate the use of such line tester to check a AC mains socket.

Most Desk top computers need AC mains supply for its operation. Although the mains supply available in the 3-pin socket shown above can be used, mostly this AC supply is cleaned fro spikes before connecting to computers. The device used for cleaning the spikes in the mains AC supply are called Spike Arrestors or Spike busters.

Computers are used with spike busters because, AC spikes are likely to damage the costly computers. In addition to spike busters, most computers use other power safety devices called the voltage stabilizers and uninterrupted power supplies.

Power supply in computers: Power supply unit in computers are firmly fitted on the processing unit cabinet using torx screws. Generally there will be four such screws fitted to fix the power supply unit in the cabinet.

Windows Operating System

Objective: At the end of this exercise you shall be able to
 • list out the windows versions and features

Windows versions and its features

Microsoft Windows has seen nine major versions since its first release in 1985. Over 29 years later, Windows looks very different but somehow familiar with elements that have survived the test of time, increases in computing power and - most recently - a shift from the keyboard and mouse to the touchscreen.

Here's a brief look at the history of Windows, from its birth at the hands of Bill Gates with Windows 1 to the latest arrival under new Microsoft chief executive SatyaNadella.

Windows 1

The first version of Windows

This is where it all started for Windows. The original Windows 1 was released in November 1985 and was Microsoft's first true attempt at a graphical user interface in 16-bit.

Development was spearheaded by Microsoft founder Bill Gates and ran on top of MS-DOS, which relied on command-line input.

It was notable because it relied heavily on use of a mouse before the mouse was a common computer input device. To help users become familiar with this odd input system, Microsoft included a game, Reversi (visible in the screenshot) that relied on mouse control, not the keyboard, to get people used to moving the mouse around and clicking onscreen elements.

Windows 2

Windows 2 with overlapping windows.

Two years after the release of Windows 1, Microsoft's Windows 2 replaced it in December 1987. The big innovation for Windows 2 was that windows could overlap each other, and it also introduced the ability to minimise or maximise windows instead of "iconising" or "zooming".

The control panel, where various system settings and configuration options were collected together in one place, was introduced in Windows 2 and survives to this day.

Microsoft Word and Excel also made their first appearances running on Windows 2.

Windows 3

Windows 3.0 got colourful.

The first Windows that required a hard drive launched in 1990. Windows 3 was the first version to see more widespread success and be considered a challenger to

Apple's Macintosh and the Commodore Amiga graphical user interfaces, coming pre-installed on computers from PC-compatible manufacturers including Zenith Data Systems.

Windows 3 introduced the ability to run MS-DOS programmes in windows, which brought multitasking to legacy programmes, and supported 256 colours bringing a more modern, colourful look to the interface.

More important - at least to the sum total of human time wasted - it introduced the card-moving timesink (and mouse use trainer) Solitaire.

Windows 3.1

Windows 3.1 with Minesweeper.

Windows 1 and 2 both had point release updates, but Windows 3.1 released in 1992 is notable because it introduced TrueType fonts making Windows a viable publishing platform for the first time.

Minesweeper also made its first appearance. Windows 3.1 required 1MB of RAM to run and allowed supported MS-DOS programs to be controlled with a mouse for the first time. Windows 3.1 was also the first Windows to be distributed on a CD-ROM, although once installed on a hard drive it only took up 10 to 15MB (a CD can typically store up to 700MB).

Windows 95

Windows 95: oh hello Start menu.

As the name implies, Windows 95 arrived in August 1995 and with it brought the first ever Start button and Start.

It also introduced the concept of "plug and play" - connect a peripheral and the operating system finds the appropriate drivers for it and makes it work. That was the idea; it didn't always work in practice.

Windows 95 also introduced a 32-bit environment, the task bar and focused on multitasking. MS-DOS still played an important role for Windows 95, which required it to run some programmes and elements.

Internet Explorer also made its debut on Windows 95, but was not installed by default requiring the Windows 95 Plus! pack. Later revisions of Windows 95 included IE by default, as Netscape Navigator and NCSA Mosaic were popular at the time.

Windows 98

Windows 98, the last great DOS-based Windows.

Released in June 1998, Windows 98 built on Windows 95 and brought with it IE 4, Outlook Express, Windows

Address Book, Microsoft Chat and NetShow Player, which was replaced by Windows Media Player 6.2 in Windows 98 Second Edition in 1999.

Windows 98 introduced the back and forward navigation buttons and the address bar in Windows Explorer, among other things. One of the biggest changes was the introduction of the Windows Driver Model for computer components and accessories - one driver to support all future versions of Windows.

USB support was much improved in Windows 98 and led to its widespread adoption, including USB hubs and USB mice.

Windows ME

Windows ME was one to skip.

Considered a low point in the Windows series by many - at least, until they saw Windows Vista - Windows Millennium Edition was the last Windows to be based on MS-DOS, and the last in the Windows 9x line.

Released in September 2000, it was the consumer-aimed operating system twinned with Windows 2000 aimed at the enterprise market. It introduced some important concepts to consumers, including more automated system recovery tools.

IE 5.5, Windows Media Player 7 and Windows Movie Maker all made their appearance for the first time. Autocomplete also appeared in Windows Explorer, but the operating system was notorious for being buggy, failing to install properly and being generally poor.

Windows 2000

Windows 2000 was ME's enterprise twin.

The enterprise twin of ME, Windows 2000 was released in February 2000 and was based on Microsoft's business-orientated system Windows NT and later became the basis for Windows XP.

Microsoft's automatic updating played an important role in Windows 2000 and became the first Windows to support hibernation.

Windows XP

Windows XP still survives to this day.

Arguably one of the best Windows versions, Windows XP was released in October 2001 and brought Microsoft's enterprise line and consumer line of operating systems under one roof.

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It was based on Windows NT like Windows 2000, but brought the consumer-friendly elements from Windows ME. The Start menu and task bar got a visual overhaul, bringing the familiar green Start button, blue task bar and vista wallpaper, along with various shadow and other visual effects.

ClearType, which was designed to make text easier to read on LCD screens, was introduced, as were built-in

CD burning, autoplay from CDs and other media, plus various automated update and recovery tools, that unlike Windows ME actually worked.

Windows XP was the longest running Microsoft operating system, seeing three major updates and support up until April 2014 - 13 years from its original release date. Windows XP was still used on an estimated 430m PCs when it was discontinued.

Its biggest problem was security: though it had a firewall built in, it was turned off by default. Windows XP's huge popularity turned out to be a boon for hackers and criminals, who exploited its flaws, especially in Internet Explorer, mercilessly - leading Bill Gates to initiate a "Trustworthy Computing" initiative and the subsequent issuance of Service Pack updates that hardened XP against attack substantially.

Windows Vista

Windows Vista, arguably worse than Windows ME.

Windows XP stayed the course for close to six years before being replaced by Windows Vista in January 2007. Vista updated the look and feel of Windows with more focus on transparent elements, search and security. Its development, under the codename "Longhorn", was troubled, with ambitious elements abandoned in order to get it into production.

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It was buggy, burdened the user with hundreds of requests for app permissions under "User Account Control" - the outcome of the Trustworthy Computing initiative which now meant that users had to approve or disapprove attempts by programs to make various changes.

The problem with UAC was that it led to complacency, with people clicking "yes" to almost anything - taking security back to the pre-UAC state. It also ran slowly on older computers despite them being deemed as "Vista Ready" - a labelling that saw it sued because not all versions of Vista could run on PCs with that label.

PC gamers saw a boost from Vista's inclusion of Microsoft's DirectX 10 technology.

Windows Media Player 11 and IE 7 debuted, along with Windows Defender an anti-spyware programme. Vista also included speech recognition, Windows DVD Maker and Photo Gallery, as well as being the first Windows to be distributed on DVD. Later a version of Windows Vista without Windows Media Player was created in response to anti-trust investigations.

Windows 7

Windows 7 was everything Windows Vista should have been.

Considered by many as what Windows Vista should have been, Windows 7 was first released in October 2009. It was intended to fix all the problems and criticism faced by Vista, with slight tweaks to its appearance and a

concentration on user-friendly features and less "dialogue box overload".

It was faster, more stable and easier to use, becoming the operating system most users and business would upgrade to from Windows XP, forgoing Vista entirely.

Handwriting recognition debuted in 7, as did the ability to "snap" windows to the tops or sides of the screen, allowing faster more automatic window resizing.

Windows 7 saw Microsoft hit in Europe with antitrust investigations over the pre-installing of IE, which led to a browser ballot screen being shown to new users allowing them to choose, which browser to install on first boot.

Windows 8

Windows 8 focused more on touch than a keyboard and mouse.

Released in October 2012, Windows 8 was Microsoft's most radical overhaul of the Windows interface, ditching the Start button and Start menu in favour of a more touch-friendly Start screen.

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The new tiled interface saw programme icons and live tiles, which displayed at-a-glance information normally associated with "widgets", replace the lists of programmes and icons. A desktop was still included, which resembled Windows 7.

Windows 8 was faster than previous versions of Windows and included support for the new, much faster USB 3.0 devices.

The Windows Store, which offers universal Windows apps that run in a full-screen mode only, was introduced. Programs could still be installed from third-parties like other iterations of Windows, but they could only access the traditional desktop interface of Windows.

The radical overhaul was not welcomed by many. Microsoft attempted to tread a fine line between touchscreen support and desktop users, but ultimately desktop users wanting to control Windows with a traditional mouse and keyboard and not a touchscreen felt Windows 8 was a step back.

There were also too few touchscreens in use, or on offer, to make its touch-oriented interface useful or even necessary - despite the parallel rise of tablets such as the iPad, and smartphones, which had begun outselling PCs by the end of 2010.

Windows RT, which runs on ARM-based processors traditionally found in smartphones and non-PC tablets, was introduced at the same time as Windows 8 with the Microsoft Surface tablet.

It looked and felt like Windows 8, but could not run traditional Windows applications, instead solely relying on the Windows Store for third-party apps.

Windows 8.1

Windows 8.1 and the great reappearance of the Start button.

A free point release to Windows 8 introduced in October 2013, Windows 8.1 marked a shift towards yearly software updates from Microsoft and included the first step in Microsoft's U-turn around its new visual interface.

Windows 8.1 re-introduced the Start button, which brought up the Start screen from the desktop view of Windows 8.1. Users could also choose to boot directly into the desktop of Windows 8.1, which was more suitable for those using a desktop computer with a mouse and keyboard than the touch-focused Start screen.

Windows 10

With Windows 10, Microsoft is trying to keep some of the touch and tablet features it created for Windows 8, combine them with the familiar Start menu and desktop, and run it all on top of an improved operating system with more security, a new browser, the Cortana assistant, its own version of Office for on-the-go editing and plenty of new features intended to make life simpler.

Of course, that also means it's very different to use, whether you come from Windows 7, Windows 8 or Windows XP. You have to look in a new place even to turn your PC off.

On top of that, Windows 10 is more than just a PC operating system; it's also what will run on Windows phones - and on small tablets as well, because a 6-inch phone and a 7-inch tablet aren't such very different devices.

Microsoft is expecting people to put Windows 10 on a billion devices (which ought to encourage more app developers to at least take a look at building their apps for Windows phones and tablets, as well as for Xbox One and HoloLens).

The Start menu evolves

The full-screen Start screen of Windows 8 is back to being a Start menu in Windows 10 that tries to combine the best of both options. A scrolling Start menu that's restricted to a single column, with jump lists and flyout menus for extra options, divided into frequently used and recently installed programs, with the option to switch to a scrolling view of all the applications, sorted alphabetically.

Fig 1



Copa 13701

But also get an extra pane ,where can pin Windows 8-style tiles, complete with 'rotating 3D cube' animations of live tiles. drag the Start menu to be a larger size or even set it to be full screen.

Desktop Background

Another component of the Desktop is the Background. This is simply an image that appears at the back of the screen. Most computers come with a pre-selected background, but change it to any image.

To change the background, follow these steps:

1. Right-click on the background and choose "Personalize"
2. From the Personalization window, choose from a series of pre-selected pictures or browse for your own.

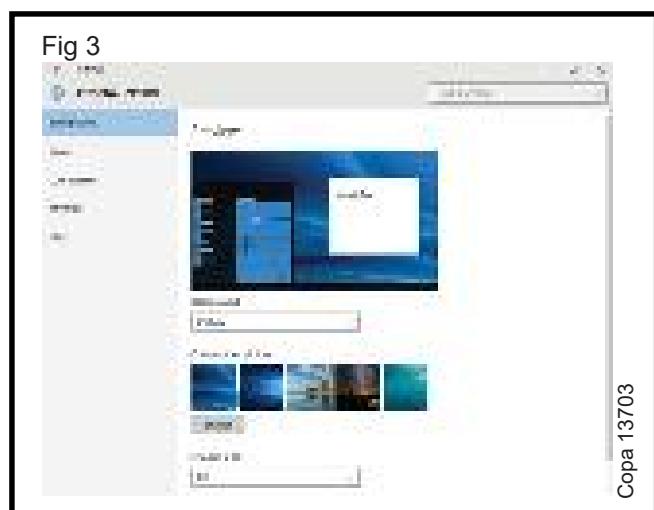
After choosing a picture, the Background will change automatically.

Start Menu

If looking for a specific application, open the Start Menu and click "All Applications". This will open an alphabetical



list of all the applications installed on computer.



File Explorer

If you are looking for a specific document, another

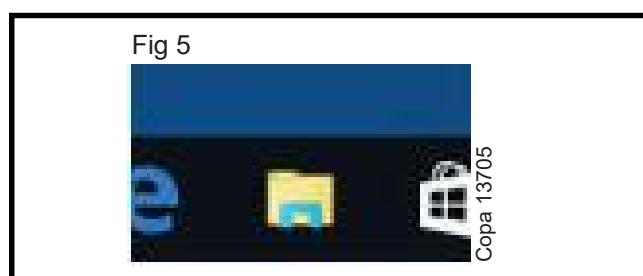
alternative is to use the File Explorer by clicking on the Folder icon on the Taskbar.

In the File Explorer window, browse all the folders and documents.

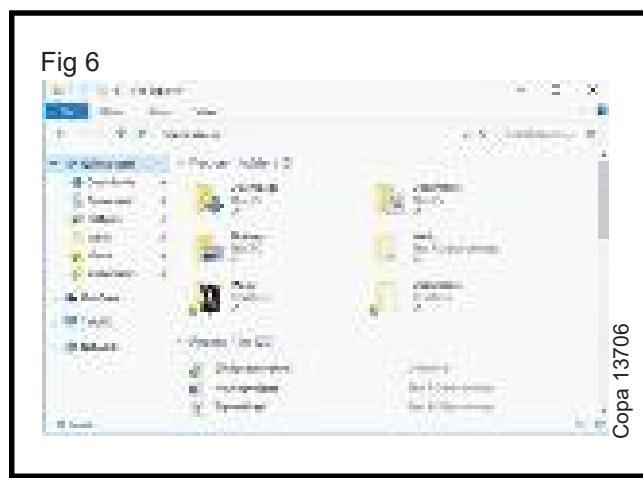


Virtual Desktops

One of the new features of Windows 10 is the addition of Virtual Desktops. This allows you to have multiple desktop screens where to keep open windows organized.



To add a virtual desktop, follow these steps:



1. Click Task View on the Taskbar
2. Click the "New desktop" option on the lower-right corner. You can access or delete the new Desktop by clicking Task View again.

Cortana helps as with search and control

Cortana, the Windows Phone assistant, shows up in

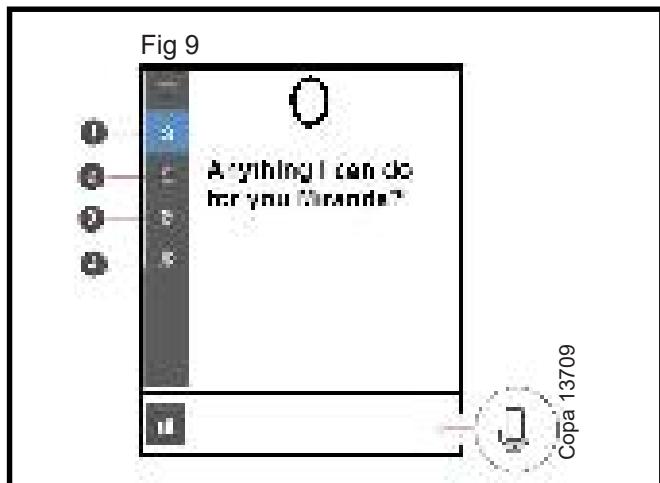


Windows 10 as a search pane on the taskbar, which can also trigger by saying 'Hey Cortana' - and when start searching the Start menu.



That gets the apps have installed, documents access to, apps could install from the Store, search results from the web and a range of other information - including from apps and services that integrate with Cortana.

Activating Cortana



If Cortana isn't active, can turn it on by typing "Cortana" in the Taskbar search to access the Cortana settings, or just clicking the "Gear" icon on the left-side of the menu.

After activating Cortana, it will start gathering information about to personalize the experience.

Task switcher

Most Windows users don't know the Alt-Tab keyboard



combination to see and switch between all running apps, so as well as having a redesigned task switcher with bigger



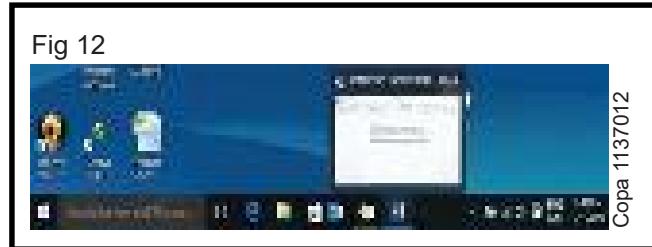
thumbnails, Windows 10 also puts a task view icon in the taskbar to help them find it.

TASKBAR

The Windows 10 taskbar sits at the bottom of the screen giving the user access to the Start Menu, as well as the icons of frequently used applications. On the right-side, the Taskbar features the Notification Area which informs the user of different things like the state of the Internet connection or the charge of the laptop battery.

The icons in the middle of the Taskbar are "pinned" applications, which is a way to have a quick access to

applications you use frequently. "Pinned" applications will stay in the Taskbar until you "unpin" them.



Pin an Application to the Taskbar

Step 1: Search for the application you want to pin in the Start Menu.

Step 2: Right-click on the application.

Step 3: Select "More" option at the top of the menu.

Step 4: Select the "Pin to taskbar" option.

Unpin an Application from the Taskbar

To "unpin" it, just right-click the icon in the Taskbar and select "Unpin from taskbar". You can "pin" it back again



any time you want.

Notification Area

The Notification Area is located at the right side of the



Taskbar. It shows different types of notifications from your computer like your Internet connection, or the volume level.

At first, the Notification Area shows a limited amount of icons. But you can click the upward arrow on its left-side to see other icons as well.

Snap Assist

Because all the apps and programs run in windows on the



desktop, instead of modern apps from the Store being in their own space, and can no longer drag across the left edge of the screen to bring another app on screen and get a split view. Instead, drag windows into the corners of the screen to get the familiar Snap view.

Now use all four corners of the screen if want each window to take up a quarter of the screen instead of half, and the space that isn't filled by the window you just dragged shows thumbnails of your other windows to make it easier to snap the next one into place.

Action Center

If we used Windows Phone 8.1 (or Android and/or iOS), we used to a notification centre can drag down from the top of the screen.

Windows 10 puts that on the right of the screen, where the charms bar was in Windows 8, with notifications from various apps at the top and the choice of various settings buttons at the bottom for quick access.

The command prompt

Those of us that use the command prompt have been stuck with pretty much the same experience since the 1990s, but in Windows 10 can finally resize the command prompt window and use familiar keyboard shortcuts to copy and paste at the command prompt.

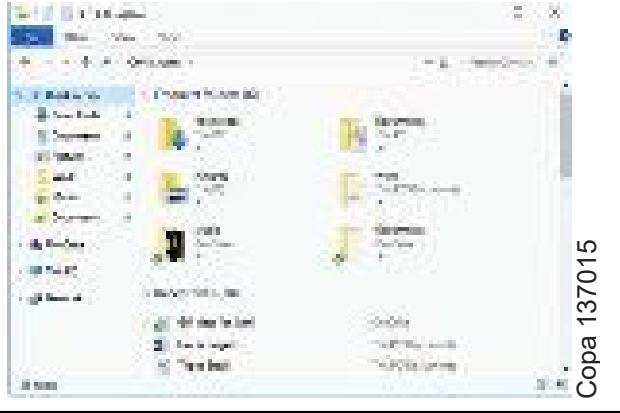
It's far from ground-breaking but it's a very welcome improvement after years of frustration.

FILE EXPLORER

File Explorer is the file management application used by Windows operating systems to browse folders and files. It provides a graphical interface for the user to navigate and access the files stored in the computer.

The main way to access the File Explorer is by clicking the folder icon in the Taskbar. After clicking the icon, the File Explorer window will open.

Fig 15



The initial File Explorer window is comprised of the following sections:

1. The **File Explorer ribbon**, which resembles the ribbon featured in Microsoft Office. The ribbon contains buttons for common tasks to perform with your files and folders.
2. The **Navigation Pane** gives you access to your libraries of documents and pictures, as well as your storage devices. It also features frequently used folders and network devices.
3. The **Frequent folders section** on the right features the folders you've worked with recently to allow for quick access to them.
4. The **Recent files section** in the lower part of the window features files and documents that you've opened recently.

The new Edge browser

To catch up with fast-moving browsers like Chrome and Firefox, Microsoft took its browser back to basics, ripping out years of code that didn't fit with web standards and making a lean, fast browser.

It's a work in progress - it won't get support for things like ad-blocking extensions until a while after Windows 10 launches - but can do plenty of neat things here. For example, and can scribble notes on a web page to send to a friend and Edge has Cortana built in to pull useful information out of web pages, like the phone number of a restaurant, or the opening hours.

Sites like Medium that didn't work properly with IE should look better and have more features in Edge.

Multiple desktops

User need to arrange a lot of windows and don't have multiple monitors, user can put them on multiple virtual desktops. And can use Alt-Tab to move between apps as usual and then Windows-Ctrl and the left and right arrow keys to move between desktops.

Schedule restarts

No more having Windows announce that you have fifteen minutes to get everything done before it restarts to apply an update. Instead of leaving Windows 10 to decide when to do that, if there's an update that will need a restart and can have Windows ask when you want to schedule that for.

user can only do that once the update has been downloaded. If user want to have certain times off-limits for restarts, they will need the features in Windows Update for Business (for Windows 10 Pro and Enterprise) which lets block restarts so they don't happen in working hours, or on certain dates.

Universal apps - including Office

Windows 10 gets a new Windows Store, where download desktop programs as well as modern Windows apps. Many of those apps will be universal apps that are the same code on a PC, a Windows phone, an Xbox One and even on HoloLens, with the interface changing to suit the different screen sizes. The Office for Windows apps like Word and Excel are universal apps, as are the Outlook Mail and Calendar apps.

Settings and control panel

The Windows 8 Settings app has taken over many more of the settings that used to be in Control Panel, and it has a Control Panel-style interface with icons to navigate with. But the old Control Panel interface is still there, for settings that aren't in the new Settings app (or if you're just used to finding things there).

Windows 10 - Keyboard Shortcuts

Like most Windows applications, there are several keyboard shortcuts you can use to make it easier or faster for some to perform certain tasks.

Most of the new Windows shortcuts use the Windows key () combined with other keys to perform several actions. The following are some of the most common or useful shortcuts used in Windows 10.

Keyboard Shortcuts for Navigating Windows 10

Press This	To Do This
Windows Logo	Toggle the Start menu
Windows Logo+A	Open the Notifications pane
Windows Logo+B	Activate the notification area's Show Hidden Icons arrow (press Enter to display the hidden icons)
Windows Logo+C	Open Cortana for voice commands
Windows Logo+D	Minimize all open windows to display the desktop
Windows Logo+E	Run File Explorer
Windows Logo+F	Display the Start menu and activate the Search box
Windows Logo+H	Display the Share pane
Windows Logo+I	Run the Settings app
Windows Logo+K	Display the Devices pane
Windows Logo+L	Lock your computer
Windows Logo+M	Minimize all windows
Windows Logo+O	Turn the tablet orientation lock on and off
Windows Logo+P	Display the Project pane to configure a second display
Windows Logo+Q	Open Cortana for voice commands
Windows Logo+R	Open the Run dialog box
Windows Logo+S	Open Cortana for keyboard commands
Windows Logo+T	Activate the taskbar icons (use the arrow keys to navigate the icons)
Windows Logo+U	Open the Ease of Access Center
Windows Logo+W	Activate the Search box
Windows Logo+X	Display a menu of Windows tools and utilities
Windows Logo+Z	Display an app's commands (although this works in only some Modern apps)
Windows Logo+=	Open Magnifier and zoom in
Windows Logo+-	Zoom out (if already zoomed in using Magnifier)
Windows Logo+,	Temporarily display the desktop
Windows Logo+Enter	Open Narrator
Windows Logo+Left	Snap the current app to the left side of the screen
Windows Logo+Right	Snap the current app to the right side of the screen
Windows Logo+Up	Restore a minimized app; maximize a restored app
Windows Logo+Down	Restore a maximized app; minimize a restored app
Windows Logo+PgUp	Move the current app to the left monitor
Windows Logo+PgDn	Move the current app to the right monitor
Windows Logo+PrtSc	Capture the current screen and save it to the Pictures folder
Windows Logo+Ctrl+D	Create a virtual desktop
Windows Logo+Ctrl+Right	Switch to the next virtual desktop
Windows Logo+Ctrl+Left	Switch to the previous virtual desktop
Windows Logo+Ctrl+F4	Close the current virtual desktop
Windows Logo+Tab	Open Task View, which displays thumbnails for each running app as well as the available virtual desktops

Handling printers

Objectives : At the end of this lesson you shall be able to

- explain about typewriter
- explain about printer
- explain types and cost of printers
- explain programming languages for printers
- explain how to locate printer driver files.

Typewriter

A typewriter is a mechanical or electromechanical device with keys that, when pressed, cause characters to be printed on a medium, usually paper as on Fig 1. Typically one character is printed per keypress, and the machine prints the characters by making ink impressions of type elements similar to the sorts used in movable type letterpress printing.

Fig 1



Fig 2



After their invention in the 1860s, typewriters quickly became indispensable tools for practically all writing other than personal correspondence. They were widely used by professional writers, in offices, and for business correspondence in private homes. By the end of the 1980s, word processors and personal computers had largely displaced typewriters in most of these uses.

Computer printer

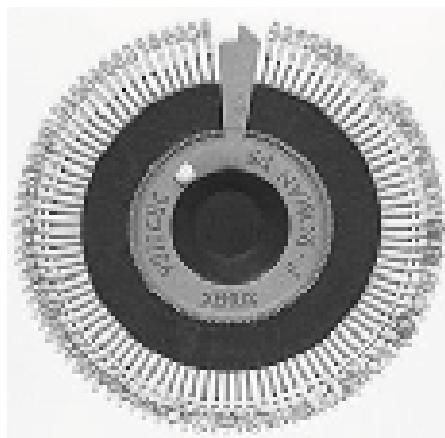
A printer is a piece of hardware for a computer as on Fig 2. It is a device that must be connected to a computer which allows a user to print items on paper, such as letters and pictures. It can also work with digital cameras to print directly without the use of a computer.

Types of printers

Today, the following types of printers are in regular use:

Daisy wheel printing is an impact printing technology invented in 1969 by David S. Lee at Diablo Data Systems as on Fig 3. It uses interchangeable pre-formed type elements, each with typically 96 glyphs, to generate high-quality output comparable to premium typewriters such

Fig 3



as the IBM Selectric, but two to three times faster. Daisy wheel printing was used in electronic typewriters, word processors and computers from 1972. According to Webster's, the daisy wheel is so named because of its resemblance to the daisy flower.

Dot-matrix printers are now almost extinct. They used a ribbon and made a lot of noise. There were models with 9 pins and models with 24 pins as on Fig 4. A dot matrix printer or impact matrix printer is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism on a typewriter.

Fig 4



Inkjet printing is a type of computer printing that creates a digital image by propelling droplets of ink onto paper as on Fig 5. Inkjet printers are the most commonly used type of printer, and range from small inexpensive consumer models to very large professional machines that can cost tens of thousands of dollars.

Fig 5



The concept of inkjet printing originated in the 20th century, and the technology was first extensively developed in the early 1950s. Starting in the late 1970s inkjet printers that could reproduce digital images generated by computers were developed, mainly by Epson, Hewlett-Packard (HP), and Canon. In the worldwide consumer market, four manufacturers account for the majority of inkjet printer sales: Canon, HP, Epson, and Lexmark, a 1991 spin-off from IBM.

The plotter is a computer printer for printing vector graphics as on Fig 6. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. It is now commonplace to refer to

Fig 6



such wide-format printers as "plotters," even though they technically are not.

Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are restricted to line art, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines.

Laser printing is a digital printing process that rapidly produces high quality text and graphics on plain paper. As with digital photocopiers and multifunction printers (MFPs), laser printers employ a xerographic printing process, but differ from analog photocopiers in that the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

A laser beam projects an image of the page to be printed onto an electrically charged rotating drum coated with selenium or, more common in modern printers, organic photoconductors. Photoconductivity allows charge to leak away from the areas exposed to light.

Dry ink (toner) particles are then electrostatically picked up by the drum's charged areas, which have not been exposed to light. The drum then prints the image onto paper by direct contact and heat, which fuses the ink to the paper.

Cost of printers

There are different costs with a printer. Printers that are more expensive to buy will usually be less expensive in the consumables (the ink, toner, or ribbon used by the printer). Therefore, laser printers are often more expensive to buy than inkjet printers, but are not expensive to use over a long period of time.

Inkjet printers on the other hand have a higher cost of consumables because the ink tanks they use are more expensive than the toner for a laser printer.

Laser printers that can print in color are usually more expensive than those that only print in black and white.

Other options, like being able to print on both sides of a sheet of paper, to automatically sort the output, or to staple the output will also make a printer more expensive.

Common programming languages for printers include:

- ESC/P
- Postscript
- PCL
- GDI
- HPGL and HPGL/2
- PDF
- VPS

How to Locate Printer Driver Files

Printers can be connected to a computer by a variety of wired and wireless methods, but all printers require drivers to be installed on a computer. The printer drivers are small programs that help communicate information from the operating system to the printer.

Driver errors can make the printer unusable. Using the Windows device manager, you can look up details about the drivers as well as pinpoint their physical location on your hard drive.

Scanner

A scanner is an electronic device which can capture images from physical items and convert them into digital formats, which in turn can be stored in a computer, and viewed or modified using software applications.

Different types of scanners are available with different resolutions. In the world of electronic data transmission, scanning is considered to be the most cost-effective and reliable way of transmitting images.

The basic principle of a scanner is to analyze an image and reproduce it to a digital one using the optical character recognition techniques.

Fig 7



Copa 110107

Prominent features of a scanner include:

- Reliability - Unlike certain forms of data transmission, scanning involves only transfer of hard images to digital forms. The role of the end-user is limited in case of scanning. And as they are not dependent on two-way communication, they can also help in storing important information or transmitting important information.
- Efficiency - Modern scanners are built for efficiency and speed. And it comes with ease of use as well as convenience.
- Quality - Scanning ensures the best resolution possible for digital images. Compared to fax machines, which may find it difficult to reproduce the accurate details, scanners can reproduce images with high resolution and precision. They are quite useful for photography and engineering arenas.
- Cost saving - One of the biggest advantages of scanning is the replacement of physical files/forms with digital ones. Along with saving physical space, which has to be used for storage, there are also environmental benefits by using scanner.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

The Basic Input/Output System (BIOS), also known as System BIOS, ROM BIOS or PC BIOS is a generally accepted standard defining a firmware interface.

The fundamental purpose of the BIOS is to initialize and test the system hardware components and load an operating system from a mass memory device. The BIOS is special software that interfaces the major hardware components of the computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM. The BIOS is a firmware (software instructions permanently recorded on a chip located on your motherboard). (Refer Fig.1).



Functions of BIOS

The BIOS software has a number of different roles, but its most important role is to load the operating system. The BIOS checks and initializes the PC hardware each time the system powers up or restarts before handing over control to the operating system. Some of the other common tasks that the BIOS performs include:

- A power-on self-test (POST) for all of the different hardware components in the system to make sure everything is working properly
- Activating other BIOS chips on different cards installed in the computer - For example the graphics cards often have their own BIOS chips.
- Providing a set of low-level routines that the operating system uses to interface to different hardware devices. They manage things like the keyboard, the screen, and the ports, especially when the computer is booting.

- Managing a collection of settings for the hard disks, clock, etc.

CMOS Setup

The first thing the BIOS will do is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed.

Configuring BIOS

The BIOS checks the CMOS Setup for custom settings. To change the CMOS settings we need to enter the CMOS setup. To enter the CMOS Setup, a certain key or combination of keys must be pressed during the initial startup sequence. Most systems use "Esc," "Del," "F1," "F2," "Ctrl-Esc" or "Ctrl-Alt-Esc" to enter setup. There is usually a line of text at the bottom of the display that tells "Press ___ to Enter Setup."

The BIOS setup shows a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

- System Time/Date - Set the system time and date
- Boot Sequence - The order that BIOS will try to load the operating system
- Plug and Play - A standard for auto-detecting connected devices; should be set to "Yes" if your computer and operating system both support it
- Mouse/Keyboard - "Enable Num Lock," "Enable the Keyboard," "Auto-Detect Mouse"...
- Drive Configuration - Configure hard drives, CD-ROM and floppy drives
- Memory - Direct the BIOS to shadow to a specific memory address
- Security - Set a password for accessing the computer
- Power Management - Select whether to use power management, as well as set the amount of time for "standby" and "suspend"

- Exit - Save your changes, discard your changes or restore default settings.

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium or Ni-Cad battery can supply enough power to keep the data for years. Major BIOS manufacturers include American Megatrends Inc. (AMI), Phoenix Technologies, Winbond etc. A typical BIOS screenshot is shown in fig. given below.(Refer Fig.2)



Installing the Windows operating System

A hard disk needs to be partitioned (though not mandatory) and formatted before you can store data on it.

Partitioning

A partition, sometimes also called a volume, is an area on a hard disk that can be formatted with a file system and identified with a letter of the alphabet. For example, drive C on most Windows computers is a partition. the first three partitions you create are primary partitions. These can be used to start an operating system. If you want to create more than three partitions, the fourth partition is created as an extended partition.

An extended partition is a container that can hold one or more logical drives. Logical drives function like primary partitions except that they cannot be used to start an operating system.

Many computers are partitioned as a single partition that equals the size of the hard disk. Partitioning a hard disk into several smaller partitions is not required, but it can be useful for organizing data on your hard disk.

Creating more than one partition has the following advantages:

- Separation of the operating system (OS) and program files from user files.
- Having a separate area for operating system virtual memory swapping/paging.
- Keeping frequently used programs and data near each other.

- Use of multi-boot setups, which allow users to have more than one operating system on a single computer. For example, one could install Linux and Microsoft Windows or other operating systems on different partitions of the same HDD and have a choice of booting into any operating system at power-up.
- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected.
- Raising overall computer performance on systems where smaller file systems are more efficient.
- Partitioning for significantly less than the full size available can reduce the time for diagnostic tools such as checkdisk to run.

Formatting

Disk formatting is the process of preparing a data storage device such as a hard disk drive, solid-state drive or USB flash drive for initial use. It is the act of creating a file system on a volume, so that the operating system can store and retrieve data on that volume.

Formatting of a disk is of two categories:

- 1 Low-level formatting (i.e., closest to the hardware) marks the surfaces of the disks with markers indicating the start of a recording block. It also provides information about block checks done for future use by the disk controller to read or write data. This is intended to be the permanent foundation of the disk, and is often completed at the factory. A hard disk needs to be partitioned and formatted before you can store data on it
- 2 High-level formatting creates the file system format within a disk partition or a logical volume. This formatting includes the data structures used by the OS to identify the logical drive or partition's contents. This may occur during operating system installation, or when adding a new disk.

Installing the Windows operating System

The three basic types of windows installation procedures are as follows:

- Install on a brand new disk or computer system
- Erase the disk, format it, and install.
- Install into a new directory for dual-booting

For the first two methods, it must be ensured that the computer can boot from a DVD or any other removable drive. To do this the drive boot order needs to be changed in the BIOS. The latest Windows DVDs are bootable and run the Setup program automatically. Then the installation can be done by following the procedure step by step as indicated on the subsequent screens as in trade practicals.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

Format a hard drive

Fig 1



Copa 110101

There are many reasons why it is required to format a hard drive, such as to install Windows fresh, to get rid of a virus or malware or simply because a pc is refreshed or cleaned up on selling.

The process can be different depending on whether it's an only hard drive and whether there is a spare PC or not.

It cannot be formatted, the hard drive on which Windows is running. In order to do this, it is in need to boot the PC from a Windows installation disc, a USB flash drive or another bootable disc.

Format a disk?

Formatting is the process of deleting all the data on the hard drive, but beware of 'Quick Format' which leaves all data in place and makes the drive appear to be empty. A quick format is ok if there is a brand new hard drive, or need to reinstall Windows, but not if its disposing of the disk or giving it to someone else.

A word of warning: make sure to have successfully backed up any photos, videos, music and other documents from the drive before formatting it. Although deleted files can be recovered in some situations, prevention is always better than cure.

Format hard drive partitions

It's important to understand about partitions before getting started. A hard drive can be divided up into smaller sections, called partitions. It's possible to format one partition while leaving the others untouched.

If it is required to format the entire hard drive and use the entire capacity in one block, delete the partition information.

Format a hard drive from the BIOS?

Many people ask how to format a hard disk from BIOS. The short answer is no.

If it is required to format a disk and you can't do it from within Windows, create a bootable CD, DVD or USB flash drive and run a free third-party formatting tool.

One option is Darik's Boot and Nuke (DBAN), which is free for personal use. This program will totally erase and format your hard disk, allowing for a clean install of a new OS, but the process cannot be undone.

Fig 2



Copa 110102

DBAN is supposedly only able to create a bootable CD/DVD-R, but if don't have any blank discs or a burner, there is a workaround available in the form of a separate third-party program.

Universal USB Installer will quickly and easily convert the DBAN ISO image downloaded to run from a bootable USB. Simply insert a blank USB flash drive, run the Universal USB Installer setup program, and follow the prompts.

It will ask to scroll through and pick the Linux Distribution want to install to USB (in this case, the latest version of DBAN), followed by its location on the computer and the letter of the USB drive like to install it to.

Once that information is complete, click create.

Fig 3



To boot from this USB drive rather than usual boot device (in most cases, this would be the hard drive), it have to be changed some settings in the BIOS.

In the BIOS, navigate to the boot order settings, and change the primary boot device to the USB drive (it shouldn't need to be plugged in to make this selection). After saved the settings and exited the BIOS, insert the bootable USB, restart the computer.

Fig 4



The PC should automatically boot the DBAN software, which will guide through the process of erasing the hard drive, with options for different levels of data-wiping.

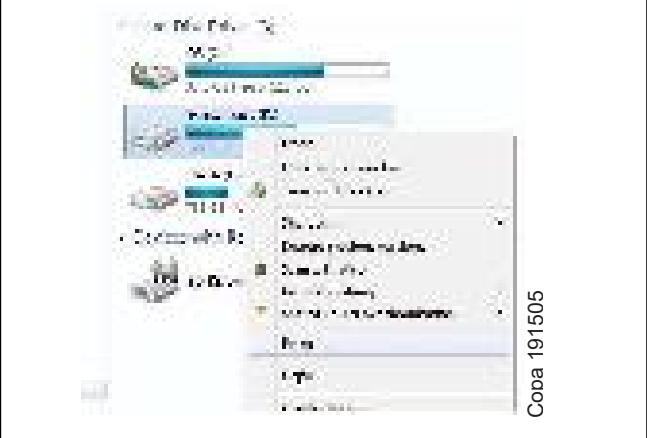
It will treat the USB as another drive so to avoid inadvertently wiping that as well, remove it after booted into DBAN.

Quick format a hard drive?

Yes, but don't use this method if want the data to be permanently erased. A quick format doesn't delete the data but instead erases only the pointers to the files.

Windows Vista, 7, 8 and 10 have a built-in Disk Management tool (see below), but the fastest way to format a hard drive is to click the Start button, then Computer and right-click on the hard drive to wipe. It can't be formatted the drive on which Windows is installed for obvious reasons.

Fig 5



By default Quick Format is checked, and choose the file system and allocation unit size as well as changing the volume label (the drive's name). Typically, leave all settings unchanged and click the Start button. In under a minute the hard drive will be formatted.

Fig 6



Choose NTFS as the file system if it isn't already selected for Windows Vista, 7, 8 or 10 and ensure the Allocation Unit Size is set to 'Default Allocation Size'.

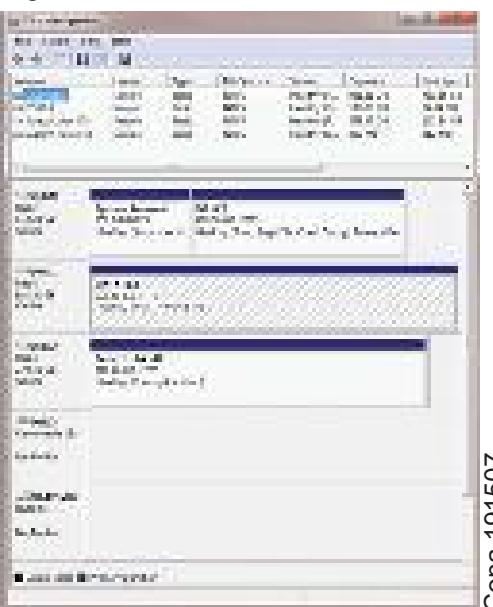
Using the Disk Management tool

Type diskmgmt.msc or Disk Management into the search box in Vista, 7, 8 or 10 and then click on only result that appears in the menu above, with the same name.

This is the easiest way to launch Disk Management, but also find it in the Control Panel if search for 'disk' and select the 'Create and format hard disk partitions'.

Disk Management isn't as powerful as a standalone partition management tool, but it is still capable of formatting data.

Fig 7

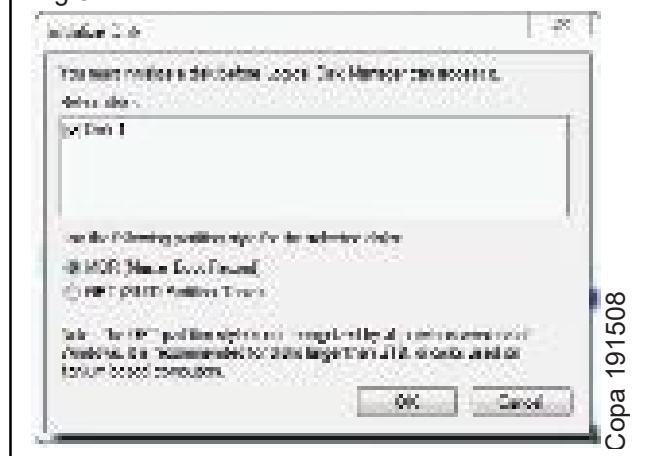


Copa 191507

If it is to install a new (additional) hard drive in a PC, it might be a thing to wonder why it doesn't appear in Windows Explorer. The reason is because it needs to be initialised and formatted -which can be done in Disk Management.

When the tool loads, it will analyse all of the computer's drives and will prompt to initialise a new disk that it finds.

Fig 8



Copa 191508

If the disk is larger than 2TB, opt for GPT (GUID Partition Table). This setting also lets to create more than four partitions.

If don't see a prompt, look in the list of drives and see one that says 'Not Initialized'. Right-click on it and choose Initialize Disk.

Once that's done, right-click in the hatched Unallocated space and choose New Simple Volume...

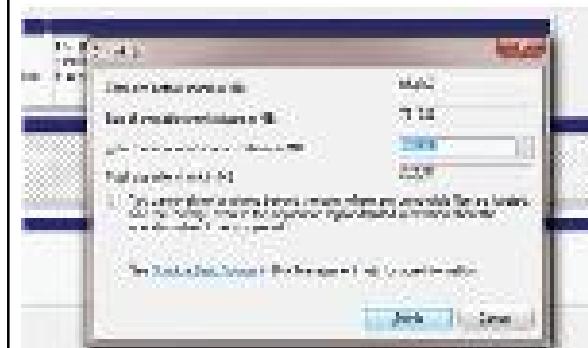
Follow the instructions, choosing how big to want the partition to be (in MB - 1024MB = 1GB), and which drive letter to assign (one will be chosen, but can opt to change it if desired).

If select a size for the partition that's smaller than the total capacity of the drive, say 500B on a 1TB drive, end up with some unallocated space on the drive which can format by repeating the process just completed.

change partition size

Disk Management can be used to expand or shrink a partition. Simply right-click on one and choose the appropriate option from the menu that appears. If shrinking, the partition will be checked to find out how much empty space it contains.

Fig 9



Copa 191509

It's a little confusing as the numbers are displayed in MB rather than GB, but it can be adjusted the amount of space to shrink and the 'Total size after shrink' will be updated, also can't shrink a partition beyond the point where files are located - it may be able to free up space by defragmenting the drive first.

Conversely it can only expand a partition if there is unused space on the drive. If not, the option will be greyed out.

Resetting Windows

If PC is having problems and the user don't wish to lose the personal files by wiping the hard drive, then it might want to refresh or reset the PC which can be done in Windows 8 and 10.

If user looking to keep your personal files and settings, but want to have a fresh Windows install, itsall want to refresh the PC.

Do note that a refresh will remove all programs and apps installed on the machine, but will keep the Windows-default programs intact.

A reset reinstalls Windows and deletes all files, settings and programs, it is suggested performing this if have previously backed up all the files and don't mind transferring user's personal files.

Windows 10 has a slightly different approach and might confuse those coming from Windows 8. Microsoft removed the refresh option and has instead combined the refresh and reset options into one setting.

Fig 10



Copa 1915010

To find the option, open the Start Menu, click on Settings > Update & security > Recovery > Get started (under the Reset this PC option).

Upon selecting the option, it will present with three separate options:

- Keep my files
- Remove everything
- Restore factory settings (not available on all PCs)

'Keep my files' saves personal files but deletes user settings, drivers and programs, whilst also reinstalling Windows 10.

'Remove everything' also gets rid of personal files and 'Restore factory settings' does the same actions as 'Remove everything', but also resets the PC to the version of Windows which came with the machine.

This option will only be available to those who bought a pre-built PC or laptop which came with Windows already pre-installed.

Troubleshooting computer

Objectives: At the end of this lesson you shall be able to

- state the basic steps involved in troubleshooting a PC
- explain the basic approach to solve a problem
- list the probable defects and symptoms in a faulty Computer
- analyse the causes for the complaints
- state the shortest path for servicing the defects.
- list the probable defect and symptoms in the faulty Computer
- analyse the causes for the complaint “When windows is started, system runs surface test and goes to safemode” with the help of a Problem Tree and TSC

Basic Troubleshooting

One of the difficulties while troubleshooting problems on a PC is that in most cases they are not what they seem. The cause behind a frequent hanging of a PC may be due to one of six or more well defined areas or a dozen of unidentified problems. The problem could be due to software or hardware. Even with years of experience and training, PC technicians come out with troubleshooting procedures that do not solve the real problem. For example a personal computer running windows operating system with several i/o cards connected may freeze the screen , mouse, and keyboard and take as long as 3 minutes before responding. After trying out with all the options like replacing a memory module, installing new parallel port and NIC drivers, the technician finally checks the system logs to find that a vital operating system library was corrupted and needed to be reinstalled. The issue to be mentioned here is that if the technician used a systematic approach to troubleshooting, the problem would likely have been solved much sooner. Maintaining a good troubleshooting plan certainly gives us the scope to approach the problem in a more systematic and scientific manner. A troubleshooting plan is nothing but a written check list that we use for any problem. The elements that should be included in any troubleshooting plan are as follows

- Maintenance record
- Identification of possible causes
- Identification of possible solutions
- Application and testing of solutions
- Follow-up

In the maintenance record, record the hardware installed in the PC when it is installed, all preventive maintenance activities, all software updates or additions, and all hardware installations and upgrades. Further any problems that occur and the actions you take to resolve them should be recorded . when it comes to troubleshooting a PC, with the maintenance record one can pin down a problem and devise solution for it. The first entry in such record should be a profile of the PC, which includes its configuration, operating system, and the date each component was installed.

Such tables gives an idea of the type of information one should include in the sytem configuration, as summerised below:

- The processor's make, model and speed.
- Amount of system memory(RAM) and the memory module type, size and configuration of the memory
- Hard disk size and the type of interface
- Make, model and speed of the compact disk (CD) or digital versatile disk (DVD) drive
- Memory size of the video or graphics adapter
- Make, model, type and speed of the modem
- The version number of the operating system
- A list of software applications installed on the PC
- A list of peripheral equipment attached to the PC, indicating the port to which they are attached

The maintenance record should be updated each time any maintenance work is carried over on the PC. Any time new or replacement hardware is installed, record the activity and update the system configuration. The activity entries should include

- Date of the activity or changes made to the system
- The make, model and serial number of any hardware removed or added to the PC
- The name, version and publisher of any software added to the PC
- Detailed information on any configuration changes made to the basic input/output system(BIOS) or other configuration for the new device or software.

Troubleshooting approach

For solving any problems associated with PC, first go through the maintenance record of that PC and follow a systematic procedure for isolating the problem. The standard problem solving process includes the following steps

Identify the problem: This is the most difficult part of the process. To perform this step successfully collect all the data about the problem

Identify possible causes: analyse all the symptoms of the problem and try to list all the causes in order from the most likely to the least likely.

Identify possible solutions: identify solutions for each of the causes that are identified. A possible cause could have more than one possible solution.

Analyze the possible solutions: if two solutions produce the same result, consider the one which is more economic and apply the same.

After following the above steps and on solving the problem update the maintenance record and make necessary entries into it. In some cases the problems may be very clear and the solution is very transparent and even in such cases try to follow the above mentioned steps to make it a practice to follow the systematic approach. Whenever a problem occurs with a PC, while following the steps, try to collect the information about the system by answering questions such as

- Under what circumstances this problem cropped up?
- Were there any indications in the form of beep codes/ error messages or any clear symptoms?
- What softwares were active when the problem happened?
- Has it happened for the first time or occurred in the past also?
- Were there any configuration changes made during the session that required a restart that was not performed?

Optimizing the PC:

APC which was functioning absolutely well and developed a symptom of slowing down or if it is unable to keep pace with the demands of newer software, one of the possible solutions is to consider updating or optimizing the PC to enhance its performance. Optimization steps may cost money , but many involve software you already own or software readily available on the web.

Optimizing the BIOS and Boot process:

BIOS setup configuration includes many settings in the CMOS. How quickly the system boots and performs depends on the these settings. Enabling of valuable features such as system caching or using the quick POST process are very vital for optimum performance.

Optimizing the hard disk: Windows ScanDisk and Disk Defragmenter utilities are the best tools available for optimizing the hard disk in terms of usage and access speeds. ScanDisk is used to check a disk for errors and repair them or remove unrecoverable areas of the disk from the usage tables to prevent future errors. Similarly Disk Defragmenter organizes data file fragments into a more optimized and logical format that provides for faster access times and less head movement.

Optimizing the Expansion cards: The best way to optimize I/O controllers and other expansion cards is to install them in the correct order. No harm is done even if

they are installed out of order, but there is some benefit to be gained from putting them in the proper sequence. On a Pentium system, use PCI cards and avoid ISA cards, if possible. All I/O adapters including video cards, sound cards, NICs, modems and SCSI adapters are available for the PCI expansion bus. Consult the motherboard documentation and install video card in the first PCI slot, followed by the NIC, modem, and sound card, in that order.

Optimizing the processor: One can speed up the processor in the following ways

- Replace it with a faster speed or higher level processor
- Use a utility from the processor manufacturer to apply patches or fixes to the processor's logic
- Overclock the processor

The requirement for replacing the processor with a higher level or faster processor is that your motherboard and chipset will support the new processor both logically and physically. Logically the chipset and motherboard must support the bus speed of the processor and have the supporting circuits it requires. It is often much better to replace the complete motherboard. Some times the manufacturer of the processor may release some utilities that will improve some aspect of processor's capabilities such as video processing, buffer handling, caching and other processor based functions. Overclocking a processor means running a processor at speeds faster than it was released to support. Most processors are capable of running at speeds higher than their nominal speeds. The nominal speed of a processor is the speed at which it has been tuned to run with a certain chipset, motherboard, cooling system, and other components of the PC. Raising the speed of the processor can create heating problems on the processor and lead to frequent system lockups, memory problems and other issues.

Troubleshooting sources of Non-software problems:

Any time pc fails for no apparent software reason, check the following areas

- Ensure proper AC power
- Scan the PC for a computer virus
- Ensure that CPU fan is spinning
- Ensure proper connections of external I/O connectors
- Reseat the expansion cards and check the power and data cables of internal devices
- Most of the boot problems are the result of a recent change, check out the BIOS setup configuration data
- To install any new hardware or software, visit manufacturer's web site for any known conflict or incompatibility
- Check for any resource conflict if any new hardware or software is installed.

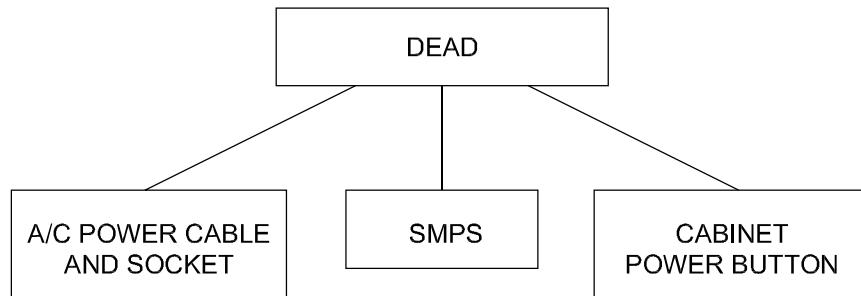
The forth coming lessons on Troubleshooting PC are provided with Problem Trees for different type of problems which a user face normally. Each Tree with a specific

problem gives scope to analyse the areas to be suspected or looked into for fixing the problem. This lesson includes a Problem Tree for a PC which is Dead with no display on monitor.

PROBLEM TREE : PT- 01

Observed symptom : Dead

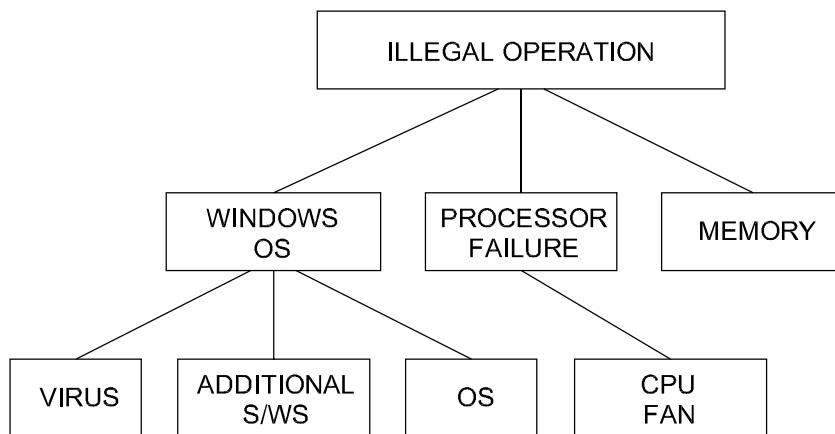
Additional symptom : No display



PROBLEM TREE : PT- 02

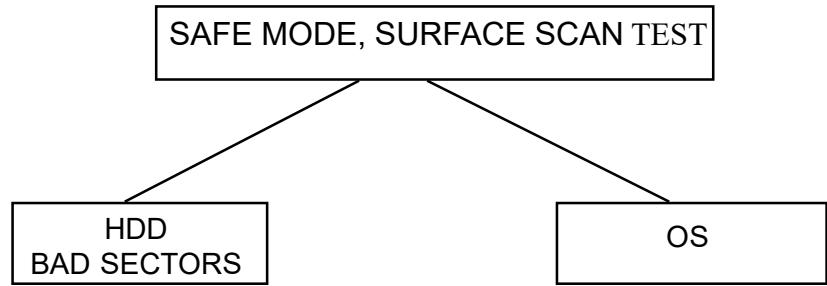
Observed symptom : Windows shows “illegal operation”

Additional symptom : Windows not working



Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”.

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

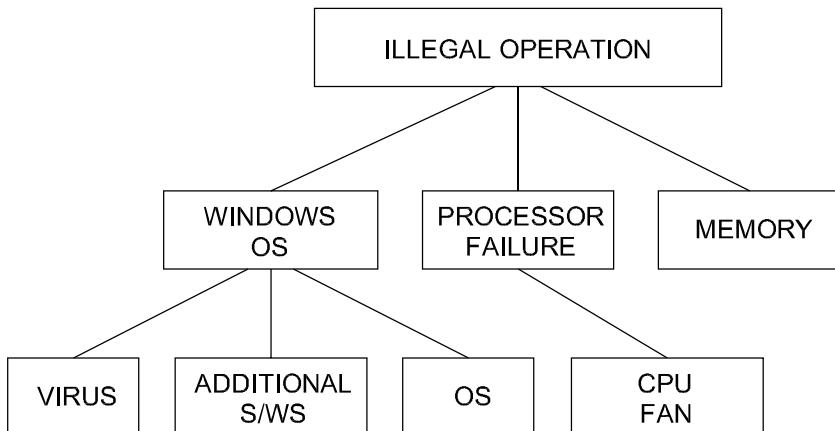


Discuss the Troubleshooting chart (TSC-01) and Service flow sequence (SFS-01) for the complaint “When windows is started system runs surface test and goes to safemode” referring to exercise 2.33

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 02

Observed symptom : Windows shows “illegal operation”
Additional symptom : Windows not working

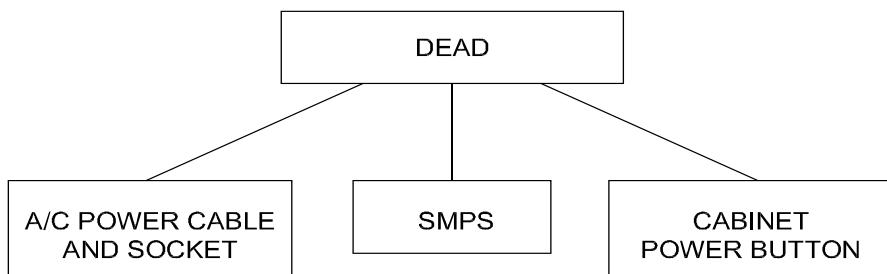


Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 03

Observed symptom : DVD drive can't read
Additional symptom :



Application softwares

Objective: At the end of this lesson you shall be able to

- describe various software types.

Application software

Application software is a term which is used for software created for a specific purpose. It is generally a program or collection of programs used by end users. It can be called an application or simply an app.

In fact all the software other than system software and programming software are application software.

Application software definition

A software which is developed to help the user to perform specific tasks is called application software.

The different types of application software include the following:

Application Software Type	Examples
Word processing software	MS Word, WordPad and Notepad
Database software	Oracle, MS Access etc
Spreadsheet software	Apple Numbers, Microsoft Excel
Multimedia software	Real Player, Media Player
Presentation Software	Microsoft Power Point, Keynotes
Enterprise Software	Customer relationship management system
Information Worker Software	Documentation tools, resource management tools
Educational Software	Dictionaries: Encarta, Britannica Mathematical: MATLAB Others: Google Earth, NASA World Wind
Simulation Software	Flight and scientific simulators
Content Access Software browsers	Accessing content through media players, web
Application Suites	OpenOffice, Microsoft Office
Software for Engineering and Product Development	IDE or Integrated Development Environments

There are various different types of application software such as licensed, sold, freeware, shareware and open source.

Application software's either need to be installed or can run online. Application software's can also be distinguished on the basis of usage into the following:

- Utility programs
- Generic programs
- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software
- Database software
- Presentation software
- Internet Browsers
- Email Programs
- Graphic Programs (Pixel based)
- Graphic Programs (vector based)
- Communication software: Communication through audio, video or chat based means

Bluetooth devices

Objectives : At the end of this lesson you shall be able to

- describe the meaning of Bluetooth
- describe the method of using Bluetooth
- list the major applications of Bluetooth.

Introduction:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the range 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). It is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device.

It can connect up to eight devices (items of electronic equipment) at the same time. The chip can be plugged into items such as computers, digital cameras, mobile phones and faxes. Bluetooth is particularly convenient in certain situations - for example, when transferring files from one mobile phone to another without cables. Sending music and photos between a PC and a mobile phone is another useful application.

Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a quasi optical wireless path must be viable.

Range is power-class-dependent, but effective ranges vary in practice varying from 10 to 100 m.

The name 'Bluetooth' reflects the Scandinavian origins of the technology. It is named after a 10th century Danish viking, King Harald Blåtand (translating as 'Bluetooth' in English). He united and controlled Denmark and Norway, hence the association of uniting devices through Bluetooth.

Using Bluetooth

To use Bluetooth, the device must be Bluetooth enabled. For this purpose a device called "Dongle" may be used. A dongle is a device that plugs into the computer to enable it to use Bluetooth. Every manufacturer of compatible devices will have their own instructions for accessing Bluetooth. For detailed instructions you will need to see the manual, but as a general guide:

To set up Bluetooth:

(Identify the blue tooth icon on devices.)

- 1 Turn on, or enable, Bluetooth. Ensure your device is 'visible' and not 'hidden', so other nearby devices can pick up the signal.
- 2 Give your device a name to identify it when connecting to other compatible equipment.

When devices like mobile phones, laptops, tablets etc. enable Bluetooth the Bluetooth icon is on.

To establish a Bluetooth connection:

- 1 Find the file you wish to send.
- 2 Select the option to send it via Bluetooth - your device will search for other devices within range and display them.
- 3 Scroll to the device you wish to connect with and select it.
- 4 If the other device needs 'pairing', you will need to enter a passcode - a bit like a PIN number - and make sure it is entered on the other device.

When the connection is established, the data will start to send. You do not need worry about a clear line of sight between devices.

List of Bluetooth applications

Some of the Bluetooth applications are as follows:

Wireless control of and communication between a mobile phone and a handsfree headset.(Refer fig. 1)

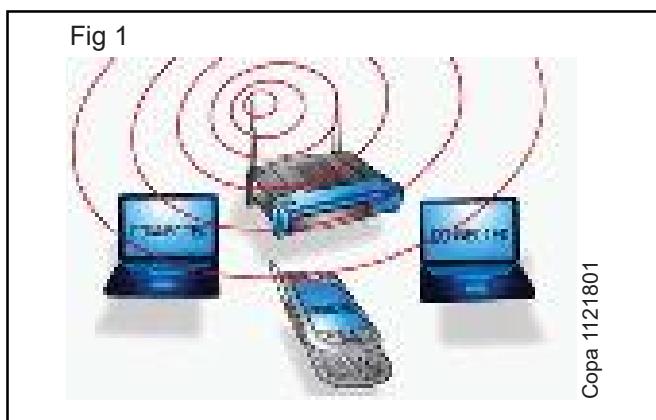


- Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.
- Wireless control of and communication with tablets and speakers such as iPad and Android devices.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being the mouse, keyboard and printer.

- Transfer of files, contact details, calendar appointments, and reminders between devices with OBEX(Objects exchange).
- Replacement of previous wired RS-232 serial communications in test equipment, GPS receivers, medical equipment, bar code scanners, and traffic control devices.
- Wireless bridge between two Industrial Ethernet networks.
- Wireless controllers in gaming consoles.
- Personal security application on mobile phones for prevention of theft or loss of items. The protected item has a Bluetooth marker (e.g., a tag) that is in constant communication with the phone. If the connection is broken (the marker is out of range of the phone) then an alarm is raised.

Wi-Fi:

Wi-Fi is a popular wireless networking technology. Wi-Fi stands for "wireless fidelity". The Wi-Fi was invented by NCR corporation/AT&T in Netherlands in 1991. By using this technology we can exchange the information between two or more devices. Wi-Fi has been developed for mobile computing devices, such has laptops, but it is now extensively using for mobile applications and consumer electronics like televisions, DVD players and digital cameras. There should be two possibilities in communicating with the Wi-Fi connection that may be through access point to the client connection or client to client connection. Wi-Fi is a one type of wireless technology. It is commonly called as wireless LAN (local area network). Wi-Fi allows local area networks to operate without cable and wiring. It is making popular choice for home and business networks. A computer's wireless adaptor transfers the data into a radio signal and transfers the data into antenna for users.

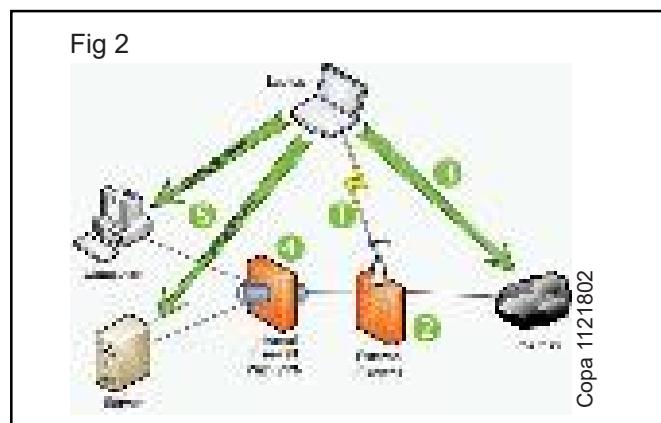


Working Principle:

Wi-Fi is a high speed internet connection and network connection without use of any cables or wires. The wireless network is operating three essential elements that are radio signals, antenna and router. The radio waves are keys which make the Wi-Fi networking possible. The computers and cell phones are ready with Wi-Fi cards. Wi-Fi compatibility has been using a new creation to constituent within the ground connected with community network. The actual broadcast is connected with in sequence in fact it is completed by way of stereo system surf as well as the worth of wires with monitor to classification prone. Wi-Fi allows the person in order to get access to web any place in the actual provided area.

And can now generate a system within Resorts, library, schools, colleges, campus, personal institutes, as well as espresso stores as well as on the open public spot to help to make the company much more lucrative as well as interact with their own customer whenever. Wi-Fi compatibility can make surf with stare to company using their inspiring cable television much a smaller amount force down.

The radio signals are transmitted from antennas and routers that signals are picked up by Wi-Fi receivers, such has computers and cell phones that are ready with Wi-Fi cards. Whenever the computer receives the signals within the range of 100-150 feet for router it connect the device immediately. The range of the Wi-Fi is depends upon the environment, indoor or outdoor ranges. The Wi-Fi cards will read the signals and create an internet connection between user and network. The speed of the device using Wi-Fi connection increases as the computer gets closer to the main source and speed is decreases computer gets further away.



Security:

Security is impairment element in the Wi-Fi technology. Security is our personal decision but having a wireless connection we should pay attention to protect our private details. We can connect easily to unsecured wireless routers. The problem is any one is connected to the wireless router using the data like download games, download apps and planning terrorist activities, sharing illegal music and movie files etc. So it is necessary to provide security to the wireless technologies based devices.

DVDs, CDs and burning DVDs

Objectives : At the end of this lesson you shall be able to

- describe the features of CDs & DVDS
- describe the main formats of DVDs
- describe DVD burning
- describe the features of CDs.

Introduction

DVD (sometimes called as "digital video disc" or "digital versatile disc") is a digital optical disc storage format. DVDs can be used with many types of players, including PCs and standalone players.

These discs are known as DVD-ROM, because data can only be read and not written or erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased multiple times.

DVD features and formats

DVDs are used in DVD-Video consumer digital video format and in DVD-Audio consumer digital audio format. They can also be used in a special AVCHD format (Advanced Video Coding High Definition) often used with AVCHD format camcorders. DVDs containing other types of information may be referred to as DVD data discs.

A typical recordable DVD can hold about 4.7 gigabytes (GB). However, the total amount of disc space that you can use to burn files to the disc is less than the amount that's often listed on the disc itself. This is because the disc capacity is calculated differently when it's used in a computer. For example, a typical DVD-R that has a listed disc capacity of 4.7 GB can only store about 4.37 GB of data on the disc. DVDs offer a storage capacity of approximately 4.7 GB. DVD discs do not deteriorate over time and are unaffected by magnetic fields.

The type of recordable disc to be used depends on a few different factors, such as:

- The types of recordable discs that work with the disc burner.
- The disc drive on the computer or device will read the disc after it is burned.
- The total size of all the files that will be burned on to a disc.

DVD burning

The process of recording source material onto an optical disc (CD or DVD) is called burning / writing or optical disc authoring. Creating an optical disc usually involves first creating a disk image with a full file system designed for the optical disc, and then actually burning the image to the disc. Many programs are available as bundled applications to create the disk image and burn the files.

The speed at which a DVD can be written is expressed as a multiplier: 16X means 16 times faster than just playing it. Speeds up to 52X are also very common.

CD or DVD formats

For burning DVDs, the two main disc formats in use are:

- Live File System and
- Mastered disc formats.

Live File System format :

Discs that use the Live File System format are often more convenient because you can copy selected files immediately and as often as you want, just like you can with a USB flash drive. This is convenient if you want to keep a disc in your CD, DVD, or Blu ray Disc burner and copy files whenever the need arises. In this format you can copy and erase files over and over again. However, the Live File System optical disc format is only readable by Windows 7, Windows Vista, and Windows XP systems. These discs are not blank after they're formatted.

Discs formatted in this format have the option name in the Burn a Disc dialog box: "Like a USB flash drive."

Mastered disc formats:

If we want to create an optical disc that can be used to transfer data files to older versions of the Windows operating system or even to another operating system, we need to use the Mastered optical disc format. Also if we want to burn music or pictures and use the disc in regular CD, DVD, or Blu ray Disc players that can play MP3 files and show digital pictures, we should use the Mastered optical disc format.

The Mastered format works just like burning CDs in Windows XP. In other words, when we write the disc, we copy a file or a group of files to the optical disc all at once. Once this is done, the disc is closed and we cannot copy more files to the disc nor can we delete the existing files. Hence it is recommended not to copy files immediately; it is a good practice to assemble the entire collection of files that needed to be copied to the disc and then burn them all at once.

Discs formatted with the Mastered option have the option in the Burn a Disc dialog box: "With a CD/DVD player."

There are many types of tools available to create data, music, video and audio discs. We can also create

backups that span across multiple discs, rip music tracks from Audio CDs and create or burn disc images in different formats. They may also provide features like automatic audio conversion from WAV, MP3, FLAC, WMA files, disc copying, compressed file backup and restore, disk erasing, VCD/SVCD support, project burning etc..

Blu - ray Discs

Blu-ray, also known as Blu-ray Disc (BD) is the name of a new optical disc format that is rapidly replacing DVD. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc.

The name Blu-ray is derived from the underlying technology, which utilizes a blue-violet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). They are referred to as "Blu-ray" discs or BDs.

The following formats are part of the present day Blu-ray Disc specification:

- 1 BD-ROM - read-only format for distribution of HD movies, games, software, etc.
- 2 BD-R - recordable format for HD video recording and PC data storage.
- 3 BD-RE - rewritable format for HD video recording and PC data storage.

At present, a single-layer disc can hold 25GB and a dual-layer disc can hold 50GB. Over 9 hours of high-definition (HD) video on a 50GB disc. About 23 hours of standard-definition (SD) video on a 50GB disc.

Command line interface with DOS

Objectives: At the end of this lesson you shall be able to

- describe the hierarchical directory system in DOS
- use dos commands to create directories and subdirectories
- use dos commands to change and list directory
- use dos commands to access specific files.

Hierarchical Directory System: Hierarchy in simple terms, is, organisation or an arrangement of entities. Entities can be anything such as objects, files, people, ideas, or any other thing.

Arrangement refers to, for example, Currency can be arranged by denomination. Pebbles can be arranged by their size .

There are many other ways to organize entities besides hierarchically. But, hierarchical organization is special because by this arrangement you can name each entity by its relationship to other entities.

In DOS, entities are the *Directories* in a directory system. Here, the hierarchy begins with the essential *core* or *root entity*. For instance, in a family tree, we may consider great-great-grand father who was the root cause of our existence as the core entity. In DOS , this core entity is referred to as the *the root directory*.

As in the example considered above, if we consider great-great-grandfather as the *root directory*, then, great-grand father, grand father, father are referred as *sub directories*. So the directories under the root directory are called subdirectories in DOS. These subdirectories can trace their paths back to the root directory.

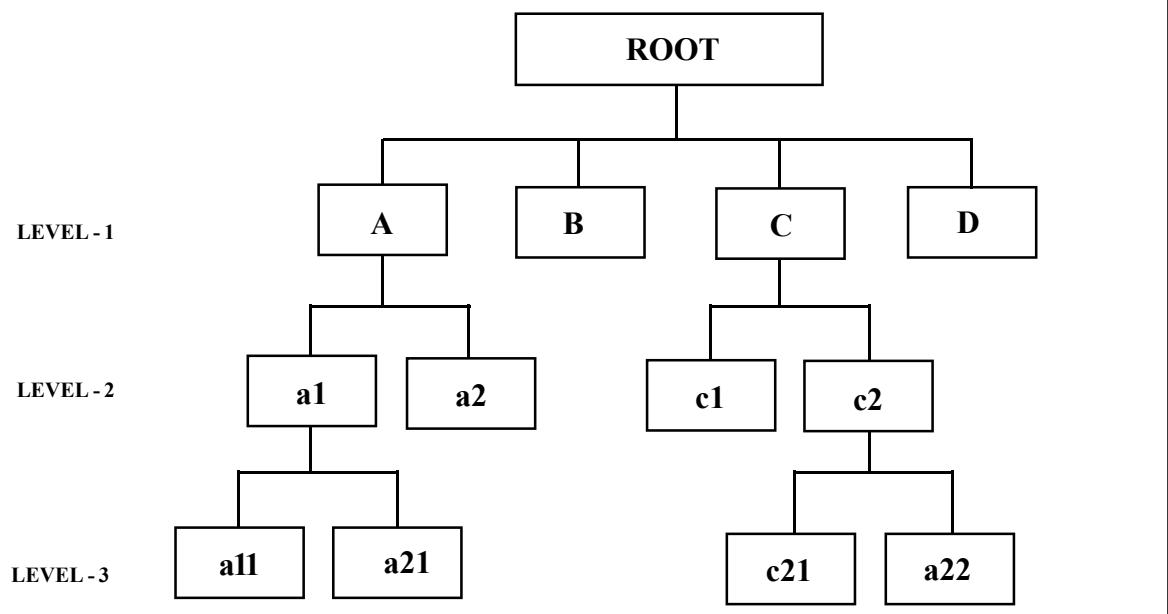
The DOS hierarchical file system is called a *tree-structured file system*. At the base of this tree structure is the root directory.

In a family tree, say, Govinda is the son of Rajappa, who is son of Ramappa who is son of Venkappa. Venkappa is the head or root of the family tree for Govinda.

One can create many directories from the root. The root will then be the parent of each of these directories. You can also create subdirectories that stem from other subdirectories that stem from other subdirectories and so on. These new subdirectories have a subdirectory as their parent directory. How subdirectories are arranged hierarchically from the root is illustrated in Fig 1. The DOS directory system is often called a *tree-structured directory system*.

Three levels of subdirectories are represented in Fig 1. Regardless of the number of levels, the relationship of the subdirectories is important. Each subdirectory, as well as the root directory, can contain user files. Two files can have the same file name and extension as long as the files reside in different directories. This is because, DOS needs to know which of two same-named files your command specifies. For this, DOS needs the name of the directories, starting from the root, that lead to the desired file. This sequence of directory names leading to a file is called a *path*.

Fig 1



A path is a chain of directory names that tell DOS how to find a file that you want. Each directory is separated from the other by a ‘\’ character. This ‘\’ is referred to as the DOS *directory delimiter*. A files full path name including the drive specifier (C: or D: etc.,) is the absolute indicator of where the file is located. Typical path notation are given below;

D:\Animals\Domestic\Pets\Dog.txt
C:\Admin\Accounts\Tours\Bata.txt

Further details of path and directory structure will be discussed at appropriate lessons.

DOS COMMANDS

1 MKDIR Makes or Creates a new Directory.

or

MD

Syntax

MKDIR C:pathname\dirname

Or

MD d:pathname\dirname

Where,

C: is the disk drive for the sub directory

path\ indicates the path to the directory that will hold the subdirectory being created.

dirname is the name of the subdirectory being creating.

Switch

(None)

Important Notes

- **MKDIR or its short form MD makes new subdirectories under the selected root directory.**
- It is possible to create as many subdirectories as you want , but remember: *DOS accepts no more than 63 characters, including backslashes, for the path name.*
- Do not create too many levels of subdirectories and with long names.
- You cannot create a directory name that is identical to a file name in the current directory.

For example, if you have a file named FLIES in the current directory, you cannot create a subdirectory by the name FLIES in this directory. However, if the file FLIES is given an extension FLIES.DOC , then the names will not conflict and you can create a subdirectory by name FLIES.

Examples

To create the subdirectory by name **Drivers** under the **current drive**, the instruction will be,

MKDIR\Drivers

Or

MD\Drivers

C:\Devices>MD \Printers

This instruction creates a subdirectory by name **Printers** under the current drive C:. Note that although the command is issued from another subdirectory named devices, the newly created subdirectory **Printers** does not get created under the directory Devices but directly under the root C:. This may be verified by issuing DIR command under C:\ and under C:\Devices.

To create a subdirectory under the directory Devices the instruction will be,

C:\Devices>MD Printers

Discuss the following different varieties of creating directories:

C:\Devices\Printers>MD C:\Devices\Plotters

2 CHDIR or CD

Changes or shows the path of the current directory.

Syntax

CHDIR d: path

Or, using the short form:

CD d : path

D : path are valid disk drive and directory names.

Switch

(None)

You have two methods for maneuvering through the hierarchical directories with CD: (1) starting at the root , or top, directory of the disk and moving down, or (2) starting with the current directory and moving in either direction.

To start at the root directory of a disk, you must begin the path with the path character (\), as in \ or B:\. When DOS sees \ as the first character in the path, the system starts with the root directory. Otherwise, DOS starts with the current directory.

Changing Drives: Computer will have built in memory, the hard disk and it will also have provision to store/read data from floppy disk, compact disk etc. Every disk is identified by a name such as C drive, A drive, B drive etc. C drive is represented by C: and A drive is represented by A: and so on. DOS allows to change from current or default drive by typing the letter identification of disk drive desired followed immediately by a colon as shown in the example below:

C> a:

This command instructs to change control from **C** drive to **D** drive.

If the disk drive is not accessed due to non availability of floppy or any other reason, DOS will display an error message

Not ready error reading drive A

Abort, Retry, Fail ?

It is required to press either A,R or F keys, which are defined below

A Directs DOS to abort the command that was responsible for the error. If this option is selected DOS will terminate the command and redisplay prompt.

R Directs DOS to retry the command that caused the error. In most cases this option is selected to correct the problem that was causing the error. (Floppy disk might not be inserted).

F Directs DOS to ignore the error and attempt to continue processing. In some cases DOS will have an error when it reads a portion of disk.

DOS COMMAND

DIR Displays a list of files and subdirectories in a directory.

Syntax

```
DIR C:pathname [/P] [/W] [/A[[:]attribs]] [/O[[:]sortord]]  
[/S] [/B] [/L] [/C[H]]
```

Where,

- **C:** is the disk drive holding the directory for displaying list of files and subdirectories
- **path/** specifies directory and/or files to list.
- **filename** specifies file or list of files to display, if file name is not specified all the files in the directory will be listed.
- **[/P] [/W]** specifies the switches for formatting the output.

Switch

/ P Pauses after each screenful of information and waits to press any key. On pressing any key another screenful or remaining information will be displayed. Command is DIR/P

/ W Uses wide format of 80-column to display file names only and information about file size, date, and time is not displayed. Command is DIR/W

/ A Displays files with specified attributes.

attribs

D Directories

R Read-only files

H Hidden files

S System files

A Files ready to archive - Prefix meaning "not"

/ O List be files in sorted order.

sorted N By name (alphabetic)

S By size (smallest first)

E By extension (alphabetic)

D By date & time (earliest first)

G Group directories first

- Prefix to reverse order

C By compression ratio (smallest first)

/ S Displays files in specified directory and all subdirectories.

/ B Uses bare format (no heading information or summary).

/ L Uses lowercase.

/ C[H] Displays file compression ratio; /CH uses host allocation unit size.

Important Notes:

- In the directory listing similar files can be listed by using wildcards (* and ?), where (*) star and (?) question mark are called wild characters or wild cards. * can replace remaining characters and ? can replace any single character.
- When DIR is used without parameters or switches, It displays the disks volume label and serial number; one directory or filename per line, including the file size in bytes, and the date and time the file was modified; and the total number of files listed, their cumulative size and the free space (in bytes) remaining on the disk.

Examples

DIR *.txt

*.txt instruction will list all files having txt extension in the specified directory.

DIR ???T.*

???T instruction will search for files having four characters which ends with T like TEST, REST etc. And * instructs that these files may have any extension like .txt, .dat etc.

Methods to display the contents of a text file

Objectives: At the end of this lesson you shall be able to

- use DOS commands to display the contents of a text file
- use DOS commands to copy, rename, delete and undelete files.

DOS Commands

TYPE Displays the contents of a text file.

Syntax

TYPE C:path/filename

Where,

- **C:** is the disk drive holding the file for displaying.
- **path/** Specifies the location of file for displaying.
- **filename** specifies file to display.

Switch

(none)

Important notes:

- **TYPE** command provides a quick way to display contents of an ASCII file without having to use another program. The file is stored on the disk as ASCII (American Standard code for Information Interchange) text which is standard way the computer translates binary (ones and zeros) into letters, numbers & symbols. If the information is not stored in the ASCII format, on using TYPE command the information will look like gibberish.
- On issuing command DOS will look in drive specified, moves into the path to reach the filename specified. Then it simply translates ASCII format into the characters, numbers and symbols and displays on the monitor. The video monitor can show 24 lines of information only. If the file contains more than 24 lines starting lines can not be seen since the type command simply scrolls all information on to the screen. Scrolling can be controlled by pressing Control + S keys together (on holding control key press S key and release both the keys is called as Control + S) scrolling of information will stop on the monitor. After viewing the contents on the screen any key can be pressed to scroll through the remaining contents. To view the contents of the file screen page by screen page, MORE command can also be used. which will stop the scrolling of information on the screen exactly after a screen page and in the screen page at 24 line a prompt message — More— is displayed. After pressing any key another screen page will be displayed. MORE is a filter e.g. it is a program that manipulates the stream of standard characters to the file to the standard output (monitor) screen page by screen page.

Examples

1 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt**

C:\COPA\ DOS\ PRACT_3 is the path to the file TEST.txt and TYPE is the command to be executed by DOS.

2 C:\>TYPE C:\COPA\ DOS\ PRACT_3>**TEST1.txt**

This results in the same output as in example1. While working from C: (C drive) this command can be issued without changing the directories.

3 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt | MORE**

This will also result in the same output but displayed screen page by screen page. Screen page can be changed on press of any key. Along with MORE another character is prefixed ‘|’ this is called the piping command, Which will route the output of TYPE command to another command MORE and the MORE filter outputs the information.

Renaming of file(s)

RENAME This command allows to change

Or the name of a file.

REN

Syntax

REN C: PATH\filename1.ex1 filename2.ex2

Where,

- **C:** is the disk drive holding the file for displaying.
- **PATH/** Specifies the location of file for displaying.
- **filename1.ex1** is the file to be renamed
- **filename2.ex2** is the new filename

Important Notes:

- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be renamed.
- A valid file name with appropriate extension is to be given for new filename.
- Wild characters are permitted in the file names by which required group of files can be renamed.

- Only file names will be changed and contents remain same.
- If attempted to change a file name to a name that already exists in the directory.

DOS prompts an error message

Duplicate file name or file not found

- If a invalid file name or the new name is not given, then also DOS prompts an error message

Rules for the file names.

- A File name must have 1 to 8 characters.
- An optional extension of 1 to 3 characters
- A period (.) between the name and extension name, if extension is used
- All letters from A through Z (lower case letters are automatically transferred to uppercase), 0 to 9 numbers and special characters & symbols \$ # & @ ! ^ () _ - { } ' ~ are permitted in the file name.
- The control characters such as Esc, Del, or space bar cannot be used in the file name.
- The characters + = / [] : ; ? * < > : are not permitted.
- Each file name in a directory must be unique.

Examples:

1 C:\COPA\ DOS\ PRACT_3>REN TEST2.txt
CHECKED.txt

C:\COPA\ DOS\ PRACT_3\ is the drive and path to the TEST2.txt file

TEST2.txt is the file name to be renamed

CHECKED.txt is the new filename

2 C:\COPA\ DOS\ PRACT_3>REN *.pic *.jpg the pic extension will be changed to jpg extension files.

Copying files:

COPY Copies one or more files to another location.

Syntax

COPY [/A | /B] source [/A | /B] [+ source [/A | /B] [+ ...]] [destination[/A | /B]] [/V] [/Y | /-Y] source specifies the file or files to be copied. Destination specifies the directory and/or filename for the new file(s).

Switches

/A Indicates an ASCII text file.

/B Indicates a binary file.

/V Verifies that new files are written correctly.

/Y Suppresses prompting to confirm you want to overwrite an existing destination file.

/-Y Causes prompting to confirm you want to overwrite an existing destination file.

Instructor shall discuss the simple switches with at least two examples in each case .

For further details on COPY command switches refer any tutorial or hand book on DOS

Important Notes:

- DOS command COPY can duplicate one or more files. In the same directory with different names or from one directory to other directory either in the same name or in different name.
- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used.
- Exact file name with extension is to be given for the file to be copied
- A valid file name with appropriate extension is to be given for new copied filename
- Wild characters are permitted in the file names by which required group of files can be copied
- On copying, both source and target files will have same contents.
- Copy overwrites the target file with the same name
- Copy will not allow to copy a file to it self that is source and target files should not be same
- If the destination file name is not specified while concatenation the first file name will become the destination name. After the first file name, additional source files must be preceded by a plus (+) sign.

Example

1 C:\COPA\ DOS\ PRACT_3>**COPY TEST2.txt TRIAL.txt**

With the above command C:\COPA\ DOS\ PRACT_3 directory TEST2.txt file will be copied as TRIAL.txt file in the same directory. On listing the directory both the files will have same details and on viewing the contents of both the file will be same. After copying DOS prompts a message 1 file copied

2 C:\COPA\ DOS\ PRACT_3>**COPY *.bmp *.pic**

With the above command C:\COPA\ DOS\ PRACT_3 directory all files with bmp extension file will be copied as pic extension files in the same directory. While copying DOS prompts the name of file it has copied and after completion of copying it prompts the number of files copied.

3 C:\COPA\ DOS\ PRACT_3>**COPY *.pic C:\COPA\ DOS\ PRACT_4**

All files with pic extension in C:\COPA\ DOS\ PRACT_3 directory will be copied to C:\COPA\ DOS\ PRACT_4 directory with same name & extension.

Using *.* after the copy command will copy all files with all extension to the destination.

Copy concatenating: Multiple file can be combined to form a single file by use of + between the source files and is called as concatenation

Example 4 C:\COPA\ DOS\ PRACT_3\ COPYTEST2.txt
+ TRIAL.txt CONCAT1.txt

With the above command TEST2.txt and TRIAL.txt will be combined and CONCAT1.txt file will be created which will have the contents of first two source files.

Deleting file

DEL Deletes the files specified.

or

Erase

Syntax

DEL C: path/filename [/P]

ERASE C: path/filename [/P]

Where,

- **C:** is the disk drive holding the file to be deleted.
- **path/** Specifies the location of file to be deleted.
- **filename** is the file to be deleted

Switch

/P Prompts for confirmation before deleting the specified file. Using the /P switch

If the /P switch is used, DEL displays the name of a file and prompts with a message in the following format:

filename, Delete (Y/N)?

Press Y to confirm the deletion, N to cancel the deletion and display the next filename (if a group of files are specified), or CRTL+C to stop the DEL command.

Important Notes

- If the drive is not specified current disk drive will be used
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be deleted
- Wild characters are permitted in the file names by which required group of files can be deleted
- On deleting, files name(s) will be removed from the directory.
- All the files in a directory can be deleted by typing the DEL command followed by [drive:]path. Wildcard also can be used (*) and (?) to delete more than one file at a time. However, Wildcards should be used cautiously with the DEL command to avoid deleting files unintentionally.

The following command is given for deleting all the files.

del *.*

DEL displays the following prompt:

All files in directory will be deleted! Are you sure (Y/N)?

Press Y and then ENTER to delete all files in the current directory, or

press N and then ENTER to cancel the deletion.

- Directories can not be removed with DEL command a separate command is available for removing the directory.
- Once the file is deleted it can not be recovered if the memory space is occupied by a new file. If accidentally file (s) are deleted immediately it can be recovered by using utility command.
- The space occupied by the deleted file on the disk or diskette is freed.
- Check for the typographic errors in the file names before the press of enter key to activate delete command

Example

1 C:\COPA\ DOS\ PRACT_3>DEL TEST2.txt

With the above command TEST2.txt file will be deleted from the C:\COPA\ DOS\ PRACT_3 directory. On listing the directory TEST2.txt will not be available.

2 C:\COPA\ DOS\ PRACT_4>DEL *.txt

With the above command in the C:\COPA\ DOS\ PRACT_4 directory all files with txt extension will be deleted.

3 C:\COPA\ DOS\ PRACT_3\TEMP > DEL *.*

All files with any extension in C:\COPA\ DOS\ PRACT_3\TEMP directory will be deleted.

Recovering deleted files:

UNDELETE delete protection facility

Syntax

UNDELETE C: path/filename [/DT | /DS | /DOS]

UNDELETE [/LIST | /ALL | /PURGE[DRIVE] | / STATUS | /LOAD | /UNLOAD

/UNLOAD | /S[DRIVE] | /T[DRIVE]-entries]]

Where,

- **C:** is the disk drive holding the files to be undeleted.
- **path/** Specifies the location of file to be undeleted.
- **filename** is the file to be undeleted

Switches

/LIST	Lists the deleted files available to be recovered.
/ALL	Recover files without prompting for confirmation.
/DOS	Recover files listed as deleted by MS-DOS.
/DT	Recover files protected by Delete Tracker.
/DS	Recover files protected by Delete Sentry.
/LOAD	Loads Undelete into memory for delete protection.
/UNLOAD	Unloads Undelete from memory.
/PURGE[drive]	Purges all files in the Delete Sentry directory.
/STATUS	Display the protection method in effect for each drive.
/S[drive]	Enables Delete Sentry method of protection.
/T[drive][-entries]	Enables Delete Tracking method of protection.

Important Notes:

Once a file is deleted from disk, it may not be possible to retrieve it. Although the UNDELETE command can retrieve deleted files, it can do so with certainty only if no other files have been created or changed on the disk. If a file is accidentally deleted and it is required to keep, stop what all other activities on the computer and immediately use the UNDELETE command to retrieve the file.

Example

1 C:\COPA\ DOS\ PRACT_3>UNDELETE TEST2.txt

With the above command TEST2.txt file will be recovered. On listing TEST2.txt file will be available in C:\COPA\ DOS\ PRACT_3 directory.

2 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE

With the above command multiple files can be recovered. DOS will prompt for confirmation of undeletion of each file and asks to type the first letter of the file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

3 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE /ALL

With the above command multiple files can be recovered. DOS will not prompt for confirmation of undeletion of each file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

Introduction to Linux operating system

Objectives: At the end of this lesson you shall be able to

- overview of linux
 - define futures of linux
 - explain application area of linux
 - describe about kernel.
-

Overview of Linux

The operating system

Developers need special tools (like the compilers and command lines found in GNU) to write applications that can talk to the kernel. They also need tools and applications to make it easy for outside applications to access the kernel after the application is written and installed.

This collective set of tools, combined with a kernel, is known as the operating system. It is generally the lowest layer of the computer's software that is accessible by the average user. General users get to the operating system when they access the command line.

Linux provides powerful tools with which to write their applications: developer environments, editors, and compilers are designed to take a developer's code and convert it to something that can access the kernel and get tasks done.

Like the kernel, the Linux operating system is also modular. Developers can pick and choose the operating tools to provide users and developers with a new flavor of Linux designed to meet specific tasks.

Introduction to Linux

Linux (pronounced Lih-nucks) is a UNIX-like operating system that runs on many different computers. Although many people might refer to Linux as the operating system and included software, strictly speaking, Linux is the operating system kernel, which comes with a distribution of software.

Linux was first released in 1991 by its author Linus Torvalds at the University of Helsinki. Since then it has grown tremendously in popularity as programmers around the world embraced his project of building a free operating system, adding features, and fixing problems.

Linux is popular with today's generation of computer users for the same reasons early versions of the UNIX operating system enticed fans more than 20 years ago. Linux is portable, which means you'll find versions running on name-brand or clone PCs, Apple Macintoshes, Sun workstations, or Digital Equipment Corporation Alpha-based computers. Linux also comes with source code, so you can change or customize the software to adapt to your needs. Finally, Linux is a great operating system, rich in features adopted from other versions of UNIX.

Where is Linux?

One of the most noted properties of Linux is where it can be used. Windows and OS X are predominantly found on personal computing devices such as desktop and laptop computers. Other operating systems, such as Symbian, are found on small devices such as phones and PDAs, while mainframes and supercomputers found in major academic and corporate labs use specialized operating systems such as AS/400 and the Cray OS.

Linux, which began its existence as a server OS and has become useful as a desktop OS, can also be used on all of these devices. „From wristwatches to supercomputers,“ is the popular description of Linux' capabilities.

The future of Linux

Linux is already successful on many different kinds of devices, but there are also many technological areas where Linux is moving towards, even as desktop and server development continues to grow faster than any other operating system today.

Linux is being installed on the system BIOS of laptop and notebook computers, which will enable users to turn their devices on in a matter of seconds, bringing up a streamlined Linux environment. This environment will have Internet connectivity tools such as a web browser and an e-mail client, allowing users to work on the Internet without having to boot all the way into their device's primary operating system—even if that operating system is Windows.

At the same time, Linux is showing up on mobile Internet devices (MIDs). This includes embedded devices such as smart phones and PDAs, as well as netbook devices—small laptop-type machines that feature the core functionality of their larger counterparts in a smaller, more energy-efficient package.

The growth of cloud computing is a natural fit for Linux, which already runs many of the Internet's web servers. Linux enables cloud services such as Amazon's A3 to work with superior capability to deliver online applications and information to users.

Related to Linux' growth in cloud computing is the well-known success of Linux on supercomputers, both in the high-performance computing (HPC) and high-availability (HA) areas, where academic research in physics and bioengineering, and firms in the financial and energy

industries need reliable and scalable computing power to accomplish their goals.

Many of the popular Web 2.0 services on the Internet, such as Twitter, Linked In, YouTube, and Google all rely on Linux as their operating system. As new web services arrive in the future, Linux will increasingly be the platform that drives these new technologies.

Current application of Linux operating systems

Today Linux has joined the desktop market. Linux developers concentrated on networking and services in the beginning, and office applications have been the last barrier to be taken down. They don't like to admit that Microsoft is ruling this market, so plenty of alternatives have been started over the last couple of years to make Linux an acceptable choice as a workstation, providing an easy user interface and MS compatible office applications like word processors, spreadsheets, presentations and the like. On the server side, Linux is well-known as a stable and reliable platform, providing database and trading services for companies like Amazon, the well-known online bookshop, US Post Office, the German army and many others. Especially Internet providers and Internet service providers have grown fond of Linux as firewall, proxy- and web server, and you will find a Linux box within reach of every UNIX system administrator who appreciates a comfortable management station. In post offices, they are the nerve centres that route mail and in large search engine, clusters are used to perform internet searches. These are only a few of the thousands of heavy-duty jobs that Linux is performing day-to-day across the world. It is also worth to note that modern Linux not only runs on workstations, mid- and high-end servers, but also on "gadgets" like PDA's, mobiles, a shipload of embedded applications and even on experimental wristwatches. This makes Linux the only operating system in the world covering such a wide range of hardware.

The code

Linux is also unique from other operating systems in that it has no single owner. Torvalds still manages the development of the Linux kernel, but commercial and private developers contribute other software to make the whole Linux operating system.

The kernel

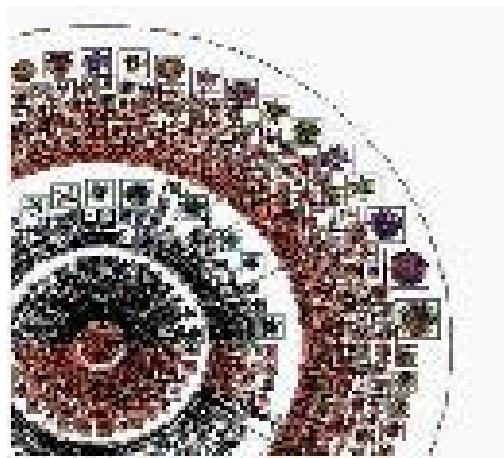
All operating systems have kernels, built around the architectural metaphor that there must be a central set of instructions to direct device hardware, surrounded by various modular layers of functionality. The Linux kernel is unique and flexible because it is also modular in nature.

Modularity is desirable because it allows developers to shed parts of the kernel they don't need to use. Typically a smaller kernel is a faster kernel, because it isn't running processes it does not need.

If a device developer wants a version of Linux to run on a cell phone, she does not need the kernel functionality that deals with disk drives, Ethernet devices, or big monitor screens. She can pull out those pieces (and others), leaving just the optimized kernel to use for the phone.

The kernel of the Window operating system (which few people outside of Microsoft are allowed to look at without

Fig 1



paying for the privilege) is a solidly connected piece of code, unable to be easily broken up into pieces. It is difficult (if not impossible) to pare down the Windows kernel to fit on a phone.

This modularity is significant to the success of Linux. The ability to scale down (or up) to meet the needs of a specific platform is a big advantage over other operating systems constrained to just a few possible platforms.

Modularity also effects stability and security as well. If one piece of the kernel code happens to fail, the rest of the kernel will not crash. Similarly, an illicit attack on one part of the kernel (or the rest of the operating system) might hamper that part of the code, but should not compromise the security of the whole device.

The environments

The windows, menus, and dialog boxes most people think of as part of the operating system are actually separate layers, known as the windowing system and the desktop environment.

These layers provide the human-oriented graphical user interface (GUI) that enables users to easily work with applications in the operating system and third-party applications to be installed on the operating system.

In Linux, there a lot of choices for which windowing system and desktop environment can be used, something that Linux allows users to decide. This cannot be done in Windows and it's difficult to do in OS X.

Like the operating system and kernel, there are tools and code libraries available that let application developers to more readily work with these environments (e.g., gtk+ for GNOME, Qt for KDE).

The applications

Operating systems have two kinds of applications: those that are essential components of the operating system itself, and those that users will install later. Closed operating systems, like Windows and OS X, will not let users (or developers) pick and choose the essential component applications they can use. Windows developers must use Microsoft's compiler, windowing system, and so on.

Linux application developers have a larger set of choices to develop their application. This allows more flexibility to build an application, but it does mean a developer will need to decide which Linux components to use.

The distributions

A Linux distribution is a collection of (usually open source) software on top of a Linux kernel. A distribution (or short, distro) can bundle server software, system management tools, documentation and many desktop applications in a central secure software repository. A distro aims to provide a common look and feel, secure and easy software management and often a specific operational purpose.

Let's take a look at some popular distributions.

Red hat

Red Hat is a billion dollar commercial Linux company that puts a lot of effort in developing Linux. They have hundreds of Linux specialists and are known for their excellent support. They give their products (Red Hat Enterprise Linux and Fedora) away for free. While Red

Hat Enterprise Linux (RHEL) is well tested before release and supported for up to seven years after release, Fedora is a distro with faster updates but without support.

Ubuntu

Canonical started sending out free compact discs with Ubuntu Linux in 2004 and quickly became popular for home users (many switching from Microsoft Windows). Canonical wants Ubuntu to be an easy to use graphical Linux desktop without need to ever see a command line. Of course they also want to make a profit by selling support for Ubuntu.

Debian

There is no company behind Debian. Instead there are thousands of well organised developers that elect a Debian Project Leader every two years. Debian is seen as one of the most stable Linux distributions. It is also the basis of every release of Ubuntu. Debian comes in three versions: stable, testing and unstable. Every Debian release is named after a character in the movie Toy Story.

Other

Distributions like Cent OS, Oracle Enterprise Linux and Scientific Linux are based on Red Hat Enterprise Linux and share many of the same principles, directories and system administration techniques. Linux Mint, Edubuntu and many other ubuntu named distributions are based on Ubuntu and thus share a lot with Debian. There are hundreds of other Linux distributions.

Handling commands and various editors

Objectives: At the end of this lesson you shall be able to

- know about terminal
- explain the command shell
- list out the directory layout of linux
- define the linux commands
- list out the special characters of linux OS
- explain various editors in linux OS.

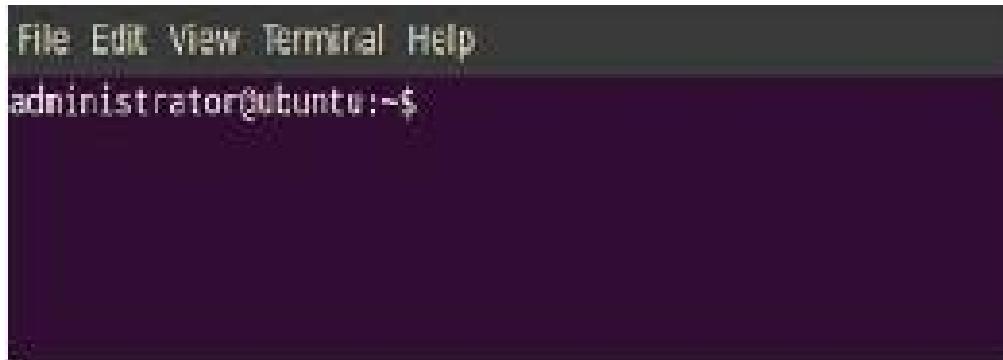
Starting up a terminal

To access the shell we will use a shell-like application, also called a terminal emulator. There is a huge number of good terminal applications out there, including the default ones in GNOME or KDE, or Yakuake, Guake, rxvt and so on. For now let's just stick with the default that

Some of the most popular shells are:

- **bash** - the Bourne-Again Shell, the default shell on most Linux systems.
- **sh** - the Bourne Shell, an older shell which is not so widely used anymore.

Fig 1



comes with your system. If you're using GNOME you can access the terminal by going to **Applications -> Accessories -> Terminal** or pressing Alt+F2 and typing gnome-terminal in the run box that appears, followed by Enter. If you're running KDE you can type instead **console** after pressing Alt+F2.

Depending on the distribution, the prompt may look something like **user@host\$**. The first part before the ampersand is the login username, and the other one is the hostname of the computer.

Command shell

A shell is a **command interpreter** which allows you to interact with the computer. The way things work is pretty simple: you type in commands, the shell interprets them, performs the tasks it was asked to do, and finally it sends the results to the standard output, which is usually the screen.

This is a list of files inside the root directory. The root directory is the first location in the file system tree hierarchy, and it is represented by the **slash** character :/.

- **csh** - the 'C' Shell, which accepts a syntax which resembles the 'C' programming language.
- **tcsh** - an improved version of the 'C' Shell.
- **ksh** - the Korn Shell, initially developed in the early 1980's.
- **dash** - Debian Almquist Shell, a shell created by the Debian distribution.

Listing of shells available in the system

```
$ cat /etc/shells/
```

The above command will display the following output as on Fig 2.

In this tutorial we will focus on **Bash**, since it is the most widely used and also one of the most powerful shells out there. Bash is a modern implementation of the older Bourne Shell (**sh**), developed by the GNU project, which provides a huge amount of tools and which, together with the Linux kernel, desktop environments like GNOME or KDE and applications which run on top of them, comprise the whole Linux platform. On a Debian or Ubuntu distribution, the default shell used by the system is specified in the file **/etc/passwd** (default being Bash).

Fig 2

```
File Edit View Terminal Help
administrator@ubuntu:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/csh
/bin/sh
/usr/bin/es
/usr/bin/ksh
/bin/ksh
/usr/bin/rc
/usr/bin/tcsh
/bin/tcsh
/usr/bin/esh
/bin/dash
/bin/bash
/bin/rbash
/usr/bin/screen
administrator@ubuntu:~$
```

How to display default shell in the system

Type the following command in the terminal

\$ echo \$SHELL

And press Enter key. The default shell will be displayed as on Fig 3.

Fig 3

```
File Edit View Terminal Help
administrator@ubuntu:~$ echo $SHELL
/bin/bash
administrator@ubuntu:~$
```

The Linux directory layout

Directory	Description
	The nameless base of the file system. All other directories, files, drives, and devices are attached to this root. Commonly (but incorrectly) referred to as the "slash" or "/" directory. The "/" is just a directory separator, not a directory itself.
/bin	Essential command binaries (programs) are stored here (bash, ls, mount, tar, etc.)
/boot	Static files of the boot loader
/dev	Device files. In Linux, hardware devices are accessed just like other files, and they are kept under this directory.
/etc	Host-specific system configuration files.
/home	Location of users' personal home directories (e.g. /home/Susan).
/lib	Essential shared libraries and kernel modules.
/proc	Process information pseudo-file system. An interface to kernel data structures
/root	The root (super user) home directory.
/sbin	Essential system binaries (fdisk, fsck, init, etc.).
/tmp	Temporary files. All users have permission to place temporary files here.
/usr	The base directory for most shareable, read-only data (programs, libraries, documentation, and much more).
/usr/bin	Most user programs are kept here (cc, find, du, etc.).
/usr/include	Header files for compiling C programs.
/usr/lib	Libraries for most binary programs
/usr/local	"Locally" installed files. This directory only really matters in environments where files are stored on the network. Locally-installed files go in /usr/local/bin, /usr/local/lib, etc.). Also often used for Software packages installed from source, or software not officially shipped with the distribution.
/usr/sbin	Non-vital system binaries (lpd, useradd, etc.)
/usr/share	Architecture-independent data (icons, backgrounds, documentation, terminfo, man pages, etc.).
/usr/src	Program source code. E.g. The Linux Kernel, source RPMs, etc.
/usr/X11R6	The X Window System
/var	Variable data: mail and printer spools, log files, lock files, etc.

What are Linux commands?

Linux commands are executable binary files which can be ran to perform certain tasks, like for example listing the files in a directory running an entire graphical application. Examples of frequently used commands are ls, cd, pwd, date or cat. With the exception of executable files, there is also a category called shell built-ins, which are commands provided by the shell itself (Bash in our case). We'll deal with those later.

The general form of a Linux command is:

command options(s) filename(s)

Which specifies a command, followed by one or more parameters, and optionally one or more files to apply it on. For example:

```
$ echo -e 'Hello, world!\n'
```

Will output the text 'Hello, world!' followed by a newline character. The **-e** parameter (also called argument, or switch in this case) tells the echo command to interpret escaped characters, like the trailing **\n**, which will add a newline after the text inside the single quotes. Ignore the leading dollar sign, it just signifies the shell prompt.

A command may or may not have arguments. An argument can be an option or a filename.

Special characters in linux operating system

It is important to know that there are many symbols and characters that the shell interprets in special ways. This means that certain typed characters: a) cannot be used in certain situations, b) may be used to perform special operations, or, c) must be "escaped" if you want to use them in a normal way.

Character	Description
\	Escape character. If you want to reference a special character, you must "escape" it with a backslash first. Example: touch /tmp/filename*
/	Directory separator, used to separate a string of directory names. Example: /usr/src/linux
.	Current directory. Can also "hide" files when it is the first character in a filename.
..	Parent directory
~	User's home directory
*	Represents 0 or more characters in a filename, or by itself, all files in a directory. Example: pic*2002 can represent the files pic2002, picJanuary2002, picFeb292002, etc.
?	Represents a single character in a filename. Example: hello?.txt can represent hello1.txt, helloz.txt, but not hello22.txt
[]	Can be used to represent a range of values, e.g. [0-9], [A-Z], etc. Example: hello[0-2].txt represents the names hello0.txt, hello1.txt, and hello2.txt
	"Pipe". Redirect the output of one command into another command. Example: ls more
>	Redirect output of a command into a new file. If the file already exists, over-write it. Example: ls > myfiles.txt
>>	Redirect the output of a command onto the end of an existing file. Example: echo .Mary 555-1234. >> phonenumbers.txt
<	Redirect a file as input to a program. Example: more < phonenumbers.txt
;	Command separator. Allows you to execute multiple commands on a single line. Example: cd /var/log ; less messages

The cd command

The cd command is used to change the current directory (i.e., the directory in which the user is currently working) in Linux and other Unix-like operating systems. It is similar to the CD and CHDIR commands in MS-DOS.

cd's syntax is

cd [option] [directory]

The items in square brackets are optional. When used without specifying any directory name, cd returns the user to the previous current directory. This provides a convenient means of toggling between two directories.

When a directory name is provided, cd changes the current directory to it. The name can be expressed as an absolute pathname (i.e., location relative to the root directory) or as a local pathname (i.e., location relative to the current directory). It is usually more convenient to use a local pathname when changing to a subdirectory of the current directory.

As an example, the following would change the current directory, regardless of where it is on the system (because it is an absolute path), to the root directory (which is represented by a forward slash):

cd /

Likewise, the following would change the current directory, regardless of its location, to the /usr/sbin directory (which contains non-vital system utilities that are used by the system administrator):

cd /usr/sbin

If a user currently in the directory /usr/local/share/man/ desired to change to the directory /usr/local/share/man/man2, which is a subdirectory of the current directory, it would be possible to change by using the absolute pathname, i.e.,

cd /usr/local/share/man/man2

However, it would clearly be much less tedious to use the relative pathname, i.e.,

cd man2

On Unix-like operating systems the current directory is represented by a singledot and its parent directory (i.e., the directory that contains it) is represented by two consecutive dots. Thus, it is possible (and often convenient) to change to the parent of the current directory by using the following:

cd ..

Another convenient feature of cd is the ability for any user to return directly to its home directory by merely using a tilde as the argument. A home directory, also called a login directory, is the directory on a Unix-like operating system that serves as the repository for a user's personal files, directories and programs. It is also the directory that a user is first in after logging into the system. A tilde is a short, wavy, horizontal line character that represents the

home directory of the current user. That is, any user can return immediately to its home directory by typing the following and then pressing the Enter key:

cd ~

This is easier than typing the full name of the user's home directory, for instance, /home/josephine in the case of a user named josephine. (And it is just one of the numerous shortcuts that help make the command line on Unix-like operating systems so easy to use.)

When followed by a space and then a hyphen, cd both returns the user to the previous current directory and reports on a new line the absolute pathname of that directory. This can further enhance the already convenient toggling capability of cd. Toggling is particularly convenient when at least one of the two directories has a long absolute pathname, such as /usr/local/share/man/man2.

cd has only two options, and neither of them are commonly used. The -P option instructs cd to use the physical directory structure instead of following symbolic links. The -L option forces symbolic links to be followed.

The pwd command

The pwd command reports the full path to the current directory.

The current directory is the directory in which a user is currently operating while using a command line interface. A command line interface is an all-text display mode and it is provided via a console (i.e., a display mode in which the entire screen is text only) or via a terminal window (i.e., a text-only window in a GUI).

The full path, also called an absolute path, to a directory or file is the complete hierarchy of directories from the root directory to and including that directory or file. The root directory, which is designated by a forward slash (/), is the base directory on the filesystem (i.e., hierarchy of directories), and it contains all other directories, subdirectories and files on the system. Thus, the full path for any directory or file always begins with a forward slash.

pwd is one of the most basic commands in Linux and other Unix-like operating systems, along with ls, which is used to list the contents of the current directory, and cd, which is used to change the current directory.

pwd's syntax is

pwd [option]

Unlike most commands, pwd is almost always used just by itself, i.e.,

Pwd

That is, it is rarely used with its options and never used with arguments (i.e., file names or other information provided as inputs). Anything that is typed on the same line after pwd, with the exception of an option, is ignored, and no error messages are returned.

As an example, if a user with the username janis is in its home directory, then the above command would typically return /home/janis/ (because, by default, all home

directories are located in the directory /home). Likewise, if a user were currently working in directory /usr/share/config (which contains a number of program configuration files), then the same command would return /usr/share/config.

pwd is useful for confirming that the current directory has actually been changed to what the user intended after using cd. For example, after issuing the cd command to change the current directory from /home/janis to /usr/share/config, pwd could be used for confirmation; that is, the following sequence of commands would be issued:

```
cd /usr/share/config/  
pwd
```

The standard version of pwd has a mere two options, both of which are employed only infrequently. The --help option is used as follows:

```
pwd --help
```

This option displays information about pwd, of which there is very little because it is such a simple command (i.e., it only has two options and accepts no arguments).

The other option is --version, which displays the version number, i.e.,

```
pwd --version
```

Although it is often thought of as standing for present working directory, pwd is actually an acronym for print working directory. The word print is traditional UNIX terminology for write or display, and it originated when computer output was typically printed on paper by default because CRT (cathode ray tube) display monitors were not yet widely available.

The echo command

echo is a built-in command in the bash and C shells that writes its arguments to standard output.

A shell is a program that provides the command line (i.e., the all-text display user interface) on Linux and other Unix-like operating systems. It also executes (i.e., runs) commands that are typed into it and displays the results. bash is the default shell on Linux.

A command is an instruction telling a computer to do something. An argument is input data for a command. Standard output is the display screen by default, but it can be redirected to a file, printer, etc.

The syntax for echo is

```
$ echo $USER  
$ echo "Hello world"
```

The items in square brackets are optional. A string is any finite sequence of characters (i.e., letters, numerals, symbols and punctuation marks).

When used without any options or strings, echo returns a blank line on the display screen followed by the command prompt on the subsequent line. This is because pressing the ENTER key is a signal to the system to start a new

line, and thus echo repeats this signal.

When one or more strings are provided as arguments, echo by default repeats those strings on the screen. Thus, for example, typing in the following and pressing the ENTER key would cause echo to repeat the phrase This is a pen. on the screen:

```
echo This is a pen.
```

It is not necessary to surround the strings with quotes, as it does not affect what is written on the screen. If quotes (either single or double) are used, they are not repeated on the screen.

Fortunately, echo can do more than merely repeat verbatim what follows it. That is, it can also show the value of a particular variable if the name of the variable is preceded directly (i.e., with no intervening spaces) by the dollar character (\$), which tells the shell to substitute the value of the variable for its name.

For example, a variable named x can be created and its value set to 5 with the following command:

```
x = 5
```

The value of x can subsequently be recalled by the following:

```
echo The number is $x.
```

Echo is particularly useful for showing the values of environmental variables, which tell the shell how to behave as a user works at the command line or in scripts (short programs).

For example, to see the value of HOME, the environmental value that shows the current user's home directory, the following would be used:

```
echo $HOME
```

Likewise, echo can be used to show a user's PATH environmental variable, which contains a colon-separated list of the directories that the system searches to find the executable program corresponding to a command issued by the user:

```
echo $PATH
```

echo, by default, follows any output with a newline character. This is a non-printing (i.e., invisible) character that represents the end of one line of text and the start of the next. It is represented by \n in Unix-like operating systems. The result is that the subsequent command prompt begins on a new line rather than on the same line as the output returned by echo.

The -e option is used to enable echo's interpretation of additional instances of the newline character as well as the interpretation of other special characters, such as a horizontal tab, which is represented by \t. Thus, for example, the following would produce a formatted output:

```
echo -e "\n Projects: \n\ntplan \n\tcode \n\nttest\n"
```

(The above command should be written on a single line, although it may render as two lines on smaller display screens.) The -n option can be used to stop echo from adding the newline to output.

By making use of output redirection, echo provides a very simple way of creating a new file that contains text. This is accomplished by typing echo followed by the desired text, the output redirection operator (which is a rightward pointing angle bracket) and finally the name of the new file. The file can likewise be formatted by using special characters. Thus, for example, the formatted output from the above example could be used to create a new file called project1:

```
echo -e "\n Project1: \n\n\tplan \n\twrite \n\ttest\n" > project1
```

The contents of the new file, including any formatting, can be verified by using a command such as cat or less, i.e.,

less project1

echo can likewise be a convenient way of appending text to the end of a file by using it together with the append operator, which is represented by two consecutive rightward pointing angle brackets. However, there is always the risk of accidentally using a single bracket instead of two, thereby overwriting all of the contents of the file, and thus, this feature is best reserved for use in scripts.

echo can also be used with pattern matching, such as the wildcard character, which is represented by the star character. For example, the following would return the phrase The gif files are followed by the names of all the .gif image files in the current directory:

```
echo -e The gif files are *.gif
```

The cal command

Displays calendar of current month.

```
$ cal
```

July 2012

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

'cal' will display calendar for specified month and year.

```
$ cal 08 1991
```

August 1991

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Date command

Display current time and date.

```
$ date
```

```
Fri Jul 6 01:07:09 IST 2012
```

If you are interested only in time, you can use 'date +%T' (in hh:mm:ss):

```
$ date +%T
```

```
01:13:14
```

tty command

Displays current terminal.

```
$ tty
```

```
/dev/pts/0
```

whoami command

This command reveals the current logged in user.

```
$ whoami
```

```
raghu
```

id command

This command prints user and groups (UID and GID) of current user.

```
$ id
```

```
uid=1000(raghu) gid=1000(raghu)
```

groups = 1000 (raghu), 4(adm), 20(dialout), 24(cdrom), 46(plugdev), 112(lpadmin), 120(admin), 122(sambashare)

By default information about current user is displayed. If another username is provided as an argument, information about that user will be printed:

```
$ id root
```

```
uid=0(root) gid=0(root) groups=0(root)
```

Clear command

This command clears the screen.

Getting help command

For all its advantages, a big disadvantage of command line is that there are a lot of commands and even more are their options and usage. But nobody can remember all commands. There are some smarter ways of using command line. Linux provides us with several such resources discussed here:

--help option

With almost every command, '--help' option shows usage summary for that command.

```
$ date --help
```

```
Usage: date [OPTION]... [+FORMAT]
```

or: date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]

Display the current time in the given FORMAT, or set the system date.

The whatis command

The whatis command provides very brief descriptions of command line programs (i.e., all-text mode programs) and other topics related to Linux and other Unix-like operating systems.

It accomplishes this by searching the short descriptions in the whatis database for each keyword provided to it as an argument (i.e., input data). This database contains just the title, section number and description from the NAME section of each page in the man manual that is built into most Unix-like systems.

The syntax for whatis is:

whatis keyword(s)

For example, the following provides a single line summary of the head command (which by default displays the first ten lines of each file that is provided to it as an argument):

whatis head

whatis can be used to simultaneously search for information about multiple topics. For example, the following would provide information about both head and tail (which by default reads the final ten lines of files):

whatis head tail

The output of whatis is limited by the fact that it provides only a single line for each keyword found in the database; thus it supplies incomplete information about even moderately complex commands. For example, the following use of whatis to obtain information about the cat command generates the output "concatenate files and print on the standard output":

whatis cat

However, this omits some important information about cat, particularly the facts that it is very convenient to use for reading files and that it is also used to create and write to files.

whatis is similar to the apropos command. However, apropos is more powerful in that its arguments are not limited to complete words but can also be strings (i.e., any finite sequences of characters) which comprise parts of words. Both commands are unusual in that they have no options.

The man command (which is used to read the built-in manual pages), when used with its -f option, produces the same output as whatis. Thus, for example,

man -f cat

is equivalent to

whatis cat

Info pages

Info documents are sometimes more elaborated than man pages. But for some commands, info pages are just the same as man pages. These are like web pages. Internal links are present within the info pages. These links are called nodes. Info pages can be navigated from one page to another through these nodes.

\$ info date

Word processors in the Linux environment

Text editors are used by many different types of people. Casual users, writers, programmers, and system administrators will all use a text editor at one time or another in Linux.

Use of text editor

A text editor is just like a word processor without a lot of features. All operating systems come with a basic text editor. Linux comes with several. The main use of a text editor is for writing something in plain text with no formatting so that another program can read it. Based on the information it gets from that file, the program will run one way or another.

vi Editor

"vi" (pronounced "vee eye") is a text editor with a deceptively simple appearance that belies its great power and efficiency. New users soon realize that there is far more to this little program than meets the eye.

vi, or one of its clones, is found in almost every version of Linux and Unix, and, in fact, it is the only editor that is available in virtually every Unix installation.

History of vi

The vi editor was developed starting around 1976 by Bill Joy, who was then a graduate student at the University of California at Berkeley. Joy later went on to help found Sun Microsystems and became its Chief Scientist.

"ed" was the original Unix text editor. Like other early text editors, it was line oriented and used from dumb printing terminals. Joy first developed "ex" as an improved line editor that supported a superset of ed commands. He then developed vi as a "visual interface" to ex. That is, it allows text to be viewed on a full screen rather than only one line at a time. vi takes its name from this fact.

vi remains very popular today in spite of the development and widespread availability of GUI (graphical user interface) mode text editors which are far more intuitive and much easier for beginners to use than text-mode text editors such as vi. GUI-mode text editors include gedit and Emacs, both of which have become very common on Linux and other Unixes today.

Features of vi

- It is present in almost every Linux Unix system, even the most minimal.
- It is very small. In fact, some versions have a total code size of less than 100KB. This makes it easy to include vi on even the tiniest versions of Linux, such as those in embedded systems and those that run from a single floppy disk.
- It is typist-friendly, at least once you get used to it. For example, the commands are very short, usually just a few keystrokes. And because vi does not use the mouse, there is never any need to remove one's hands

from the keyboard. This can speed up editing substantially.

- It is very powerful, as just a few very short commands can make sweeping changes to large documents. In fact, vi is more powerful than most of its users realize, and few of them know more than just fraction of all the commands.

Opening and closing file

vi can be used both when your system is in text mode (the entire screen is devoted to text and there are no images) and when your system is in GUI mode (the screen contains windows, images and menus). When it is in GUI mode (usually KDE or Gnome), vi runs in a terminal window. A terminal window is a text-only window, and it can usually be opened by clicking on an icon (small image) of a computer screen.

(In the case of Red Hat Linux, the terminal window can be opened by clicking on the icon of a red hat in the lower left hand corner of the screen, opening the System Tools menu and then selecting Terminal from that menu. It can be convenient to add the icon for the terminal window to the launcher panel along the bottom of the screen, if it is not already there.)

There are at least two ways to use vi to simultaneously create and open a new file. One is by just typing vi at the command line, like this:

vi

This creates an empty file that will not have a name until you save its contents to disk (i.e., transfer the text you typed into it to your hard disk, floppy disk, etc. for long term storage).

A second way to open a new file is by typing vi followed by the name of the file to be created, for example:

vi apple

This creates a new file named "apple" in the current directory (the directory or folder which is currently open on your all-text screen or your terminal window).

If you want, it could create the same file with an extension such as ".txt" added to the end of the file name. In Linux this is merely a matter of convenience (or habit), and it generally makes no real difference for the file because it remains a plain text file in either case. For example:

vi apple.txt

To close a file to which no changes have been made, hit ESC (the Esc key, which is located in the upper left hand corner of the keyboard), then type :q (a colon followed by a lower case "q") and finally press ENTER. (The term "hit" is used here instead of "press" to emphasize that it is not necessary to keep the ESC key held down but just to press it momentarily.)

To close a file to which changes have been made (such as text having been added or removed) without saving the

changes, hit ESC, type :q! and then press ENTER. This is sometimes referred to as a "forced quit."

vi works with a buffer (a block of memory in the RAM chips). When you open an existing file, vi copies that file from the hard disk (or floppy, CDROM, etc.) to a buffer. All changes that you make to a file are initially made only to the copy in the buffer, and they are only made to the file itself when you "save" your changes. "Saving" a file means writing (i.e., transferring) the contents of the buffer to the hard disk (or floppy disk).

Likewise when you open a new file. All text you enter (and subsequent edits you make to it) exists only in the buffer until you save the file to disk.

To save the changes that have been made to a file, hit ESC, type :w and then press ENTER. The "w" stands for "write." An alternative, and perhaps easier, way to save a file and quit at the same time is to hit ESC and then type ZZ (two capital Z's in succession).

After you have created a new text file and closed it, you might want to confirm that nothing went wrong and that the file actually exists. Probably the simplest way to do this is to use the standard Unix ls command, which displays a list of all of the files in the current directory.

Entering text

vi has two basic modes of operation: command mode and text insert mode. How to switch back and forth between them is probably the most confusing thing about vi for beginners. But it is actually very simple, and once you get used to it you might also find it quite efficient.

Command mode is the default mode when a file (existing or new) is opened. (This is the opposite of most text and word processors and therefore may seem counter-intuitive.) Because every file opens initially in command mode, you can not immediately begin typing text. That is, everything that is typed on the keyboard is interpreted by vi to be a command.

Examples of the many types of commands can perform on a file while in command modes are:-

- Switching to text insert mode.
- Moving the cursor around the file.
- Deleting characters or lines.
- Transposing characters.
- Changing case.
- Appending the contents of the file to another (closed) file.
- Setting vi options.
- Saving the file to disk.
- Closing the file and quitting vi.

The other mode, text insert mode, is also referred to as simply "insert mode" or "input mode." It is used for entering text into the buffer memory (and simultaneously onto the screen). In this mode everything that is typed on the keyboard is added to the text and does not become a command (although you can perform some command operations in text mode with vi clones).

The most common way to switch from command mode to the input mode is to use the i (which stands for "insert" or "input") command. This is accomplished by simply typing the letter i while in command mode. Now you are ready to start typing text.

Unlike word processors and even most word editors, there is no automatic word wrap in the traditional version of vi (although you will notice it in some clones). New lines are started by pressing ENTER.

When finished typing text or need to perform some other operation such as moving to a different position in the text or deleting some of it, hit ESC in order to return to the command mode.

Once you have typed some text, you can use the four basic commands for moving the cursor around the text. These commands enable you to go to any desired location in order to modify the text, including making insertions and deletions. The four basic cursor positioning commands are:

- h move cursor one character to left
- j move cursor one line down
- k move cursor one line up
- l move cursor one character to right

Each of these commands can be either used by itself or modified by typing an integer in front of it to indicate the number of characters or lines to move. For example, typing (in command mode, of course)

3j - will move the cursor down three lines. Or typing 2h will move it two characters to the left.

These commands can be repeated by holding the key down. If attempting an impossible movement, such as pressing k when the cursor is on the top line, the screen might flash or a beeping sound might be made (depending on how your computer is set up).

The cursor can be moved directly to any desired line by using the G command preceded by the line number. For example, typing

5G - moves the cursor to the fifth line from the top of the text. Just typing G without any number moves the cursor to the final line of text.

When you switch from command mode to input mode with the i command and then start typing text, each character you type is placed to the left of the character covered by the cursor. This causes the character covered by the cursor as well as everything to its right to be shifted to the right.

There will be times when it needs to place a character to the right of the character under the cursor. This is particularly useful when the cursor is over the last character in a line and you want to append the line. To do this, simply use the a (lower case "a," which stands for "append") command instead of the i command to switch from command mode into insert mode.

After it has saved a file that have created or modified using vi, might want to verify that its contents are really what you had intended. One way to do this is to use cat, the Unix concatenation utility. (No, this has no relationship to the popular domesticated animal whose name has the same spelling). For example, type:

```
cat /home/john/fruit/lemon
```

Editing Text

vi offers a rich assortment of commands for editing text. Among the most basic are those used for deleting or erasing.

The x (lower case "x") command deletes the character immediately under (i.e., covered by) the cursor. To delete any desired character, just switch to the command mode (if you are not already there) and then use an appropriate combination of the h, j, k and l commands (of course, one at a time) to move the cursor to that character. Then type x and the character is deleted.

By pressing x continuously instead of just hitting it once, the cursor continuously moves to the right and each character under it is successively deleted.

The X (upper case "X") command is similar except that it deletes the character to the left of the cursor rather than the character under it.

There are several additional commands for deleting text. The D (upper case "D") command removes the text on the current line from the character under the cursor to the end of the line.

The d (lower case "d") command is very flexible because it can be modified to delete any number of characters, words or lines. Typing d by itself will not do anything, but typing dw causes the character the cursor is resting on and the remaining characters to the right of it in the same word to be deleted. (The "w" stands for "word.")

Typing 2dw causes the character under the cursor, the remaining characters to the right of it in the same word and all of the characters in the next word to be deleted. For example, typing 2dw with the cursor on the "a" of the string "pineapple plantation" causes the string "apple plantation" to be deleted.

As another example, typing 3dw with the cursor on the "j" of the string "the bluejay flew south" causes the string "jay flew south" to be deleted. That is, "jay" and two words to the right of it are deleted.

Deleting an entire line can be accomplished with the dd command. This command can also be used to delete multiple lines by preceding it with an integer representing the number of lines to be removed. For example, typing

2dd will delete two consecutive lines beginning with the current line.

With some terminals, deletion of a line causes it to be replaced on the screen with an "@" character. This character merely represents an empty line and is not inserted into the text. Its purpose is to relieve the processor from having to redraw the screen (i.e., change the whole screen). This character can be removed if desired by typing r (or I on some terminals) while holding down the CTRL key.

The change command c (lower case "c") differs from the delete command in that it not only deletes a section of text but also activates insert mode to allow you to type in replacement text. After you have completed typing in the replacement text, be sure to press ESC to return to the command mode.

As is the case with d, the c command is not used by itself but is only used in combination with another letter after it and an optional integer before it.

For example, the command cw (which stands for "change word") deletes the characters in the current word under and to the right of the cursor and then switches vi to the insert mode so that you can enter text to replace the deleted characters. The number of new characters typed in can be the same as, fewer or more than the number deleted.

The amount of text to be changed can be increased by preceding the command with a number. For instance, typing 2cw will additionally remove the next word for replacement with whatever is typed in. The space between the words is not preserved.

The d and c commands can also be modified by other characters in addition to "w." For example they can be used with "b," which stands for "back." Thus, typing 3bd will delete the characters to the left of the cursor in the current word together with the two words to the left of the current word.

The cc command erases the current line, leaving it blank and awaiting replacement text. Preceding this command with an integer will delete that number of lines, beginning with the current line. For example, typing 5cc will allow you to change five consecutive lines starting with the current line.

Another change command, R, differs from the c commands in that it does not initially delete anything. Rather, it activates insert mode and lets you replace the characters under the cursor one at a time with characters that you type in.

vi supports several types of transposition. Transposing the order of two adjacent characters is easy with the xp command. Just place the cursor on the left-most of the two characters, type x to erase the left character and then type p for the deleted character to be put to the right of the cursor.

Two adjacent words can be transposed with the deep command. To use it, position the cursor in the space just to the left of the word on the left and type deep. Two adjacent

lines can be transposed with the ddp command by placing the cursor on the upper line and typing ddp.

It is also a simple matter to change the case of a letter. When the cursor is over the desired letter, hit the "~" (tilde) key. This will change a capital letter to a small letter and visa versa.

The J (upper case "J") command is used to join the next line to the current line. The opposite operation, splitting a line, is accomplished in insert mode by merely positioning the cursor over what will be the first character of the new line and then hitting ENTER.

vi also has an undo capability. The u (lower case "u") command is used to reverse the effects of an already issued command that has changed the buffer, but which is not yet written to disk. U (upper case "U") undoes all of the changes that have been made to the current line during your current visit to it

Searching Text

vi also has powerful search and replace capabilities. To search the text of an open file for a specific string (combination of characters or words), in the command mode type a colon (:), "s," forward slash (/) and the search string itself. What you type will appear on the bottom line of the display screen. Finally, press ENTER, and the matching area of the text will be highlighted, if it exists. If the matching string is on an area of text that is not currently displayed on the screen, the text will scroll to show that area.

The formal syntax for searching is:

:s/string

For example, suppose you want to search some text for the string "cherry." Type the following and press ENTER:

:s/cherry

The first match for "cherry" in your text will then be highlighted. To see if there are additional occurrences of the same string in the text, type n, and the highlight will switch to the next match, if one exists.

The syntax for replacing one string with another string in the current line is

:s/pattern/replace/

Here "pattern" represents the old string and "replace" represents the new string. For example, to replace each occurrence of the word "lemon" in a line with "orange," type:

:s/lemon/orange/

The syntax for replacing every occurrence of a string in the entire text is similar. The only difference is the addition of a "%" in front of the "s":

%s/pattern/replace/

Thus repeating the previous example for the entire text instead of just for a single line would be:

%s/lemon/orange/

Working with multiple files

It is easy to insert text into an open file from another file. All that is necessary is to move the cursor to the location where you want the text inserted, then type

:r filename

where "filename" is the name of the file to insert.

For example, if you want to copy the contents of the file "peach" into the file "fruit," you would first position the cursor to the desired line in "fruit" and then type

:r peach

Notice that this operation causes no change to the file "peach."

You can also append text from the currently open file to any other file. This is accomplished using the :w (colon + "w") command followed without a space by >>. For example, to append the contents of a currently open file named "pear" to the file named "apple," type

:w>> apple

At times it can be convenient to open multiple files simultaneously. This is efficiently accomplished by just listing all of the files to be opened after the vi command. For example, to simultaneously open files about three kinds of fruit, type:

vi apple pear orange

This allows you to edit "apple" first. After saving "apple," typing :n calls up "pear" for editing.

If you want to simultaneously open all files in the current directory, just type vi * (vi + space + asterisk).

Additional operations

As you have learned, creating and opening files in vi can be a very simple matter. However, many combinations of options are available that can add much power and flexibility for these tasks, as can be seen by looking at the full syntax for opening files:

vi [flags] [cmd] [filename]

The square brackets ([]) around each section of arguments (modifiers) of the command indicates that they are optional. (That is, a file can be opened by just typing vi alone or by typing it with any combination of the three arguments. For instance, the example of vi dog contains only the mandatory vi and the optional third argument, which is the name of the file to open.)

As only one of many possible examples of adding options for opening files, an existing file can be opened with the cursor appearing on any desired line instead of just on the first line. (One situation in which this can be particularly useful is if your file is part of a program which you are writing and the compiler reports an error on a specific line in that file.) This is accomplished by adding the + (plus sign) command followed the desired line number. For example, to open the file "apple" with the cursor located on the third line, type:

vi +3 apple

Use of the + command without any modifying number opens a file with the cursor positioned on the last line of text. This can save some keystrokes when you want to open a file just to append data to the end of it. For example:

vi + apple

You have already learned several commands for switching from command mode to insert mode, including i for inserting to the left of the cursor position, a for inserting to the right of the cursor position and the c commands for changing text. A more complete list is as follows:

a	appends after current cursor position.
A	appends at end of current line.
c	starts a change option.
C	starts a change option from current position to end of current line.
i	inserts to the left of the cursor position.
I	inserts at start of line.
o	cursor moves to new, blank line below its current position.
O	cursor moves to new, blank line above its current position.
R	replaces characters one at a time.

A simple way to obtain basic information about any file that is currently open, including name, size and the current line number, is to hold down CTRL and type g. This data appears on the bottom line of the display.

Summary of commands

The following list contains the basic commands presented in the first eight pages of this tutorial along with occasional examples of usage (shown in parenthesis). They are presented in roughly the same order in which they appear in the tutorial. (All commands that begin with a colon are followed by ENTER.)

vi	typed at the command line to open one or more files in the same directory (vi tomato.txt opens a file named "tomato.txt" in the current directory) (vi parsley sage rosemary opens the three files "parsley," "sage" and "rosemary" in the current directory)
vi *	typed at the command line to open every file in the current directory
:q	closes (quits) a file to which no changes have been made
:q!	quits without saving any changes
:w	writes (i.e., saves) the current file to disk
:wq	writes the buffer contents to disk (i.e., saves changes) and quits
zz	same as :wq
i	activates text insert mode, inserting text immediately under the current position of the cursor.
h	moves the cursor one character to the left (2h moves the cursor two characters to the left)
j	moves the cursor one line down (3j moves the cursor three lines down)
k	moves the cursor one line up
l	moves the cursor one character to the right
G	moves the cursor to the desired line; moves the cursor to the last line of text if not preceded by a modifying integer (5G moves the cursor to the fifth line)
a	switches to insert mode and allows insertion of text immediately to the right of the cursor.
x	deletes the character immediately under the cursor (xxx deletes the character immediately under cursor and then deletes the two characters to its right)
X	deletes a single character to the left of cursor
D	removes the text on the current line from the character under the cursor to the end of the line
dw	deletes the character immediately under the cursor and the remaining characters to the right of it in the same word (2dw deletes the character immediately under the cursor, the remaining characters to the right of it in same word and all of the next word)
dd	deletes the entire line containing the cursor, and the cursor then moves to the next line (2dd deletes two consecutive lines beginning with the current line)
cw	deletes the character under the cursor and to its right in the same word and allows new characters to be typed in to replace them (2cw deletes the character under the cursor and to its right in the same word and in the next word, and then allows replacement characters to be typed in)

cc	erases the current line and allows replacement text to be typed in (2cc erases the current line and the next line and allows replacement text to be typed in for both lines)
cb	deletes the characters to the left of the cursor in the current word and allows replacement characters to be typed in (3cb deletes the characters to the left of the cursor in the current word together with the two words to its left and then allows replacement text to be typed in)
R	activates text input mode allowing text under and to the right of the cursor to be overwritten one character at a time
xp	transposes two adjacent characters
deep	transposes two adjacent words
ddp	transposes two adjacent lines
~	changes case of the character under the cursor
J	joins the current line with the next line
u	reverses the effects of the most recent command that has changed the buffer
U	undoes all changes made to the current line during the current visit to it
:s/	searches the text for the first instance of a designated string (:s/cucumber searches the text for the first instance of the string "cucumber")
n	searches the text for the next instance of a designated string
:s/ / /	replaces the first instance of a designated string (:s/cucumber/radish/ replaces the first instance of the string "cucumber" with the string "radish")
:%s/ / /	replaces every instance of a designated string (:%s/cucumber/radish/ replaces every instance of the string "cucumber" with the string "radish")
:r	inserts text into the currently open file from another file (:r lettuce.txt inserts text into the currently open file from the file named "lettuce.txt")
:w>>	appends the text from the currently open file into another file (:w>> cabbage appends the text from the currently open file into the file named "cabbage")

pico editor

pico is a simple text editor in the style of the pine composer.

Syntax

pico [options] [file]

Description

pico is a simple, display-oriented text editor based on the pine message composer. As with pine, commands are displayed at the bottom of the screen, and context-sensitive help is provided. As characters are typed they are immediately inserted into the text.

Editing commands are entered using control-key combinations. As a work-around for communications programs that swallow certain control characters, you can emulate a control key by pressing ESCAPE twice, followed by the desired control character. For example, "ESC ESC c" would be equivalent to entering a ctrl-c. The editor has five basic features: paragraph justification, searching, block cut/paste, a spelling checker, and a file browser.

Paragraph justification (or filling) takes place in the paragraph that contains the cursor, or, if the cursor is between lines, in the paragraph immediately below. Paragraphs are delimited by blank lines, or by lines beginning with a space or tab. Unjustification can be done immediately after justification using the control-U key combination.

String searches are not sensitive to case. A search begins at the current cursor position and wraps around the end of the text. The most recent search string is

offered as the default in subsequent searches.

Blocks of text can be moved, copied or deleted with creative use of the command for mark (Ctrl-^), delete (Ctrl-k) and undelete (Ctrl-u). The delete command will remove text between the "mark" and the current cursor position, and place it in the "cut" buffer. The undelete command effects a "paste" at the current cursor position.

The spell checker examines all words in the text. It then offers each misspelled word for correction while highlighting it in the text. Spell checking can be cancelled at any time. Alternatively, pico will substitute for the default spell checking routine a routine defined by the SPELL environment variable. The replacement routine should read standard input and write standard output.

The file browser is offered as an option in the "Read File" and "Write Out" command prompts. It is intended to help in searching for specific files and navigating directory hierarchies. Filenames with sizes and names of directories in the current working directory are presented for selection. The current working directory is displayed on the top line of the display while the list of available commands takes up the bottom two. Several basic file manipulation functions are supported: file renaming, copying, and deletion.

Movement commands:

Depending on your system, the arrow keys or the backspace key may not work. Instead, you can use these commands to perform the same tasks.

To	Hold down Ctrl key and press	Instead of
Delete a character	backspace	backspace
Move up a line	p	up arrow
Move down a line	n	down arrow
Move left one space	b	left arrow
Move right one space	f	right arrow
Move to the end of line	e	end

Some pico editor options

^C Cancel allows you to stop a process at any time. If you make a mistake, just hold down the Ctrl key and press c.

^G get help

Get clear and concise assistance from the Pico help, in case something unexpected happens or you need additional information about a command.

^X Exit

Exit Pico at anytime. If made changes to a file or worked on a new file, but you haven't saved the changes, you see this message:

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) (y/n)?

Answering no (press n) will close Pico and bring you back to the prompt without saving your file.

Answering yes (press y) will allow you to save the file you've been working on (see Write Out section below for details).

^O WriteOut

Save the file without hassles or worries. Fill in the name of the file beside the File Name to write: prompt. If the file already has a name, then press enter.

^T To Files option lets to save the text over a file that exists in the directory. By choosing the To Files option, Pico takes you to a directory Browser.

^R Read File

Insert text from another file into your current text file. This option allows you to search through your directories for a file that you would like to add to your text. This option is especially handy if you've saved a document and would like to add its content to the new file you're working on. Text from the file you select is placed on the line directly above your cursor.

At the Insert file : prompt you may either type a file name or use the Browser options.

^T To Files option lets you import a text file directly into the file you're currently typing. By choosing the To Files option, Pico takes you to a directory Browser.

^Y Prev Pg

Move quickly to the previous page. Although you could just as easily press the up arrow key several times, this command quickly jumps your cursor up one page.

^V Next Pg

Move quickly to the next page. Although you could just as easily press the down arrow key several times, this command quickly jumps your cursor down one page.

^K Cut text

Cut a line of text. This option allows you to cut a full line of text. By using the uncut command and your arrow keys, you can then paste the cut text at another location in your document. To cut specific text in a line or to cut several lines of text, first select the text (see Selecting Text on the next page).

Selecting text

To select text for cutting and pasting use the following steps:

Move the cursor to the beginning of the text to select

Hold down the Ctrl key and press ^

Use the right arrow key or hold down Ctrl and press f to highlight text

When you have highlighted the appropriate text, hold down the Ctrl key and press k to cut it.

Paste the text you cut, anywhere in your document, using UnCut Text

^U UnCut Text

Paste text that previously cut. If use this option to undo an accidental cut of text or place cut text at another location in the document. The text you cut is pasted on the line directly above the cursor.

^C Cur Pos

Indicate the current position of the cursor, relative to the entire document. This is a helpful option if you'd like to check exactly where in the document. The status line indicates the following items:

[line 8 of 18 (44%), character 109 of 254 (42%)]

^J Justify

Even out lines of text. This command is handy when accidentally type extra spaces between words or press the key before reaching the end of a line. The option evens the length of text lines automatically.

^U UnJustify

UnJustify lines of text. For the messy line look you can always select the UnJustify option.

^W Where is

Find a particular string of text quickly. This option allows you to do a word search in your text. This option is especially handy for longer documents. If the word you designated at the Search: prompt is found, it places the cursor beside it.

^T To Spell

Check for spelling errors. The spell check option allows to correct spelling errors throughout the document. If spell

checker finds a misspelled word or a word it doesn't recognize (don't worry, this rarely happens), it will correct the word. At the Edit a replacement: prompt, type in the correct spelling of a word. However, if you don't want to make any changes, simply press the enter key.

Any words that have corrected but re-occur in the document can be automatically replaced. At the Replace a with b? [y]: prompt press y to replace all occurrences of the misspelled word or n to ignore.

Pine Editor

pine is a program for accessing email and newsgroups.

Syntax

pine [options] [address, address]

Description

pine is a screen-oriented message-handling tool. In its default configuration, pine offers an intentionally limited set of functions geared toward the novice user, but it also has a growing list of optional power-user and personal-preference features. pine's basic feature set includes:

- View, Save, Export, Delete, Print, Reply and Forward messages.
- Compose messages in a simple editor (pico) with word-wrap and a spelling checker. Messages may be postponed for later completion.
- Full-screen selection and management of message folders.
- Address book to keep a list of long or frequently-used addresses. Personal distribution lists may be defined. Addresses may be taken into the address book from incoming mail without retyping them.
- New mail checking and notification occurs automatically.
- Context-sensitive help screens.

pine supports MIME (Multipurpose Internet Mail Extensions), an Internet Standard for representing multipart and multimedia data in email. pine allows you to save MIME objects to files, and in some cases, can also initiate the correct program for viewing the object. It uses the system's mailcap configuration file to determine what program can process a particular MIME object type. pine's message composer does not have multimedia capability

itself, but any type of data file (including multimedia) can be attached to a text message and sent using MIME's encoding rules. This allows any group of individuals with MIME-capable mail software to exchange formatted documents, spread-sheets, image files, etc, via Internet email.

pine uses the "c-client" messaging API to access local and remote mail folders. This library provides a variety of low-level message-handling functions, including drivers for a variety of different mail file formats, as well as routines to access remote mail and news servers, using IMAP (Internet Message Access Protocol) and NNTP (Network News Transport Protocol). Outgoing mail is usually handed off to the send mail program but it can optionally be posted directly via SMTP.

Examples

Pine

Launch **pine**.

pine address@example.com

Launch pine, and immediately begin composing an email addressed to address@example.com.

Joe editor

'joe'- sounds like a comic strip. Actually, they are two other text editors that I like and I think are a little easier to manage. They're like 'vi' in that you use them to create and edit non-formatted text, but they're a little more user-friendly. Using 'joe' 'joe' was created by Joseph Allen, so that's why it's called Joe.

The majority of joe's commands are based on the CTRL-K keys and a third key. The most important of these is CTRL-K-H which gets 'help'. Help shows the key combinations to use with 'joe'.

The most important thing about 'joe' is the logical concept that you can just start writing if you want. Try writing anything you want.

To save it, press CTRL-K-D. To save and quit, CTRL-K-X.

To quit without saving, CTRL-C, (without the K).

The feature of 'joe' is that if edit a file again, it will save the previous file with a tilde on the end, like 'tryjoe~' That little tilde file has saved times. 'joe' is a very good option for writing those short text files.

Managing files and directories

Objectives: At the end of this lesson you shall be able to

- define manipulating files and directories
- define basic file commands
- explain other file commands
- define additional useful commands in linux OS.

Manipulating files or directories

Using Linux isn't different from any other computer operating system. You create, delete, and move files on your hard drive in order to organize your information and manage how your system works or looks. This section shows you how to do these tasks quickly and easily.

Although the graphical interface for Linux, the X Window System, may offer drag and drop or multiple selections in order to copy or delete files, many of the commands you'll learn here form the base of these operations. It is worth knowing how these programs work, even if you don't use Linux in the console mode.

Working with files

In this chapter we learn how to recognise, create, remove, copy and move files using commands like file, touch, rm, cp, mv and rename, etc...

All files are case sensitive

Files on Linux (or any Unix) are case sensitive. This means that FILE1 is different from

file1, and /etc/hosts is different from /etc/Hosts (the latter one does not exist on a typical Linux computer).

The file command

The file command attempts to classify each filesystem object (i.e., file, directory or link) that is provided to it as an argument (i.e., input). Thus, it can usually provide immediate information as to whether some specified object is, for example, a GIF89a image file, a directory, a GNU tar archive, ASCII English text, a symbolic link, an HTML document, an empty file, bzip2 compressed data, an ELF 32-bit LSB executable, etc.

File accomplishes this by probing each object with three types of tests until one succeeds. The first is a filesystem test, which uses the stat system call to obtain information from the object's inode (which contains information about a file). A system call is a request in a Unix-like operating system for a service performed by the kernel (i.e., the core of the operating system).

The second test checks to see if there is a magic number, which is a number embedded at or near the beginning of many types of files that indicates the file format(i.e., the type of file).

In the event that the first two tests fail to determine the type of a file, language tests are employed to determine if

it is plain text (i.e., composed entirely of human-readable characters), and, if so, what type of plain text, such as HTML (hypertext markup language) or source code (i.e., the original version of a program as written by a human). In this situation, file also attempts to determine the natural language (e.g., English, Turkish or Japanese) that is used in the file.

A simplified version of file's syntax is

file [option(s)] object_name(s)

File has several options, but it is most commonly used without any of them. For example, information about a file named file1 that is located in the current directory (i.e., the directory in which the user is currently working) could be obtained by merely typing the following and pressing the RETURN key:

file file1

Information about the types of all of the files in the current directory can be obtained by using the star wildcard to represent every object in that directory as follows:

file *

Likewise, information about all of the files in another directory can be obtained by using that directory as an argument and following it immediately by a forward slash and the star wildcard. For example, the following classifies all of the objects in the /boot directory:

file /boot/*

The square brackets wildcard can be used together with the star wildcard to show the file types for only those objects whose names begin with specified letters or with a specified range of letters. For example, the following would show only those objects in the current directory whose names begin with letters a through g:

file [a-g]*

The -k option tells file to not stop at the first successful test, but to keep going; this can result in the reporting of additional information about some filesystem objects. The -b (i.e., brief) option tells file to not prepend filenames to output lines, which can be useful when compiling statistics about file types. The -v option returns information about the version of file that is installed.

Creating files and directories command

mkdir command

The mkdir command is used to create new directories.

A directory, referred to as a folder in some operating systems, appears to the user as a container for other directories and files. However, Unix-like operating systems treat directories as merely a special type of file that contains a list of file names and their corresponding inode numbers. Each inode number refers to an inode, which is located in inode tables (which are kept at strategic locations around the filesystem) and which contains all information about a file (e.g., size, permissions and date of creation) except its name and the actual data that the file contains.

mkdir has the following example

```
$ mkdir example
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

directory_name is the name of any directory that the user is asking mkdir to create. Any number of directories can be created simultaneously.

Thus, for example, the following command would create three directories within the current directory (i.e., the directory in which the user is currently working) with the names dir_1, dir_2 and dir_3:

```
mkdir dir_1 dir_2 dir_3
```

If a directory name provided as an argument (i.e., input) to mkdir is the same as that of an existing directory or file in the same directory in which the user is asking mkdir to create the new directory, mkdir will return a warning message such as mkdir: cannot create directory `dir_1': File exists and will not create a file with that name. However, it will then continue to create directories for any other names provided as arguments.

It is necessary for a user to have write permission (i.e., permission from the system to create or change a file or directory) in the parent directory (i.e., the directory in which the new directory is to be created) in order to be able to create a new directory.

Directories created by mkdir automatically include two hidden directories, one representing the directory just created (and represented by a single dot) and the other representing its parent directory (and represented by two consecutive dots). This can be seen by using the ls (i.e., list) command with its -a option, which tells ls to show all directories and files, (including hidden ones) in any directory provided to it as an argument, or in the current directory if there are no arguments, i.e.,

```
ls -a
```

mkdir's -m option is used to control the permissions of new directories. New directories are by default created with the read, write and execute (i.e., run as a program if

a program) permissions enabled for the owner (i.e., the creator of the directory by default) and group and the read and execute permissions enabled for other users. Thus, for example, to create a directory named dir_4 for which all three types of permissions were enabled for all users, the sequence 777 would be employed after -m, for example:

```
mkdir -m 777 dir_4
```

The first digit represents the owner, the second represents the group and the third represents other users. The number 7 represents all three types of permission (i.e., read, write and execute), 6 stands for read and write only, 5 stands for read and execute, 4 is read only, 3 is write and execute, 2 is write only, 1 is execute only and 0 is no permissions.

Thus, for example, to create a new directory named dir_5 for which the owner has read and write permissions, the group has read permission and other users have no permissions, the following would be used:

```
mkdir -m 640 dir_5
```

The -p (i.e., parents) option creates the specified intermediate directories for a new directory if they do not already exist. For example, it can be used to create the following directory structure:

```
mkdir -p food/fruit/citrus/oranges
```

It is very easy to confirm that this series of directories has been created by using the du (i.e., disk usage) command with the name of the first directory as an argument. In the case of the above example this would be

du food

Other options include -v (i.e., verbose), which returns a message for each created directory, --help, which returns brief information about mkdir, and --version, which returns the version number of the currently installed mkdir program

touch command

The touch command updates the access and modification times of each FILE to the current system time.

If you specify a FILE that does not already exist, touch creates an empty file with that name.

If the FILE argument is a dash ("") is handled specially and causes touch to change the times of the file associated with standard output.

```
$ touch file1 file2 file3
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file2
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

A feature of touch is that, in contrast to some commands such as cp (which is used to copy files and directories) and mv (which is used to move or rename files and

directories), it does not automatically overwrite (i.e., erase the contents of) existing files with the same name. Rather, it merely changes the last access times for such files to the current time.

Several of touch's options are specifically designed to allow the user to change the timestamps for files. For example, the -a option changes only the access time, while the -m option changes only the modification time. The use of both of these options together changes both the access and modification times to the current time, for example:

touch -am file3

The -r (i.e., reference) option followed directly by a space and then by a file name tells touch to use that file's time stamps instead of current time. For example, the following would tell it to use the times of file4 for file5:

touch -r file4 file5

The -B option modifies the timestamps by going back the specified number of seconds, and the -F option modifies the time by going forward the specified number of seconds. For example, the following command would make file7 30 seconds older than file6.

touch -r file6 -B 30 file7

The -d and -t options allow the user to add a specific last access time. The former is followed by a string (i.e., sequence of characters) in the date, month, year, minute:second format, and the latter uses a [[CC]YY]MMDDhhmm[.ss] format. For example, to change the last access time of file8 to 10:22 a.m. May 1, 2005, 1 May 2005 10:22 would be enclosed in single quotes and used as follows, i.e.,:

touch -d '1 May 2005 10:22' file8

Partial date-time strings can be used. For example, only the date need be provided, as shown for file9 below (in which case the time is automatically set to 0:00):

touch -d '14 May' file9

Just providing the time, as shown below, automatically changes the date to the current date:

touch -d '14:24' file9

The most commonly used way to view the last modification date for files is to use the ls command with its -l option. For example, in the case of a file named file10 this would be

ls -l file10

The complete timestamps for any file or directory can be viewed by using the stat command. For example, the following would show the timestamps for a file named file11:

stat file11

The --help option displays a basic list of options, and the --version option returns the version of the currently installed touch program.

Copy, move and remove commands

Copy command

The cp command is used to copy files and directories. The copies become independent of the originals (i.e., a subsequent change in one will not affect the other).

cp's basic syntax is

\$cp source destination

As a safety precaution, by default cp only copies files and not directories. If a file with the same name as that assigned to the copy of a file (or a directory with the same name as that assigned to the copy of a directory) already exists, it will be overwritten (i.e., its contents will be lost). However, the owner, group and permissions for the copy become the same as those of the file with the same name that it replaced. The last access time of the source file and the last modification time of the new file are set to the time the copying was performed.

When a copy is made of a file or directory, the copy must have a different name than the original if it is to be placed in the same directory as the original. However, the copy can have the same name if it is made in a different directory. Thus, for example, a file in the current directory (i.e., the directory in which the user is currently working) named file1 could be copied with the same name into another directory, such as into /home/john/, as follows:

cp file1 /home/john/file1

Any number of files can be simultaneously copied into another directory by listing their names followed by the name of the directory. cp is an intelligent command and knows to do this when only the final argument (i.e., piece of input data) is a directory. The files copied into the directory will all have the same names as the originals. Thus, for example, the following would copy the files named file2, file3 and file4 into a directory named dir1:

cp file2 file3 file4 dir1

The -r (i.e., recursive) option, which can also be written with an upper case R, allows directories including all of their contents to be copied. (Directories are not copied by default in order to make it more difficult for users to accidentally overwrite existing directories which have the same name as that assigned to the copy being made and which might contain critical directory structures or important data.) Thus, for example, the following command would make a copy of an existing directory called dir2, inclusive of all its contents (i.e., files, subdirectories, their subdirectories, etc.), called dir3:

cp -r dir2 dir3

The -i (i.e., interactive) option prompts the user in the event that any name assigned to a copy is already in use by another file and that file would thus be overwritten. Entering the letter y (either lower case or upper case) in response to the prompt causes the command to continue; any other answer prevents the command from overwriting the file. Thus, for example, if it is desired to make a copy of a directory called dir4 and call it dir5 and if a directory named

dir4 already exists, the following would prompt the user prior to replacing any files with identical names in the latter directory:

cp -ri dir4 dir5

The -a option preserves as much of the structure and attributes of the original directory and its contents as possible in the new directory and is thus useful for creating archives. It is similar to the -r option in that it copies directories recursively; however, it also never follows symbolic links. It is equivalent to the -rdp combination of options.

All the files in a directory can be copied to another directory by using the star wildcard. The star character represents any single character or any combination of characters. Thus, for example, the following would copy all of the files in a directory named dir6 into another existing directory called dir7:

cp dir6/* dir7

cp can also be used with the star wildcard or other pattern matching characters to selectively copy files and directories. For example, to copy all of the files in the current directory that have the filename extension .html into another existing directory called dir8, the following would be used:

cp *.html dir8

In this case, the star wildcard represents anything whose name ends with the .html extension.

Among the other options for cp are -b, which makes backup copies of each destination file, -f (i.e., force), which removes destination files that cannot be opened and tries again, -s, which makes symbolic links instead of copying, -u (i.e., update), which copies only if the source file is newer than the destination file or if the destination file is missing, -v (i.e., verbose), which makes brief comments about what is going on, and -x, which tells cp to stay on the same filesystem.

Move command

The mv command is used to rename and move files and directories. Its general syntax is:

\$ mv source destination

The arguments are names of files and directories. If two file names are provided as arguments, mv renames the first as the second. If a list of arguments is provided and the final argument in the sequence is the name of an existing directory, mv moves all of the other items into that directory. If the final argument is not an existing directory and more than two arguments are provided, an error message is returned.

If the destination file is located in the same directory as the source file, then the source file can only be renamed. If both are in different directories, then the source file is moved to the directory named in the destination argument, in which it can keep its original name or be assigned a new name. If the target is a directory, then the source file

or directory is moved into that directory and retains its original name.

Thus, for example, the following would rename a file called file1 to file2, while keeping it in the current directory (i.e., the directory in which the user is currently working):

mv file1 file2

The following would move a file named file3, without changing its name, from the current directory to an existing subdirectory of the current directory named dir1:

mv file3 dir1/file3

mv can be used to move any number of files and directories simultaneously. For example, the following command moves all files and directories, including all the contents of those directories, from the current directory to the directory /home/alice/new/:

mv * /home/alice/new/

The asterisk is a wildcard character that represents any string (i.e., sequence of characters). Thus, in the above example it represents the name of every file and directory in the current directory.

mv makes it as easy to move a file or directory up the hierarchy of directories (i.e., closer to the root directory) as down it. For example, the following would move a file named file4, which is currently located in the sub-subdirectory dir/dir/ of the user's home directory, to the top level in the user's home directory:

mv dir/dir/file4 ~

The root directory is the directory that contains all other directories on a Unix-like operating system and which is at the top of the hierarchy of directories. A user's home directory is the directory in which a user finds itself by default after logging into the system and which can be represented by the tilde (wavy horizontal linecharacter).

By default, mv does not provide any confirmation on the display screen if its action is completed without problems. This is consistent with the rule of silence tenet of the Unix philosophy.

Thus it is wise for users new to Unix-like operating systems to always use the -i option, which makes mv interactive in the situation in which files and/or directories with the same name already exist in the destination directory. For example, the above command would be made interactive as follows:

mv -i * /home/alice/new/

Among mv's few other options are -b, which tells it to make a backup copy of each file that would otherwise be overwritten or removed, and -v, which tells it to be verbose and display the name of each file before moving it. Detailed information (including all options) about mv can be obtained by using its --help option, and information about the current version can be obtained by using its --version option.

Remove or Delete

\$ rmdir

'rmdir' command removes any empty directories, but cannot delete a directory if a file is present in it. To use 'rmdir' command, you must first remove all the files present the directory you wish to remove (and possibly directories if any).

Remove files and directories

The rm (i.e., remove) command is used to delete files and directories on Linux and other Unix-like operating systems.

The general syntax for rm is:

rm [options] [-r directories] filenames

The items in square brackets are optional. When used just with the names of one or more files, rm deletes all those files without requiring confirmation by the user. Thus, in the following example, rm would immediately delete the files named file1, file2 and file3, assuming that all three are located in the current directory (i.e., the directory in which the user is currently working):

rm file1 file2 file3

Error messages are returned if a file does not exist or if the user does not have the appropriate permission to delete it. Write-protected files prompt the user for a confirmation (with a y for yes and an n for no) before removal. Files located in write-protected directories can never be removed, even if those files are not write-protected.

The -f (i.e., force) option tells rm to remove all specified files, whether write-protected or not, without prompting the user. It does not display an error message or return error status if a specified file does not exist. However, if an attempt is made to remove files in a write-protected directory, this option will not suppress an error message.

The -i (i.e., interactive) option tells rm to prompt the user for confirmation before removing each file and directory. If both the -f and -i options are specified, the last one specified takes affect.

As a safety measure, rm does not delete directories by default. In order to delete directories, it is necessary to use the -r option, which is the same as the -R option. This option recursively removes directories and their contents in the argument list; that is, the specified directories will first be emptied of any subdirectories (including their subdirectories and files, etc.) and files and then removed. The user is normally prompted for removal of any write-protected files in the directories unless the -f option is used.

If a file encountered by rm is a symbolic link, the link is removed, but the file or directory to which that link refers will not be affected. A user does not need write permission to delete a symbolic link, as long as the user has write permission for the directory in which that link resides.

The rm command supports the -- (two consecutive dashes) parameter as a delimiter that indicates the end of the options. This is useful when the name of a file or directory

begins with a dash or hyphen. For example, the following removes a directory named -dir1:

rm -r -- -dir1

Other options include -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rm, and --version, which tells the version of rm that is currently in use. Some differences exist among the various versions of rm, so it is always wise to read the documentation for the particular system.

The rmdir command differs from rm in that it is only used to remove empty directories

The rmdir command

The rmdir command is used to remove empty directories in Linux

The syntax for rmdir is

rmdir [option] directory_names

When used without any options, rm will delete any empty directories whose names are supplied as arguments (i.e., inputs) regardless of whether such directories have write permission or not. Thus, for example, the following command would remove two empty directories named dir1 and dir2 that are located in the current directory (i.e., the directory in which the user is currently working):

rmdir dir1 dir2

The ability to remove only empty directories is a built-in safeguard that helps prevent the accidental loss of data. This is important because once deleted, it is extremely difficult or impossible to recover deleted data on Unix-like operating systems1.

The -p (i.e., parents) option tells rmdir to remove the parent directories of the specified directory if each successive parent directory will, in turn, become empty and if each parent directory has write permission. Thus, for example, the following would remove dir5, dir4 and dir3 if dir5 were empty, dir4 only contained dir5 and dir3 only contained dir4 (which, in turn, contained dir5):

rmdir -p dir3/dir4/dir5

This provides a symmetry with the -p option of the mkdir command, which is used to create directories. Thus, the above set of nested directories could be easily created with the following:

mkdir -p dir3/dir4/dir5

In contrast to the rm command, which is used to delete both files and directories, there is no -r option for rmdir. at least on the GNU version that is standard on Linux. That option allows rm to recursively delete a directory by first deleting all of its contents, beginning with those in the lowest levels of subdirectories. Thus, if a user wants to remove an entire directory structure, it is usually most efficient to use rm with its -r option rather than trying to first remove the contents of each directory, its subdirectories, etc.

Three options that rmdir shares with rm are -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rmdir, and --version, which tells the version of rmdir that is currently in use. Some differences exist among the various versions of rmdir, so it is always wise to read the documentation for the particular system.

Listing and combining files with the cat command

The cat (concatenate file) command is used to send the contents of files to your screen. This

command may also be used to send files' contents into other files. Hour 6 covers terms such as standard input, standard output, and redirection, and this section shows you some basic uses for this command.

Although cat may be useful for reading short files, it is usually used to either combine, create, overwrite, or append files. To use cat to look at a short file, you can enter

\$ cat test.txt

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

The cat command also has a number of options. If you'd like to see your file with line

numbers, perhaps to note a specific phrase, you can use the -n option:

\$ cat -n test.txt

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

and also use cat to look at several files at once, because cat accepts wildcards, for example:

\$ cat -n test*

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.
- This is the first line of test2.txt.
- This file was also created by cat.
- This is the last line of test2.txt.

As you can see, cat has also included a second file in its output, and has numbered each line of the output, not each file. Note that also see both files with

\$ cat test.txt test2.txt

The output will be exactly the same as if had used a wildcard. But looking at several files is only one way to use cat. You can also use the cat command with the redirection operator > to combine files. For example, if you would like to combine test.txt and test2.txt into a third file called test3.txt, you can use

\$ cat test* > test3.txt

check the result with

ls -l test*

In this case, user first decide whether you want the contents of test.txt to go into test2.txt, or the contents of test2.txt to go into test.txt . Then, using cat with the >> redirection operator, you might type

\$ cat test.txt >> test2.txt

This appends the contents of test.txt to the end of the test2.txt . To check the results, use cat again:

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

Note that if you had entered the command.

\$ cat -n test.txt >> test2.txt

The test2.txt file would look like

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

Finally, here's a trick you can use if you want to create a short text file without running a word processor or text editor. Because the cat command can read the standard input (more about this in Hour 6), you can make the cat command create a file and fill it with your keystrokes.

Here's how:

\$ cat > myfile.txt

Now, enter some text:

\$ cat > myfile.txt

This is the cat word processor.

This is the end of the file.

Then, when you're done typing, press Ctrl+D to close the file. To see if this works, try

```
$ ls -l myfile.txt
```

```
-rw-rw-r-- 1 bball bball 61 Nov 12 18:26 myfile.txt
```

```
$ cat myfile.txt
```

This is the cat word processor.

This is the end of the file.

user should also know that the cat command will print out the contents of any file, and not

just text files. Although cat may be useful to look at one or several short files,

Other file commands

The clear Command

The clear command is used to remove all previous commands and output from consoles and terminal windows in Unix-like operating systems.

A console is an all-text mode user interface that occupies the entire screen of the display device and which does not sit on top of a graphical user interface (GUI). A terminal window is a text-only window in a GUI that emulates a console and which can be opened by clicking the appropriate icon (i.e., small image) or menu item.

Clear is one of the very few commands in Unix-like operating systems that accepts neither options nor arguments (i.e., input files). That is, it is only used as follows:

Clear

After the clear command has been issued, all that remains on the display screen is the command prompt in the upper left hand corner. A command prompt, also referred to as a prompt, is a short text message at the start of a line that informs the user that the system is ready for the next command, data element or other input.

The descriptions are rather terse, and they can seem somewhat cryptic to new users. However, users typically find them to be increasingly useful as they become more familiar with them and gain experience in the use of Unix-like operating systems.

The man command itself is extremely easy to use. Its basic syntax is

```
man [option(s)] keyword(s)
```

man is most commonly used without any options and with only one keyword. The keyword is the exact name of the command or other item for which information is desired. For example, the following provides information about the ls command (which is used to list the contents of any specified directory):

```
man ls
```

As another example, the following displays the man page about the man pages:

```
man man
```

man automatically sends its output through a pager, usually the program less. A pager is a program that causes the output of any program to be displayed one screenful at a time, rather than having a large amount of text scroll down the screen at high (and generally unreadable) speed.

less writes a colon at the bottom of the screen to indicate the end of the on-screen page. The user can move to the next page by pushing the space bar and can return to the previous page by pressing the b key. Pressing the q exits the man pages and returns the user to the shell program.

Each man page is a self-contained article that is divided into a number of sections, the headers for which are labeled with upper case letters. The sections for commands are typically something like NAME, SYNOPSIS, DESCRIPTION, OPTIONS, AUTHOR, BUGS, COPYRIGHT, HISTORY and SEE ALSO, although there may be some differences according to the particular command. Some of these might be broken down into subsections, particularly OPTIONS in the case of a command that has numerous options.

Also, the man pages as a whole are organized into sections, each containing pages about a specific category of topics as shown below. The section to which an article belongs is indicated in parenthesis in the top line, before the NAME header.

1. executable programs or shell commands
2. system calls
3. library routines
4. special files (i.e., devices in the /dev directory)
5. file formats
6. games
7. macro packages
8. system administration commands
9. kernel routines

Some topic names will have multiple articles, depending on context. For instance, there are two articles for mount, one corresponding to its use as a command in system management (i.e., to logically attach partition or other devices to the main filesystem) and the other for use in the C programming language. Generally, the most commonly used topic is displayed by default, and there are references to any other topics with the same name in the SEE ALSO section at the bottom of the final on-screen page.

The syntax to specify an article from a particular section is:

```
man section_number keyword
```

Thus, for example, the following would display the article about mount from Section 2 instead of from the default Section 8:

man 2 mount

The -w and -W options tell man to not actually display the man pages, but to provide the location(s) of the file(s) that would be formatted or displayed. If no arguments (i.e., input files) are provided, a list of directories that is searched by man for man pages is returned.

The -f option produces the same output as the whatis command. whatis provides very brief descriptions of commands from a database that is automatically created from the first line of the NAME section of each relevant man page.

The Whoami and who command

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output. Standard output is, by default, the display screen, unless redirected to a file, printer, etc.

whoami is particularly useful when using shells such as ash and sh that do not show the name of the current user in the command prompt (a short text message at the start of the command line on an all-text display). It is also useful for confirming the current owner of a session after using the su (i.e., substitute user) command, which changes the owner of the session without the original owner having to first log out.

A shell is a program that provides the traditional, text-only user interface for Unix-like operating systems. Its primary function is to read commands that are typed into a console (i.e., an all-text display mode) or terminal window (an all-text window in a GUI) and then execute (i.e., run) them.

The formal syntax for whoami is:

whoami [option]

When used without any options or redirection, as it usually is, i.e.,

Whoami

and followed by pressing the ENTER key, whoami displays on the monitor screen the user name of the owner of the current session.

There are only two options for whoami: --help and --version. The former outputs the very brief description that is contained in the man (i.e., built-in system manual) pages, and the latter outputs the number of the version currently installed on the system.

whoami produces the same result as the id command (which by default provides more detailed information about the current user than does whoami) when id is used with its -u and -n options, i.e.,

id -un

The -u option tells id to provide only the identification for the current owner of the session, and the -n option tells it to present that identification as the user name instead of as a number.

The who command differs from whoami in that it provides a list of all users currently logged into the system as well

as additional information about each of those users (including login times and terminal numbers). It also differs in that, in the event of a change in ownership of a login session through the use of the su command, it reports the original owner of the session, whereas whoami provides the user name of the effective (i.e., current) owner of the session.

stat command

File Stat - Display Information About File

For example, to find out more information about 101hacks.txt file, execute the stat command as shown below.

\$ stat 101hacks.txt

File: '/home/sathiyamoorthy/101hacks.txt'

Size: 854 Blocks: 8 IO Block: 4096 regular file

Device: 801h/2049d Inode: 1058122 Links: 1

Access: (0600/-rw-----) Uid: (1000/ sathiya)
Gid: (1000/ sathiya)

Access: 2009-06-28 19:29:57.000000000 +0530

Modify: 2009-06-28 19:29:57.000000000 +0530

Change: 2009-06-28 19:29:57.000000000 +0530

Details of Linux stat command output

- **File:** '/home/sathiyamoorthy/101hacks.txt' - Absolute path name of the file.
- **Size:** 854 - File size in bytes.
- **Blocks:** 8 - Total number of blocks used by this file.
- **IO Block:** 4096 - IO block size for this file.
- **Regular file** - Indicates the file type. This indicates that this is a regular file. Following are available file types.
 - regular file. (ex: all normal files).
 - directory. (ex: directories).
 - socket. (ex: sockets).
 - symbolic link. (ex: symbolic links.)
 - block special file (ex: hard disk).
 - character special file. (ex: terminal device file).
- Device: 801h/2049d - Device number in hex and device number in decimal
- Inode: 1058122 - Inode number is a unique number for each file which is used for the internal maintenance by the file system.
- Links: 1 - Number of links to the file
- Access: (0600/-rw---): Access specifier displayed in both octal and character format. Let us see explanation about both the format.

- **Uid:** (1000/ sathiya) - File owner's user id and user name are displayed.
- **Gid:** (1000/ sathiya) - File owner's group id and group name are displayed.
- **Access:** 2009-06-28 19:29:57.000000000 +0530 - Last access time of the file.
- **Modify:** 2009-06-28 19:29:57.000000000 +0530 - Last modification time of the file.
- **Change:** 2009-06-28 19:29:57.000000000 +0530 - Last change time of the inode data of that file.

Dir Stat - Display Information About Directory You can use the same command to display the information about a directory as shown below.

\$ stat /home/ramesh

File: '/home/ramesh'

Size: 4096 Blocks: 8 IO Block: 4096 directory

Device: 803h/2051d Inode: 5521409 Links: 7

Access: (0755/drwxr-xr-x) Uid: (401/ramesh)
Gid: (401/ramesh)

Access: 2009-01-01 12:17:42.000000000 -0800

Modify: 2009-01-01 12:07:33.000000000 -0800

Change: 2009-01-09 12:07:33.000000000 -0800

head command

The head command reads the first few lines of any text given to it as an input and writes them to standard output (which, by default, is the display screen).

head's basic syntax is:

head [options] [file(s)]

The square brackets indicate that the enclosed items are optional. By default, head returns the first ten lines of each file name that is provided to it.

For example, the following will display the first ten lines of the file named aardvark in the current directory (i.e., the directory in which the user is currently working):

head aardvark

If more than one input file is provided, head will return the first ten lines from each file, precede each set of lines by the name of the file and separate each set of lines by one vertical space. The following is an example of using head with two input files:

head aardvark armadillo

If it is desired to obtain some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, the above example could be modified to display the first 15 lines from each file:

head -n15 aardvark armadillo

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in

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between. Thus, the following command would produce the same result:

head -n 15 aardvark armadillo

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell head how many lines to return. Thus, the following would produce the same result as the above commands:

head -15 aardvark armadillo

head can also return any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the start of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, the following would display the first five bytes of each of the two files provided:

head -c 5 aardvark anteater

When head counts by bytes, it also includes the newline character, which is an un-printing (i.e., invisible) character that is designated by a backslash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the start of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or on paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would display the first five kilobytes of the file aardvark:

head -c5k aardvark

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case head would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like head: aardvark: invalid number of bytes:

head -c aardvark

If head is used without any options or arguments (i.e., file names), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the first ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

head -n3

As is the case with other command line (i.e., all-text mode) programs in Linux and other Unix-like operating systems, the output from head can be redirected from the display monitor to a file or printer using the output redirection operator (which is represented by a rightward-pointing angular

bracket). For example, the following would copy the first 12 lines of the file Yuriko to the fileDecember:

head -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two consecutive rightward pointing angle brackets) could be used to add the output from head to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

head -n 12 Yuriko >> December

The output from other commands can be sent via a pipe (represented by the vertical bar character) to head to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to head, which, in turn, displays the first ten lines of the output that it receives from ls:

ls | head

This output could easily be redirected, for example to the end of a file namedfile1 as follows:

ls | head >> file1

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reverse alphabetic order prior to appending file1:

ls | head | sort -r >> file1

The -q (i.e., quiet) option causes head to not show the file name before each set of lines in its output and to eliminate the vertical space between each set of lines when there are multiple input sources. Its opposite, the -v (i.e., verbose) option, causes head to provide the file name even if there is just a single input file.

The tail command is similar to the head command except that it reads the final lines in files rather than the first lines.

As is the case with other commands on Unix-like operating systems, additional information can be obtained about head and tail by using the man and infocommands to reference the built-in documentation, for example

man head

or

info tail

tail command

The tail command reads the final few lines of any text given to it as an input and writes them to standard output (which, by default, is the monitor screen).

The basic syntax for tail is:

tail [options] [filenames]

\$ tail -n 4 /etc/passwd

The square brackets indicate that the enclosed items are optional. By default, tail returns the final ten lines of each file name that is provided to it.

For example, the following command will print (traditional Unix terminology for write) the last ten lines of the file named aardvark in the current directory (i.e., the director in which the user is currently working) to the display screen:

tail aardvark

If more than one input file is provided, tail will print the last ten lines from each file to the monitor screen. Each set of lines will be preceded by the name of the file and separated by one vertical space from other sets of lines. The following is an example of using tail with multiple input files:

tail file1 file2 file3

If it is desired to print some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, to print the final 15 lines from each file in the above example, the command would be modified as follows:

tail -n15 file1 file2 file3

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in between. Thus, the following command would produce the same result:

tail -n 15 file1 file2 file3

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell tail how many lines to print. Thus, the following would produce the same result as the above commands:

tail -15 file1 file2 file3

tail can also print any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the end of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, to view the final five bytes of each of the two files aardvark and anteater, the following command would be used:

tail -c 5 file1 file2

When tail counts by bytes, it also includes the newline character, which is a non-printing (i.e, invisible) character that is designated by a backward slash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the end of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would print the last five kilobytes of the file aardvark:

tail -c5k file1

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case tail would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like tail: aardvark: invalid number of bytes:

tail -c file1

If tail is used without any options or arguments (i.e., inputs), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the final ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

tail -n3

As is the case with other command line (i.e., all-text mode) programs in Unix-like operating systems, the output of tail can be redirected from the monitor to a file or printer using the redirection operator (which is represented by a rightward pointing angular bracket). For example, the following would write the final 12 lines of the file Yuriko to the file December:

tail -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two rightward pointing angular brackets) could be used to add the output from tail to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

tail -n 12 Yuriko >> December

The output from other commands can be piped (i.e., sent) to tail to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to tail, which, in turn, prints the final ten lines of the output that it receives from ls to the monitor screen:

ls | tail

This output could easily be redirected, for example to a file named last_filenames as follows:

ls | tail >> last_filenames

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reversealphabetic order prior to writing to a file:

ls | tail | sort -r >> last_filenames

The -q (i.e., quiet) option causes tail to not print the file name before each set of lines and to eliminate the vertical space between each set of lines when there are multiple input sources. The -v (i.e., verbose) option causes tail to print the file name even if there is just a single input file.

Tail could be viewed as a counterpart of the head command, which always starts reading from the beginning of files and which can continue until any specified distance from the beginning. However, there are a few differences. Perhaps the most useful of these is that tail is somewhat more flexible in that, in addition to being able to start reading any specified distance from the end of a file, it can also start at any specified distance from the beginning of a file.

Tail can be instructed to begin printing from some number of lines or bytes from the start of a file by preceding the number with a plus sign instead of a minus sign. For example, the following would print each of the designated files to the display monitor beginning with the seventh line and until the end:

tail +7 file1 file2 file3

The c option could be used to tell tail to print each of the designated files beginning with the seventh byte instead of the seventh line:

tail +7c file1 file2 file3

A particularly common application for tail is examining the most recent entries in log files. This is because the newest entries are appended to the ends of such files, which tail excels in showing. As log files can be a rather long, this can eliminate a lot of scrolling that would be necessary if some other command were used to read them. For example, the most recent entries to the log /var/log/messages can easily be viewed by using the following:

tail /var/log/messages

wc command

The wc (i.e., word count) command by default counts the number of lines, words and characters in text.

wc defines a word as a set of contiguous letters, numbers and/or symbols which are separated from other characters by one or more spaces, tabs and/or newline characters (which are generated when the RETURN key is pressed). When counting the number of characters, all characters are counted, not only letters, numbers and symbols, but also spaces, tabs and newline characters. A line is only counted if it ends with a newline character.

wc's syntax is

wc [options] [file_name(s)]

The items in square brackets are optional. If no file names are provided, wc reads from its standard input, which by default is text entered at the keyboard.

This can be seen by typing.

wc

at the command line (i.e., in the all-text mode), pressing the ENTER key to move to a new line and then typing some text on one or more lines. The command isexecuted (i.e., run) by pressing the ENTER key again and then pressing the CONTROL and d keys simultaneously. This causes wc to write in a new line (under the lines of text) its count of the numbers of lines, words and characters in the text.

The following command counts the number of lines, words and characters in a file named file1 that resides in the current directory (i.e., the directory in which the user is currently working) and likewise writes them, followed by the name of the file, to standard output, which is by default the display monitor:

wc file1

wc can provide its output for multiple files by listing the name of each separated by a space. For example,

wc file1 file2 file3

The numbers of lines, words and characters for each file along with its name will be displayed on a separate line and in the order that the files are listed as arguments(i.e., input files). In the case of multiple arguments such as this, wc also provides an additional line that shows the total number of lines, words and characters for all the files.

Likewise, wc can provide a count for all of the text files within a directory. This is accomplished by using the star wildcard character, which represents everythingand is designated by an asterisk (*). For example, the following will display the number of lines, words and characters for each file in the current directory (which is represented by a dot) as well as totals for all files in the directory:

wc . *

wc has only a few options, the most commonly used of which restrict the information it provides. The -l option tells wc to count only the number of lines, the -woption tells it to count only the number of words, the -m option tells it to count only the number of characters and the -c option tells wc to count only the number ofbytes. Thus, for example, the following displays just the number of words in a file named file4:

wc -w file4

The following displays the number of characters in the same file:

wc -m file4

As is generally the case with commands in Unix-like operating systems, any combination of options can be used together. For example, the following would count both the numbers of lines and words in a file named file5:

wc -lw file5

Redirection can be used with wc to create more complex commands. For example, the output from the above command can be redirected using the standard output redirection operator (which is designated by a rightward pointing angle bracket) from the display screen to a file named file6 with the following:

wc -lw file5 > file6

If file6 already exists, its contents will be overwritten; if it does not exist, it will be created. The contents of file6 can be easily confirmed with a text editor or with a command such as cat, which is commonly used to read text files, i.e.,

cat file6

grep command

grep is used to search text for patterns specified by the user. It is one of the most useful and powerful commands on Linux and other Unix-like operating systems.

grep's basic syntax is:

grep [option(s)] pattern [file(s)]

The items in square brackets are optional. When used with no options and no arguments (i.e., input files), grep searches standard input (which by default is text typed in at the keyboard) for the specified pattern and returns each line that contains a match to standard output (which by default is the display screen).

A line of text is defined in this context not as what appears as a line of text on the display screen but rather as all text between two newline characters. Newline characters are invisible characters that are represented in Unix-like operating systems by a backslash followed by the letter n and which are created when a user presses the ENTER key when using a text editor (such as gedit). Thus, a line of text returned by grep can be as short as a single character or occupy many lines on the display screen.

grep can search any number of files simultaneously. Thus, for example, the following would search the three files file1, file2 and file3 for any line that contains thestring (i.e., sequence of characters) Lin:

grep Lin file1 file2 file3

Each result is displayed beginning on a separate line, and it is preceded by the name of the file in which it was found in the case of multiple files. The inclusion of the file names in the output data can be suppressed by using the -h option.

grep is not limited to searching for just single strings. It can also search for sequences of strings, including phrases. This is accomplished by enclosing the sequence of strings that forms the pattern in quotation marks (either single or double). Thus, the above example could be modified to search for the phrase Linux is:

grep 'Linux is' file1 file2 file3

Text searches with grep can be considerably broadened by combining them with wildcards and/or performing recursive searches. A wildcard is a character that can represent some specific class of characters or sequence of characters. The following is a modification of the above example that uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to search all text files in the current directory (i.e., the directory in which the user is currently working):

grep 'Linux is' *

grep's search area can be broadened even further by using its -r option to search recursively through an entire directory tree (i.e., a directory and all levels of subdirectories within it) rather than just the files within a specified directory. For example, the following would search all files in the current

directory and in all of its subdirectories (including their subdirectories, etc.) for every line containing the full name of the creator of Linux:

```
grep -r 'Linus Torvalds' *
```

One of the most commonly employed of grep's many options is -i, which instructs it to ignore case, that is, to ignore whether letters in the pattern and text searched are lower case (i.e., small letters) or upper case (i.e., capital letters). Thus, for instance, the previous example could very easily be converted to a case-insensitive search as follows:

```
grep -ir 'Linus Torvalds' *
```

This would produce the same results as

```
grep -ir 'linUS torvAlds' *
```

Another frequently used option is -c, which causes grep to only report the number of times that the pattern has been matched for each file and to not display the actual lines. Thus, for instance, the following would show the total number of times that the string inu appears in a file named file4:

```
grep -c inu file4
```

Another useful option is -n, which causes grep to precede each line of output with the number of the line in the text file from which it was obtained. The -v option inverts the match; that is, it matches only those lines that do not contain the given pattern.

The -w option tells grep to select only those lines that contain an entire word or phrase that matches the specified pattern. The -x option tells grep to select only those lines that match exactly the specified pattern.

The -l option tells grep to not return the lines containing matches but to only return the names of the files that contain matches. The -L option is the opposite of the -l option (and analogous to the -v option) in that it will cause grep to return only the names of files that do not contain the specified pattern.

grep does not search the names of files for a specified pattern, only the text contained within files. However, sometimes it is useful to search the names of files, as well as of directories and links, rather than the contents of files. Fortunately, this can easily be accomplished by first using the ls command to list the contents of a directory and then using a pipe (which is represented by the vertical bar character) to transfer its output to grep for searching. For example, the following would provide a list of all files, directories and links in the current directory that contain the string linu in their names:

```
ls | grep linu
```

The following example uses ls with its -l (i.e., long) option (which is unrelated to grep's -l option) to find all filesystem objects in the current directory whose permissions have been set so that any user can read, write and execute them:

```
ls -l | grep rwxrwxrwx
```

grep is very useful for obtain information from log and configuration files. For example, it can be used to obtain information about the USB (universal serial bus) devices on a system by filtering the output from the dmesg command (which provides the messages from the kernel as a system is booting up) as follows:

```
dmesg | grep -i usb
```

Among grep's other options are --help, which provides a very compact summary of some of its many capabilities, and -V, or --version, which provides information about the currently installed version.

grep's search functionality can be even further refined through the use of regular expressions. These are a pattern matching system that uses strings constructed according to pre-defined syntax rules to find desired patterns in text. Additional information about grep, including its use with regular expressions, can be obtained from its built-in manual page by using the man command, i.e.,

man grep

The name grep comes from a command in ed, which was the original text editor on the UNIX operating system. The command takes the form g/re/p, which means to search globally for matches to the regular expression (i.e., re), and print (which is UNIX terminology for write on the display screen) lines that are found.

In command

In command is used to create links. Links are a kind of shortcuts to other files. The general form of command is:

```
$ In TARGET LINK_NAME
```

There are two types of links, soft links and hard links. By default, hard links are created. If you want to create soft link, use -s option. In this example, both types of links are created for the file usrlisting.

```
$ In usrlisting hard_link
```

```
$ In -s usrlisting soft_link
```

```
$ ls -l
```

```
total 12
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 hard_link
```

```
lrwxrwxrwx 1 raghu raghu 10 2012-07-09 14:00 soft_link -> usrlisting
```

```
-rw-r--r-- 1 raghu raghu 491 2012-07-06 16:02 usrcopy
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 usrlisting
```

Some additional useful commands

alias command

'alias' is another name for a command. If no argument is given, it shows current aliases. Aliases can be used for short names of commands. For example, you might use clear command frequently. You can create an alias for it:

\$ alias c="clear"

Next time enter c on command line, your screen will be clear. Current aliases can be checked with 'alias' command:

\$ alias

```
alias alert='notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e \'s/^\\s*[0-9]+\\s*//;s/[;&]\\s*alert$//\'")'
```

alias c='clear'

alias egrep='egrep --color=auto'

alias fgrep='fgrep --color=auto'

alias grep='grep --color=auto'

alias l='ls -CF'

alias la='ls -A'

alias ll='ls -alF'

alias ls='ls --color=auto'

w command

The w command shows who is logged in to the system and what they are doing.

A login, logging in or logging on is the entering of identifier information into a system by a user in order to access that system (e.g., a computer or a website). It generally requires the user to enter two pieces of information, first a user name and then a password.

The basic syntax of w is:

w [options] [username1, username2, ...]

The square brackets indicated that the enclosed items are optional. When used without any options, w sends to standard output (which is by default the display screen) a header line followed by a table that contains a line of data for each user currently logged in.

The header shows six items: the current time, how long the system has been running (in minutes) since it was booted up (i.e., started up), how many users are currently logged on, and the system load averages, i.e., the average number of processes active, during the last one, five and 15 minutes. A process is an executing(i.e., running) instance of a program.

The main part of w's output consists of a table showing eight items of information for each user currently logged into the system. The eight columns are labeled USER, TTY, FROM, LOGIN@, IDLE, JCPU, PCPU and WHAT.

USER is the login name of the user. TTY (which now stands for terminal type but originally stood for teletype) is the name of the console or terminal (i.e., combination of monitor and keyboard) that the user logged into, which can also be found by using the tty command. Every time a user logs in across the network, a new tty is assigned to that user.

The consoles can be real or virtual. A feature of Linux systems is the use of virtual consoles, which act as

independent logical consoles that run in separate login sessions, but which are accessed from the same physical console (i.e., the same keyboard and screen). That is, each virtual console can have a different, or the same, user logged into it. On a Red Hat system, seven virtual consoles are configured and active by default.

FROM is the remote host (i.e., the name of some other computer), if any, that the user logged into. LOGIN@ is the time at which the user logged in. IDLE is the number of hours and minutes since the user last typed anything at the keyboard.

JCPU is the number of minutes accumulated by all processes attached to the tty. It does not include past background processes (i.e., low priority processes that operate only in gaps between higher priority foreground processes), but it does include currently running background processes.

PCPU is the time consumed by the current process, named in the WHAT column. WHAT lists the name of the current process along with any options and arguments(i.e., input files) used with the command that launched it.

Among the more useful of w's few options is -h, which tells it to omit the header header line from its output. The -s option tells it to use the short format, which omits the login time, JCPU and PCPU columns. The -l option creates a long listing, which is the same as the default. The -V option displays the version number of the currently installed w program.

By default, w reports on all users. However, it can be made to report on only a specified set of users by providing those usernames in a comma-separated list.

w provides information similar to that which would be provided by a combination of the uptime, who and ps -a commands. uptime produces a single line of output that is the same as w's header line. who shows who is currently logged into the system. ps -a lists all processes with a tty except session leaders (i.e., processes that created sessions).

w can be useful, but there are some faults with the information it provides, and thus its output should only be considered approximate. In particular, the notion of thecurrent process is unclear and there are some problems detecting background processes, even though they usually account for much of the load on the system. Also, the CPU time is only an estimate; for example, if a user leaves a background process running after logging out, the time is credited to the person currently on that terminal.

last command

Display information about the users who logged in and out of the system. The output of last can be very large, so the following output has been filtered (through head) to display top 10 lines only:

```
$ last | head
root tty1 Mon Jul 9 10:06 still logged in
root tty1 Mon Jul 9 10:06 - 10:06 (00:00)
raghu pts/1 :0.0 Mon Jul 9 10:05 - 10:06 (00:00)
raghu pts/0 :0.0 Mon Jul 9 09:34 still logged in
raghu tty7 :0 Mon Jul 9 09:19 still logged in
reboot system boot 2.6.38-13-generi Mon Jul 9 09:09 -
10:12 (01:02)
raghu tty7 :0 Sun Jul 8 23:36 - 00:30 (00:54)
reboot system boot 2.6.38-13-generi Sun Jul 8 23:36 -
00:30 (00:54)
raghu tty7 :0 Sun Jul 8 21:07 - down (01:06)
reboot system boot 2.6.38-13-generi Sun Jul 8 21:07 -
22:14 (01:07)
```

A similar command is lastb that shows last bad login attempts. But this command must be run as root otherwise would get an error of permission denied

```
$ lastb
raghu tty2 Mon Jul 9 10:16 - 10:16 (00:00)
UNKNOWN tty2 Mon Jul 9 10:15 - 10:15 (00:00)
ubuntu tty8 :1 Mon Jul 2 10:23 - 10:23 (00:00)
btmp begins Mon Jul 2 10:23:54 2012
```

du command

du command determines disk usage of a file. If the argument given to it is a directory, then it will list disk usage of all the files and directories recursively under that directory:

```
$ du /etc/passwd
4 /etc/passwd
$ du hello/
52 hello/HelloApp
4 hello/orb.db/logs
20 hello/orb.db
108 hello/
```

df command

df reports file system usage. For example:

```
$ df
Filesystem 1K-blocks Used Available Use% Mounted on
/dev/sda7 10079084 7372872 2194212 78% /
none 1522384 768 1521616 1% /dev
none 1529012 252 1528760 1% /dev/shm
none 1529012 108 1528904 1% /var/run
none 1529012 4 1529008 1% /var/lock
/dev/sda8 5039616 3758824 1024792 79% /home
```

```
/dev/sda2 209715196 196519248 13195948 94%
media/Data
```

fdisk command

The fdisk is the tool for getting partition information, adding and removing partitions. The fdisk tool requires super user privileges. To list all the partitions of all the hard drives available:

```
$ fdisk -l
Disk /dev/sda: 320.1 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x396f396f

Device Boot Start End Blocks Id System
/dev/sda1 1 2611 20971520 7 HPFS/NTFS
/dev/sda2 2611 28720 209715200 7 HPFS/NTFS
/dev/sda3 * 28720 38914 81882113 5 Extended
  /dev/sda5 28720 33942 41943040 7 HPFS/NTFS
  /dev/sda6 33942 34464 4194304 7 HPFS/NTFS
  /dev/sda7 34464 35739 10240000 83 Linux
  /dev/sda8 35739 36376 5120000 83 Linux
  /dev/sda9 36376 36886 4096000 82 Linux swap / Solaris
  /dev/sda10 36887 38276 11164672 83 Linux
  /dev/sda11 38277 38914 5117952 83 Linux
```

fdisk is an interactive tool to edit the partition table. It takes a device (hard disk) as an argument, whose partition table needs to be edited.

\$ fdisk /dev/sda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): m

Command	action
a	toggle a bootable flag
b	edit bsd disk label
c	toggle the dos compatibility flag
d	delete a partition
l	list known partition types
m	print this menu
n	add a new partition
o	create a new empty DOS partition table
p	print the partition table
q	quit without saving changes

s	create a new empty Sun disklabel
t	change a partition's system id
u	change display/entry units
v	verify the partition table
w	write table to disk and exit
x	extra functionality (experts only)

Pressing 'm' at the fdisk prompt prints out above help that lists all the commands available for fdisk. A new partition can be created with n and an existing partition can be deleted with d command. When you are done editing the partitions, press w to write the changes to the disk, and finally, q to quit from fdisk (q dies not save changes).

netstat command

'netstat' is the command used to check the network statistics of the system. It will list the current network connections, routing table information, interface statistics, masquerade connections and a lot more information.

\$ netstat | head

Active Internet connections (w/o servers)

Proto Recv-Q Send-Q Local Address Foreign Address State

Active UNIX domain sockets (w/o servers)

Proto RefCnt Flags Type State I-Node Path

unix 13 [] DGRAM 8498 /dev/log

unix 2 [] DGRAM 6824 @/org/kernel/udev/udevd

unix 3 [] STREAM CONNECTED 56738 /var/run/dbus/
system_bus_socket

unix 3 [] STREAM CONNECTED 56113

unix 3 [] STREAM CONNECTED 29138

unix 3 [] STREAM CONNECTED 29137

history command

This command shows the commands you have entered on your terminal so far.

passwd command

Change your password with 'passwd' command.

shutdown -h now

Finally shut down your system using this command.

Understanding and using file permissions

In Linux and Unix, everything is a file. Directories are files, files are files and devices are files. Devices are usually referred to as a node; however, they are still files.

All of the files on a system have permissions that allow or prevent others from viewing, modifying or executing. If the file is of type Directory then it restricts different actions than files and device nodes. The super user "root" has the ability to access any file on the system. Each file has access restrictions with permissions, user restrictions with owner/group association. Permissions are referred to as bits.

If the owner read & execute bit are on, then the permissions are:

There are three types of access restrictions:

Permission	Action	Chmod option
read	(view)	r or 4
write	(edit)	w or 2
execute	(execute)	x or 1

There are also three types of user restrictions:

User	ls output
owner	-rwx----
group	---rwx---
other	-----rwx

**The restriction type scope is not inheritable:
the file owner will be unaffected by restrictions
set for his group or everybody else.**

Folder/Directory Permissions

Directories have directory permissions. The directory permissions restrict different actions than with files or device nodes.

Permission	Action	chmod option
Read	(view contents, i.e. ls command)	r or 4
Write	(create or remove files from dir)	w or 2
execute	(cd into directory)	x or 1

1. read restricts or allows viewing the directories contents, i.e. ls command
2. write restricts or allows creating new files or deleting files in the directory. (Caution: write access for a directory allows deleting of files in the directory even if the user does not have write permissions for the file!)
3. execute restricts or allows changing into the directory, i.e. cd command

Folders (directories) must have 'execute' permissions set (x or 1), or folders (directories) will NOT FUNCTION as folders (directories) and WILL DISAPPEAR from view in the file browser (Nautilus).

Permissions in Action

```
$ ls -l /etc/hosts
```

```
-rw-r--r-- 1 root root 288 2005-11-13 19:24 /etc/hosts
```

Using the example above we have the file "/etc/hosts" which is owned by the user root and belongs to the root group.

The permissions from the above /etc/hosts ls output

```
-rw-r--r--
```

owner = Read & Write (rw-)

group = Read (r--)

other = Read (r--)

Changing permissions

The command to use when modifying permissions is chmod. There are two ways to modify permissions, with numbers or with letters. Using letters is easier to understand for most people. When modifying permissions be careful not to create security problems. Some files are configured to have very restrictive permissions to prevent unauthorized access. For example, the /etc/shadow file (file that stores all local user passwords) does not have permissions for regular users to read or otherwise access.

```
$ ls -l /etc/shadow
```

```
-rw-r----- 1 root shadow 869 2005-11-08 13:16 /etc/shadow
```

Permissions:

owner = Read & Write (rw-)

group = Read (r--)

other = None (---)

Ownership:

owner = root

group = shadow

chmod with Letters

Usage: chmod {options} filename

Options	Definition
U	owner
G	group
O	other
A	all (same as ugo)
X	execute
W	write
R	read
+	add permission
-	remove permission
=	set permission

Here are a few examples of chmod usage with letters (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
```

```
$ ls -l
```

```
total 0
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod u+x file1
```

```
$ ls -l file1
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod o+wx file2
```

```
$ ls -l file2
```

```
-rwxr--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod g-r file3
```

```
$ ls -l file3
```

```
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod ugo+rwx file4
```

```
$ ls -l file4
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
```

```
$
```

chmod with Numbers

Usage: chmod {options} filename

Options	Definition
#-	owner
#	group
-#	other
1	execute
2	write
4	read

Owner, Group and Other is represented by three numbers. To get the value for the options determine the type of access needed for the file then add.

For example if need a file that has -rw-rw-rwx permissions will use the following:

Owner	Group	Other
read & write 4+2=6	read & write 4+2=6	read, write & execute 4+2+1=7

\$ chmod 667 filename

Another example if you want a file that has --w-r-x-- permissions you will use the following:

Owner	Group	Other
write 2	read & execute 4+1 = 5	execute 1

\$ chmod 251 filename

Here are a few examples of chmod usage with numbers (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
$ ls -l
total 0
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod 744 file1
$ ls -l file1
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod 647 file2
$ ls -l file2
-rw-r--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod 604 file3
$ ls -l file3
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod 777 file4
$ ls -l file4
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
$
```

chmod with sudo

Changing permissions on files that do not have ownership of: (Note that changing permissions the wrong way on the wrong files can quickly mess up the system a great deal!

Please be careful when using sudo!)

```
$ ls -l /usr/local/bin/somefile
-rw-r--r-- 1 root root 550 2005-11-13 19:45 /usr/local/bin/
somefile
```

\$

```
$ sudo chmod o+x /usr/local/bin/somefile
```

```
$ ls -l /usr/local/bin/somefile
```

```
-rw-r--r-x 1 root root 550 2005-11-13 19:45 /usr/local/
bin/somefile
```

\$

Recursive permission changes

To change the permissions of multiple files and directories with one command. Please note the warning in the chmod with sudo section and the Warning with Recursive chmod section.

Recursive chmod with -R and sudo

To change all the permissions of each file and folder under a specified directory at once, use sudo chmod with -R

```
$ sudo chmod 777 -R /path/to/someDirectory
```

```
$ ls -l
```

```
total 3
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file2
```

Recursive chmod using find, pipemill, and sudo

To assign reasonably secure permissions to files and folders/directories, it's common to give files a permission of 644, and directories a 755 permission, since chmod -R assigns to both. Use sudo, the find command, and a pipemill to chmod as in the following examples.

To change permission of only files under a specified directory.

```
$ sudo find /path/to/someDirectory -type f -print0 | xargs
-0 sudo chmod 644
```

```
user@host:/home/user$ ls -l
```

```
total 3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

To change permission of only directories under a specified directory (including that directory):

```
$ sudo find /path/to/someDirectory -type d -print0 | xargs
-0 sudo chmod 755
```

```
$ ls -l
```

```
total 3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
drwxr-xr-x 2 user user 4096 Nov 19 20:13 folder
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

Warning with Recursive chmod

WARNING: Although it's been said, it's worth mentioning in context of a gotcha typo. Please note, Recursively deleting or chown-ing files are extremely dangerous. You will not be the first, nor the last, person to add one too many spaces into the command. This example will hose your system:

```
$ sudo chmod -R / home/john/Desktop/tempfiles
```

Note the space between the first / and home. You have been warned.

Changing the file owner and group

A file's owner can be changed using the chown command. For example, to change the foobar file's owner to tux:

```
$ sudo chown tux foobar
```

To change the foobar file's group to penguins, you could use either chgrp or chown with special syntax:

```
$ sudo chgrp penguins foobar
```

```
$ sudo chown :penguins foobar
```

Finally, to change the foobar file's owner to tux and the group to penguins with a single command, the syntax would be:

```
$ sudo chown tux:penguins foobar
```

Note that, by default, you must use sudo to change a file's owner or group.

Difference between chown and chgrp

- 1) Chown command is used to change ownership as well as group name associated to different one, whereas chgrp can change only group associated to it.
- 2) Many people say that regular user is only able to use chgrp to change the group if the user belongs to them. But it's not true; a user can use chown and chgrp irrespective of changing group to one of their groups because chown is located in /bin folder so everyone can use it with some limited access.

umask - Set default permissions

The umask command controls the default permissions given to a file when it is created.

It uses octal notation to express a mask of bits to be removed from a file's mode attributes.

```
[me@linuxbox ~]$ rm -f foo.txt
```

```
[me@linuxbox ~]$ umask
```

```
0002
```

```
[me@linuxbox ~]$ > foo.txt
```

```
[me@linuxbox ~]$ ls -l foo.txt
```

```
-rw-rw-r-- 1 me me 0 2008-03-06 14:53 foo.txt
```

We first removed any old copy of foo.txt to make sure we were starting fresh. Next,

we ran the umask command without an argument to see the current value. It responded with the value 0002 (the value 0022 is another common default value), which is the octal representation of our mask. We next create a new instance of the file foo.txt and observe its permissions.

We can see that both the owner and group both get read and write permission, while everyone else only gets read permission. The reason that world does not have write permission is because of the value of the mask.

```
$ rm foo.txt
```

```
$ umask 0000
```

```
$ > foo.txt
```

```
$ ls -l foo.txt
```

```
-rw-rw-rw- 1 me me 0 2008-03-06 14:58 foo.txt
```

When we set the mask to 0000 (effectively turning it off), we see that the file is now

world writable. To understand how this works, we have to look at octal numbers again.

If we take the mask and expand it into binary, then compare it to the attributes.

Original file mode	--- rw- rw- rw-
Mask	000 000 000 010
Result	--- rw- rw- r--

Ignore for the moment the leading zeros (we'll get to those in a minute) and observe that

where the 1 appears in our mask, an attribute was removed—in this case, the world

write permission. That's what the mask does. Everywhere a 1 appears in the binary value

of the mask, an attribute is unset. If we look at a mask value of 0022, we can see what it does:

Original file mode	--- rw- rw- rw-
Mask 000 000 010 010	000 000 000 010
Result	--- rw- r-- r--

Again, where a 1 appears in the binary value, the corresponding attribute is unset. Play with some values (try some sevens) to get used to how this works. When you're done, remember to clean up:

```
$ rm foo.txt; umask 0002
```

The Tar command

The tar (i.e., tape archive) command is used to convert a group of files into an archive.

An archive is a single file that contains any number of individual files plus information to allow them to be restored to their original form by one or more extraction programs. Archives are convenient for storing files as well as for transmitting data and distributing programs. Moreover, they are very easy to work with, often much more so than dealing with large numbers of individual files.

Although tar was originally designed for backups on magnetic tape, it can now be used to create archive files anywhere on a file system. Archives that have been created with tar are commonly referred to as tar balls.

Unlike some other archiving programs, and consistent with the Unix philosophy that each individual program should be designed to do only one thing but do it well, tar does not perform compression. However, it is very easy to compress archives created with tar by using specialized compression utilities.

tar's basic syntax is

tar option(s) archive_name file_name(s)

tar has numerous options, many of which are not frequently used. Unlike many commands, tar requires the use of at least one option, and usually two or more are necessary.

tar files are created by using both the -c and -f options. The former instructs tar to create an archive and the latter indicates that the next argument (i.e., piece of input data in a command) will be the name of the new archive file. Thus, for example, the following would create an archive file called file.tar from the three files named file1, file2 and file3 that are located in the current directory (i.e., the directory in which the user is currently working):

tar -cf file.tar file1 file2 file3

It is not absolutely necessary that the new file have the .tar extension; however, the use of this extension can be very convenient because it allows the type of file to be visually identified. It is necessary, however, that the -f option be the final option in a sequence of contiguous, single-letter options; otherwise, the system will become confused as to the desired name for the new file and will use the next option in the sequence as the name.

The -v (i.e., verbose) option is commonly used together with the -c and -f options in order to display a list of the files that are included in the archive. In such case, the above example would become

tar -cvf file.tar file1 file2 file3

tar can also be used to make archives from the contents of one or more directories. The result is recursive; that is, it includes all objects (e.g., directories and files) within each level of directories. For example, the contents of two directories named dir1 and dir2 could be archived into a file named dir.tar with the following:

tar -cvf dir.tar dir1 dir2

It is often convenient to use tar with a wildcard (i.e., a character which can represent some specific class of characters or sequence of characters). The following example uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to create an archive of every object in the current directory:

tar -cf *

By default, tar creates an archive of copies of the original files and/or directories, and the originals are retained.

However, they can be removed when using tar by adding the --remove-files option.

As it has no compression and decompression capabilities of its own, tar is commonly used in combination with an external compression utility. A very handy feature of the GNU version (which is standard on Linux) is the availability of options that will cause standard compression programs to compress a new archive file as soon as it has been created. They are -j (for bzip2), -z (for gzip) and -Z (for compress). Thus, for example, the following would create an archive named files.tar.bz2 of the files file4, file5 and file6 that is compressed using bzip2:

tar -cvjf files.tar.bz2 file4 file5 file6

tar can also be used for unpacking tar files. However, before doing this, there are several steps that should be taken. One is to confirm that sufficient space is available on the hard disk drive (HDD). Another is to move to an empty directory (which usually involves creating one with an appropriate name) to prevent the reconstituted files from cluttering up the current directory and overwriting any files or directories with same names that are in it. In addition, if the archive has been compressed, it must first be decompressed using the appropriate decompression program (which can usually be determined by the filename extension).

In order to unpack a tar file, the -x (for extract) and -f options are required. It is also common to add the -v option to provide a running listing of the files being unpacked. Thus, for example, to unpack the archive file.tar created in a previous example the following would be used:

tar -xvf file.tar

Just as options are available to allow three compression programs to automatically compress newly created tar files, the same options can be used to have the compression programs automatically decompress tar files prior to extraction. Thus, for instance, the following would decompress and extract the contents of the compressed archive files.tar.bz2 that was created in an above example:

tar -xjvf files.tar.bz2

Files can be added to an existing archive using the -r option. As is always the case with tar, it is also necessary to use the -f option to indicate that the following string (i.e., sequence of characters) is the name of the archive. For example, the following would append a file named file7 to file.tar:

tar -rf file.tar file7

The --delete option allows specified files to be completely removed from a tar file (except when the tar file is on magnetic tape). However, this is different from an extraction, as copies of the removed files are not made and placed in the current directory. Thus, for example, the files file1 and file2 can be removed from file.tar with the following:

tar -f file.tar --delete file1 file2

The -t option tells tar to list the contents of an uncompressed archive without performing an extraction. Thus, the following would list the contents of file.tar:

```
tar -tf file.tar
```

Input, output and error redirection in linux

Input/output redirection means the text that is showing on the screen while you are running any command(program)in the shell, that information can be redirect elsewhere and even it can store this output in a file or can be print directly.

This function called Redirection, and can also redirect the input of program.

In Linux systems everything consider as a file.

A file descriptor is number that is associated with every file

When run a program in shell (i.e when execute a command) on the back end Linux access 3 special files.

Standard input - 0 file descriptor(example = mouse,)

Standard output - 1 file descriptor(example = Screen)

Standard error output - 2 file descriptor(example=Screen)

So it can redirect these files to other files. If user redirect standard output (Descriptor = 1) to the printer, instead of showing these outputs on the screen and the computer start getting print on paper.

Output Redirection

Output Redirection is most commonly used, when execute a command it's normally appears on the terminal . If extract any tar file you will notice all the output scrolls down rapidly. And can redirect this output in a file for inspecting the output or can send anybody via email. This is called Output Redirection. Using this operator '>' in shell can redirect the output in a file.

Example :

```
$ ls > output.txt  
$ cat output.txt  
bin  
boot  
dev  
etc  
home  
lib  
lib64  
lost+found  
media  
mnt  
opt  
output.txt  
proc
```

```
root  
sbin  
selinux  
srv  
sys  
tmp  
usr  
var  
$
```

If output.txt file is already exist then '>' operator will overwrite the file for append more output into output.txt use '>>' instead of '>'.

Input Redirection

You can redirect your input by using '<' operator. Cannot run input redirection on all programs or commands. And can use only with that programs or commands that accept Input from keyboard.

Example : user going to send an email and already have Template of that email. and can put template in the email body using input redirect.

```
$ mail ali < mail_template.txt
```

above command launch email program with mail_template.txt contents.

Now due to advancement in GUI, and also lots of good email clients, method is rarely used.

Error Redirection

Error Redirection is very helpful when in trouble. In this case user trying to open a file that is not readable for my user will get permission denied errors. it will redirect these error into error.txt file.

Example :

```
$ cat ali.txt 2> /home/H.Ali/error.txt  
$ cat /home/H.Ali/error.txt  
cat: ali.txt: Permission denied
```

In the above command 2 is descriptor of error redirection file by typing '2>' you are saying redirect any kind of error to the file error.txt

Pipes ' | ' in Linux

Linux pipes allow us connect output stream of 'command a' to input stream of 'command b'. here in my case i will pipe cat commands output into less as input.

Example : cat /var/log/messages | less

we can also use pipe for searching strings specially from large text files.

```
cat /var/log/messages | grep kernal | less
```

grep is a line searcher it will search lines for specific piece of text.

above command will search a keyword 'kernel' with grep and then pipe it again to less.

Pipes in linux

A pipe is a form of redirection that is used in Linux and other Unix-like operating systems to send the output of one program to another program for further processing.

Redirection is the transferring of standard output to some other destination, such as another program, a file or a printer, instead of the display monitor (which is its default destination). Standard output, sometimes abbreviated stdout, is the destination of the output from command line (i.e., all-text mode) programs in Unix-like operating systems.

Pipes are used to create what can be visualized as a pipeline of commands, which is a temporary direct connection between two or more simple programs. This connection makes possible the performance of some highly specialized task that none of the constituent programs could perform by themselves. A command is merely an instruction provided by a user telling a computer to do something, such as launch a program. The command line programs that do the further processing are referred to as filters.

This direct connection between programs allows them to operate simultaneously and permits data to be transferred between them continuously rather than having to pass it through temporary text files or through the display screen and having to wait for one program to be completed before the next program begins.

Examples

A pipe is designated in commands by the vertical bar character, which is located on the same key as the backslash on U.S. keyboards. The general syntax for pipes is:

command_1 | command_2 [| command_3 . . .]

This chain can continue for any number of commands or programs.

A very simple example of the benefits of piping is provided by the dmesg command, which repeats the startup messages that scroll through the console (i.e., the all-text, full-screen display) while Linux is booting (i.e., starting up). dmesg by itself produces far too many lines of output to fit into a single screen; thus, its output scrolls down the screen at high speed and only the final screenful of messages is easily readable. However, by piping the output of dmesg to the filter less, the startup messages can conveniently be viewed one screenful at a time, i.e.,

dmesg | less

less allows the output of dmesg to be moved forward one screenful at a time by pressing the SPACE bar and back one screenful at a time by pressing the b key. The command can be terminated by pressing the q key. (The more command could have been used here instead of less; however, less is newer than more and has additional functions, including the ability to return to previous pages of the output.)

The same result could be achieved by first redirecting the output of dmesg to a temporary file and then displaying the contents of that file on the monitor. For example, the following set of two commands uses the output redirection operator (designated by a rightward facing angle bracket) to first send the output of dmesg to a text file called tempfile1 (which will be created by the output redirection operator if it does not already exist), and then it uses another output redirection operator to transfer the output of tempfile1 to the display screen:

dmesg > tempfile1

tempfile1 > less

However, redirection to a file as an intermediate step is clearly less efficient, both because two separate commands are required and because the second command must await the completion of the first command before it can begin.

The use of two pipes to chain three commands together could make the above example even more convenient for some situations. For example, the output of dmesg could first be piped to the sort filter to arrange it into alphabetic order before piping it to less:

dmesg | sort -f | less

The -f option tells sort to disregard case (i.e., whether letters are lower case or upper case) while sorting.

Likewise, the output of the ls command (which is used to list the contents of a directory) is commonly piped to the less (or more) command to make the output easier to read, i.e.,

ls -al | less

or

ls -al | more

ls reports the contents of the current directory (i.e., the directory in which the user is currently working) in the absence of any arguments (i.e., input data in the form of the names of files or directories). The -l option tells ls to provide detailed information about each item, and the -a option tells ls to include all files, including hidden files (i.e., files that are normally not visible to users). Because ls returns its output in alphabetic order by default, it is not necessary to pipe its output to the sort command (unless it is desired to perform a different type of sorting, such as reverse sorting, in which case sort's -r option would be used).

This could just as easily be done for any other directory. For example, the following would list the contents of the /bin directory (which contains user commands) in a convenient paged format:

ls -al /bin | less

The following example employs a pipe to combine the ls and the wc (i.e., word count) commands in order to show how many filesystem objects (i.e., files, directories and links) are in the current directory:

ls | wc -l

ls lists each object, one per line, and this list is then piped to wc, which, when used with its -l option, counts the number of lines and writes the result to standard output (which, as usual, is by default the display screen).

The output from a pipeline of commands can be just as easily redirected to a file (where it is written to that file) or a printer (where it is printed on paper). In the case of the above example, the output could be redirected to a file named, for instance, count.txt:

```
ls | wc -l > count.txt
```

The output redirection operator will create count.txt if it does not exist or overwrite it if it already exists. (The file does not, of course, require the .txt extension, and it could have just as easily been named count, lines or anything else.)

The following is a slightly more complex example of combining a pipe with redirection to a file:

```
echo -e "orange \npeach \ncherry" | sort > fruit
```

The echo command tells the computer to send the text that follows it to standard output, and its -e option tells the computer to interpret each \ as the newline symbol (which is used to start a new line in the output). The pipe redirects the output from echo -e to the sort command, which arranges it alphabetically, after which it is redirected by the output redirection operator to the file fruit.

As a final example, and to further illustrate the great power and flexibility that pipes can provide, the following uses three pipes to search the contents of all of the files in current directory and display the total number of lines in them that contain the string Linux but not the string UNIX:

```
cat * | grep "Linux" | grep -v "UNIX" | wc -l
```

In the first of the four segments of this pipeline, the cat command, which is used to read and concatenate (i.e., string together) the contents of files, concatenates the contents of all of the files in the current directory. The asterisk is a wildcard that represents all items in a specified directory, and in this case it serves as an argument to cat to represent all objects in the current directory.

The first pipe sends the output of cat to the grep command, which is used to search text. The Linux argument tells grep to return only those lines that contain the string Linux. The second pipe sends these lines to another instance of grep, which, in turn, with its -v option, eliminates those lines that contain the string UNIX. Finally, the third pipe sends this output to wc -l, which counts the number of lines and writes the result to the display screen.

Find hardware devices in Ubuntu Linux with lshw

There are a variety of ways to find out what kind of hardware running in linux, but one of the easiest ways that gives a large amounts of valuable data is to use lshw (Hardware Lister). And lshw is installed by default. Testing of lshw command as shown below...

```
$ sudo lshw
```

Installing

lshw is available on most package management systems.

If use APT (Debian-based distros: Ubuntu, Linux Mint, and others), run the following command in terminal:

```
$ sudo apt-get install lshw
```

If use Yum (Red Hat, Fedora, CentOS, Yellow Dog Linux, etc), run the following command in terminal:

```
$ sudo yum install lshw
```

If these instructions don't match your package manager, look for specific instructions on the lshw site to get it installed on your system.

Using lshw

If you just run lshw by itself on the command line, your screen will be flooded with large amounts of text. Fortunately, it is very easy to get lshw to give you output that meets your needs.

Shorter output

If you just quickly want to quickly find the chipset version of a piece of hardware is, you can run the following to provide a very short output that should give you what you need:

```
$ sudo lshw -short
```

For example, here is a sample when I run this on my Dell Studio 17 laptop (Note: I've removed a large portion of the output to make this fit):

```
$ sudo lshw -short
```

Device class	Description
system	Studio 1735
bus	0H275K
memory	64KiB BIOS
processor	Intel(R) Core(TM)2 Duo CPU T8100 @ 2.10GHz
memory	32KiB L1 cache
memory	3MiB L2 cache
memory	4GiB System Memory
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
display	Mobility Radeon HD 3650
multimedia	RV635 Audio device [Radeon HD 3600 Series]
multimedia	82801H (ICH8 Family) HD Audio Controller
eth1 network	BCM4322 802.11a/b/g/n Wireless LAN Controller
eth0 network	NetLink BCM5784M Gigabit Ethernet PCIe
/dev/sda disk	250GB WDC WD2500BEVS-7

This of course leaves out a lot of detail. Maybe we just need to store the data somewhere so it's easier to work with.

Storing output to a file

If you'd like to put all the lshw output into a file, you can do so easily from the terminal with output redirection.

```
$ sudo lshw > hardware.txt
```

This will run the lshw command and put all the output into a file in the current directory called hardware.txt. Note that this will replace any file in the current directory called hardware.txt. Make sure that you either backup the file, give the output file a unique name, or are prepared to lose that original file's information.

Now you can open the hardware.txt file with your favorite editor and look through the informations.

Creating HTML or XML Output

lshw has the ability to format its output in either HTML or XML. This can be very helpful if you want to post your hardware specs somewhere online to be viewed or to send the data to a storage system.

To create HTML output, simply give lshw the -html option:

```
$ sudo lshw -html > hardware.html
```

This will format the output into a HTML document and save the output in a file called hardware.html.

Creating XML is done with the -xml option:

```
$ sudo lshw -xml > hardware.xml
```

Like before, this will output the document in XML format and save it to hardware.xml.

Date command examples to display and set system date time

Date command is helpful to display date in several formats. It also allows you to set systems date and time.

Here few examples on how to use date command with practical examples.

When execute date command without any option, it will display the current date and time as shown below.

```
$ date
```

```
Mon May 20 22:02:24 PDT 2013
```

1. Display Date from a String Value using -date Option

If you have a static date or time value in a string, you can use -d or -date option to convert the input string into date format as shown below.

Please note that this doesn't use the current date and time value. Instead is uses the date and time value that you pass as string.

The following examples takes an input date only string, and displays the output in date format. If you don't specify time, it uses 00:00:00 for time.

```
$ date --date="12/2/2014"
```

```
Tue Dec 2 00:00:00 PST 2014
```

```
$ date --date="2 Feb 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

```
$ date --date="Feb 2 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

The following example takes an input date and time string, and displays the output in date format.

```
$ date --date="Feb 2 2014 13:12:10"
```

```
Sun Feb 2 13:12:10 PST 2014
```

2. Read Date Patterns from a file using -file option

This is similar to the -d or -date option that we discussed above. But, you can do it for multiple date strings. If you have a file that contains various static date strings, you can use -f or -file option as shown below.

In this example, we can see that datefile contained 2 date strings. Each line of datefile is parsed by date command and date is outputted for each line.

```
$ cat datefile
```

```
Sept 9 1986
```

```
Aug 23 1987
```

```
$ date --file=datefile
```

```
Tue Sep 9 00:00:00 PDT 1986
```

```
Sun Aug 23 00:00:00 PDT 1987
```

3. Get Relative Date Using -date option

You can also use date command to get a future date using relative values.

For example, the following examples gets date of next Monday.

```
$ date --date="next mon"
```

```
Mon May 27 00:00:00 PDT 2013
```

If string=@is given to date command, then date command convert seconds since the epoch (1970-01-01 UTC) to a date.

It displays date in which 5 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@5
```

```
Wed Dec 31 16:00:05 PST 1969
```

It displays date in which 10 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@10
```

```
Wed Dec 31 16:00:10 PST 1969
```

It displays date in which 1 minute (i.e. 60 seconds) is elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@60
```

```
Wed Dec 31 16:01:00 PST 1969
```

4. Display past date

You can display a past date using the -date command. Few possibilities are shown below.

```
$ date --date='3 seconds ago'
```

```
Mon May 20 21:59:20 PDT 2013
```

```
$ date --date="1 day ago"
```

```
Sun May 19 21:59:36 PDT 2013
```

```
$ date --date="yesterday"
```

```
Sun May 19 22:00:26 PDT 2013
```

```
$ date --date="1 month ago"
```

```
Sat Apr 20 21:59:58 PDT 2013
```

```
$ date --date="1 year ago"
```

```
Sun May 20 22:00:09 PDT 2012
```

5. Set Date and Time using -set option

You can set date and time of your system using -s or -set option as shown below..

In this example, initially it displayed the time as 20:09:31. We then used date command to change it to 21:00:00.

```
$ date
```

```
Sun May 20 20:09:31 PDT 2013
```

```
$ date -s "Sun May 20 21:00:00 PDT 2013"
```

```
Sun May 20 21:00:00 PDT 2013
```

```
$ date
```

```
Sun May 20 21:00:05 PDT 2013
```

6. Display Universal Time using -u option

You can display date in UTC format using -u, or -utc, or -universal option as shown below.

```
$ date
```

```
Mon May 20 22:07:53 PDT 2013
```

```
$ date -u
```

```
Tue May 21 05:07:55 UTC 2013
```

7. Display Last Modification Time using -r option

In this example, the current time is 20:25:48

```
$ date
```

```
Sun May 20 20:25:48 PDT 2013
```

The timestamp of datefile is changed using touch command. This was done few seconds after the above date command's output.

```
$ touch datefile
```

The current time after the above touch command is 20:26:12

```
$ date
```

```
Sun May 20 20:26:12 PDT 2013
```

Finally, use the date command -r option to display the last modified timestamp of a file as shown below. In this example, it displays last modified time of datefile as 20:25:57. It is somewhere between 20:25:48 and 20:26:12 (which is when we execute the above touch command to modify the timestamp).

```
$ date -r datefile
```

```
Sun May 20 20:25:57 PDT 2013
```

8. Various Date command formats

You can use formatting option to display date command in various formats using the following syntax:

```
$ date +%<format-option>
```

Command	Description
• apropos whatis	Show commands pertinent to string. See also threadsafe
• man -t ascii ps2pdf - > ascii.pdf	make a pdf of a manual page
which command	Show full path name of command
time command	See how long a command takes
• time cat	Start stopwatch. Ctrl-d to stop. See also sw
dir navigation	
• cd -	Go to previous directory
• cd	Go to \$HOME directory
(cd dir && command)	Go to dir, execute command and return to current dir
• pushd .	Put current dir on stack so you can popd back to it
file searching	
• alias l='ls -l --color=auto'	quick dir listing. See also l
• ls -lrt	List files by date. See also newest and find_mm_yyyy
• ls /usr/bin pr -T9 -W\$COLUMNS	Print in 9 columns to width of terminal
find -name '*.[ch]' xargs grep -E 'expr'	Search 'expr' in this dir and below. See also findrepo
find -type f -print0 xargs -r0 grep -F 'example'	Search all regular files for 'example' in this dir and below
find -maxdepth 1 -type f xargs grep -F 'example'	Search all regular files for 'example' in this dir
find -maxdepth 1 -type d while read dir; do echo \$dir; echo cmd2; done	Process each item with multiple commands (in while loop)
• find -type f ! -perm -444	Find files not readable by all (useful for web site)
• find -type d ! -perm -111	Find dirs not accessible by all (useful for web site)
• locate -r 'file[^/]*\.txt'	Search cached index for names. This re is like glob *file*.txt
• look reference	Quickly search (sorted) dictionary for prefix
• grep --color reference /usr/share/dict/words	Highlight occurrences of regular expression in dictionary
archives and compression	
gpg -c file	Encrypt file
gpg file.gpg	Decrypt file
tar -c dir/ bzip2 > dir.tar.bz2	Make compressed archive of dir/
bzip2 -dc dir.tar.bz2 tar -x	Extract archive (use gzip instead of bzip2 for tar.gz files)
tar -c dir/ gzip gpg -c ssh user@remote 'dd of=dir.tar.gz.gpg'	Make encrypted archive of dir/ on remote machine

	<code>find dir/ -name '*.txt' xargs cp -a --target-directory=dir_txt/ --parents</code>	Make copy of subset of dir/ and below
	<code>(tar -c /dir/to/copy) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) copy/ dir to /where/to/ dir
	<code>(cd /dir/to/copy && tar -c .) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) contents of copy/ dir to /where/to/
	<code>(tar -c /dir/to/copy) ssh -C user@remote 'cd /where/to/ && tar -x -p'</code>	Copy (with permissions) copy/ dir to remote:/where/to/ dir
	<code>dd bs=1M if=/dev/sda gzip ssh user@remote 'dd of=sda.gz'</code>	Backup harddisk to remote machine

rsync (Network efficient file copier: Use the --dry-run option for testing)

	<code>rsync -P rsync://rsync.server.com/path/to/file file</code>	Only get diffs. Do multiple times for troublesome downloads
	<code>rsync --bwlimit=1000 fromfile tofile</code>	Locally copy with rate limit. It's like nice for I/O
	<code>rsync -az -e ssh --delete ~/public_html/ remote.com:'~/public_html'</code>	Mirror web site (using compression and encryption)
	<code>rsync -auz -e ssh remote:/dir/ . && rsync -auz -e ssh . remote:/dir/</code>	Synchronize current directory with remote one

ssh (Secure SHell)

	<code>ssh \$USER@\$HOST command</code>	Run command on \$HOST as \$USER (default command=shell)
•	<code>ssh -f -Y \$USER@\$HOSTNAME xeyes</code>	Run GUI command on \$HOSTNAME as \$USER
	<code>scp -p -r \$USER@\$HOST: file dir/</code>	Copy with permissions to \$USER's home directory on \$HOST
	<code>scp -c arcfour \$USER@\$LANHOST: bigfile</code>	Use faster crypto for local LAN. This might saturate GigE
	<code>ssh -g -L 8080:localhost:80 root@\$HOST</code>	Forward connections to \$HOSTNAME:8080 out to \$HOST:80
	<code>ssh -R 1434:imap:143 root@\$HOST</code>	Forward connections from \$HOST:1434 in to imap:143
	<code>ssh-copy-id \$USER@\$HOST</code>	Install public key for \$USER@\$HOST for password-less log in

networking (Note ifconfig, route, mii-tool, nslookup commands are obsolete)

	<code>ethtool eth0</code>	Show status of ethernet interface eth0
	<code>ethtool --change eth0 autoneg off speed 100 duplex full</code>	Manually set ethernet interface speed
	<code>iw dev wlan0 link</code>	Show link status of wireless interface wlan0
	<code>iw dev wlan0 set bitrates legacy-2.4 1</code>	Manually set wireless interface speed
•	<code>iw dev wlan0 scan</code>	List wireless networks in range
•	<code>ip link show</code>	List network interfaces
	<code>ip link set dev eth0 name wan</code>	Rename interface eth0 to wan
	<code>ip link set dev eth0 up</code>	Bring interface eth0 up (or down)
•	<code>ip addr show</code>	List addresses for interfaces

	ip addr add 1.2.3.4/24 brd + dev eth0	Add (or del) ip and mask (255.255.255.0)
•	ip route show	List routing table
	ip route add default via 1.2.3.254	Set default gateway to 1.2.3.254
•	ss -tupl	List internet services on a system
•	ss -tup	List active connections to/from system
	host pixelbeat.org	Lookup DNS ip address for name or vice versa
•	hostname -i	Lookup local ip address (equivalent to host `hostname`)
•	whois pixelbeat.org	Lookup whois info for hostname or ip address

windows networking (Note samba is the package that provides all this windows specific networking support)

•	smbtree	Find windows machines. See also findsmb
	nmblookup -A 1.2.3.4	Find the windows (netbios) name associated with ip address
	smbclient -L windows_box	List shares on windows machine or samba server
	mount -t smbfs -o fmask=666,guest //windows_box/share /mnt/share	Mount a windows share
	echo 'message' smbclient -M windows_box	Send popup to windows machine (off by default in XP sp2)

text manipulation (Note sed uses stdin and stdout. Newer versions support inplace editing with the -i option)

	sed 's/string1/string2/g'	Replace string1 with string2
	sed 's/(.*\1)\1/\2/g'	Modify anystring1 to anystring2
	sed '/^ *#/d; /^ *\$/d'	Remove comments and blank lines
	sed ':a; /\\$\N; s/\n//; ta'	Concatenate lines with trailing \
	sed 's/[\t]*\$//'	Remove trailing spaces from lines
	sed 's/\\([`"\$`\]\\)/\\\\\\1/g'	Escape shell metacharacters active within double quotes
•	seq 10 sed "s/^/ /; s/ *\(\.\{7,\}\)/\1/"	Right align numbers
•	seq 10 sed p paste - -	Duplicate a column
	sed -n '1000{p;q}'	Print 1000th line
	sed -n '10,20p;20q'	Print lines 10 to 20
	sed -n 's/.*<title>\(.*)</title>.*/\1/ip;T;q'	Extract title from HTML web page
	sed -i 42d ~/.ssh/known_hosts	Delete a particular line
	sort -t. -k1,1n -k2,2n -k3,3n -k4,4n	Sort IPV4 ip addresses
•	echo 'Test' tr '[:lower:]' '[:upper:]'	Case conversion
•	tr -dc '[:print:]' < /dev/urandom	Filter non printable characters
•	tr -s '[:blank:]' '\t' </proc/diskstats cut -f4	cut fields separated by blanks
•	history wc -l	Count lines
•	seq 10 paste -s -d ''	Concatenate and separate line items to a

set operations (Note you can export LANG=C for speed. Also these assume no duplicate lines within a file)

sort file1 file2 uniq	Union of unsorted files
sort file1 file2 uniq -d	Intersection of unsorted files
sort file1 file1 file2 uniq -u	Difference of unsorted files
sort file1 file2 uniq -u	Symmetric Difference of unsorted files
join -t'\0' -a1 -a2 file1 file2	Union of sorted files
join -t'\0' file1 file2	Intersection of sorted files
join -t'\0' -v2 file1 file2	Difference of sorted files
join -t'\0' -v1 -v2 file1 file2	Symmetric Difference of sorted files

math

• echo '(1 + sqrt(5))/2' bc -l	Quick math (Calculate φ). See also bc
• seq -f '4/%g' 1 2 99999 paste -sd-+ bc -l	Calculate n the unix way
• echo 'pad=20; min=64; (100*10^6)/((pad+min)*8)' bc	More complex (int) e.g. This shows max FastE packet rate
• echo 'pad=20; min=64; print (100E6)/((pad+min)*8)' python	Python handles scientific notation
• echo 'pad=20; plot [64:1518] (100*10**6)/((pad+x)*8)' gnuplot -persist	Plot FastE packet rate vs packet size
• echo 'obase=16; ibase=10; 64206' bc	Base conversion (decimal to hexadecimal)
• echo \$((0x2dec))	Base conversion (hex to dec) ((shell arithmetic expansion))
• units -t '100m/9.58s' 'miles/hour'	Unit conversion (metric to imperial)
• units -t '500GB' 'GiB'	Unit conversion (SI to IEC prefixes)
• units -t '1 googol'	Definition lookup
• seq 100 paste -s -d+ bc	Add a column of numbers. See also add and funcpy

calendar

• cal -3	Display a calendar
• cal 9 1752	Display a calendar for a particular month year
• date -d fri	What date is it this friday. See also day
• [\$(date -d '12:00 today +1 day' +%d) = '01'] exit	exit a script unless it's the last day of the month
• date --date='25 Dec' +%A	What day does xmas fall on, this year
• date --date='@2147483647'	Convert seconds since the epoch (1970-01-01 UTC) to date
• TZ='America/Los_Angeles' date	What time is it on west coast of US (use tzselect to find TZ)
• date --date='TZ="America/Los_Angeles" 09:00 next Fri'	What's the local time for 9AM next Friday on west coast US

locales

• printf "%'d\n" 1234	Print number with thousands grouping appropriate to locale
-----------------------	--

• BLOCK_SIZE='\1 ls -l	Use locale thousands grouping in ls. See also l
• echo "I live in `locale territory`"	Extract info from locale database
• LANG=en_IE.utf8 locale int_prefix	Lookup locale info for specific country. See also ccodes
• locale -kc \$(locale sed -n 's/\(LC_\)\{4,\}\)=.*/\1/p') less	List fields available in locale database

recode (Obsoletes iconv, dos2unix, unix2dos)

• recode -l less	Show available conversions (aliases on each line)
recode windows-1252.. file_to_change.txt	Windows "ansi" to local charset (auto does CRLF conversion)
recode utf-8/CRLF.. file_to_change.txt	Windows utf8 to local charset
recode iso-8859-15..utf8 file_to_change.txt	Latin9 (western europe) to utf8
recode ../b64 < file.txt > file.b64	Base64 encode
recode /qp.. < file.qp > file.txt	Quoted printable decode
recode ..HTML < file.txt > file.html	Text to HTML
• recode -lf windows-1252 grep euro	Lookup table of characters
• echo -n 0x80 recode latin-9/x1..dump	Show what a code represents in latin-9 charmap
• echo -n 0x20AC recode ucs-2/x2..latin-9/x	Show latin-9 encoding
• echo -n 0x20AC recode ucs-2/x2..utf-8/x	Show utf-8 encoding

CDs

gzip < /dev/cdrom > cdrom.iso.gz	Save copy of data cdrom
mkisofs -V LABEL -r dir gzip > cdrom.iso.gz	Create cdrom image from contents of dir
mount -o loop cdrom.iso /mnt/dir	Mount the cdrom image at /mnt/dir (read only)
wodim dev=/dev/cdrom blank=fast	Clear a CDRW
gzip -dc cdrom.iso.gz wodim -tao dev=/dev/cdrom -v -data -	Burn cdrom image (use --prcap to confirm dev)
cdparanoia -B	Rip audio tracks from CD to wav files in current dir
wodim -v dev=/dev/cdrom -audio -pad *.wav	Make audio CD from all wavs in current dir (see also cdrdao)
oggenc --tracknum=\$track track.cdda.wav -o track.ogg	Make ogg file from wav file

disk space

• ls -lSr	Show files by size, biggest last
• du -s * sort -k1,1rn head	Show top disk users in current dir. See also dutop
• du -hs /home/* sort -k1,1h	Sort paths by easy to interpret disk usage
• df -h	Show free space on mounted filesystems
• df -i	Show free inodes on mounted filesystems
• fdisk -l	Show disks partitions sizes and types (run as root)

• rpm -q -a --qf '%10{SIZE}\t%{NAME}\n' sort -k1,1n	List all packages by installed size (Bytes) on rpm distros
• dpkg-query -W -f='\${Installed-Size;10}\t\${Package}\n' sort -k1,1n	List all packages by installed size (KBytes) on deb distros
• dd bs=1 seek=2TB if=/dev/null of=ext3.test	Create a large test file (taking no space). See also truncate
• > file	truncate data of file or create an empty file

monitoring/debugging

• tail -f /var/log/messages	Monitor messages in a log file
• strace -c ls >/dev/null	Summarise/profile system calls made by command
• strace -f -e open ls >/dev/null	List system calls made by command
• strace -f -e trace=write -e write=1,2 ls >/dev/null	Monitor what's written to stdout and stderr
• ltrace -f -e getenv ls >/dev/null	List library calls made by command
• lsof -p \$\$	List paths that process id has open
• lsof ~	List processes that have specified path open
• tcpdump not port 22	Show network traffic except ssh. See also tcpdump_not_me
• ps -e -o pid,args --forest	List processes in a hierarchy
• ps -e -o pcpu,cpu,nice,state,cputime,args --sort pcpu sed '/^ 0.0 /d'	List processes by % cpu usage
• ps -e -orss=,args= sort -b -k1,1n pr -TW\$COLUMNS	List processes by mem (KB) usage. See also ps_mem.py
• ps -C firefox-bin -L -o pid,tid,pcpu,state	List all threads for a particular process
• ps -p 1,\$\$ -o etime=	List elapsed wall time for particular process IDs
• watch -n.1 pstree -Uacp \$\$	Display a changing process subtree
• last reboot	Show system reboot history
• free -m	Show amount of (remaining) RAM (-m displays in MB)
• watch -n.1 'cat /proc/interrupts'	Watch changeable data continuously
• udevadm monitor	Monitor udev events to help configure rules

system information

• uname -a	Show kernel version and system architecture
• head -n1 /etc/issue	Show name and version of distribution
• cat /proc/partitions	Show all partitions registered on the system
• grep MemTotal /proc/meminfo	Show RAM total seen by the system
• grep "model name" /proc/cpuinfo	Show CPU(s) info
• lspci -tv	Show PCI info

• lsusb -tv	Show USB info
• mount column -t	List mounted filesystems on the system (and align output)
• grep -F capacity: /proc/acpi/battery/BAT0/info	Show state of cells in laptop battery
# dmidecode -q less	Display SMBIOS/DMI information
# smartctl -A /dev/sda grep Power_On_Hours	How long has this disk (system) been powered on in total
# hdparm -i /dev/sda	Show info about disk sda
# hdparm -T /dev/sda	Do a read speed test on disk sda
# badblocks -s /dev/sda	Test for unreadable blocks on disk sda
interactive	
• readline	Line editor used by bash, python, bc, gnuplot, ...
• screen	Virtual terminals with detach capability, ...
• mc	Powerful file manager that can browse rpm, tar, ftp, ssh, ...
• gnuplot	Interactive/scriptable graphing
• links	Web browser
• xdg-open .	open a file or url with the registered desktop application

MS WORD 2010 THEORY

Objectives : At the end of this lesson you shall be able to

- state what is MS Office
- brief what is MS Word and starting steps
- explain various screen blocks of MS Word
- explain procedures to create, save, print a document!

Microsoft office is a application software package introduced by Microsoft Corporation. MS Office consists of the following popular packages :

- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint
- Microsoft Access
- Microsoft Outlook

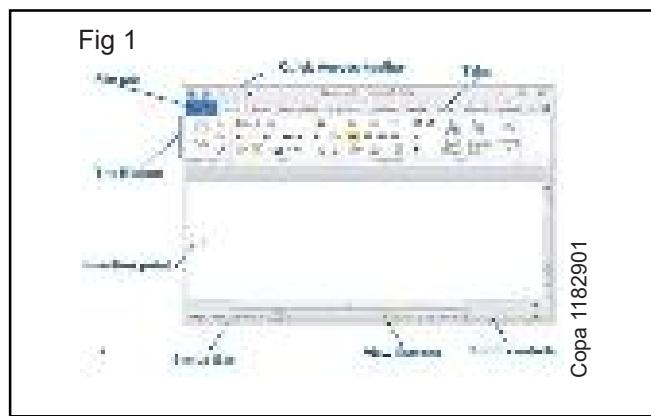
Word 2010

It is a word processor package that helps to create and edit a document. It is the most known word processor of nowadays. It makes professional looking documents by providing a comprehensive set of tools for creating and formatting a document, memos, letters, reports, brochures, business documents and even internet web pages.

Starting Word

Click on the Start > (windows Logo) All programmes > Microsoft office > Microsoft Word. MS Word opens along with a default blank document with default settings page layout.

Fig 1 - Default page layout



Unlike previous version, MS Office 2010 has a common set of features for all the components. It makes it easy to understand and common utilities to remain available on all the packages of MS Office including Word, Excel, PowerPoint, Access, etc. Many features are redesigned so as enabling the diverted users of other packaged can afford with. These enhancements and utilities in Word 2010 are described as below.

The Ribbon tab of Word has eight major parts viz. File, Home, Insert, Page Layout, References, Mailings, Review and View.

File tab of the ribbon is useful to create a new file, a blank or a template page as required. Ctrl + N always create a new blank document in Office Package. The documents so created can be saved as default word document or given compatible format. Furthermore, permission for accessing a documents can be fixed, share a document on a network, even manage a document to be compatible with previous and external versions. Print option makes the document to get a hard copy or a pdf format according to the installed printer features. Recently opened files can also be viewed to find it easy to work again. Help on word is there in the same tab.

Fig. 2 Home Tab



Home tab has clipboard options including cut, copy, paste and paste special. The Font block has all the options of setting fonts, size, superscript, subscript, bold, italic, underline, strikethrough, font colors, etc.

Fig 3 - Paragraph Group



Paragraph group creates the formatting paragraphs with alignments left, right, center, justify and indentations, para and line spacing. Line and page breaks allows to create pagination options and exceptions of formatting.

Fig 4 - Styles and Editing Group

Fig 4



The Styles group allows preformatted text styles like Heading styles, Paragraph styles, Subtitles, etc. Custom styles can also be stored with altered specifications. The Editing group used to select specific area, find and / or replace option in a specified area in text.

The Insert tab has 7 groups. Fig 5 - Pages, Tables and Illustrations blocks (Fig 5)

Fig 5



Page group makes cover pages, blank pages insertion and page breaks. Tables group helps to insert a table in a text document with ready specified row-column set or a customized table format. Illustration group inserts pictures from external sources, cliparts, shapes, smart art, charts of data, even screenshot into the text document.

Fig 6 - Links and Header/Footer Groups

Fig 6



Links group creates hyperlink on texts, bookmarks and cross references in a document.

The header and footer group inserts header, footer to be appearing on every page and page numbers to display as to placement area.

Fig 7 - Text and Symbols block

Fig 7



Text group allows creating text box, quick parts likely to create brochures, designed text as WordArt, paragraph styles, a signature line, date and time and an object insert option.

Symbols group inserts symbols of equations like math equations or symbols like currency, math symbols, etc.

Fig 8 - Themes and Page Setup Group

Fig 8



Page Layout tab has five major groups. Themes block creates predefined template setup using themes on documents. Even new themes customized can be created and saved for future use.

Page setup group has features on margin around, page orientation i.e. vertical or horizontal, paper size, columns to display, breaks, line numbers and hyphenation.

Fig 9 - Page Background and Paragraph Group

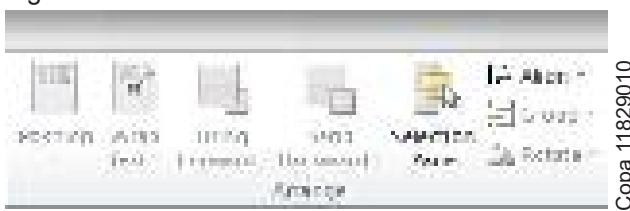
Fig 9



Page Background group creates a watermark, page Background color and page borders. Paragraph block has specified options already discussed in Home -> Paragraph group.

Fig 10 - Arrange Group

Fig 10



The arrange group creates position of objects, text elements, text wrapping, arranging objects, aligning of objects, grouping and transformations.

References tab has six blocks.

Fig 11 - TOC and Footnotes Group

Fig 11

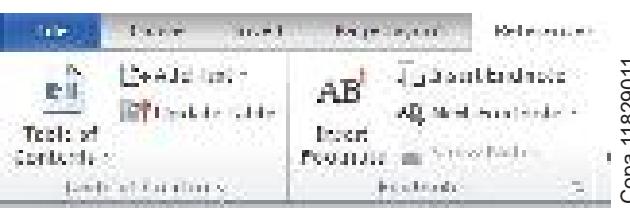


Table of contents creates the TOC of a particular publication document automatically and upon modifications updatable. Footnotes tab creates footnotes of a page, block area which includes explanatory phrases or references. Endnote makes the note at the end of the document.

Fig 12 - Citations, Bibliography and Captions Group



Citation and Bibliography makes an external source as citation, reference tables and credits of authors related to the publication. Captions tab inserts a caption, table of figures, cross references inside a text.

Fig 13 - Index and Table of Authorities Group



Index enters a value on a main topic or sub topic and create the index accordingly. Table of authorities has the citation mark includes the list of the cases, statutes and other authorities cited in the document.

Fig 14 - Create and Mailmerge Groups



Mailings tab used to create mailing of a letter or order using common mailing features. Create block makes envelopes print using predefined formats as well as custom formats. Labels can also be printed to which the delivery address is mentioned.

Mail merge block is used to create mail merge of a letter, email. If a common letter is created and to be sent to many recipients, this option allows to create an Address block where the recipient's info should appear. Even selective recipients can be listed as well as a new recipient list can be created.

Fig 15 - Write and Insert fields Group



While writing a letter, it has many parts, which this mail merge creates fields of Address Block, Greetings Line, Merged field of content, labels, etc.

Fig 16 - Preview Results and Finish Groups



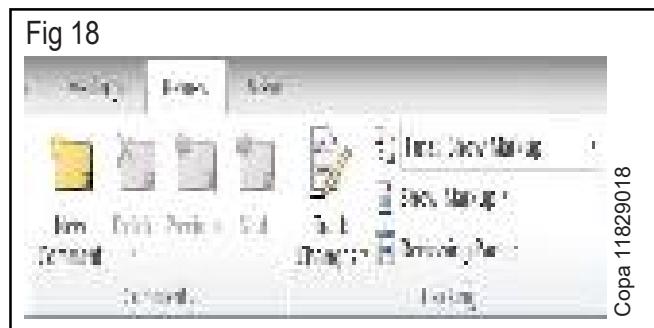
On successful completion of mail merge, it can be previewed and checked for errors for each recipients and edit accordingly. Upon validation the mail merge gets finished.

Fig 17 - Proofing and Language Groups



Review tab here is used for the various document areas to be reviewed. Proofing makes easier to check Spelling and Grammar of a document. Accidental errors can be corrected here. Research refines the search not only inside the document, but also the referenced documents. Thesaurus identifies the completeness of the document using the standard language compatibility of the region like English UK or English USA etc. Word count shows the analysis of the document as total words, total characters, with and without spaces, no. of paragraphs, lines, etc. Here Text blocks can also be included for such analysis.

Language Block helps to translate a page into the installed other languages and to change the proofing language. It requires the direct translator service from Microsoft Online.

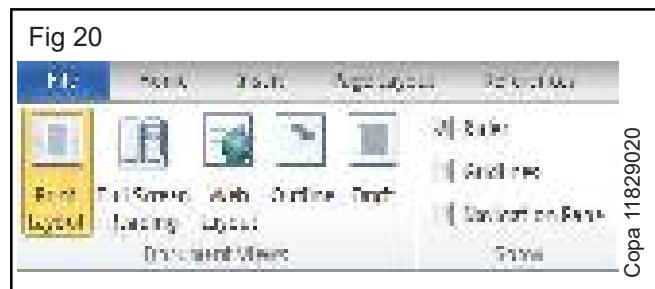
Fig 18 - Comments & Tracking Group

Comments group inserts a comment for a specific paragraph or text block.

Tracking group finds the changes made on a document by other authors in a protected mode. For example, if a document is created by user X and edited by user Y, is tracked separately with Track marks.

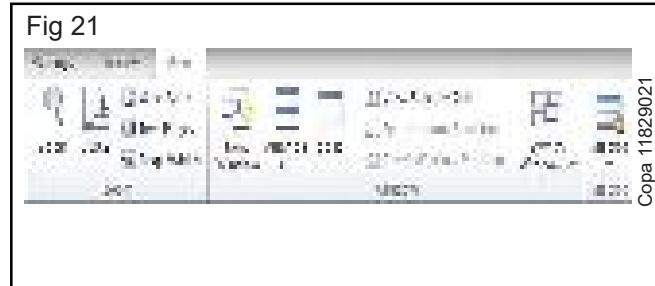
Fig 19 - Changes, Compare and Protect Groups

Changes hence made on the documents can either then accepted or rejected. More than a document can be compared for similarity using Compare. Also the document can be protected from editing by other authors.

Fig 20 - Document views and show Groups

View tab shows the way of displaying the word document. Document views have a Print Layout, a common view of Word, Full Screen Reading, minimises the tabs and ribbons to disappear and easy to read, Web Layout, which previews a html compatible view, Outline, views the basic version of document in mere text mode and Draft mode for a text editing mode.

The Rulers, Gridlines and Navigation Pane can be shown or hidden according to user preferences.

Fig 21 - Zoom / Window / Macro Groups

Also the view of the page can be Zoomed to full page, two pages view, 100% of the document and custom view. To make easy editing a document the window can be split into two, a new window for a document to cut paste, etc. can be created and all open word documents can be arranged for view. While formatting the documents, for repetition of commands the Macro option can be used. It uses the Record option to store the set of commands and repeat it again on other part of document or on another document on a single click.

Creating a file, save and other options

Objectives: At the end of this lesson you shall be able to

- explain how to create a new document, save and print
- state how to edit, format text and document styles
- brief using tables inside word document with data
- explain how to create styles in a document and save for future use
- explain Few unique features of Word 2010
- brief the mail merge processing

Fig 1 - File Info view



Word 2010 new document can be created as usual with Ctrl + N or through File menu New option. Basically the file created is saved as a word document extended format as docx in word file.

Fig 2 - Save options in Word



It can be saved using save as option in any compatible format or old versions of office, like 2003 or earlier versions. Main utility of the word software is the creation of word processing documents. It may be any of a format like publication, letter, brochure, etc. Word supports all type of formatting to design a text based presentation. Also it supports output files in major accepted formats according to industry standards.

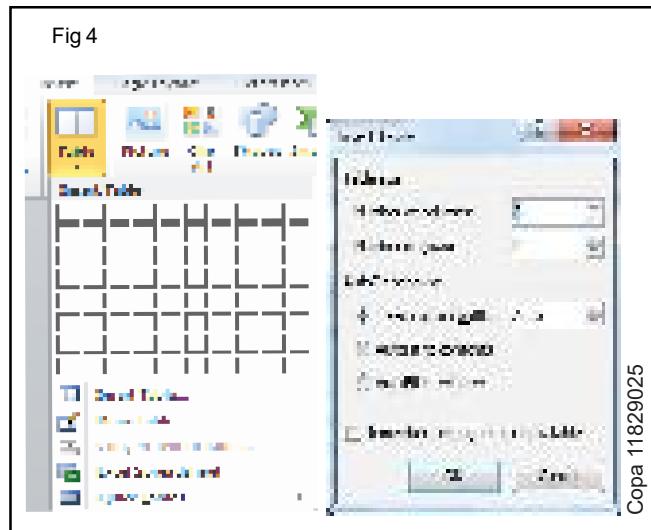
Fig 3 - Print options in word



The saved documents can be printed using the File Menu → Print option and the installed printer support makes it easy to get the document printed. If Adobe Acrobat Professional is installed, the same document can be stored as a PDF file for sharing purposes. Apart from printing and storage, the file created can be published in web as a web page or template that can be used for future publications in same format.

Basic concepts to be noted while using Word are Text properties. It includes Font type, Font size, Text Color, and usual decorations of text. Also creating of paragraphs styles are to be kept in mind. Paragraph alignment has left, right, center and justified settings. Text elements may contain items like ordered list, unordered list, subsection lists. They are found there paragraph formatting block of Home Tab. Indenting of text for creating Quotes is also there inside the same tab. According to the page size, line spacing and paragraph spacing can be adjusted, like before and after paragraph spaces, line heights, etc. The Styles can be predefined to use as ready to put on places where it required. Standard templates are available but it allows to create custom styles too.

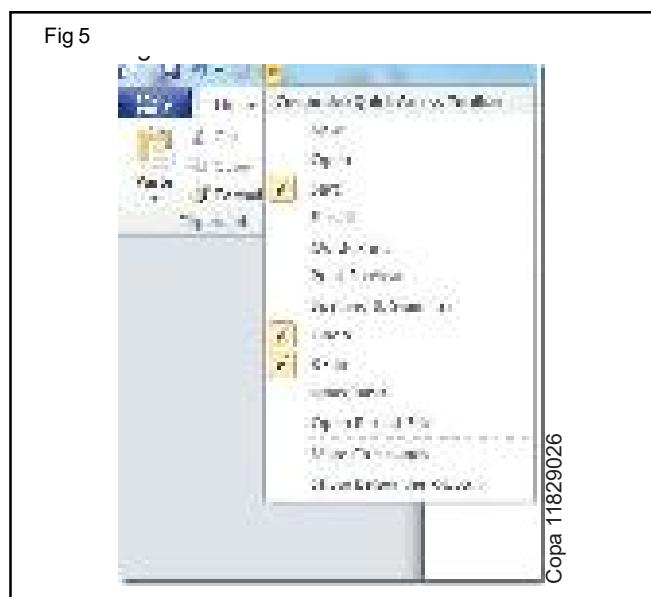
Tables can be inserted for various utilities. Normal table has adjustable width and columns so it can simply inserted with Insert > Table option directly.

Fig 4 - Table insert wizard options

In case of custom sized table is required, it can be created using insert table / draw table options. Insert table allows custom values for columns, width and other properties. Draw table creates custom table using a pen drawing tool through which new table can be drawn according to the available text contents.

Customizable Quick Access Tool Bar

Word 2010's Quick Access Toolbar displays all the commonly used options. It is located in the top left side corner of the application window, near the office button. By default it displays the following three options, Save, Undo and Redo, but is customizable and you may easily add more options to it. (Fig 5)



Paste Preview

It happens with most users that after copying and pasting something into their document, they need to undo the some changes. Word 2010 has made it easy for users, now you may eliminate this unnecessary step by using the paste preview option. It allows users to paste only the values or the formatting. (Fig 6)

Fig 6

Navigation Pane

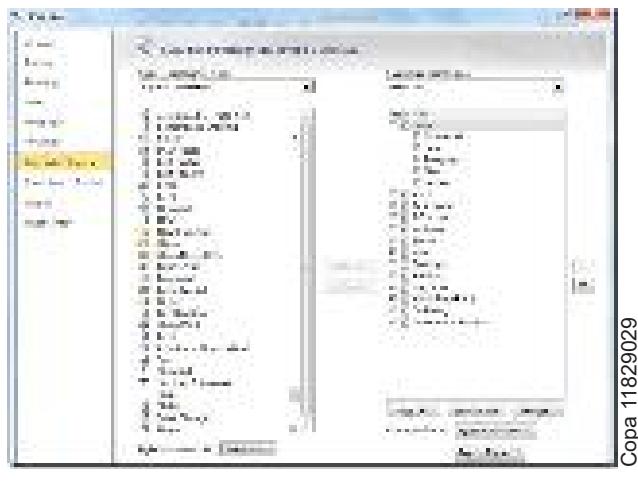
In the previous versions of Microsoft Office, one has to use the Ctrl+F hotkey to find any word or phrase from within a document. Word 2010 has added a new magic to this option, Ctrl+F now summons a Navigation Pane that appears on the left side of the document. You will see the three views available by clicking on their respective tabs, the Heading View, Thumbnail Page View, and the Search Result View. (Fig 7)

Fig 7

Customizable Ribbon Button

Apparently the Ribbon button in Word 2010 looks like the one in Word 2007. But there is one big addition, you may customize the word 2010's Ribbon button. In order to customize the Ribbon button navigate to the following option Office Button > Word Option > Customize Ribbon. (Fig 8)

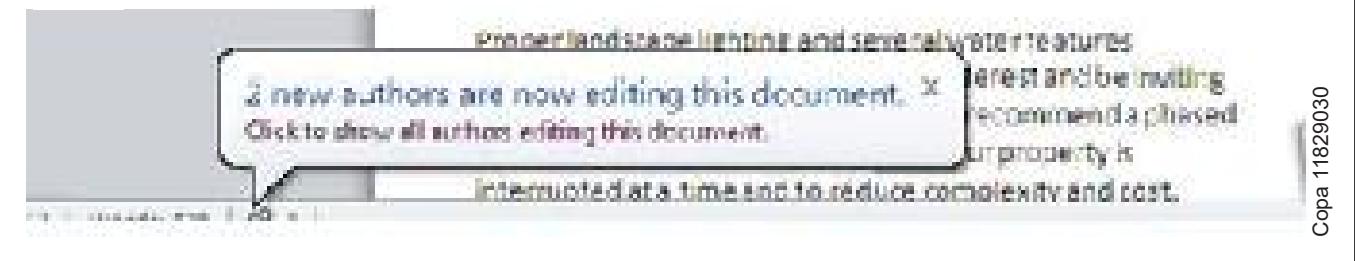
Fig 8



Improved Collaborations

Microsoft Word 2010 has a new feature called co-authoring. It allows more than one authors to edit a document at the same time. Word 2010 tells you how many authors are editing the document and their changes can be viewed too. (Fig 9)

Fig 9



Screen Capture Tool

Word 2010 includes a feature called Screen Capturing, now there is no need to use a third party or additional tool to capture a screenshot in order to use it in Word, just simply use Word 2010's built in tool to capture any area of the screen. A Screenshot may be taken by navigating to the following option Insert > Screenshot. (Fig 10)

Fig 10



Artistic Effects

In Word 2010 users can now apply a number of snazzy artistic effects to the pictures. In order to add the artistic effects to your document, Navigate to the following option Insert > Illustrations > Picture. Then browse and select the picture you want, Once the picture is added to your document, then the Picture Tools contextual tab is displayed and you will be able to see the new Artistic Effects drop down button over here. (Fig 11)

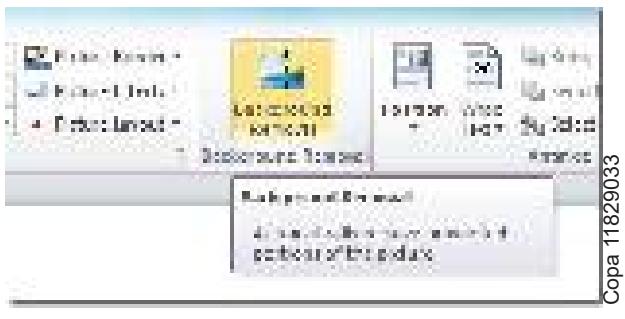
Fig 11



The Background Removal Option

Office 2010 has an awesome option by the name of Background Removal, which simply removes the background of any image. Yes, you don't need Photoshop anymore to remove the background. First insert the picture in your Word document from the Insert > Picture option. Then locate the Background Removal tool and get rid of the background. (Fig 12)

Fig 12



Office Backstage

The Office Backstage is a new concept, it is the enhanced form of the plain old office button and provides a much user-friendly menu. It helps users to manage documents, presentations, or spreadsheets at a greater level. (Fig 13)

Fig 13

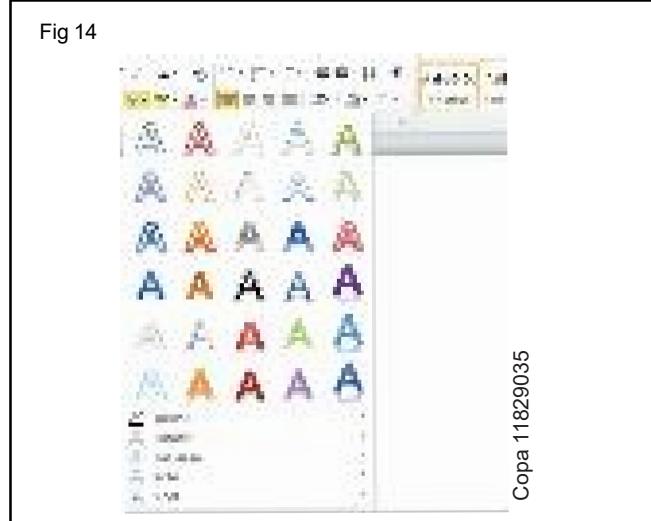


Interesting feature, right? Read more about it here.

New Art Effects in WordArt

Just like other features, WordArt has been updated with new colorful art effects. Select the text, then click Word Art and a list of all the available options will be displayed. (Fig 14)

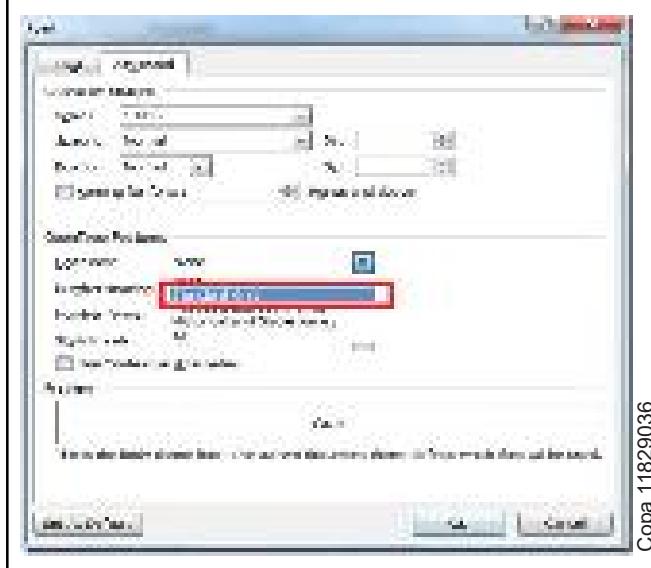
Fig 14



Ligatures

You might have heard about Ligatures. They make the fonts look fancy and they are also used to keep letters separate allowing you to search the text as if the font were regular. Its true that not all fonts support ligatures, but a large variety of the fonts supports them. You may enable them from Font Preferences > advanced, then select the standard only option in the ligatures drop down box. (Fig 15)

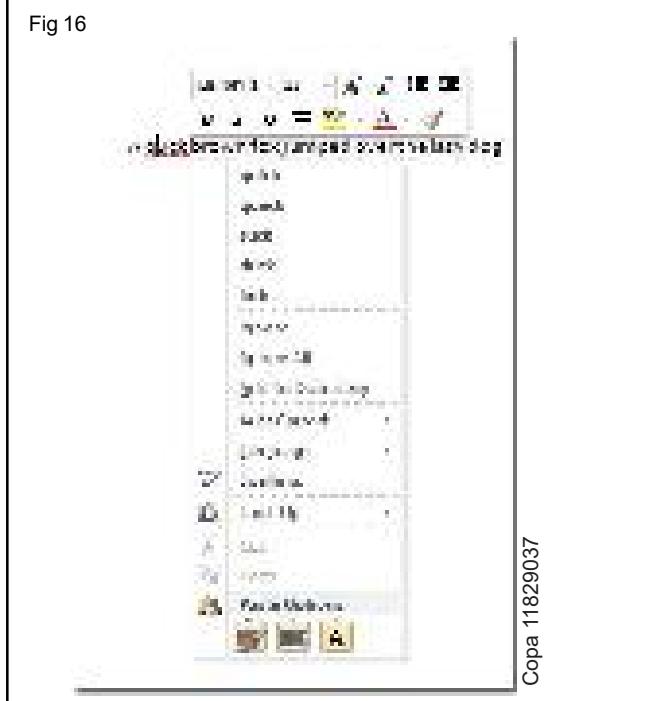
Fig 15



Improved Spell Checks

Word 2010 has added some new features to its spell checker, now it will detect the mistake and suggest changing the sentence.

Fig 16



Shortcut keys in Word 2010

Objective : at the end of the lesson you shall be able to

- **Learn the shortcut keys in MS Word.**

CTRL+SHIFT+A	converts the selected text to capital letters or vice versa
CTRL+SHIFT+F	Displays the Font dialog box.
CTRL+SHIFT+G	Displays the Word Count dialog box.
CTRL+SHIFT+S	Displays the Apply Styles task pane.
ALT+R	Displays the Review tab
ALT+CTRL+1	Apply Heading 1, Similarly ALT + CTRL + 2 will apply heading 2
CTRL+SHIFT+L	Applies Bullets
CTRL+SHIFT+F5	Bookmark
CTRL + B	Bold Text
CTRL + I	Italic Text
CTRL + U	Underline Text
CTRL+PAGE DOWN	Next
CTRL+E	Navigate to the center Paragraph
CTRL+SHIFT+ENTER	Column Break
CTRL+SHIFT+C	Copy Format
ALT+SHIFT+F7	Dictionary
ALT+CTRL+S	Splits the Document
CTRL+SHIFT+D	Double Underline
CTRL+END	End of Document
END	End of line
CTRL+SHIFT+P	Font size select
SHIFT+F5 or ALT+CTRL+Z	Go Back to previous state

CTRL+SHIFT+.	Grow Font
CTRL+]	Grow Font one point
ALT+SHIFT+R	Header Footer Link
CTRL+K	Hyperlink
CTRL+M	Indentation
CTRL+J	Justifies Paragraph
ALT+F8	Inserts Macros
ALT+SHIFT+K	Mail Merge Check
F10	Menu Mode
ALT+F7	Moves to the Next Misspelling
CTRL+H	Replace
CTRL+P	Print
CTRL+SHIFT+F12	Also launches Print
ALT+SHIFT+BACKSPACE	Redo
F12	Save As
CTRL+SHIFT+K	Small Caps
CTRL+SHIFT+S	Style
SHIFT+F7	Thesaurus
ALT+SHIFT+T	Time Field
CTRL+SHIFT+M	Unindent
	-

Typing practice using open source typing tutor tools

Objectives : At the end of this lesson you shall be able to

- understand about typing software
 - typing Tutor tools.
-

You will be able to learn touch typing quickly and efficiently with the program's intelligent practice lessons, useful support functions and an extensive progress tracker. You can also play a typing game and expand the program with open lessons or make your own to meet your specific needs.

Full courses for Beginner, Advanced and Expert typists

- Introduction course. First time using keyboard. The course covers all characters typed on your keyboard.
- Beginner course. This course helps to learn the position of keys on the keyboard. After completing this course, you will know which finger to use to hit each key without looking at the keyboard. The course also covers upper-case letters, special symbols, and the numeric pad.
- Advanced course, helps to improve your typing speed by memorizing frequently used syllables and words.

Expert course helps you to perfect the skills acquired by typing an actual text.

Progress Tracking

- The statistics reflect your typing speed, accuracy and time-out, complete with a summary at the end of each lesson.
- and it suggests your next step: Go to the next lesson or Try again comparing the results with Course goals.
- You can evaluate your own performance or students at any time by simply looking at charts.
- overall lesson rate, typing speed(WPM, CPM, KPM, WPS, CPS, KPS), accuracy and time-out are enabled in the both: table and chart presentation
- also, for each lesson, statistics by each character and keystroke in the column charts

The Typing Tutor Advantage

- Easy to Get Started
Create classes to group your students, and Import your entire student roster using our simple Student Import tool.
- Reporting
Access and export detailed reporting data. Reports and graphs exist for all levels of data.
- Statistical Graphs & Charts
Both students and teachers have access to detailed graphs and statistics to track progress.
- Complete Course - Novice to Professional
Beginner, Intermediate, Advanced, and Specialty Lessons to help typists of all levels.
- Fun Interactive Typing Games
Students can take a break from the exercises to practice with several educational typing games.
- Typing Test
Students can repeat the typing test to track their progress over time.
- Helpful Typing Hints & Tips
Tips and helpful technique information is constantly provided to reinforce proper typing techniques.
- On-Screen Keyboard & Hand Diagram
Key position and proper finger placement is always displayed to keep beginners from looking at their hands.

Introduction to MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
 - formulas and Functions
 - move Around in Excel 2010
 - conditional Formatting
 - link Excel Spreadsheet Data
-

Features & Functions of Microsoft Excel

Whether for work or home use, an Excel spreadsheet is the best tool in Microsoft Office for organizing data and making lists. Although Word documents can include tables and columns, Excel makes laying out information easier. Excel also has a range of functions for designing formulas that automate calculations. Although Excel looks intimidating at first, the program's layout is similar to other Office applications.

Cells and Worksheets

The main portion of Excel's window consists of a spreadsheet -- or worksheet of cells. Just as with a paper spreadsheet, each cell can contain any numbers or any text -- unlike working with an Access database, Excel allows to simply click on any cell and fill it however best fits the project.

In some cases, such as to track spending, if want to use an organized series of rows and columns. Other times, such as building a list of team members, cell order and positioning won't play a major role. One advantage to Excel is how simple it makes reorganizing data: select a cell and drag its border to move it to a new spot on the sheet.

Excel Workbooks

Every Excel file, called a workbook, contains one or more worksheets. To switch between sheets in a workbook, use the tabs in the lower left corner of the window. Since Excel 2010, most workbooks use the file extension XLSX,

whereas older versions used XLS files. New copies of Excel can read these old files, but to open a new workbook in an old edition, the old PC needs the Office compatibility pack.

Formulas and Functions

In addition to containing plain text and numbers, cells can contain formulas, which always start with an equals sign. With a formula, Excel displays the result of an equation in a cell, but automatically keeps that result up-to-date as you change its components. A basic formula can take the place of a calculator: write "=2+4" and Excel displays "6." Formulas also work with data in other cells: "=A1+B1" adds the values of cells A1 and B1.

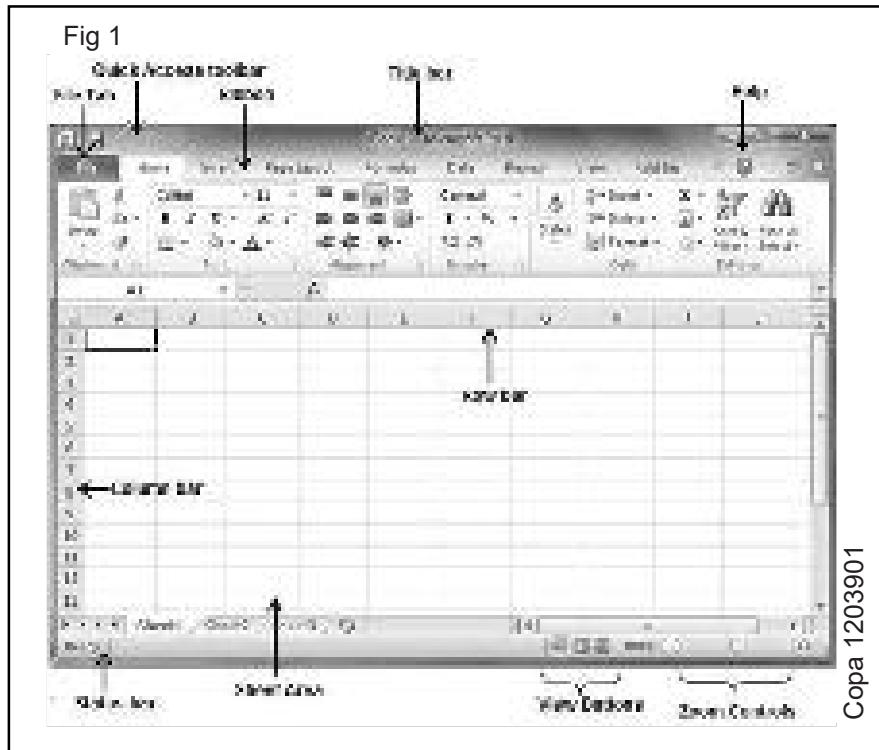
For procedures other than direct arithmetic, use functions to perform various operations on data. Functions' abilities range from simple math, such as "AVERAGE" to average a range of cells, to modifying text, such as "LOWER" to convert a line to lower case.

The two terms are often confused, but remember that each cell can contain only one formula, but each formula can use multiple functions, such as "=AVERAGE(A1, B1)+SUM(A2, B2)" to add the sum of two cells to the average of two other cells.

The following basic window appears when you start the excel application. Let us

now understand the various important parts of this window as shown in fig-1.

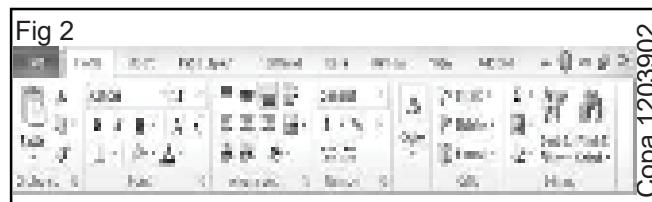
Ribbon Tabs



Copa 1203901

As with the rest of Office since 2007, Microsoft has replaced Excel's menus with ribbon tabs as shown in fig-2. The tab as visual menus that remain open each tab contains a set of related features with explanatory icons. For example, the Home tab contains the most common options, such as font and text color, while the Insert tab offers ways to insert tables, text boxes and charts. One tab, File, behaves differently. File still contains basic tasks including "New," "Open" and "Save," but displays these tasks in a full-screen area with extra options, called the backstage view. For example, the "New" button in the backstage view offers a searchable selection of templates for new workbooks.

Ribbon contains commands organized in three



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components:

Tabs: They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout is the examples of ribbon tabs.

Groups: They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment etc.

?Home: Use this tab when creating, formatting, and editing a spreadsheet.

This tab is arranged into the Clipboard, Font, Alignment, Number, Styles, Cells, and Editing groups.

Insert: Use this when adding particular elements (including graphics, PivotTables, charts, hyperlinks, and headers and footers) to a spreadsheet. This tab is arranged into the Tables, Illustrations, Sparkline, Filter, Charts, Links, and Text groups.

Page Layout: Use this tab when preparing a spreadsheet for printing or reordering graphics on the sheet. This tab is arranged into the Themes, Page Setup, Scale to Fit, Sheet Options, and Arrange groups.

Formulas: Use this tab when adding formulas and functions to a spreadsheet or checking a worksheet for formula errors. This tab is arranged into the Function Library, Defined Names, Formula Auditing, and Calculation groups. Note that this tab also contains a Solutions group when activate certain add-in programs,

Data: Use this tab when importing, querying, outlining, and subtotaling the data placed into a worksheet's data list. This tab is arranged into the Get External Data, Connections, Sort & Filter, Data Tools, and Outline groups.

Review: Use this tab when proofing, protecting, and marking up a spreadsheet for review by others. This tab is arranged into the Proofing, Language, Comments, and Changes groups. Note that this tab also contains an Ink group with a sole Start Inking button if you're running Office 2010 on a Tablet PC or on a computer equipped with some sort of electronic input tablet.

View: Use this tab when changing the display of the Worksheet area and the data it contains. This tab is arranged into the Workbook Views, Show, Zoom, Window, and Macros groups.

Title Bar

This lies in the middle and at the top of the window. Title bar shows the program and the sheet titles.

Help

The Help Icon can be used to get excel related help anytime you like. This provides nice tutorial on various subjects related to excel.

Zoom Control

Zoom control lets to zoom in for a closer look at your text. The zoom control consists of a slider that user can slide left or right to zoom in or out. The + buttons can be clicked to increase or decrease the zoom factor.

View Buttons

The group of three buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch among excel's various sheet views.

Normal Layout view: This displays the page in normal view.

Page Layout view: This displays pages exactly as they will appear when printed. This gives a full screen look of the document.

Page Break view: This shows a preview of where pages will break when printed.

Sheet Area

The area where to enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type.

Row Bar

Rows are numbered from 1 onwards and keeps on increasing as to keep entering data. Maximum limit is 1,048,576 rows.

Column Bar

Columns are numbered from A onwards and keeps on increasing as to keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.

Status Bar

This displays the sheet information as well as the insertion point location. From left to right, this bar can contain the total number of pages and words in the document, language etc.

User can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list

File Tab

The File tab replaces the Office button from Excel 2010. User can click it to check the Backstage view, where user come to open or save files, create new sheets, print a sheet, and do other file-related operations.

Quick Access Toolbar

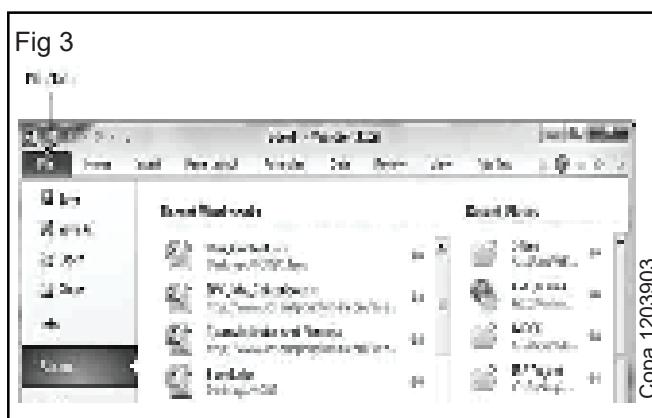
The File tab and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. And customize this toolbar based on the comfort.

Dialog Box Launcher(Fig-3)

This appears as a very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

If already have an opened sheet then it will display a window showing the

details about the opened sheet as shown fig-4. Backstage view shows three columns when select most of the available options in the first column.



First column of the backstage view will have the following options as shown in

Table-1:

Option	Description
Save	If an existing sheet is opened, it would be saved as is, otherwise it will display a dialogue box asking for the sheet name.
Save As	A dialogue box will be displayed asking for sheet name and sheet type. By default, it will save in sheet 2010 format with extension .xlsx.
Open	This option is used to open an existing excel sheet.
Close	This option is used to close an opened sheet.
Info	This option displays the information about the opened sheet.

Option	Description
Recent	This option lists down all the recently opened sheets.
New	This option is used to open a new sheet.
Print	This option is used to print an opened sheet.
Save & Send	This option saves an opened sheet and displays options to send the sheet using email etc.
Help	You can use this option to get the required help about excel 2010.
Options	Use this option to set various option related to excel 2010.
Exit	Use this option to close the sheet and exit.

Sheet Information

When click Info option available in the first column, it displays the following information in the second column of the backstage view:

Compatibility Mode: If the sheet is not a native excel 2007/2010 sheet, a Convert button appears here, enabling to easily update its format. Otherwise, this category does not appear.

Permissions: This option used to protect the excel sheet. And can set a password so that nobody can open the sheet, or lock the sheet so that nobody can edit the sheet.

Prepare for Sharing: This section highlights important information should know about the sheet before send it to others, such as a record of the edits the made as developed the sheet.

Versions: If the sheet has been saved several times, and may be able to access previous versions of it from this section.

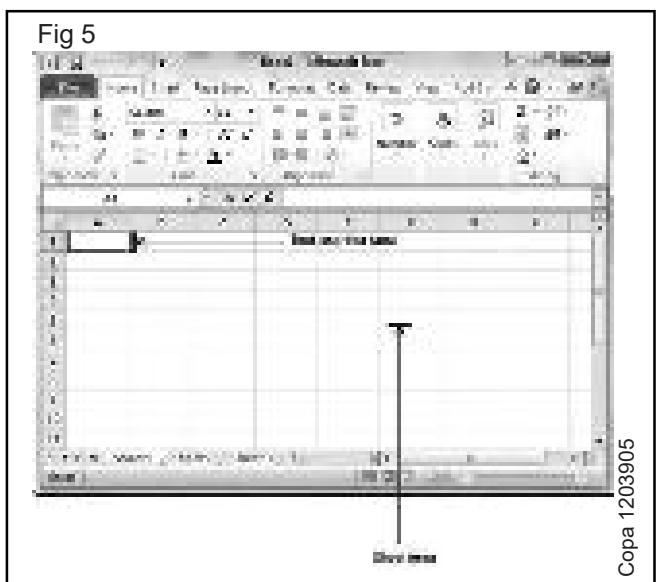
Sheet Properties

When click Info option available in the first column, it displays various properties in the third column of the backstage view. These properties include sheet size, title, tags, categories etc.

User can also edit various properties. Just try to click on the property value and if property is editable, then it will display a text box where can add the text like title, tags, comments, Author.

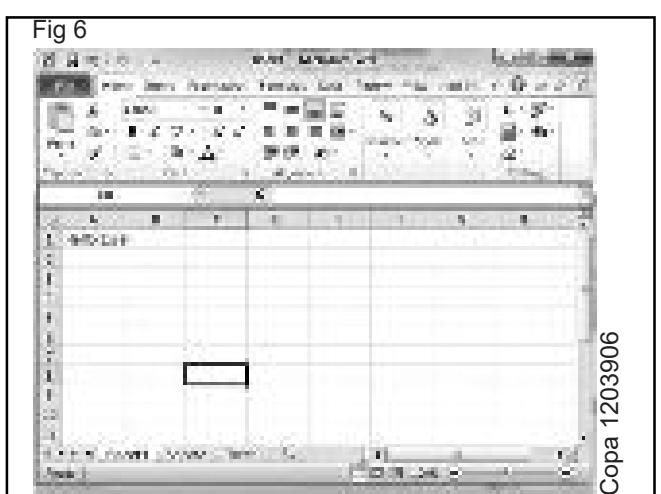
Entering values

A new sheet is displayed by default when open an excel sheet as shown in the fig-5 screen shot.



Sheet area is the place of type the text. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type. When click on a box then the box is highlighted. When double click the box, the flashing vertical bar appears and can start entering the data.

So, just keep the mouse cursor at the text insertion point and start typing whatever text would like to type. We have typed only two words "HelloExcel" as shown fig-6. The text appears to the left of the insertion point.



There are following three important points, which would help while typing:

- Press Tab to go to next column.
- Press Enter to go to next row.
- Press Alt + Enter to enter a new line in the same column.

Move Around in Excel 2010

Excel provides a number of ways to move around a sheet using the mouse and the keyboard.

First of all, let us create some sample text before we proceed. Open a new excel sheet and type any data. A sample data table as shown table-2 and fig-7.

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

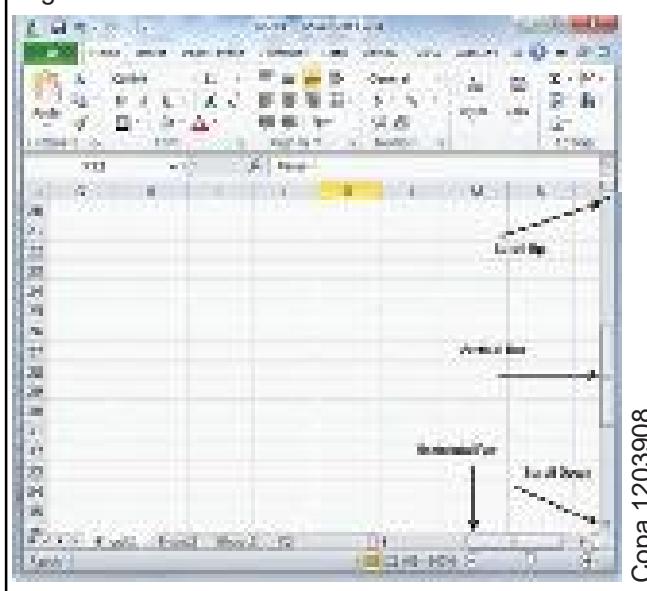
Fig 7 Table-2

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

Moving with Mouse

Mouse can easily move the insertion point by clicking in the text anywhere on the screen. Sometime if the sheet is big then user cannot see a place need to move. In such situations, to use the scroll bars, as shown fig-8 screen shot.

Fig 8



user can scroll the sheet by rolling mouse wheel, which is equivalent to clicking the up-arrow or down-arrow buttons in the scroll bar.

Moving with Scroll Bars

As shown in the above screen capture, there are two scroll bars: one for moving vertically within the sheet, and one for moving horizontally. Using the vertical scroll bar, user may ?

- Move upward by one line by clicking the upward-pointing scroll arrow.
- Move downward by one line by clicking the downward-pointing scroll arrow.
- Move one next page, using next page button (footnote).
- Move one previous page, using previous page button (footnote).
- Use Browse Object button to move through the sheet, going from one chosen object to the next.

Moving with Keyboard

The following keyboard commands, used for moving around your sheet, also move the insertion point -

Keystroke	Where the Insertion Point Moves
→	Forward one box
←	Back one box
↑	Up one box
↓	Down one box
PageUp	To the previous screen
PageDown	To the next screen
Home	To the beginning of the current screen
End	To the end of the current screen

User can move box by box or sheet by sheet. Now click in any box containing data in the sheet. It would have to hold down the Ctrl key while pressing an arrow key, which moves the insertion point as described here -

Key Combination	Where the Insertion Point Moves
Ctrl + →	To the last box containing data of the current row.
Ctrl + ←	To the first box containing data of the current row.
Ctrl + ↑	To the first box containing data of the current column.
Ctrl + ↓	To the last box containing data of the current column.
Ctrl + Page Up	To the sheet in the left of the current sheet.
Ctrl + Page Down	To the sheet in the right of the current sheet.
Ctrl + Home	To the beginning of the sheet.
Ctrl + End	To the end of the sheet.

Moving with Go To Command

Press F5 key to use Go To command as shown in fig-9, which will display a dialogue box contains various options to reach to a particular box.

Normally, we use row and column number, for example K5 and finally press Go To button.

Fig 9



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Conditional Formatting

MS Excel 2010 Conditional Formatting feature enables to format a range of values so that the values outside certain limits, are automatically formatted.

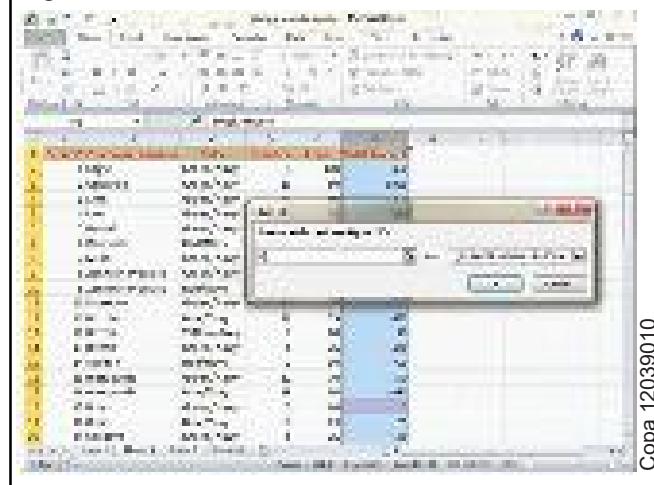
Choose Home Tab " Style group " Conditional Formatting dropdown.

Various Conditional Formatting Options

- **Highlight Cells Rules ?** It opens a continuation menu with various options for defining the formatting rules that highlight the cells in the cell selection that contain certain values, text, or dates, or that have values greater or less than a particular value, or that fall within a certain ranges of values.

Suppose to find cell with Amount 0 and Mark them as red. Choose Range of cell " Home Tab " Conditional Formatting DropDown " Highlight Cell Rules " Equal To as on fig-10.

Fig 10



After Clicking ok, the cells with value zero are marked as red as shown in fig-11.

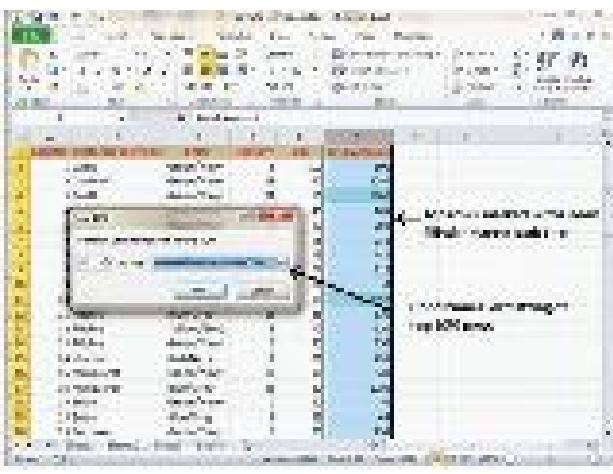
Fig 11

1	Chait	Green,White	10	30	300
2	Carmell	Green,White	10	30	300
3	Caroli	Green,White	10	30	300
4	Jad	Green,White	10	30	300
5	Kirpal	Green,White	10	30	300
6	Kiranpal	Amber	10	30	300
7	Kiran	Green,White	10	30	300
8	Kushalpreet	Green,White	10	30	300
9	Kushalpreet	Amber	10	30	300
10	Kwan	Green,White	10	30	300
11	Kwan	Amber	10	30	300
12	Kwan	Yellow,White	10	30	300
13	Kwan	Green,White	10	30	300
14	Kwan	Amber	10	30	300
15	Kwan	Yellow,White	10	30	300
16	Kwan	Green,White	10	30	300
17	Kwan	Amber	10	30	300
18	Kwan	Yellow,White	10	30	300
19	Carma	Green,White	10	30	300
20	Carma	Amber	10	30	300

- **Top/Bottom Rules:** It opens a continuation menu with various options for defining the formatting rules that highlight the top and bottom values, percentages, and above and below average values in the cell selection.

Suppose want to highlight the top 10% rows user can do this with these Top/Bottom rules as shown in fig-12.

Fig 12

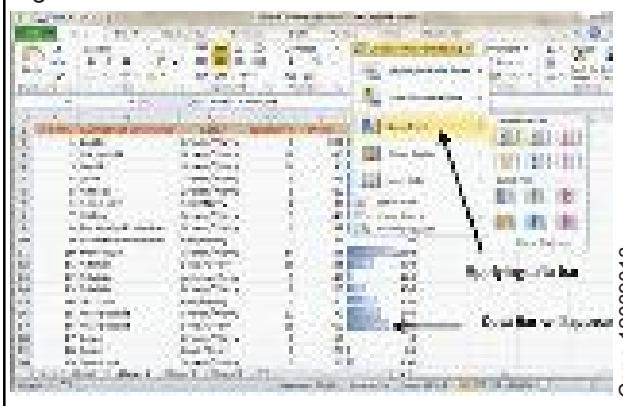


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- **Data Bars(fig-13):** It opens a palette with different color data bars that can apply to the cell selection to indicate their values relative to each other by clicking the data bar thumbnail.

With this conditional Formatting data Bars will appear in each cell.

Fig 13

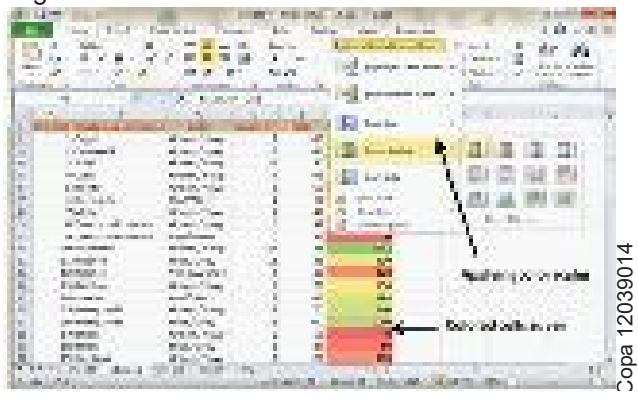


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- **Color Scales (Fig-14):** It opens a palette with different three- and two-colored scales that can apply to the cell selection to indicate their values relative to each other by clicking the color scale thumbnail.

See the below screenshot with Color Scales, conditional formatting applied.

Fig 14



- **Icon Sets** (Fig-15)? It opens a palette with different sets of icons that can apply to the cell selection to indicate their values relative to each other by clicking the icon set.

See the below screenshot with Icon Sets conditional formatting applied.

Fig 15



- **New Rule:** It opens the New Formatting Rule dialog box, where define a custom conditional formatting rule to apply to the cell selection.
- **Clear Rules:** It opens a continuation menu, where can remove the conditional formatting rules for the cell selection by clicking the Selected Cells option, for the entire worksheet by clicking the Entire Sheet option, or for just the current data table by clicking the This Table option.
- **Manage Rules:** It opens the Conditional Formatting Rules Manager dialog box, edit and delete particular rules as well as adjust their rule precedence by moving them up or down in the Rules list box.

Link Excel Spreadsheet Data

Microsoft Excel provides the ability for cells in one worksheet to be linked to cells in one or more other worksheets. This is a great productivity tool and can reduce the need for additional worksheets!

Linking Excel Worksheet Data Overview

In Excel, a link is a formula that dynamically pulls in data from a cell in another worksheet. The worksheet can be in the same workbook or a different workbook.

The destination worksheet is the worksheet that contains the link formula. The worksheet containing the data that will be brought in is called the source worksheet.

Any time the cell value in the source worksheet changes, the cell containing the link formula will be updated as well the next time the spreadsheet containing the link formula is opened. This is just one of many reasons the Excel software program is so powerful.

Need for Linking Spreadsheet Data

The ability to create links often eliminates the need to have identical data entered and updated in multiple sheets. This saves time, reduces errors, and improves data integrity. For example, a company's prices can be stored in a 'Master Price List' worksheet, and others needing pricing data can link to that worksheet.

Consider a Sales Manager who has a detailed spreadsheet for each salesperson, but would like a summary sheet to compare salespersons' performance and create grand totals. The summary sheet (destination) would bring in data from all the salespersons' sheets (source).

Create the Worksheet Link

Before creating the link, format the cell containing the link formula in the destination worksheet to equal the format of the source data.

For example, if the data from the source spreadsheet is currency with 2 decimal points, then first format the target cell for currency with 2 decimal places.

METHOD ONE

1. In the source worksheet, select the cell need to link to and click the Copy button on the Home tab. Or press **Ctrl+C**, or right-click and select **Copy**.
2. Switch to the destination spreadsheet and click the cell want to link. Then, depending on the version of Excel:
 - Excel 2007, 2010, and 2013: On the Home tab, click the down arrow below Paste and click **Paste Link**. In newer versions also right-click and select the **Paste Link** from the Paste menu.
 - Excel 2003 and older versions: On the Edit menu, click **Paste Special**, and then click **Paste Link**.
3. Return to the source worksheet and press **ESC** to remove the animated border around the cell.

METHOD TWO

This is a fast method that works in a different order than Method One.

1. In the destination worksheet cell that will contain the link formula, enter an equal sign (=).

2. In the source worksheet, click in the cell that contains the data and press the Enter key.

Link Formula Example(Fig-16)

In the example below, using Method One, we click in cell B6 in the source worksheet and click Copy. Then, on the destination worksheet, we click in cell B3, and paste the link. The value (\$3,500) automatically displays.

Follow the same steps to link the data from the Denver and Seattle worksheets to the Store Totals worksheet. And first formatted the cells to display the data as Currency. (Fig 16)

Fig 16

Source Worksheet

A	B	C
Atlanta Store	Date: 08/20/09	
	\$ Collected	
1 Register #1	\$1,800	
2 Register #2	\$1,000	
3 Register #3	\$1,200	
Total:	\$3,500	

Destination Worksheet

A	B	C
Store Totals for:	08/20/09	
	\$ Collected	
1 Atlanta	\$3,500	Paste as Link
2 Denver	\$2,900	
3 Seattle	\$3,200	
Total:	\$9,600	

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Functions and formulas in MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
- formulas and Functions
- move Around in Excel 2010
- conditional Formatting
- link Excel Spreadsheet Data

Formulas in MS Excel

formula, worksheet will be just simple tabular representation of data. A formula consists of special code, which is entered into a cell. It performs some calculations and returns a result, which is displayed in the cell.

Formulas use a variety of operators and worksheet functions to work with values and text. The values and text used in formulas can be located in other cells, which makes changing data easy and gives worksheets their dynamic nature. For example, it can quickly change the data in a worksheet and formulas works.

Elements of Formulas

A formula can consist of any of these elements ?

- Mathematical operators, such as +(for addition) and *(for multiplication)

Example -

=A1+A2 Adds the values in cells A1 and A2.

- Values or text

Example -

=200*0.5 Multiplies 200 times 0.5. This formula uses only values, and it always returns the same result as 100.

- Cell references (including named cells and ranges)

Example -

=A1=C12 Compares cell A1 with cell C12. If the cells are identical, the formula returns TRUE; otherwise, it returns FALSE.

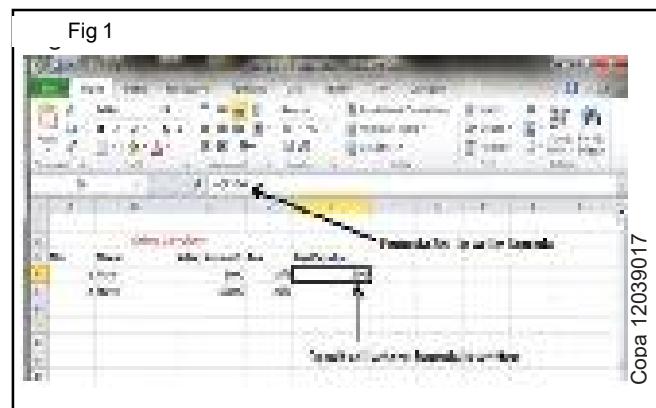
- Worksheet functions (such as SUM or AVERAGE)

Example -

=SUM(A1:A12) Adds the values in the range A1:A12.

Creating Formula

For creating a formula need to type in the Formula Bar. Formula begins with '=' sign. When building formulas manually, and can either type in the cell addresses or can point to them in the worksheet. Using the Pointing method to supply the cell addresses for formulas is often easier and more powerful method of formula building. When using built-in functions, to click the cell or drag through the cell range that want to use when defining the function's arguments in the Function Arguments dialog box as shown in Fig 1.



As soon as complete a formula entry, Excel calculates the result, which is then displayed inside the cell within the worksheet (the contents of the formula, however, continue to be visible on the Formula bar anytime the cell is active). If you make an error in the formula that prevents Excel from being able to calculate the formula at all, Excel displays an Alert dialog box suggesting how to fix the problem.

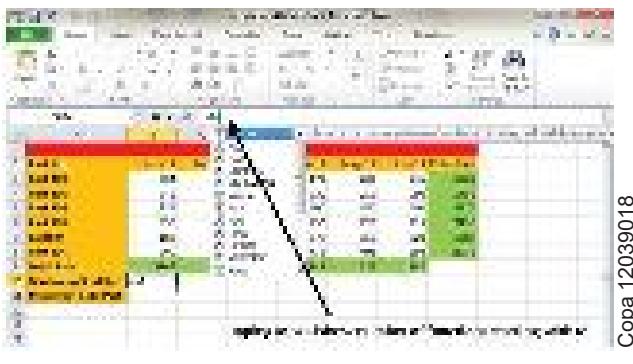
Functions in Formula

Many formulas are created using available worksheet functions. These functions enable to greatly enhance the power of the formulas and perform calculations that are difficult if use only the operators. For example, one can use the LOG or SIN function to calculate the Logarithm or Sin ratio. And cannot do this complicated calculation by using the mathematical operators alone.

Using Functions

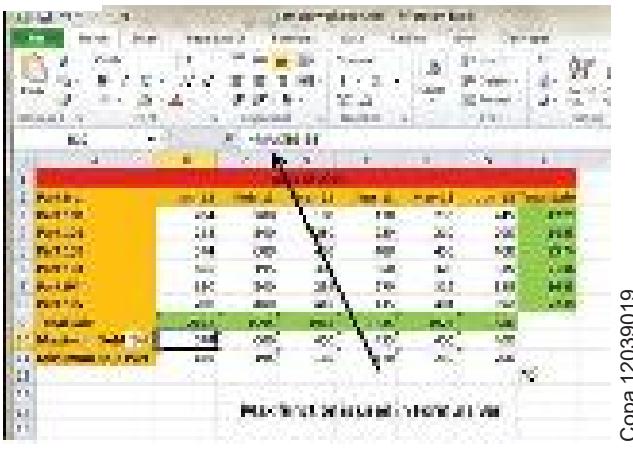
When type = sign and then type any alphabet the searched functions will show fig 2.

Fig 2



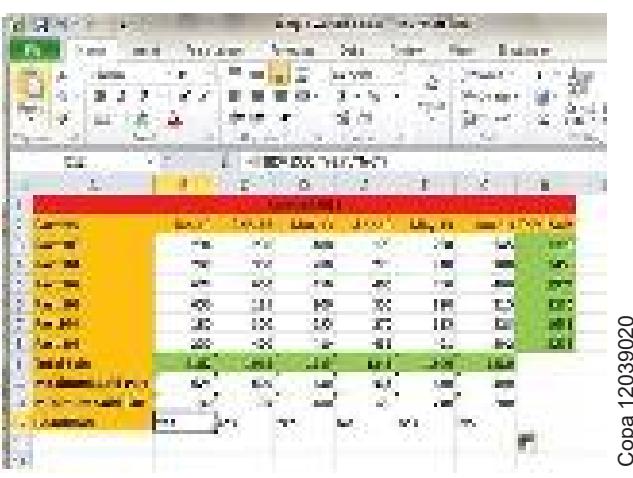
Suppose need to determine the largest value in a range. A formula can't tell the answer without using a function. We will use formula that uses the MAX function to return the largest value in the range B3:B8 as **=MAX(A1:D100)** as shown in fig 3.

Fig 3



Another example of functions. Suppose to find if the cell of month is greater than 1900 then we can give Bonus to Sales representative. The we can achieve it with writing formula with IF functions as **=IF(B9>1900,"Yes","No")** as shown in fig 4.

Fig 4



Function Arguments

In the above examples, notice that all the functions used parentheses. The information inside the parentheses is the list of arguments.

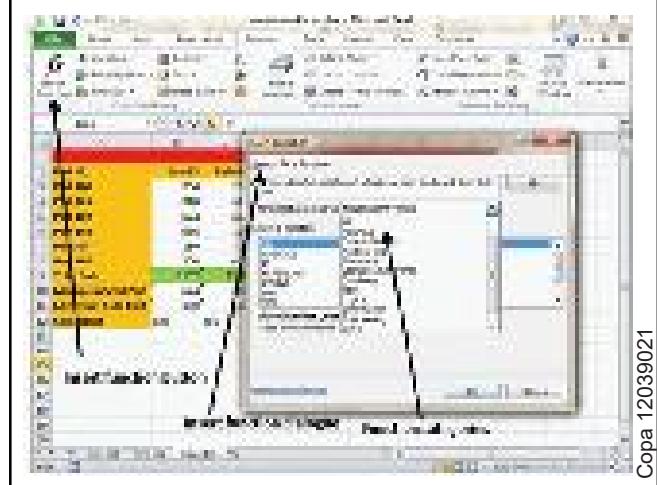
Functions vary in how they use arguments. Depending on what it has to do, a function may use.

- **No arguments** - Examples ? Now(), Date(), etc.
- **One argument** - UPPER(), LOWER(), etc.
- **A fixed number of arguments** - IF(), MAX(), MIN(), AVERAGE(), etc.
- **Infinite number of arguments**
- **Optional arguments**

Built In Functions

MS Excel has many built in functions, which we can use in our formula. To see all the functions by category, choose Formulas Tab " Insert Function as shown in fig-5. Then Insert function Dialog appears from which we can choose the function.

Fig 5



Functions by Categories

Let us see some of the built in functions in MS Excel.

Text Functions

LOWER: Converts all characters in a supplied text string to lower case

UPPER: Converts all characters in a supplied text string to upper case

TRIM : Removes duplicate spaces, and spaces at the start and end of a text string

CONCATENATE : Joins together two or more text strings.
Fig 4

LEFT : Returns a specified number of characters from the start of a supplied text string.

MID : Returns a specified number of characters from the middle of a supplied text string

RIGHT : Returns a specified number of characters from the end of a supplied text string.

LEN: Returns the length of a supplied text string

FIND: Returns the position of a supplied character or text string from within a supplied text string (case-sensitive).

Date & Time

DATE: Returns a date, from a user-supplied year, month and day.

TIME: Returns a time, from a user-supplied hour, minute and second.

DATEVALUE: Converts a text string showing a date, to an integer that represents the date in Excel's date-time code.

TIMEVALUE: Converts a text string showing a time, to a decimal that represents the time in Excel.

NOW: Returns the current date & time.

TODAY: Returns today's date.

Statistical

MAX: Returns the largest value from a list of supplied numbers.

MIN: Returns the smallest value from a list of supplied numbers.

AVERAGE: Returns the Average of a list of supplied numbers.

COUNT: Returns the number of numerical values in a supplied set of cells or values.

COUNTIF: Returns the number of cells (of a supplied range), that satisfies a given criteria.

SUM: Returns the sum of a supplied list of numbers

Logical

AND: Tests a number of user-defined conditions and returns TRUE if ALL of the conditions evaluate to TRUE, or FALSE otherwise

OR: Tests a number of user-defined conditions and returns TRUE if ANY of the conditions evaluate to TRUE, or FALSE otherwise.

NOT: Returns a logical value that is the opposite of a user supplied logical value or expression i.e. returns FALSE if the supplied argument is TRUE and returns TRUE if the supplied argument is FALSE.

Math & Trig

ABS: Returns the absolute value (i.e. the modulus) of a supplied number.

SIGN: Returns the sign (+1, -1 or 0) of a supplied number.

SQRT: Returns the positive square root of a given number.

MOD: Returns the remainder from a division between

two supplied numbers.

Filters in MS Excel

Filtering data in MS Excel refers to displaying only the rows that meet certain conditions. (The other rows gets hidden.)

Using the store data, if user interested in seeing data where Shoe Size is 36, then set filter to do this. Follow the below mentioned steps to do this.

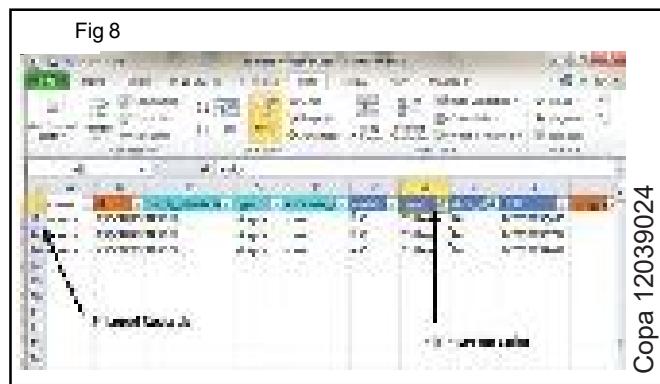
- Place a cursor on the Header Row.
- Choose **Data Tab > Filter** to set filter as shown in fig 6.

Fig 6

Shoe ID	Shoe Type	Color	Size	Quantity	Price
SHO101	Leather	Black	36	10	1200
SHO102	Leather	Black	36	10	1200
SHO103	Leather	Black	36	10	1200
SHO104	Leather	Black	36	10	1200
SHO105	Leather	Black	36	10	1200
SHO106	Leather	Black	36	10	1200
SHO107	Leather	Black	36	10	1200
SHO108	Leather	Black	36	10	1200
SHO109	Leather	Black	36	10	1200
SHO110	Leather	Black	36	10	1200
SHO111	Leather	Black	36	10	1200
SHO112	Leather	Black	36	10	1200
SHO113	Leather	Black	36	10	1200
SHO114	Leather	Black	36	10	1200
SHO115	Leather	Black	36	10	1200
SHO116	Leather	Black	36	10	1200
SHO117	Leather	Black	36	10	1200
SHO118	Leather	Black	36	10	1200
SHO119	Leather	Black	36	10	1200
SHO120	Leather	Black	36	10	1200
SHO121	Leather	Black	36	10	1200
SHO122	Leather	Black	36	10	1200
SHO123	Leather	Black	36	10	1200
SHO124	Leather	Black	36	10	1200
SHO125	Leather	Black	36	10	1200
SHO126	Leather	Black	36	10	1200
SHO127	Leather	Black	36	10	1200
SHO128	Leather	Black	36	10	1200
SHO129	Leather	Black	36	10	1200
SHO130	Leather	Black	36	10	1200
SHO131	Leather	Black	36	10	1200
SHO132	Leather	Black	36	10	1200
SHO133	Leather	Black	36	10	1200
SHO134	Leather	Black	36	10	1200
SHO135	Leather	Black	36	10	1200
SHO136	Leather	Black	36	10	1200
SHO137	Leather	Black	36	10	1200
SHO138	Leather	Black	36	10	1200
SHO139	Leather	Black	36	10	1200
SHO140	Leather	Black	36	10	1200
SHO141	Leather	Black	36	10	1200
SHO142	Leather	Black	36	10	1200
SHO143	Leather	Black	36	10	1200
SHO144	Leather	Black	36	10	1200
SHO145	Leather	Black	36	10	1200
SHO146	Leather	Black	36	10	1200
SHO147	Leather	Black	36	10	1200
SHO148	Leather	Black	36	10	1200
SHO149	Leather	Black	36	10	1200
SHO150	Leather	Black	36	10	1200
SHO151	Leather	Black	36	10	1200
SHO152	Leather	Black	36	10	1200
SHO153	Leather	Black	36	10	1200
SHO154	Leather	Black	36	10	1200
SHO155	Leather	Black	36	10	1200
SHO156	Leather	Black	36	10	1200
SHO157	Leather	Black	36	10	1200
SHO158	Leather	Black	36	10	1200
SHO159	Leather	Black	36	10	1200
SHO160	Leather	Black	36	10	1200
SHO161	Leather	Black	36	10	1200
SHO162	Leather	Black	36	10	1200
SHO163	Leather	Black	36	10	1200
SHO164	Leather	Black	36	10	1200
SHO165	Leather	Black	36	10	1200
SHO166	Leather	Black	36	10	1200
SHO167	Leather	Black	36	10	1200
SHO168	Leather	Black	36	10	1200
SHO169	Leather	Black	36	10	1200
SHO170	Leather	Black	36	10	1200
SHO171	Leather	Black	36	10	1200
SHO172	Leather	Black	36	10	1200
SHO173	Leather	Black	36	10	1200
SHO174	Leather	Black	36	10	1200
SHO175	Leather	Black	36	10	1200
SHO176	Leather	Black	36	10	1200
SHO177	Leather	Black	36	10	1200
SHO178	Leather	Black	36	10	1200
SHO179	Leather	Black	36	10	1200
SHO180	Leather	Black	36	10	1200
SHO181	Leather	Black	36	10	1200
SHO182	Leather	Black	36	10	1200
SHO183	Leather	Black	36	10	1200
SHO184	Leather	Black	36	10	1200
SHO185	Leather	Black	36	10	1200
SHO186	Leather	Black	36	10	1200
SHO187	Leather	Black	36	10	1200
SHO188	Leather	Black	36	10	1200
SHO189	Leather	Black	36	10	1200
SHO190	Leather	Black	36	10	1200
SHO191	Leather	Black	36	10	1200
SHO192	Leather	Black	36	10	1200
SHO193	Leather	Black	36	10	1200
SHO194	Leather	Black	36	10	1200
SHO195	Leather	Black	36	10	1200
SHO196	Leather	Black	36	10	1200
SHO197	Leather	Black	36	10	1200
SHO198	Leather	Black	36	10	1200
SHO199	Leather	Black	36	10	1200
SHO200	Leather	Black	36	10	1200
SHO201	Leather	Black	36	10	1200
SHO202	Leather	Black	36	10	1200
SHO203	Leather	Black	36	10	1200
SHO204	Leather	Black	36	10	1200
SHO205	Leather	Black	36	10	1200
SHO206	Leather	Black	36	10	1200
SHO207	Leather	Black	36	10	1200
SHO208	Leather	Black	36	10	1200
SHO209	Leather	Black	36	10	1200
SHO210	Leather	Black	36	10	1200
SHO211	Leather	Black	36	10	1200
SHO212	Leather	Black	36	10	1200
SHO213	Leather	Black	36	10	1200
SHO214	Leather	Black	36	10	1200
SHO215	Leather	Black	36	10	1200
SHO216	Leather	Black	36	10	1200
SHO217	Leather	Black	36	10	1200
SHO218	Leather	Black	36	10	1200
SHO219	Leather	Black	36	10	1200
SHO220	Leather	Black	36	10	1200
SHO221	Leather	Black	36	10	1200
SHO222	Leather	Black	36	10	1200
SHO223	Leather	Black	36	10	1200
SHO224	Leather	Black	36	10	1200
SHO225	Leather	Black	36	10	1200
SHO226	Leather	Black	36	10	1200
SHO227	Leather	Black	36	10	1200
SHO228	Leather	Black	36	10	1200
SHO229	Leather	Black	36	10	1200
SHO230	Leather	Black	36	10	1200
SHO231	Leather	Black	36	10	1200
SHO232	Leather	Black	36	10	1200
SHO233	Leather	Black	36	10	1200
SHO234	Leather	Black	36	10	1200
SHO235	Leather	Black	36	10	1200
SHO236	Leather	Black	36	10	1200
SHO237	Leather	Black	36	10	1200
SHO238	Leather	Black	36	10	1200
SHO239	Leather	Black	36	10	1200
SHO240	Leather	Black	36	10	1200
SHO241	Leather	Black	36	10	1200
SHO242	Leather	Black	36	10	1200
SHO243	Leather	Black	36	10	1200
SHO244	Leather	Black	36	10	1200
SHO245	Leather	Black	36	10	1200
SHO246	Leather	Black	36	10	1200
SHO247	Leather	Black	36	10	1200
SHO248	Leather	Black	36	10	1200
SHO249	Leather	Black	36	10	1200
SHO250	Leather	Black	36	10	1200
SHO251	Leather	Black	36	10	1200
SHO252	Leather	Black	36	10	1200
SHO253	Leather	Black	36	10	1200
SHO254	Leather	Black	36	10	1200
SHO255	Leather	Black	36	10	1200
SHO256	Leather	Black	36	10	1200
SHO257	Leather	Black	36	10	1200
SHO258	Leather	Black	36	10	1200
SHO259	Leather	Black	36	10	1200
SHO260	Leather	Black	36	10	1200
SHO261	Leather	Black	36	10	1200
SHO262	Leather	Black	36	10	1200
SHO263	Leather	Black	36	10	1200
SHO264	Leather	Black	36	10	1200
SHO265	Leather	Black	36	10	1200
SHO266	Leather	Black	36	10	1200
SHO267	Leather	Black	36	10	1200
SHO268	Leather	Black	36	10	1200
SHO269	Leather	Black	36	10	1200
SHO270	Leather	Black	36	10	1200
SHO271	Leather	Black	36	10	1200
SHO272	Leather	Black	36	10	1200
SHO273	Leather	Black	36	10	1200
SHO274	Leather	Black	36	10	1200
SHO275	Leather	Black	36	10	1200
SHO276	Leather	Black	36	10	1200
SHO277	Leather	Black	36	10	1200
SHO278	Leather	Black	36	10	1200
SHO279	Leather	Black	36	10	1200
SHO280	Leather	Black	36	10	1200
SHO281	Leather	Black	36	10	1200
SHO282	Leather	Black	36	10	1200
SHO283	Leather	Black	36	10	1200
SHO284	Leather	Black	36	10	1200
SHO285					

Using Multiple Filters(fig-24)

Filtering of records by multiple conditions i.e. by multiple column values. Suppose after size 36 is filtered, need to have the filter where color is equal to Coffee. After setting filter for Shoe Size, choose Color column and then set filter for color. (Fig 8)

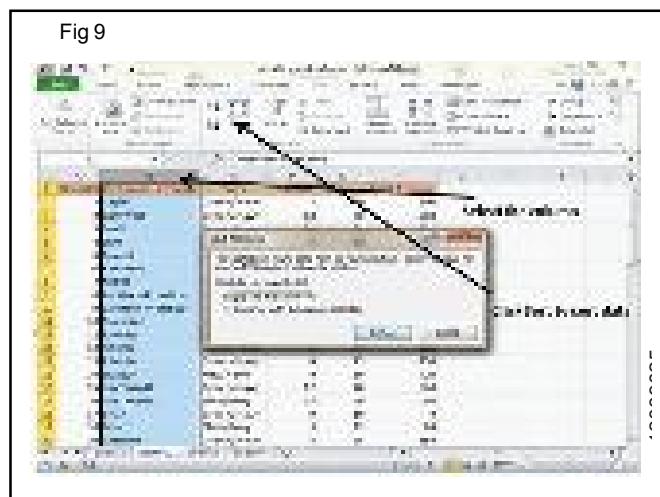


Sorting in MS Excel

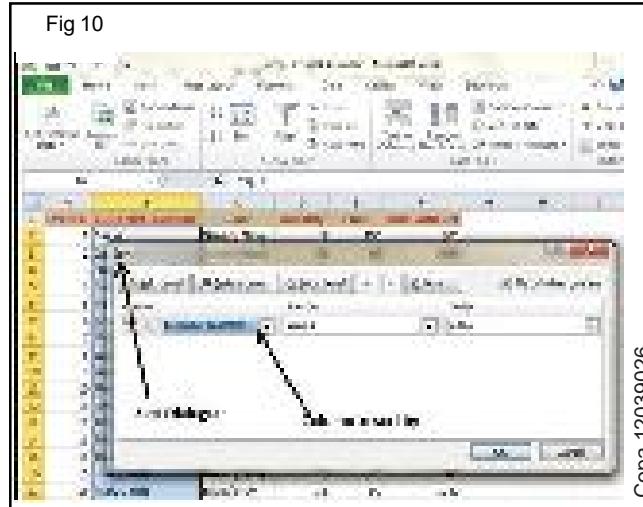
Sorting data in MS Excel rearranges the rows based on the contents of a particular column. sort a table to put names in alphabetical order Or sort data by Amount from smallest to largest or largest to smallest.

To Sort the data follow the steps mentioned below.

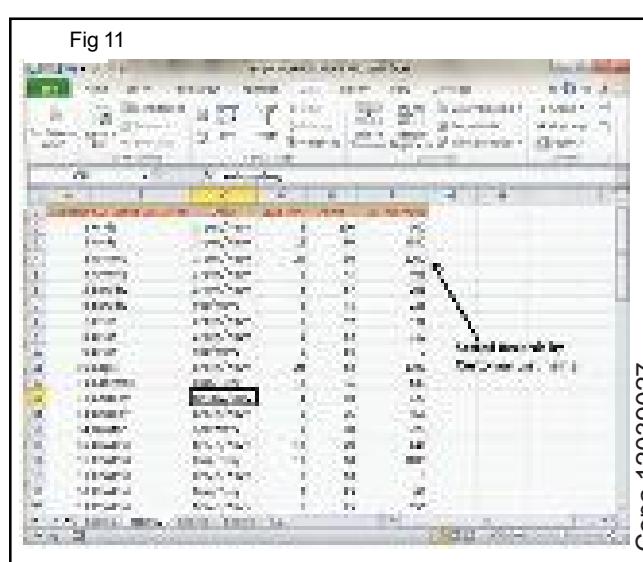
- Select the Column to sort data as on fig 9.



- Choose Data Tab " Sort Below dialog appears.
- If the user sort data based on a selected column, Choose Continue with the selection or if the data sorting based on other columns, choose Expand Selection.
- Sort the data based on the below Conditions as on fig 10.

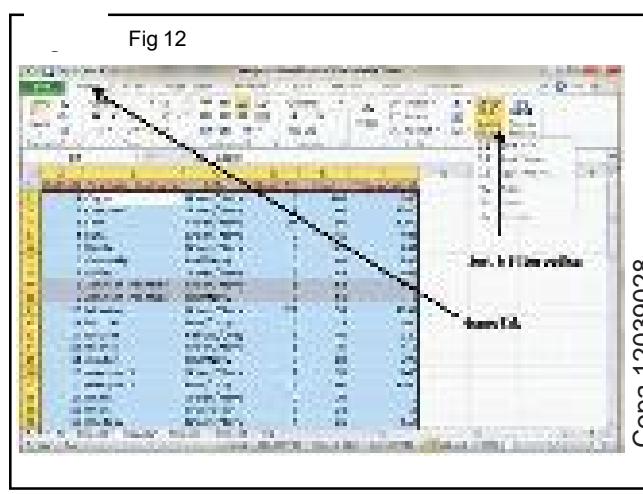


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Sorting option is also available from the Home Tab. Choose Home Tab " Sort & Filter. You can see the same dialog to sort records as on fig 12.



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Ranges in MS Excel:

A cell is a single element in a worksheet that can hold a value, some text, or a formula. A cell is identified by its address, which consists of its column letter and row number. For example, cell B1 is the cell in the second column and the first row.

A group of cells is called a range. You designate a range address by specifying its upper-left cell address and its lower-right cell address, separated by a colon.

Example of Ranges:

- C24** - A range that consists of a single cell.
- A1:B1** - Two cells that occupy one row and two columns.
- A1:A100** - 100 cells in column A.
- A1:D4** - 16 cells (four rows by four columns).

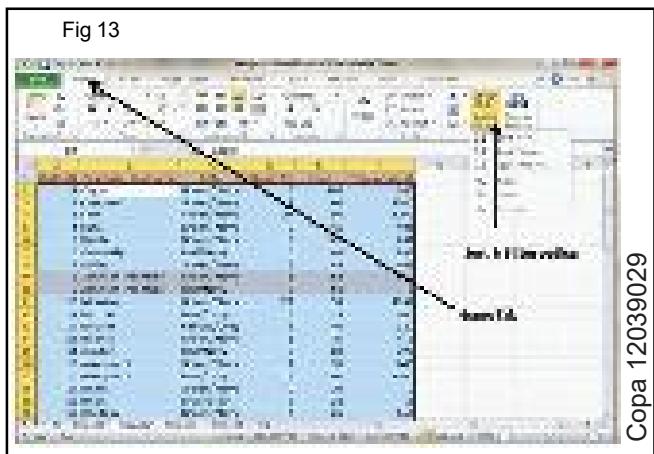
Selecting Ranges (Fig-29)

Selecting a range in several ways ?

- Press the left mouse button and drag, highlighting the range. Then release the mouse button. If drag to the end of the screen, the worksheet will scroll.
- Press the Shift key while uses the navigation keys to select a range.
- Press F8 and then move the cell pointer with the navigation keys to highlight the range. Press F8 again

to return the navigation keys to normal movement.

- Type the cell or range address into the Name box and press Enter. Excel selects the cell or range that specified. (Fig 13)



Selecting Complete Rows and Columns (Fig-30)

When user need to select an entire row or column.and can select entire rows and columns in much the same manner as select ranges:

- Click the row or column border to select a single row or column.
- To select multiple adjacent rows or columns, click a row or column border and drag to highlight additional rows or columns.
- To select multiple (nonadjacent) rows or columns, press Ctrl while click the row or column borders. (Fig 14)

Fig 14

SL	NAME	GRADE	MARKS	PERCENTAGE
1	Cagle	General Navy	100	100%
2	Connie B	General Navy	100	100%
3	Dorell	General Navy	90	100%
4	Lori C	General Navy	85	95%
5	Reita	General Navy	85	95%
6	Karenlynn	Family Member	85	95%
7	Melisa	General Navy	85	95%
8	Samatha Thompson	General Navy	85	95%
9	Sara Smith	General Navy	85	95%

Multiple columns selected

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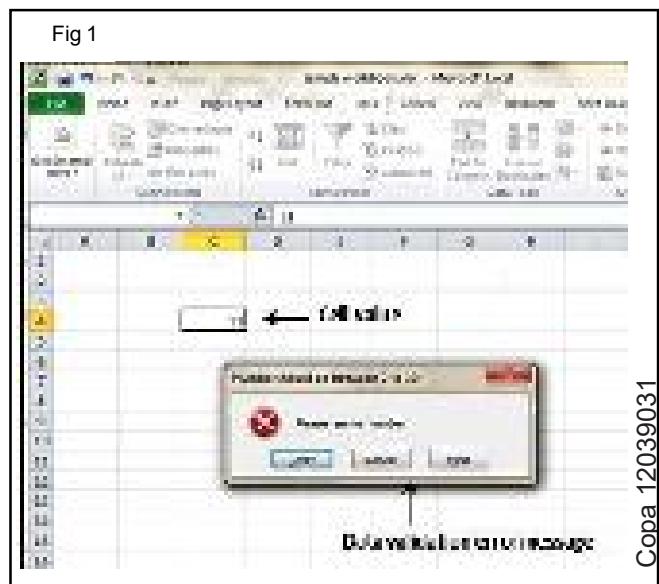
Data validations and Table management in MsExcel 2010

Objectives : At the end of this lesson you shall be able to

- data Validation
- data Table with Example
- charts and its types
- pivot table and pivot chart
- page setup and printing worksheet
- excel shortcut keys

Data Validation

MS Excel data validation feature allows to set up certain rules that dictate what can be entered into a cell. For example, user want to limit data entry in a particular cell to whole numbers between 0 and 10. If the user makes an invalid entry, and display a custom message as shown fig 1.



Validation Criteria

To specify the type of data allowable in a cell or range, follow the steps below, which shows all the three tabs of the Data Validation dialog box.

- Select the cell or range.
- Choose Data " Data Tools " Data Validation. Excel displays its Data Validation dialog box having 3 tabs settings, Input Message and Error alert.

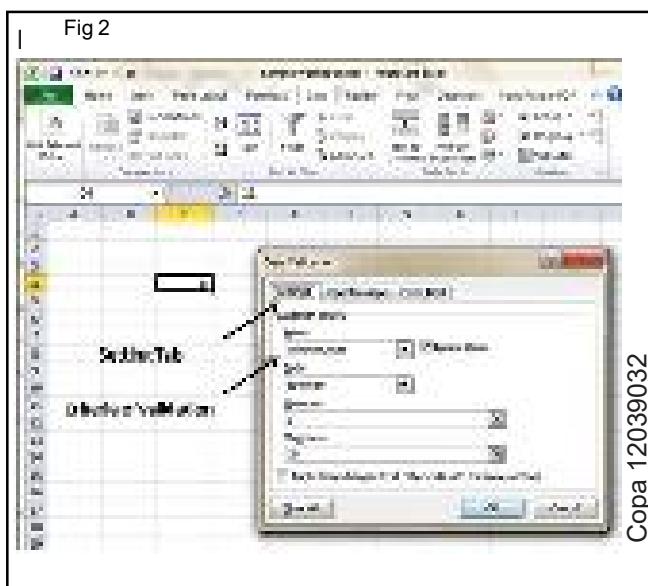
Settings Tab

Here user can set the type of validation. Choose an option from the Allow drop-down list. The contents of the Data Validation dialog box will change, displaying controls based on your choice.

- **Any Value** - Selecting this option removes any existing data validation.
- **Whole Number** - The user must enter a whole number. For example, you can specify that the entry must be a whole number greater than or equal to 50.

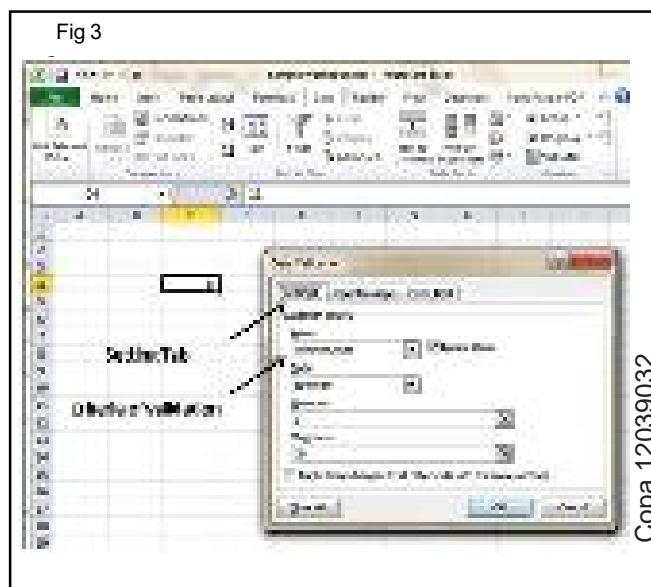
- **Decimal** - The user must enter a number. For example, you can specify that the entry must be greater than or equal to 10 and less than or equal to 20.
- **List** - The user must choose from a list of entries you provide. You will create drop-down list with this validation. You have to give input ranges then those values will appear in the drop-down.
- **Date** - The user must enter a date. You specify a valid date range from choices in the Data drop-down list. For example, you can specify that the entered data must be greater than or equal to January 1, 2013, and less than or equal to December 31, 2013.
- **Time** - The user must enter a time. Specify a valid time range from choices in the Data drop-down list. For example, user can specify that the entered data must be later than 12:00 p.m.
- **Text Length** - The length of the data (number of characters) is limited. specify a valid length by using the Data drop-down list. For example, that the length of the entered data be 1 (a single alphanumeric character).
- **Custom** - To use this option, must supply a logical formula that determines the validity of the user's entry (a logical formula returns either TRUE or FALSE).

Input Message Tab (fig 2)



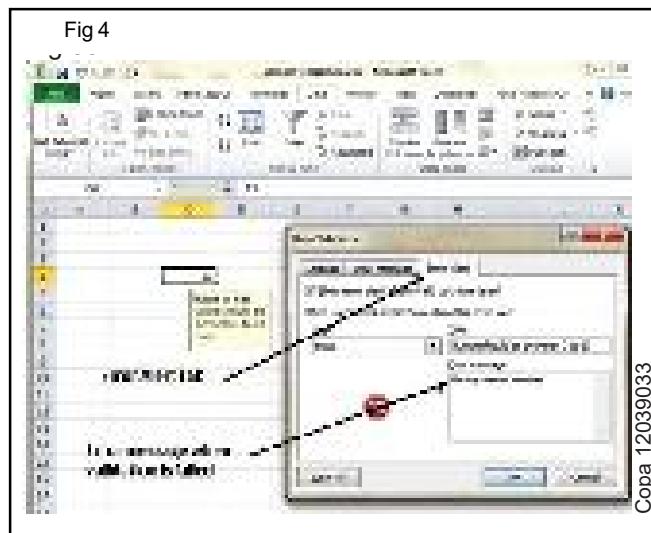
User can set the input help message with this tab. Fill the title and Input message of the Input message tab and the input message will appear when the cell is selected.

Error Alert Tab(fig 3)

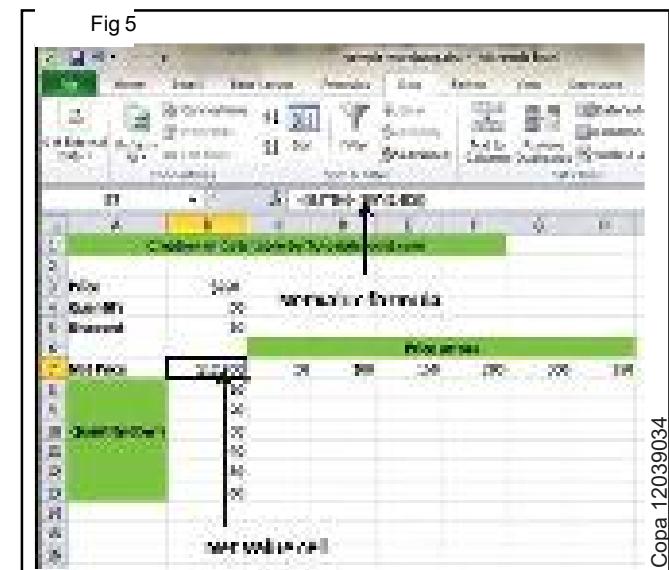


User specify an error message with this tab. Fill the title and error message. Select the style of the error as stop, warning or Information as per user need.

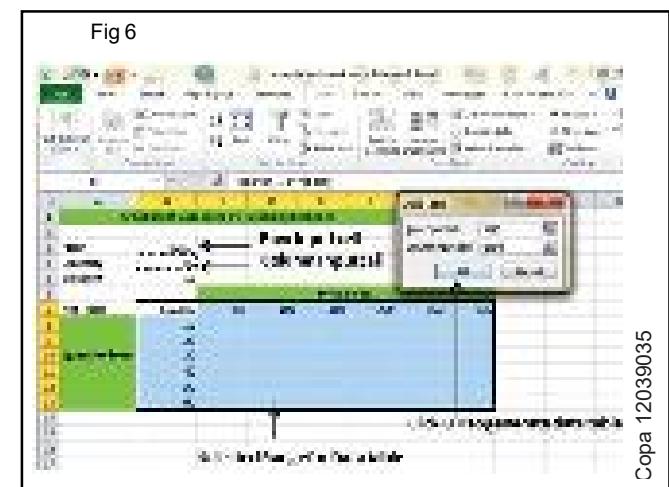
Data Table with Example (Fig 4)



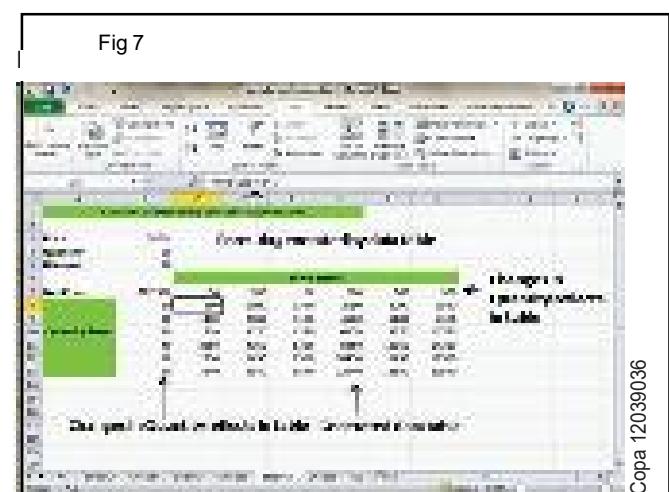
Here user have the Price and quantity of many values. Also, have the discount for that as third variable for calculating the Net Price. And can keep the Net Price value in the organized table format with the help of the data table. The Price runs horizontally to the right while quantity runs vertically down. We are using a formula to calculate the Net Price as Price multiplied by Quantity minus total discount (Quantity * Discount for each quantity) as shown in fig 5.



Now, for creation of data table select the range of data table. Choose Data Tab " What-If analysis dropdown " Data table. It will display dialogue asking for Input row and Input Column. Give the Input row as Price cell (In this case cell B3) and Input column as quantity cell (In this case cell B4) as shown in fig 6.



Clicking OK will generate data table as shown in fig 7. It will generate the table formula. And change the price horizontally or quantity vertically to see the change in the Net Price.

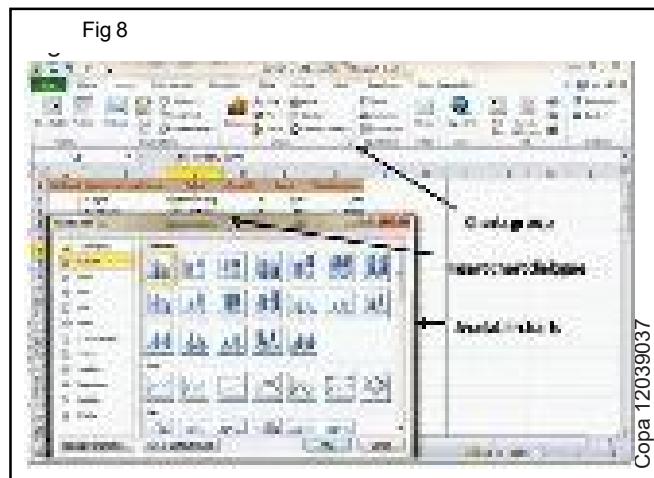


Charts

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets. Charts generated by early spreadsheet products were quite crude, but they have improved significantly over the years. Excel provides you with the tools to create a wide variety of highly customizable charts. Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships.

Types of Charts

There are various chart types available in MS Excel as shown in fig 8.



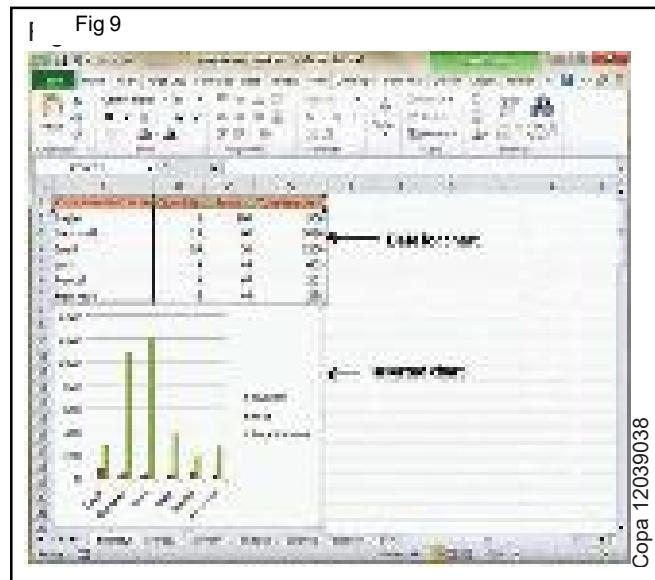
- **Column:** Column chart shows data changes over a period of time or illustrates comparisons among items.
- **Bar:** A bar chart illustrates comparisons among individual items.
- **Pie:** A pie chart shows the size of items that make up a data series, proportional to the sum of the items. It always shows only one data series and is useful to emphasize a significant element in the data.
- **Line:** A line chart shows trends in data at equal intervals.
- **Area:** An area chart emphasizes the magnitude of change over time.
- **X Y Scatter:** An xy (scatter) chart shows the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.

- **Stock:** This chart type is most often used for stock price data, but can also be used for scientific data (for example, to indicate temperature changes).
- **Surface:** A surface chart is useful to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.
- **Doughnut:** Like a pie chart, a doughnut chart shows the relationship of parts to a whole; however, it can contain more than one data series.
- **Bubble:** Data that is arranged in columns on a worksheet, so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.
- **Radar:** A radar chart compares the aggregate values of a number of data series.

Creating Chart

To create charts for the data by below mentioned steps.

- Select the data for which you want to create the chart.
- Choose Insert Tab " Select the chart or click on the Chart group to see various chart types.
- Select the chart of the choice and click OK to generate the chart as shown in fig 9.

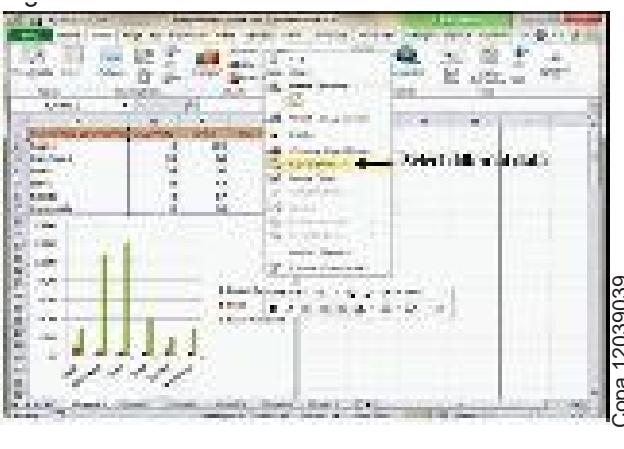


Editing Chart

You can edit the chart at any time after you have created it.

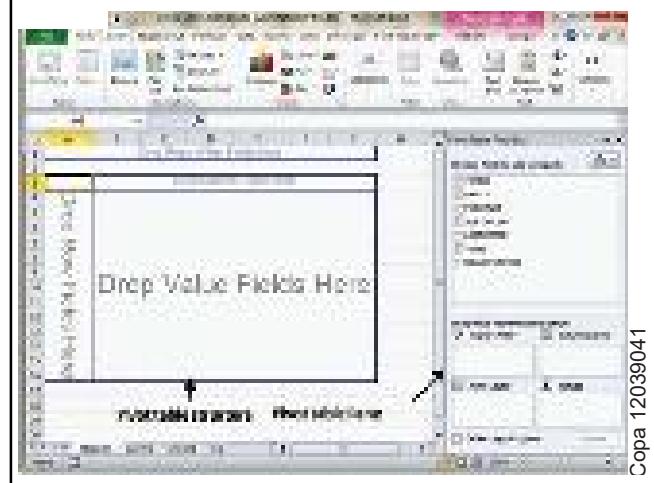
- select the different data for chart input with Right click on chart " Select data. Selecting new data will generate the chart as per the new data, as shown in fig 10.

Fig 10



This will generate the Pivot table pane as shown in fig-41. various options available in the Pivot table pane. And can select fields for the generated pivot table. (Fig 13)

Fig 12



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- change the X axis of the chart by giving different inputs to X-axis of chart.
- change the Y axis of chart by giving different inputs to Y-axis of chart.

Pivot Tables

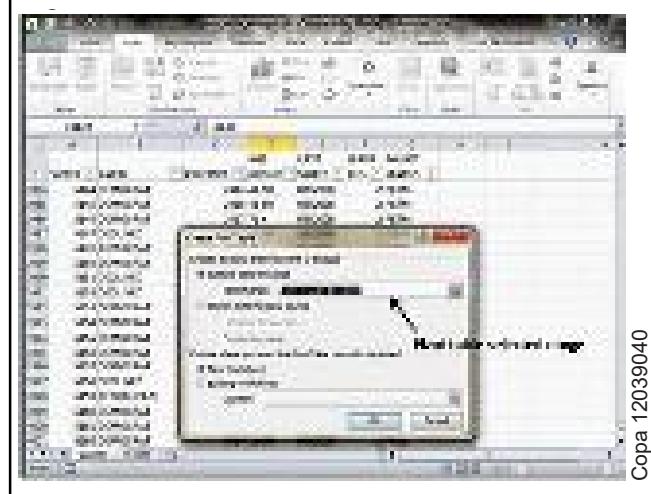
A pivot table is essentially a dynamic summary report generated from a database. The database can reside in a worksheet (in the form of a table) or in an external data file. A pivot table can help transform endless rows and columns of numbers into a meaningful presentation of the data. Pivot tables are very powerful tool for summarized analysis of the data.

Pivot tables are available under Insert tab " PivotTable dropdown " PivotTable.

Pivot Table Example (Fig-40)

Now, let us see Pivot table with the help of example. Suppose huge data of voters and need to see the summarized data of voter Information per party, use the Pivot table for it. Choose Insert tab " Pivot Table to insert pivot table. MS Excel selects the data of the table. and select the pivot table location as existing sheet or new sheet. (Fig 11)

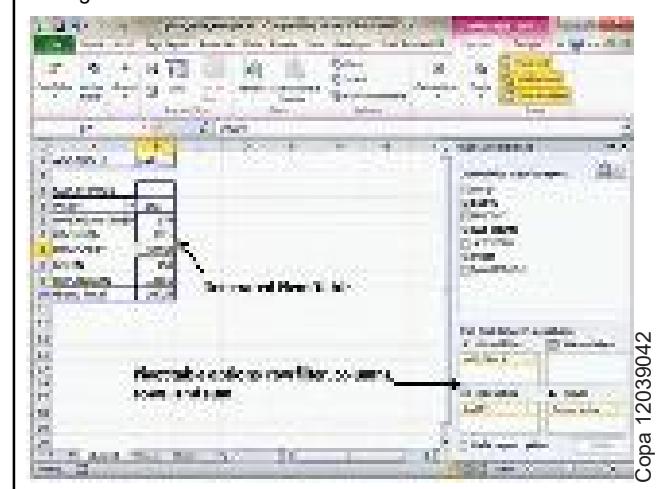
Fig 11



- **Column labels:** A field that has a column orientation in the pivot table. Each item in the field occupies a column.
- **Report Filter:** User can set the filter for the report as year, and then data gets filtered as per the year.
- **Row labels:** A field that has a row orientation in the pivot table. Each item in the field occupies a row.
- **Values area:** The cells in a pivot table that contain the summary data. Excel offers several ways to summarize the data (sum, average, count, and so on).

After giving input fields to the pivot table, it generates the pivot table with the data as shown in fig 13.

Fig 13



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Pivot Charts

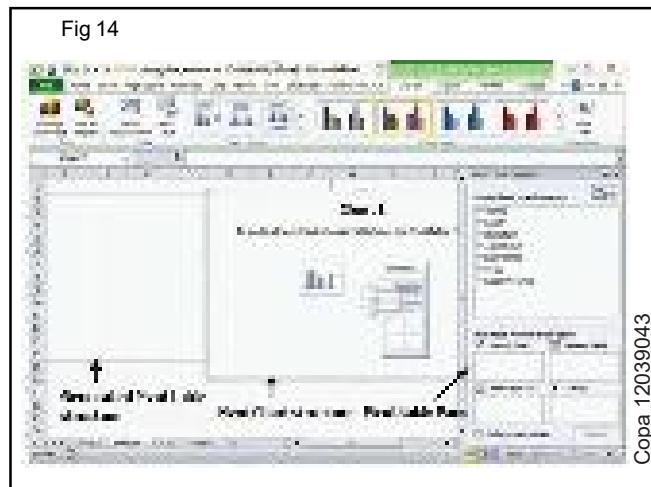
A pivot chart is a graphical representation of a data summary, displayed in a pivot table. A pivot chart is always based on a pivot table. Although Excel lets to create a pivot table and a pivot chart at the same time, user can't create a pivot chart without a pivot table. All Excel charting features are available in a pivot chart.

Pivot charts are available under **Insert tab > PivotTable dropdown > PivotChart**.

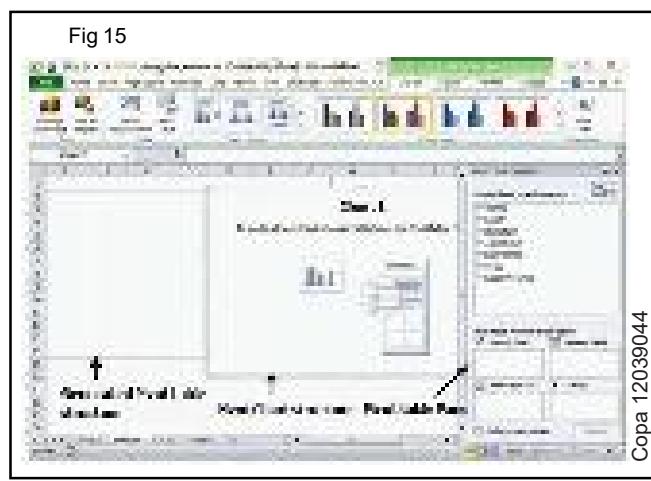
Pivot Chart Example

Suppose huge data of voters and need to see the summarized view of the data of voter

Information per party in the form of charts, then use the Pivot chart for it. Choose **Insert tab > Pivot Chart** to insert the pivot table. (Fig 14)



MS Excel selects the data of the table. And select the pivot chart location as an existing sheet or a new sheet. Pivot chart depends on automatically created pivot table by the MS Excel. generate the pivot chart in the below fig 15.



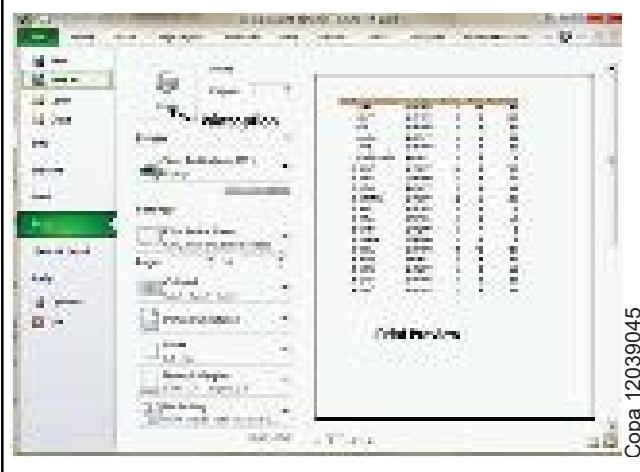
Quick Print

If user want to print a copy of a worksheet with no layout adjustment, use the Quick Print option. There are two ways in which we can use this option.

- Choose File " Print (which displays the Print pane), and then click the Print button as shown in fig 16.

- Press Ctrl+P and then click the Print button (or press Enter).

Fig 16



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Adjusting Common Page Setup Settings

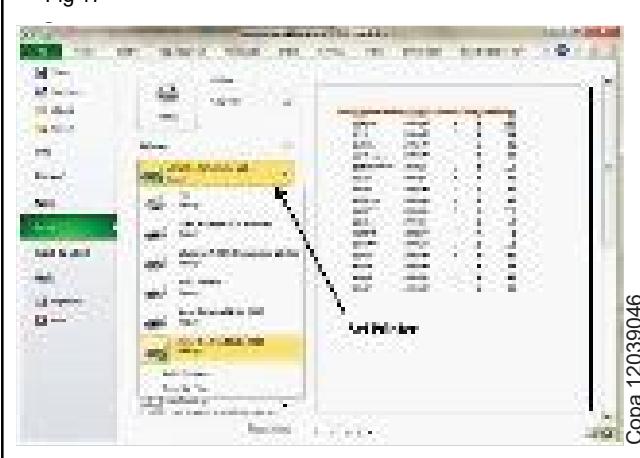
User can adjust the print settings available in the Page setup dialogue in different ways as discussed below. Page setup options include Page orientation, Page Size, Page Margins, etc.

- The Print screen in Backstage View, displayed when choose File " Print.
- The Page Layout tab of the Ribbon.

Choosing Your Printer(fig-46)

To switch to a different printer, choose **File > Print** and use the drop-down control in the Printer section to select any other installed printer. (Fig 17)

Fig 17



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Specifying What You Want to Print(Fig 18)

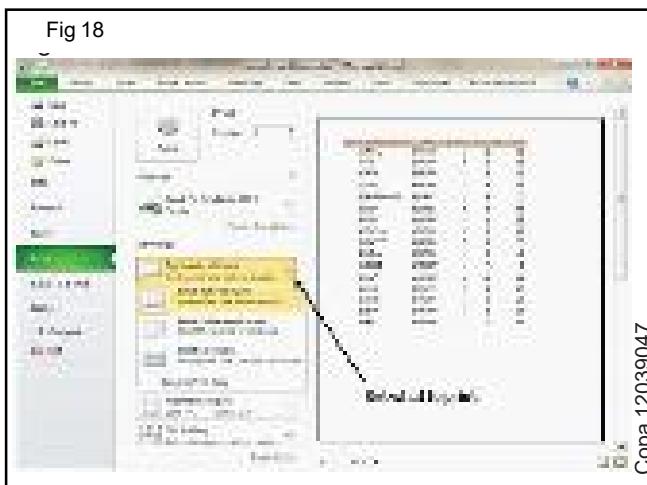
Sometimes print only a part of the worksheet rather than the entire active area. Choose **File > Print** and use the controls in the Settings section to specify what to print.

- Active Sheets:** Prints the active sheet or sheets that you selected.

- **Entire Workbook:** Prints the entire workbook, including chart sheets.
- **Selection:** Prints only the range that selected before choosing **File > Print**.

MS Excel Keyboard Short-cuts

MS Excel offers many keyboard short-cuts. Below is the list of all the major shortcut keys in Microsoft Excel. (Fig 18)



- **Ctrl + A** - Selects all contents of the worksheet.
- **Ctrl + B** - Bold highlighted selection.
- **Ctrl + I** - Italicizes the highlighted selection.
- **Ctrl + K** - Inserts link.
- **Ctrl + U** - Underlines the highlighted selection.
- **Ctrl + 1** - Changes the format of selected cells.
- **Ctrl + 5** - Strikethrough the highlighted selection.
- **Ctrl + P** - Brings up the print dialog box to begin printing.
- **Ctrl + Z** - Undo last action.
- **Ctrl + F3** - Opens Excel Name Manager.
- **Ctrl + F9** - Minimizes the current window.
- **Ctrl + F10** - Maximize currently selected window.
- **Ctrl + F6** - Switches between open workbooks or windows.
- **Ctrl + Page up** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Page down** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Tab** - Moves between Two or more open Excel files.
- **Alt + =** - Creates a formula to sum all of the above cells
- **Ctrl + '** - Inserts the value of the above cell into cell currently selected.
- **Ctrl + Shift + !** - Formats the number in comma format.
- **Ctrl + Shift + \$** - Formats the number in currency format.
- **Ctrl + Shift + #** - Formats the number in date format.
- **Ctrl + Shift + %** - Formats the number in percentage format.
- **Ctrl + Shift + ^** - Formats the number in scientific format.
- **Ctrl + Shift + @** - Formats the number in time format.
- **Ctrl + Arrow key** - Moves to the next section of text.

- **Ctrl + Space** - Selects the entire column.
- **Shift + Space** - Selects the entire row.
- **Ctrl + -** - Deletes the selected column or row.
- **Ctrl + Shift + =** - Inserts a new column or row.
- **Ctrl + Home** - Moves to cell A1.
- **Ctrl + ~** - Switches between showing Excel formulas or their values in cells.
- **F2** - Edits the selected cell.
- **F3** - After a name has been created F3 will paste names.
- **F4** - Repeat last action. For example, if you changed the color of text in another cell pressing F4 will change the text in cell to the same color.
- **F5** - Goes to a specific cell. For example, C6.
- **F7** - Spell checks the selected text or document.
- **F11** - Creates chart from the selected data.
- **Ctrl + Shift + ;** - Enters the current time.
- **Ctrl + ;** - Enters the current date.
- **Alt + Shift + F1** - Inserts New Worksheet.
- **Alt + Enter** - While typing text in a cell pressing Alt + Enter will move to the next line allowing for multiple lines of text in one cell.
- **Shift + F3** - Opens the Excel formula window.
- **Shift + F5** - Brings up the search box.

Image editing, presentations

Objectives : At the end of this lesson you shall be able to

- Introduction to Power Point and its advantages
- Creation of slide shows
- Fine tuning of presentations

Introduction

PowerPoint is a presentation graphics software program that is part of the Microsoft Office package. It uses a graphical approach for the presentations in the form of slide shows that accompany the oral delivery of the topic. This program is widely used in business and classrooms and is an effective tool when used for training purposes.

PowerPoint is one of the simplest computer programs to learn. It is the easiest program used worldwide for presentations that creates professional looking presentations. It is easy to customize presentations with company logo and has design templates that come with the programs. In addition to an on screen slide show, PowerPoint has printing options that allow the presenter to provide handouts and outlines for the audience as well as notes pages for the speaker to refer to during the presentation.

PowerPoint 2010 allows to create presentations for printing or online viewing using a variety of tools. These include wizards to help with the content and look and feel of the presentations to animation tools to create moving images.

Presentation

A presentation is a collection of data and information that is to be delivered to a specific audience. A PowerPoint presentation is a collection of electronic slides that can have text, pictures, graphics, tables, sound and video. This collection can run automatically or can be controlled by a presenter.

Advantage and application of PowerPoint 2010

- Professional looking presentations
- Animated presentations shown on a monitor or overhead screen
- Notes for the speaker
- Handouts for the audience
- Paper printouts of your slide
- Overhead projector transparencies
- Movies

Working with PowerPoint 2010

Step 1: Click the Start button.



Step 2: Click All Programs option from the menu.



Step 3: Search for Microsoft Office from the sub menu and click it.



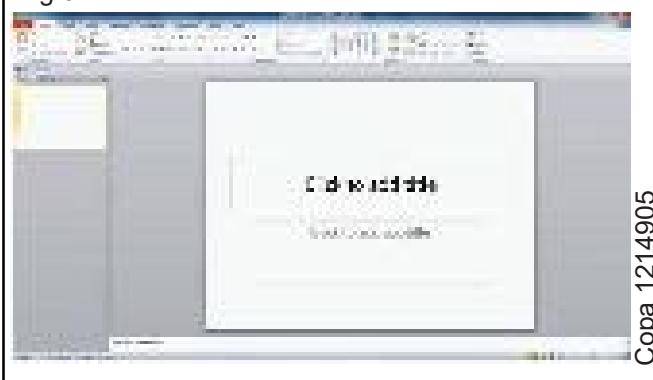
Step 4: Search for Microsoft PowerPoint 2010 from the submenu and click it.

Fig 4

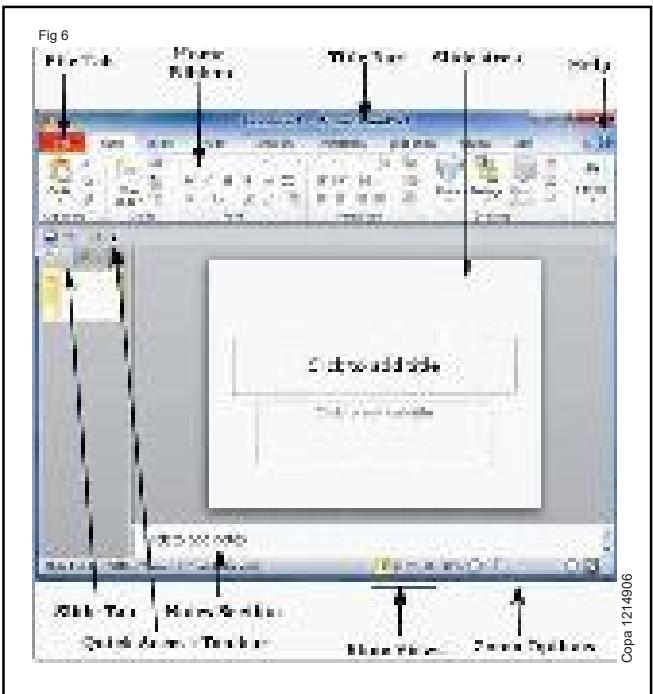


This will launch the Microsoft PowerPoint 2010 application and the following is the presentation window.

Fig 5



PowerPoint Screen



File Tab

This tab opens the Backstage view which basically allows to manage the file and settings in PowerPoint. This can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.

Ribbon

Fig 7



The ribbon contains three components:

- **Tabs:** They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.
- **Groups:** They organize related commands; each group name appears below the group on the Ribbon. For example, a group of commands related to fonts or a group of commands related to alignment, etc.
- **Commands:** Commands appear within each group as mentioned above.

Title Bar

This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

Slide Area

This is the area where the actual slide is created and edited. Add, edit and delete text, images, shapes and multimedia is supported in this section.

Help

The Help Icon can be used to get PowerPoint related help anytime. Clicking on the "?" opens the PowerPoint Help window where there is a list of common topics to browse from. Specific topics from the search bar at the top can also be used for searching.

Zoom Options

The zoom control zooms in for a closer look at the text. The zoom control consists of a slider that can slide left or right to zoom in or out, - and + buttons to can be used to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.

Slide Views

The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch between PowerPoint views.

- Normal Layout view: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows user to edit individual slides and also rearrange them.

- Slide Sorter view: This displays all the slides as a matrix. This view only allows the user to rearrange the slides but not edit the contents of each slide.
- Reading View: This view is like a slideshow with access to the Windows task bar in case the user need to switch windows. However, like the slideshow user cannot edit anything in this view.

Notes Section

This sections allows user to add notes for the presentation. These notes will not be displayed on the screen during the presentation; these are just quick reference for the presenter.

Quick Access Toolbar

The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint. User can customize this toolbar to suit their needs.

Slide Tab

This section is available only in the Normal view. It displays all the slides in sequence. User can add, delete and reorder slides from this section.

Backstage View in Powerpoint 2010

In Office 2010, Microsoft replaced the traditional file menu with the new Backstage view. This view not only offers all the menu items under the file menu, but additional details which makes management of files a lot easier.

Accessing Backstage View

User can access the Backstage view simply by clicking on the File tab. They can exit this view by clicking on any tab (including the File tab again). 'Esc' button on the keyboard can also be pressed for the same.

Organization of Backstage View

The backstage view has three sections or panes.



- First Pane ? This is the commands pane which consists of all the commands that would typically found in the file menu of older versions. it also has the Options menu which edits the options on the program like customizing the ribbon.

Various commands under the first pane are described in the table below ?

S.No	Command & Description
1	Save This allows user to save a new file or an existing file in standard format. If user is working on a previously saved file this will save the new changes in the same file format. If user is working on a new file, this command would be similar to the Save As command.
2	Save As Allows user to specify the file name and the file type before saving the file.
3	Open Allows user to open new PowerPoint files.
4	Close Allows user to close an existing file.
5	Info Displays the information about the current file.
6	Recent Lists series of recently viewed or edited PowerPoint files.
7	New Allows user to create a new file using blank or pre-defined templates.
8	Print Allows user to select the printer settings and print the presentation.
9	Save & Send Allows user to share your presentation with larger audience via emails, web, cloud services, etc.
10	Help Provides access to PowerPoint Help.
11	Options Allows user to set various options related to PowerPoint program.
12	Exit Closes the presentation and exits the program.
	• Second Pane ? This is the subcommands pane. This will list all the commands related to the main command chosen in the first pane. For example, if user selects Print in the first pane, user get to choose the printer and adjust the print settings in the second pane.

- Third Pane ? This is the preview or file information page. Depending on the command and the subcommand user select, this pane will either display the properties of the file or give a preview of the file.

Creating Presentation using Powerpoint 2010

PowerPoint offers a host of tools that will aid the user in creating a presentation. These tools are organized logically into various ribbons in PowerPoint. The table below describes the various commands that can be accessed from the different menus.

Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions.
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols.
Design	Slide setup, slide orientation, presentation themes and background.
Transitions	Commands related to slide transitions.
Animations	Commands related to animation within the individual slides.
Slide Show	Commands related to slideshow set up and previews.
Review	Proofing content, language selection, comments and comparing presentations.
View	Commands related to presentation views, Master slides, color settings and window arrangements.

Besides these depending on the objects selected in the slide, there are other menu tabs that get enabled.

Add New Slides in Powerpoint 2010

The following are the steps that allows the user to insert a new slide .

Step 1: Right-click in the Navigation Pane under any existing slide and click on the New Slide option.

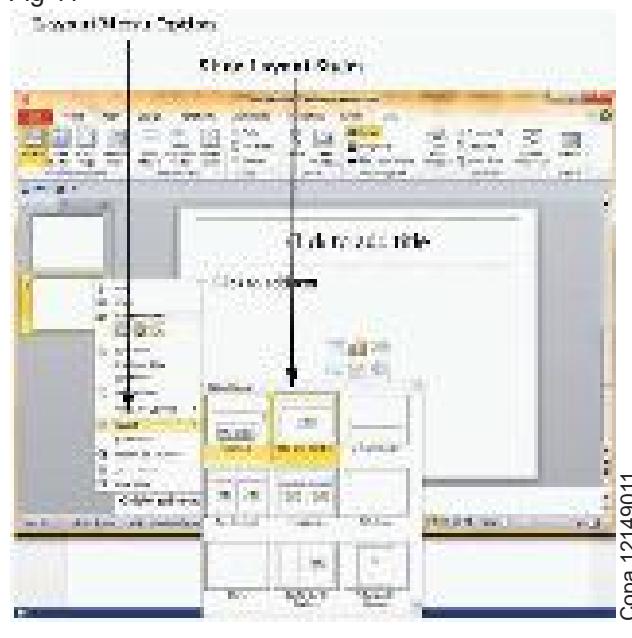


Step 2: The new slide is inserted. The layout of this slide can be changed to suit the design requirements.



Step 3: To change the slide layout, right-click on the newly inserted slide and go to the Layout option where user can choose from the existing layout styles available .

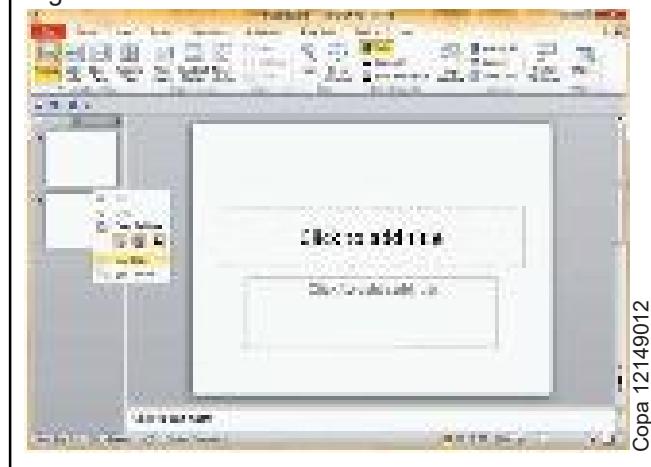
Fig 11



Same steps can be followed to insert a new slide in between existing slides or at the end on the slide list.

When we insert a new slide, it inherits the layout of its previous slide with one exception. If inserting a new slide after the first slide (Title slide), the subsequent slide will have the Title and Content layout.

Fig 12



Adding Text in Boxes in PowerPoint 2010

PowerPoint allows users to add text to the slide in a well-defined manner to ensure the content is well distributed and easy to read. The procedure to add the text in a PowerPoint slide is always the same - just click in the text box and start typing. The text will follow the default formatting set for the text box, although this formatting can be changed later as required.

The most common content blocks in PowerPoint are:

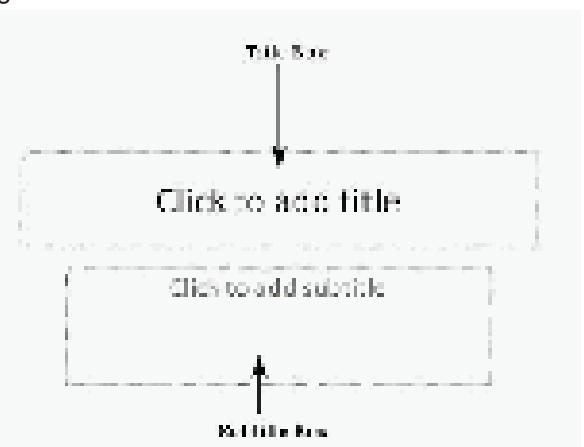
Title Box

This is typically found on slides with the title layout and in all the slides that have a title box in them. This box is indicated by "Click to add title".

Subtitle Box

This is found only in slides with the Title layout. This is indicated by "Click to add subtitle"

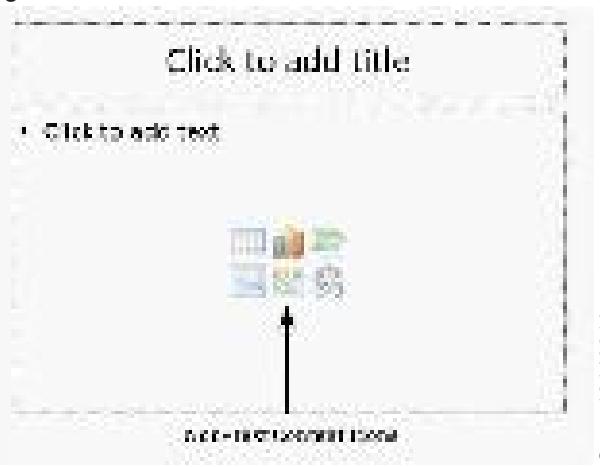
Fig 13



Content Box

This is found in most of the slides that have a placeholder for adding content. This is indicated by "Click to add text". This box allows user to add text as well as non-text content. To add text to such a box, click anywhere on the box, except on one of the content icons in the center and start typing.

Fig 14



Text Only Box

This is not a default content box available in PowerPoint, but user can create it using Slide Master, if required. This is also indicated by "Click to add text". The only difference between the Text Only Box and the Content Box is that the former only supports text in the content area.

Fig 16



Adding New Text Boxes in Powerpoint 2010

Most of the standard layouts come with the text box option. As mentioned, text boxes will have "Click to add text" as the default text. Here are the steps to add new text boxes in slide.

Step 1: Click on the Text Box icon in the Home ribbon under the Drawing section.

Fig 16



Step 2 : User will get the insert text box cursor that looks like an inverted cross.

Fig 17



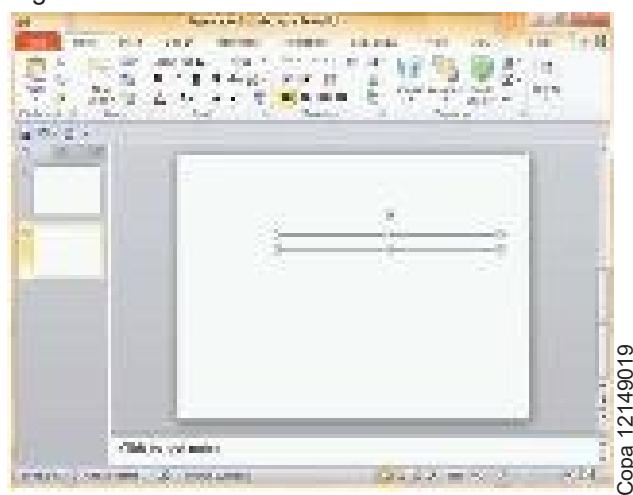
Step 3: Click to insert a text box. User can now start typing directly into the text box.

Fig 18



Step 4: Alternately, user can click and drag the cursor without releasing the click to create a text box.

Fig 19



The size of the text box can be adjusted by selecting one of the edges marked by squares or corners marked by circles.

Slide Show in Powerpoint 2010

Most PowerPoint presentations are created to be run as a slideshow. Most of these features of PowerPoint 2010 are really to help user create a good slideshow without having to go through the entire presentation over and over again after every minor change. Features related to running the slideshow are grouped under the Slideshow ribbon.

Fig 20



Section	Menu Item	Description
Start Slideshow	From Beginning From Current Slide Broadcast Slideshow Custom Slideshow	Starts slideshow from beginning Starts slideshow from the current slide Allows users to broadcast the slideshows using Microsoft's PowerPoint Broadcast Service Builds a custom slideshow by picking the slides you want to run
Set Up	Set Up Slideshow Hide Slide Rehearse Timing Record Slideshow Slideshow Checkboxes	Helps set up the slideshow including browser/ full screen display, show options with or without narration/ animation, pen and laser color during the slideshow and the slides to be presented during the show Helps mark/ unmark the slide as hidden, so it is skipped or shown during the slideshow respectively Allows users to rehearse the timing on each slide and the entire slideshow Records the slideshow including narration and animation Helps set or avoid the use of narrative audio and rehearsed timings during the show. Display media controls in the slideshow view
Monitors	Resolution Show Presentation on Use Presenter View	Defines resolution in slideshow view Picks the monitor to display the presentation one - in case of multiple monitors Run presentation in Presenter view rather than just slideshow view

Concepts of data and Databases

Objectives : At the end of this lesson you shall be able to

- explain database structure and control
- describe Ms access database utilities.

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

- Microsoft Access is just one part of Microsoft's overall data management product strategy.
- It stores data in its own format based on the Access Jet Database Engine.
- Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. However, Access 2013 also complements other database products because it has several powerful connectivity features.
- It can also import or link directly to data stored in other applications and databases.
- As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.
- Access can also understand and use a wide variety of other data formats, including many other database file structures.
- You can export data to and import data from word processing files, spreadsheets, or database files directly.
- Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.
- Software developers can use Microsoft Access to develop application software.

Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

- **Database Creation:** Create your Microsoft Access database and specify what kindof data you will be storing.
- **Data Input:** After your database is created, the data of every business day canbe entered into the Access database.
- **Query:** This is a fancy term to basically describe the process of retrievinginformation from the database.

- **Report (optional):** Information from the database is organized in a nicepresentation that can be printed in an Access Report.

Architecture

- Access calls anything that can have a name an object. Within an Access desktop database, the main objects are tables, queries, forms, reports, macros, data macros, and modules.
- If you have worked with other database systems on desktop computers, you might have seen the term database used to refer to only those files in which you store data.
- But, in Access, a desktop database (.accdb) also includes all the major objects related to the stored data, including objects you define to automate the use of your data.

RDBMS

In the computing system (web and business applications), there are enormous data that comes out every day from the web. A large section of these data is handled by Relational database management systems (RDBMS). The idea of relational model came with E.F.Codd's 1970 paper "A relational model of data for large shared data banks" which made data modeling and application programming much easier. Beyond the intended benefits, the relational model is well-suited to client-server programming and today it is predominant technology for storing structured data in web and business applications.

MS Access - RDBMS

Microsoft Access has the look and feel of other Microsoft Office products as far as its layout and navigational aspects are concerned, but MS Access is a database and, more specifically, a relational database.

- Before MS Access 2007, the file extension was ***.mdb**, but in MS Access 2007 the extension has been changed to ***.accdb** extension.
- Early versions of Access cannot read accdb extensions but MS Access 2007 and later versions can read and change earlier versions of Access.
- An Access desktop database (.accdb or .mdb) is a fully functional RDBMS.
- It provides all the data definition, data manipulation, and data control features that you need to manage large volumes of data.

- You can use an Access desktop database (.accdb or .mdb) either as a standalone RDBMS on a single workstation or in a shared client/server mode across a network.
- A desktop database can also act as the data source for data displayed on webpages on your company intranet.
- When you build an application with an Access desktop database, Access is the

RDBMS.

Data Definition

Let us now understand what Data Definition is:

- In document or a spreadsheet, you generally have complete freedom to define the contents of the document or each cell in the spreadsheet.
- In a document, you can include paragraphs of text, a table, a chart, or multiple columns of data displayed with multiple fonts.
- In spreadsheet, you can have text data at the top to define a column header for printing or display, and you might have various numeric formats within the same column, depending on the function of the row.
- An RDBMS allows you to define the kind of data you have and how the data should be stored.
- You can also usually define rules that the RDBMS can use to ensure the integrity of your data.
- For example, a validation rule might ensure that the user can't accidentally store alphabetic characters in a field that should contain a number.

Data Manipulation

Working with data in RDBMS is very different from working with data in a word processing or spreadsheet program.

- In a word processing document, you can include tabular data and perform a limited set of functions on the data in the document.
- You can also search for text strings in the original document and, with ActiveX controls, include tables, charts, or pictures from other applications.
- In a spreadsheet, some cells contain functions that determine the result you want, and in other cells, you enter the data that provides the source information for the functions.
- An RDBMS provides you many ways to work with your data. For example,
- You can search a single table for information or request a complex search across several related tables.
- You can update a single field or many records with a single command.

- You can write programs that use RDBMS commands to fetch data that you want to display and allow the user to update the data.

Access uses the powerful SQL database language to process data in your tables. Using SQL, you can define the set of information that you need to solve a particular problem, including data from perhaps many tables.

Data Control

Spreadsheets and word processing documents are great for solving single-user problems, but they are difficult to use when more than one person needs to share the data.

- When you need to share your information with others, RDBMS gives you the flexibility to allow multiple users to read or update your data.
- An RDBMS that is designed to allow data sharing also provides features to ensure that no two people can change the same data at the same time.
- The best systems also allow you to group changes (which is also known as transaction) so that either all the changes or none of the changes appear in your data.
- You might also want to be sure that no one else can view any part of the order until you have entered all of it.
- Because you can share your Access data with other users, you might need to set some restrictions on what various users are allowed to see or update.

Designing a Database

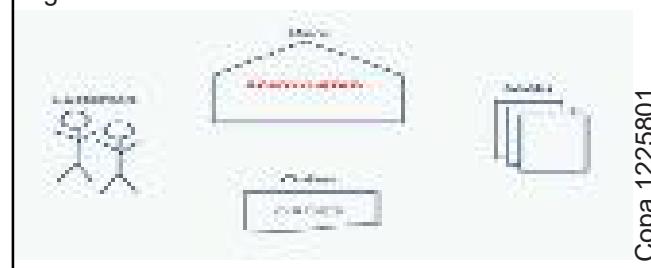
The first step in creating a database is to think about why you need it-what is its purpose? Once you know the answer, you can begin designing your own database. Ask yourself questions like What kinds of information will it store? How will I have to break down this information so it can be stored in my database? How will I use the data once it's in there?

The bookstore scenario

The best way to learn about designing a database is to jump right in to the process. Let's pretend we work for the bookstore, and we need to build a database for the store to use. Let's think about what we might need the database to do for us.

The following diagram shows that we have **customers** and sell **books** via **orders**, both in the store and online.

Fig 1



Copa 1225801

The store needs a way to keep track of these things.

Determine the purpose of the database

The first step of designing a database is to determine the purpose of the database. What do we need it to do?

At Ready-2-Read, our customers will place orders for books. At the very least, we will want our database to track the books we sell, the customers we sell them to, and the date of each of the orders.

The database will also be able to tell us where our customers live when we need to send them books or coupons. Additionally, we can use it to track our sales or to make a bestseller list to post in the store.

Plan database tables

Once we've established its purpose, we can begin about how to break up the information into the tables the database will need to store data. Recall that a table is a collection of records, and each record is broken up into the smallest pieces of needed information, called fields.

Because we're planning a database to track our customers, the books we have, and the orders our customers place, we will need a table for each one of these.

- Customers
- Orders
- Books

Plan table fields

Once you know what tables you need, the next step is deciding what fields belong in each table. Remember that fields are the smallest chunk of information in any record.

Let's look at our Ready-2-Read bookstore example again. There will be several fields in our Customers table. We'll obviously want each customer's first name and last name. We'll also need an address if we need to send a customer his order. Email will be necessary if we need to contact the customer if there is an issue with the order.

Customers	Books	Orders
First Name	Title	Customer
Last Name	Author First	Book
Street	Author Last	Date
City	Price	
State	Category	
Pin/Zip Code		
Email		

We will also need several fields in the Books table. Title and Author make sense for books. We'll need a Price for each book. Category will help us know what type of books sell the best so we can order more books that fit into this category.

The Orders table will have fewer fields. We'll need this table to track the Customer who is placing the order, the

Book the customer is ordering, and the Date the order is placed.

Creating a new database with Access

When you launch Access 2007/2010, you will see the Getting Started window.

In the left pane, the template categories-including the featured local templates-are listed, as well as the categories on Office Online. Templates are prebuilt databases focused on a specific task that you can download and use immediately.

You will also see the New Blank Database option, which allows you to build your own database from scratch.

Fig 2



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When you choose the New Blank Database option at the top of the window, you will be prompted to rename the database from the default name, which is Database1.accdb. Rename the database whatever you want. In the example below, we named the database Ready2Read because it's the name of the store in our scenario.

Fig 3



Copa 1225803

Click Create to finish naming the database.

Setting up tables

The new database opens with one table showing as a default. It also defaults to naming this table Table1 in both the navigation pane and the Table tab itself. You will want to name your tables based on your database design plan.

Fig 4

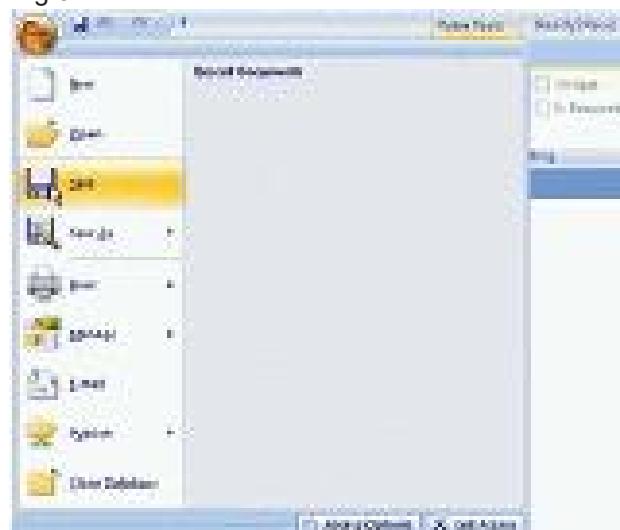


Copa 1225804

Naming a table

To give the table a unique name, you must first click on the Microsoft Office button in the upper-left corner of the application.

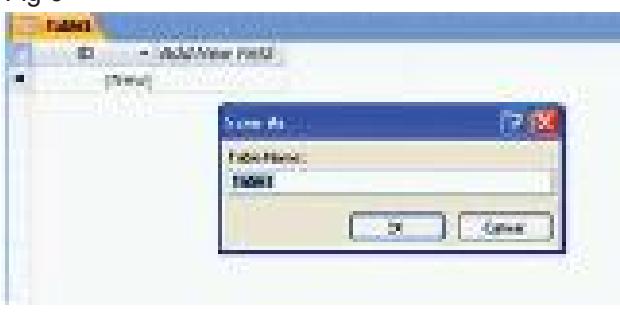
Fig 5



Copa 1225805

Next, select Save from the menu. The Save As dialog box will appear to let you save the table whatever name you want.

Fig 6



Copa 1225806

The new table names appear in both the navigation pane and the Table tab itself, as you can see in the picture below.

Fig 7



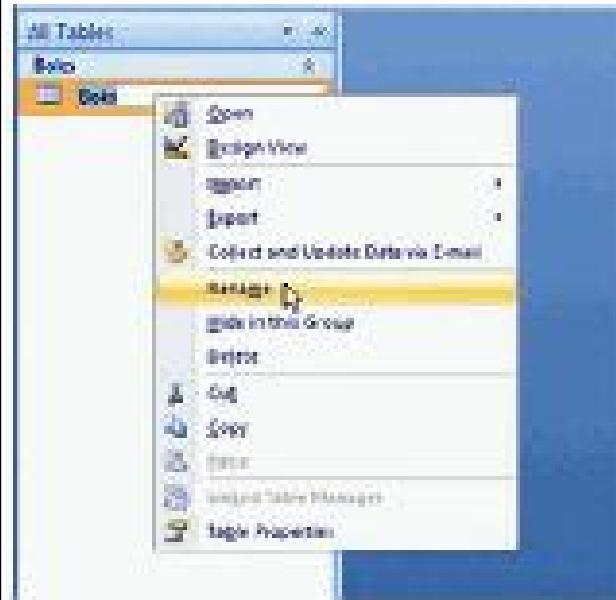
Copa 1225807

TIP: Give your tables logical, easy-to-understand names.

To rename a table:

With the table closed, right-click the Table you want to rename in the navigation pane. Select the Rename option that appears in the menu.

Fig 8



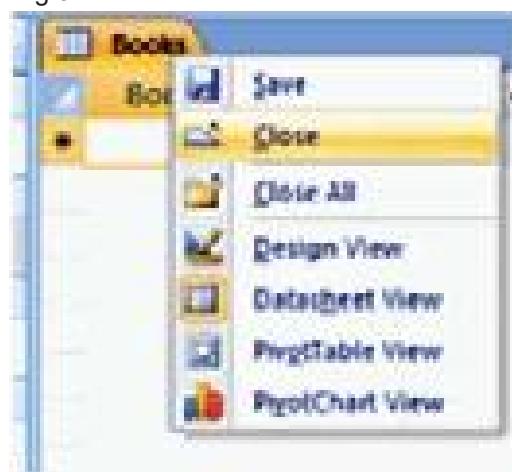
Copa 1225808

The table name will be highlighted and a cursor will appear, which means you can now type the new name right there. Left-click anywhere outside of the table name to make the change.

To close a table:

There are several ways to close an active table. You can right-click the Table tab and choose Close from the menu.

Fig 9



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A more common method is to click the X that appears in the top-right corner of the active database object window.

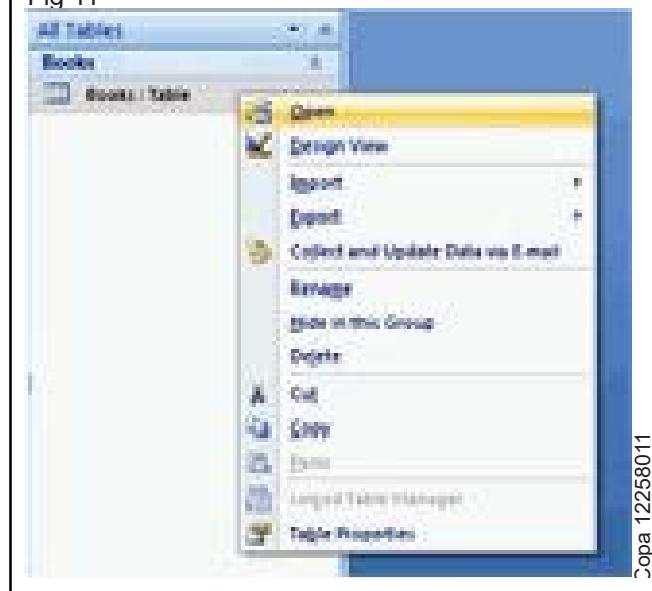
Fig 10



To open a table:

To open a table, right-click the Table name of the table you want to open in the navigation pane, then choose Open from the menu.

Fig 11



A more common method is to double-click the table name in the navigation pane. The selected table will open in the active database object window.

Adding more tables to the database

By default, Access 2007 starts out with one table. To add more tables to the database, click the Create tab on the Ribbon.

Fig 12



Next, select Table from the Tables command group. A new table will open in the active database object window. You must name your table using the Save command from Microsoft Office menu.

Adding fields to a table

Access 2007 allows you to add fields to tables when you are:

- Working in Datasheet view, which looks like a spreadsheet
- Working in Design view, where you are able to set more controls for your fields

Either way, you need to know how to switch between the two views.

To switch views:

Select the Views command group from either the Home tab (seen below) or the Datasheet tab on the Ribbon. Select the view option you want from the menu.

Fig 13



Adding fields in Datasheet view

By default, Access 2007 creates one field in each new table: the ID field. This field auto-numbers to give each record in the table a unique number identifier. Recall that records are the rows in a table. You may want to rename the ID field with a unique name because the ID field appears automatically in every table you create. While this is not necessary, it may help avoid confusion when setting up table relationships.

Fig 14



To add more fields to a table in Datasheet view, double-click the Add New Field header.

Fig 15

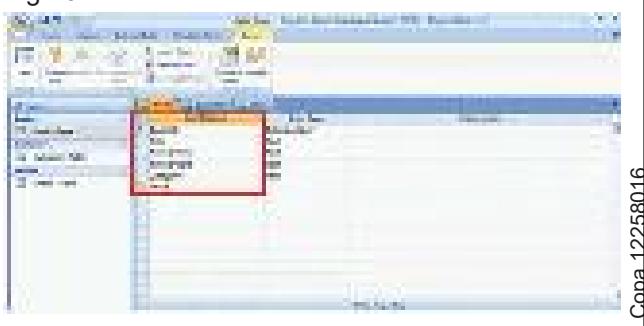


The Add New Field text will disappear from the header. Name the field by typing the name directly into the header. Press the Tab key on your keyboard to move to the next field.

Adding fields in Design view

In Design view, the field names are along the lefthand column instead of across the top like in Datasheet view, as seen below.

Fig 16



To add a new field to a table in Design view, click in the cell where you want the new field and type the field name. When you switch back to Datasheet view, your new field appears as its own column, as seen below.

Fig 17



Datatypes

Every field in a table has properties and these properties define the field's characteristics and behavior. The most important property for a field is its data type. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require characters. calculating (e.g. phone numbers).	Up to 255
Long Text	Lengthy text or combinations of text and numbers. characters.	Up to 63, 999
Number	Numeric data used in mathematical (16 bytes if set to calculations. Replication ID).	1, 2, 4, or 8 bytes
Date/Time	Date and time values for the years 100 through 9999.	8 bytes.
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes.
AutoNumber	A unique sequential (incremented by 1) number or random number assigned by set to Replication Microsoft Access whenever a new record is ID). added to a table.	4 bytes (16 bytes if
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or	1 bit.

Here are some of the other more specialized data types, you can choose from in Access.

Data Types	Description	Size
Attachment	Files, such as digital photos. Multiple files can be attached per record. This data type is not available in earlier versions of Access.	Up to about 2 GB.
OLE objects	OLE objects can store pictures, audio, video, or other BLOBS (Binary Large Objects)	Up to about 2 GB.
Hyperlink	Text or combinations of text and numbers stored as	Up to 8,192 (each part of a Hyperlink data type can contain up to 2048 characters).
Lookup	The Lookup Wizard entry in the Data Type column in the Design view is not actually a data type. When you choose this entry, a wizard starts to help you define either a simple or complex lookup field.	Dependent on the data type of the lookup field.
Wizard	A simple lookup field uses the contents of another table or a value list to validate the contents of a single value per row. A complex lookup field allows you to store multiple values of the same data type in each row.	
Calculated	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.

MS Access - Adding Data

Adding records to tables

When you enter records into your table, you are populating the database. In Access 2007, you can do this a few different ways.

To add records in the new record row:

- Click the record row with the asterisk that appears at the bottom of the table.

Fig 18



- Type the data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record navigation button:

- Click the New Record button in the navigation bar. The navigation bar is located in the bottom-left corner of the open object pane.

Fig 19



- Type data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record command:

- Click the New Record command in the Records group in the Ribbon.

Fig 20



- Type the data into the appropriate fields.
- Hit the Enter or the Tab key to move to the next field.

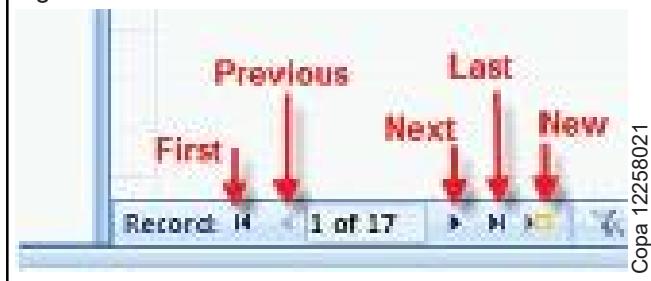
Editing records in tables

Sometimes it is necessary to edit records in the database. Like with every other task in Access 2007, this can be done several different ways.

To edit a record directly:

- Scroll through the records, or use the navigation buttons on the navigation bar to find the record to edit.

Fig 21



- Click the cell containing the information that must be edited. A pencil icon appears to indicate edit mode.

Fig 22



- Type the new information into the field.
- Click outside of the record row to apply the change.

To edit a record using Find and Replace:

- Click the Find command in the Find group on the Ribbon.

Fig 23



- The Find and Replace dialog box opens.

Fig 24



- Tell Access what to find by typing it into the Find What: area.
- Type the replace term in the Replace With: area.
- Tell Access where to look with the Look In: drop-down list. The first choice in the drop-down list is the field you were last in within the table.
- Tell Access what to Match: Any part of the field, the whole field, or just the start of the field.
- Tell Access how to Search: Up finds records above the cursor, Down finds records below the cursor, and All searches all records.
- Click one of the action options:
 - Find Next will find the next instance of the word in the table.

- Replace will put the new word into the table, overwriting what is currently there.
- Cancel stops the editing process.

CAUTION: DO NOT use Replace All because it will overwrite every instance of the Find term in the table, which can have a serious impact on your data.

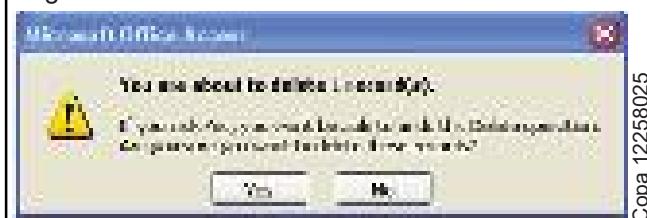
To copy and paste a Record:

- Select the record you want to copy. Right-click, then select Copy.
- Select the new record row. Right-click and select Paste. The record information appears with a new record ID number.

To delete a record:

- Select the record you want to delete, then right-click and select Delete Record.
- A dialog box appears, telling you the action cannot be undone and asking if you are sure you want to delete the record.

Fig 25

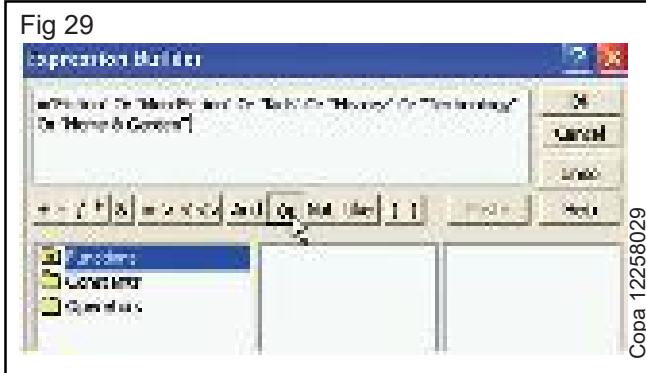


There may be other records that rely on the record you are trying to delete. DO NOT delete a record without knowing how it will impact the rest of your database.

Fig 26

	Record ID	Title	Author	Year Published	Genre
X	1	The Great Gatsby	F. Scott Fitzgerald	1925	Novel
X	2	The Catcher in the Rye	J. D. Salinger	1951	Novel
X	3	1984	George Orwell	1949	Science Fiction
X	4	Brave New World	George Orwell	1932	Science Fiction
X	5	Animal Farm	George Orwell	1945	Science Fiction
X	6	War and Peace	Lion Tolstoy	1869	Novel
X	7	Anna Karenina	Lion Tolstoy	1877	Novel
X	8	The Brothers Karamazov	Lion Tolstoy	1880	Novel
X	9	The Idiot	Lion Tolstoy	1868	Novel
X	10	The House on the Rock	John C. Maxwell	1990	Non-Fiction
X	11	The Seven Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	12	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	13	The Art of War	Sun Tzu	500 BC	Non-Fiction
X	14	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	15	The Alchemist	Paulo Coelho	1988	Novel
X	16	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	17	The 5 Love Languages	Brian L. Roberts	1995	Non-Fiction
X	18	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	19	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	20	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	21	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	22	The Alchemist	Paulo Coelho	1988	Novel
X	23	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	24	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	25	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	26	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	27	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	28	The Alchemist	Paulo Coelho	1988	Novel
X	29	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	30	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	31	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	32	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	33	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	34	The Alchemist	Paulo Coelho	1988	Novel
X	35	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	36	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	37	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	38	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	39	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	40	The Alchemist	Paulo Coelho	1988	Novel
X	41	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	42	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	43	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	44	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	45	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
X	46	The Alchemist	Paulo Coelho	1988	Novel
X	47	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	48	The Five Dysfunctions of a Team	Daniel H. Pink	2001	Non-Fiction
X	49	The 7 Habits of Highly Effective People	Raymond C. Moore	1989	Non-Fiction
X	50	The 48 Laws of Power	Robert Greene	2000	Non-Fiction
X	51	The Tao Te Ching	Lao Tzu	500 BC	Non-Fiction
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X	197	The Little Prince	Antoine de Saint-Exupéry	1943	Novel
X	198	The Five Dysfunctions of a Team	Daniel H. Pink	2	

Fig 29



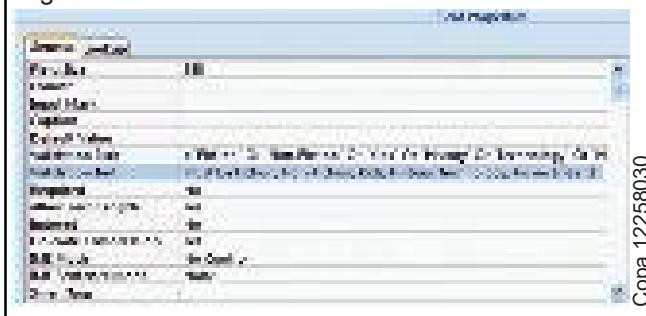
Validation rules work most easily with numerical fields. Rules for text fields require you to enclose each acceptable value inside its own quotation marks, separating them with Or, as seen above.

Validation text

Validation text is a specialized error message you can set to have Access tell the user entering data the specific way you want that person to enter it.

To set the validation text, enter the error message exactly as you want it to appear to users in the row directly beneath the Validation Rule row in the Field Properties section of Design view. For the validation rule we set for Category, you'd set the validation text like this:

Fig 30



The image below shows the resulting error message users would see when the Category validation rule has been broken.

Fig 31



Using field properties to ensure data integrity

Another way to ensure data integrity is by setting field properties such as Field Size, Format, and Required.

- Field Size can be set to hold a specific number of characters, up to as many as 255 for text fields. If you were using a text field to hold the two-letter state postal abbreviation, the field size could be set to 2 to ensure no one enters a full state name into this field.
- The Format field property can be set to display text or numbers in a standardized way. For example, text can be set to show as all uppercase, and numbers can be set to show scientific numbers, percentages, or decimals.
- Set the Required property to Yes if you want users entering data to be required to enter something in the field. Choose No if users are allowed to leave the field blank.

These are just some ways Access helps you ensure data being entered into your database is valid.

Forms, quires, and reports in access

Objectives : At the end of this lesson you shall be able to

- explain database relationship and forms
- explain quires and reports in as access

In a relational database (Access), the data in one table is related to the data in other tables. In general, tables can be related in one of three different ways: one-to-one, one-to-many or many-to-many. The relationship is used to cross reference information between tables.

One to One

In a one-to-one relationship each record in one table has at most one related record in another table.

In a one-to-one relationship, each record in Table A can have only one matching record in Table B, and each record in Table B can have only one matching record in Table A. This type of relationship is not common, because most information related in this way would be in one table. You might use a one-to-one relationship to divide a table with many fields, to isolate part of a table for security reasons, or to store information that applies only to a subset of the main table.

One to Many

A one-to-many relationship, often referred to as a "master-detail" or "parent-child" relationship.

A one-to-many relationship is the most common type of relationship. In a one-to-many relationship, a record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A.

Many to Many

In a many-to-many relationship, a record in Table A can have many matching records in Table B, and a record in Table B can have many matching records in Table A. This type of relationship is only possible by defining a third table (called a junction table) whose primary key consists of two fields the foreign keys from both Tables A and B. A many-to-many relationship is really two one-to-many relationships with a third table.

A many-to-many relationship means that for each record in one table there can be many records in another table and for each record in the second table there can be many in the first.

Many-to-many relationships can not be directly represented in relational database programs and have to be built by using two or more one-to-many relationships.

Defining relationships

You define a relationship by adding the tables that you want to relate to the Relationships window, and then dragging the key field from one table and dropping it on the key field in the other table.

- The kind of relationship that Microsoft Access creates depends on how the related fields are defined:
- A one-to-many relationship is created if only one of the related fields is a primary key or has a unique index.
- A one-to-one relationship is created if both of the related fields are primary keys or have unique indexes.
- A many-to-many relationship is really two one-to-many relationships with a third table whose primary key consists of two fields the foreign keys from the two other tables.

move a table that appears in the relationship map:

- Place your mouse over the table you want to move.
- Hold down the left mouse button, then drag the table to a new location.
- Release the mouse button to drop the table in its new place.

Understanding the relationship map

The relationship map lists all of the tables that were selected to relate, as well as all of the fields that were previously set up for that table. Notice that the first field has a key icon next to it. This is the primary key for the table.



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Primary and foreign keys

A primary key is the first field in each table of the database. You may recall that this field auto-numbers by default, so every record in the table has its own unique number to identify it. Access uses this number to quickly pull information together when you run queries or reports, which are covered later.

In the example above, the primary key for the Customers table is Customer ID, the primary key for the Orders table is Order ID, and the primary key for the Books table is Book ID.

A foreign key is a field that is the primary field in its own table but that shows up in another table. If you look closely at the Orders table, the fields Customer ID and Book ID appear there, as well as in their own respective tables. These fields are the primary key in their own tables, but in the Orders table, they are considered foreign keys.



Forms

A form is a database object that you can use to enter, edit, or display data from a table or a query. You can use forms to control access to data, such as which fields of data are displayed. For example, certain users may not need to see all of the fields in a table. Providing those users with a form that contains just the necessary fields makes it easier for them to use the database.

create a form with a single click,

1. Open the table or query upon which you want to base the form.
2. To create a form on which all fields from the underlying table or query are placed, displaying one record at a time, on the Create tab, click Form.



Forms in Access are like display cases in stores that make it easier to view or get the items that you want. Since forms are objects through which you or other users can add, edit, or display the data stored in your Access desktop database, the design of your form is an important aspect. There's a lot you can do design-wise with forms in Microsoft Access. You can create two basic types of forms -

- Bound forms
- Unbound forms

Bound Forms

- Let us now understand what Bound Forms are ?
- Bound forms are connected to some underlying data source such as a table, query, or SQL statement.
- Bound forms are what people typically think of when they think of the purpose of a form.
- Forms are to be filled out or used to enter or edit data in a database.
- Examples of bound forms will typically be what users use to enter, view or edit data in a database.

Unbound Forms

Let us look into Unbound Forms:

- These forms are not connected to an underlying record or data source.
- Unbound forms could be dialog boxes, switch boards, or navigation forms.
- In other words, unbound forms are typically used to navigate or interact with the database at large, as opposed to the data itself.

Types of Bound Forms

There are many types of bound forms you can create in Access. Let us understand the types ?

Single Item Form

This is the most popular one and this is where the records are displayed - one record at a time.

Multiple Item Form

This displays multiple records at a time from that bound data source.

Split Form

The form is divided into halves, either vertically or horizontally. One half displays a single item or record, and the other half displays a list or provides a datasheet view of multiple records from the underlying data source.

Form Controls

Every object on a form or report is a control and has its own set of properties (displayed in the Property list) that determine the characteristics of the data it contains. Some controls are linked to fields in the underlying table or query and some are merely text or graphical objects not related to any data source. Two of the most commonly used controls in a form or report are text boxes and labels.

- 1) Label: displays unchanging or informational text often times as headings or titles. Labels do not come from a source in the database such as a field or expression. This is called an unbound control because it is not bound to any data source.
- 2) Text Box: displays data as text and is a bound control. A bound control displays information that is stored in a field from the data. Text boxes are used to display, enter, and update values from fields in your database.

Form Sections

Forms consist of header, footer, and detail sections. In forms, there are two types of headers/footers. Form headers and footers are visible on every page of the form. Page headers/footers only appear on a printed copy of a form. There are never visible in Form View. Information about individual records appears in the detail sections.

Sizing Sections

Adjust the size of the area for any of the sections (headers, footers, detail), by dragging the horizontal border for that section with your mouse. To adjust line spacing in the detail section, drag the Detail border. There is no other line spacing control.

Working with Queries

Queries are questions you ask of your database. They allow you to select certain fields out of a table, or pull together data from various related tables and display it together. Queries can be used to perform calculations, and to edit the data in your tables. Queries can also form the basis of forms and reports.

Query Results

- If a query contains fields from two or more related tables, the results will only include records that have related records in all the tables. (In other words, in the query shown above, customers without records in the Orders table will not appear in the query results.) To display such records, use an outer join (see page 6) in your query.
- WARNING!** Any change you make in a query (adding, deleting or editing data) WILL BE CHANGED IN THE TABLES TOO!!!

Sort query results

In Design View, click the Sort row in the column you wish to sort by. A dropdown arrow appears; choose Ascending or Descending. If you sort by more than one column, the sorts will be done left-to-right.

Create a concatenated field in a query

Concatenated fields combine information from two or more fields into one. Ex: Combine first and last names into one field, called "FullName". In Design View, click in a blank column and type the following:

FullName:[FirstName]&" "&[LastName]

(Type a space between the two sets of quotation marks, and use square brackets around the field names.)

Create a calculated field in a query

In Design View, click in a blank column and type a mathematical expression, typing field names in square brackets. Any of the normal mathematical operators (+ - * / ^) can be used. If desired, give the expression a name as in the sample below. The following expression calculates a total cost by multiplying quantity times price:

Item Total:[Quantity]*[Price]

Use the Expression Builder to create calculated or concatenated fields

Fig 35



You can simplify the process of creating concatenated fields and other expressions with the Expression Builder. Create a blank column in your query grid and then click the Builder button in the Query Setup group on the Query Design Ribbon. The Expression Builder opens.

Type the expression in the large box at the top. One advantage is that you have way more room to type and see your expression than you have at the top of a query grid column!

A second advantage is that you can add fields to the expression by double clicking them in the Expression Categories column rather than by typing them. This removes the possibility of typos.

Fig 36



Specify criteria in a query (Filtering)

In Query Design View, click in the criteria row for the field you want to filter, and type the criteria (ex: type "OH" in the criteria row of the State field). When you run the query, only records matching the criteria.

Fig 37



Using Multiple Criteria

You can type criteria in more than one field.

- Criteria typed on the same line must all be met for a record to be displayed ("AND" logic). Ex: "OH" in the state field and "Smith" in the LastName field pulls up only Ohio-dwelling Smiths.
- If criteria are typed on different lines, records matching any of them will be retrieved ("OR" logic). Ex: "WA" and "OH" on different lines in the State field retrieves records for both states.

Criteria Ranges

Criteria ranges broaden and customize a search. Type a criteria range instead of a single value in the Criteria row of the query grid.

Criteria	Example	Description and Result
<	<14	Finds records where the field is less than a certain value. Records will have values under 14.
<=	<= #2/2/2006#	Finds records where the field is less than or equal to a certain value. Records will have dates on or before February 2, 2006 Note: dates are enclosed between # signs.
>	>100	Similar to above: Finds records where the value is
>=	>=100	greater than 100. The second expression displays records where the value is greater than or equal to 100.
=	="Diana"	Finds records where the value in the field is Diana. Note: text is enclosed in double quotes.

Expressions like these may be combined - for example, a criteria of <49 Or>=100 would return records with values below 49, or 100 or above, but not ones with values between 49 and 99.99.

Between __ And __	Between 1 and 4	Finds records where the field is between the endpoints.
Is Null	Is Null	Finds records where the field is empty.
Is Not Null	Is Not Null	Finds records where the field is not empty.
Like	Like U* Like "[U-X]*" Like **Korea** Like "*ina" Like "Chi??" Like "*4.99"	Finds records where the criteria match parts of the field. The * wildcard stands for any number of characters, and the ? wildcard stands for a single character. The sample criteria will return records where the field 1) starts with U; 2) starts with U, V, W or X, 3) contains the letters 'Korea'; 4) ends in the letters 'ina' as in ballerina; 5) has five letters and begins with the letters 'Chi' as in Chile or China; 6) is a number and ends in the digits '4.99' as in 24.99.

Create a parameter query

Parameters make queries flexible by letting users choose their own criteria each time they run the query. In the criteria box, type a phrase in square brackets; Access will use this phrase to prompt the user for a value. Ex: In a State field, type [Enter a state]. If the user types CA, only California records will be retrieved.

Specify a range in a parameter query

In the criteria box, type the following:

Between [] And []

Inside the brackets, type text telling the user what kind of information to enter.

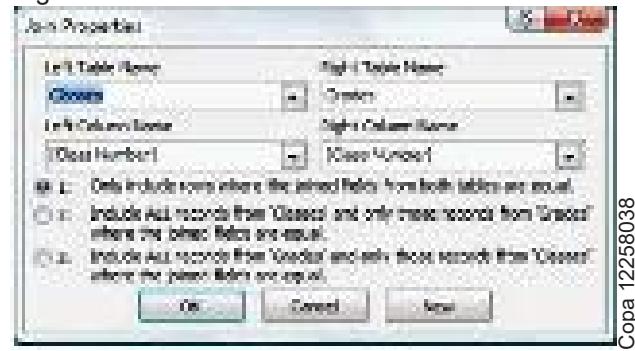
Inner Joins vs. Outer Joins

Excel normally uses inner joins in its queries. These queries return only those rows from both tables in the join that match on the joining field (e.g., customers in the Customers table with corresponding orders in the Orders table.)

If you need to display all customers, with or without orders, as well as any available order information, you need to use an outer join.

In the query tray, double click the join line between two related tables. The Join Properties dialog box will appear:

Fig 38



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Select button 2 or 3 depending on which field's records you want to display completely.

Action Queries

Action queries modify groups of records in one fell swoop. Types of action queries include:

- Update Queries (modify all records in a table that meet specific criteria - ex: change the tax rate for all Ohio customers from 5.75% to 6%)
- Delete Queries (remove records from a table - ex: delete all customers whose last order date is more than 2 years ago)
- Append Queries (add records to an existing table - ex: at the end of the year, add the year's orders to the end of an archive table)

- Make-table Queries (create a new table - ex: extract a subset of records into a new table, for a subordinate who needs Ohio customers only)

Other Specialized Queries

Instructions for creating and running these special query types can be found in the Access help manual by clicking the Help button in the upper right corner of the screen (Internet connection required).

Find Duplicates query: Lets you locate duplicate records in a table by displaying a field containing duplicate values alongside other fields for comparison, to help you tell if the record is really a duplicate.

Find Unmatched query: Lets you compare two tables and identify records in one of the tables that have no corresponding records in the other table.

Crosstab query: This is a special type of Totals query that presents summary information in a compact format that is similar to a spreadsheet.

Union query: Lets you review all of the data that is returned by several similar select queries together, as a combined set.

Concepts of network and internet

Objectives : At the end of this lesson you shall be able to

- define computer network and its advantages and disadvantages
 - name and explain the types of network and their characteristics
 - explain the types of topologies
 - state about the cables used for network system
 - name and state about the various connectors used in network system
 - explain about the hub, modem and internet
 - describe about the internet protocols connection sharing (ICS) using windows.
-

Define computer network

A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes.

Advantages of Computer Networks

The following are some of the advantages of computer networks.

- **File Sharing:** Networks offer a quick and easy way to share files directly. Instead of using a disk or USB key to carry files from one computer or office to another, you can share files directly using a network.
- **Security:** Specific directories can be password protected to limit access to authorized users. Also, files and programs on a network can be designated as "copy inhibit" so you don't have to worry about the illegal copying of programs.
- **Resource Sharing:** All computers in the network can share resources such as printers, fax machines, modems, and scanners.
- **Communication:** Even outside of the internet, those on the network can communicate with each other via electronic mail over the network system. When connected to the internet, network users can communicate with people around the world via the network.
- **Flexible Access:** Networks allow their users to access files from computers throughout the network. This means that a user can begin work on a project on one computer and finish up on another. Multiple users can also collaborate on the same project through the network.

- **Workgroup Computing:** Workgroup software like Microsoft BackOffice enables many users to contribute to a document concurrently. This allows for interactive teamwork.
- **Error reduction and improve consistency:** One can reduce errors and improve consistency by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.

Network Application Areas

There is a long list of application areas, which can be benefited by establishing Computer Networks. Few of the potential applications of Computer Networks are:

- 1 Information retrieval systems which search for books, technical reports, papers and articles on particular topics
- 2 News access machines, which can search past news, stories or abstracts with given search criteria.
- 3 Airline reservation, hotel booking, railway-reservation, car-rental, etc.
- 4 A writer's aid: a dictionary, thesaurus, phrase generator, indexed dictionary of quotations, and encyclopaedias.
- 5 Stock market information systems which allow searches for stocks that meet certain criteria, performance comparisons, moving averages, and various forecasting techniques.
- 6 Electronic Fund Transfer (EFT) between banks and via cheque clearing house.
- 7 Games of the types that grow or change with various enthusiasts adding to the complexity or diversity.
- 8 Electronic Mail Messages Systems (EMMS).

- 9 Corporate information systems such as marketing information system, customer information system, product information system, personnel information system, etc.
- 10 Corporate systems of different systems such as Order-Entry System, Centralized Purchasing, Distributed Inventory Control, etc.
- 11 On-line systems for Investment Advice and Management, Tax Minimization, etc.
- 12 Resources of interest to a home user.
- 13 Sports results.
- 14 Theatre, movies, and community events information.
- 15 Shopping information, prices, and advertisements.
- 16 Restaurants; good food guide.
- 17 Household magazine, recipes, book reviews, film reviews.
- 18 Holidays, hotels, travel booking.
- 19 Radio and TV programmes.
- 20 Medical assistance service.
- 21 Insurance information.
- 22 Computer Assisted Instruction (CAI).
- 23 School homework, quizzes, tests.
- 24 Message sending service.
- 25 Directories.
- 26 Consumer reports.
- 27 Employment directories and Job opportunities.
- 28 Tax information and Tax assistance.
- 29 Journey planning assistance viz. Train, bus, plane etc.
- 30 Catalogue of Open University and Virtual University courses.

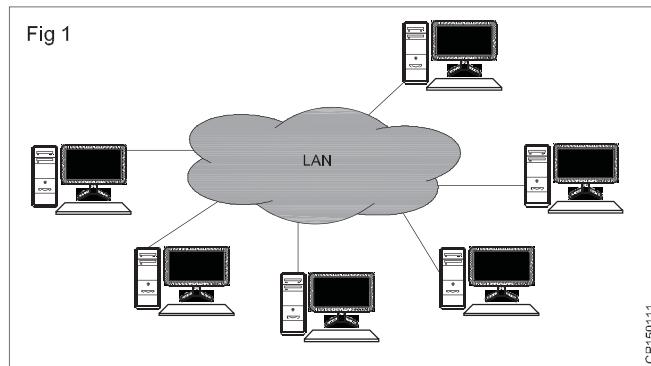
A classification of computer networks can be done to distance as in the table.

Interprocess (or) Distance	Network Type
0 to 1 Km	Local Area Network (LAN)
1 Km to 10 Km	Metropolitan Area Network (MAN)
10 Km to 1000 Km	Wide Area Network (WAN)
Above 1000 Km	Internet

Local Area Network (LAN)

Networks used to interconnect computers in a single room, rooms within a building or buildings on one site are called Local Area Network (LAN). LAN transmits data with a speed of several megabits per second (106 bits per second). The transmission medium is normally coaxial cables.

LAN (Fig 1) links computers, i.e., software and hardware, in the same area for the purpose of sharing information. Usually LAN links computers within a limited geographical area because they must be connected by a cable, which is quite expensive. People working in LAN get more capabilities in data processing, work processing and other information exchange compared to stand-alone computers. Because of this information exchange most of the business and government organisations are using LAN.



Major Characteristics of LAN

- every computer has the potential to communicate with any other computers of the network
- high degree of interconnection between computers
- easy physical connection of computers in a network
- inexpensive medium of data transmission
- high data transmission rate

Types of Connection

Peer to Peer: Peer to peer is an approach to computer networking where all computers share equivalent responsibility for processing data. Peer-to-peer

networking (also known simply as peer networking) differs from client-server networking, where certain devices have responsibility for providing or "serving" data and other devices consume or otherwise act as "clients" of those servers.

Client server: The term client-server refers to a popular model for computer networking that utilizes client and server devices each designed for specific purposes. The client-server model can be used on the Internet as well as LAN.

Advantages of LAN

- The reliability of network is high because the failure of one computer in the network does not affect the functioning for other computers.
- Addition of new computer to network is easy.
- High rate of data transmission is possible.
- Peripheral devices like magnetic disk and printer can be shared by other computers.

Disadvantages of LAN

If the communication line fails, the entire network system breaks down.

Use of LAN

Followings are the major areas where LAN is normally used

- File transfers and Access
- Word and text processing
- Electronic message handling
- Remote database access
- Personal computing
- Digital voice transmission and storage

Metropolitan Area Network (MAN)

A Data network designed for a town or city. In terms of geographic breadth, MANs are larger than, but smaller than. MANs (Fig 2) are usually characterized by very high-speed connections using optical fiber or other digital media.

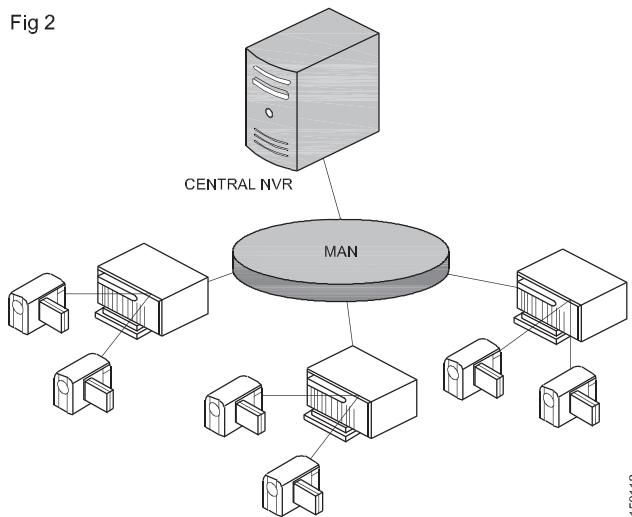
Characteristic of MAN

- 1 The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km range. Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings.
- 2 A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communications links and equipment are generally owned by either a consortium of users or by a network service provider

who sells the service to the users.

- 3 A MAN often acts as a high speed network to allow sharing of regional resources. It is also frequently used

Fig 2



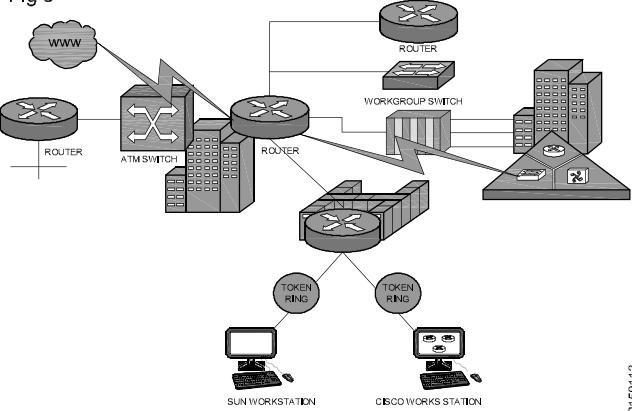
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to provide a shared connection to other networks using a link to a WAN.

Campus Area Network (CAN)

A Campus Area Network or Corporate Area Network (CAN) is a network made up of an interconnection of local area network within a limited geographical area. A

Fig 3



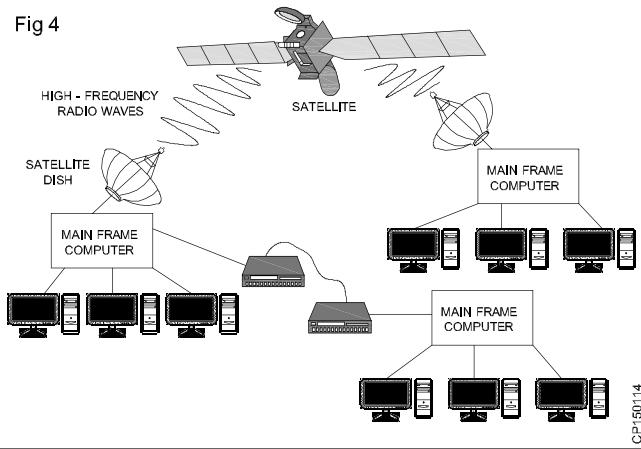
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CAN (Fig 3) is larger than a local area network but smaller than a Wide area Network

Wide Area Network (WAN)

The term Wide Area Network (Fig 4) is used to describe a computer network spanning a regional, national or global area. For example, for a large company the head quarters might be at Delhi and regional branches at Bombay, Madras, Bangalore and Calcutta. Here regional centres are connected to head quarters through WAN. The distance

Fig 4



between computers connected to WAN is larger. Therefore the transmission mediums used are normally telephone lines, microwaves and satellite links.

Characteristics of WAN

Followings are the major characteristics of WAN.

- Communication Facility:** For a big company spanning over different parts of the country the employees can save long distance phone calls and it overcomes the time lag in overseas communications. Computer conferencing is another use of WAN where users communicate with each other through their computer system.
- Remote Data Entry:** Remote data entry is possible in WAN. It means sitting at any location you can enter data, update data and query other information of any computer attached to the WAN but located in other cities.
- Centralised Information:** In modern computerised environment you will find that big organisations go for centralised data storage. This means if the organisation is spread over many cities, they keep their important business data in a single place. As the data are generated at different sites, WAN permits collection of this data from different sites and save at a single site.

Examples of WAN

- Ethernet:** Ethernet developed by Xerox Corporation is a famous example of WAN. This network uses coaxial cables for data transmission. Special integrated circuit chips called controllers are used to connect equipment to the cable.
- Arpanet:** The Arpanet is another example of WAN. It was developed at Advanced Research Projects Agency of U. S. Department. This Network connects more than 40 universities and institutions throughout USA and Europe.

Difference between LAN and WAN

- LAN is restricted to limited geographical area of few kilometers. But WAN covers great distance and op-

erate nationwide or even worldwide.

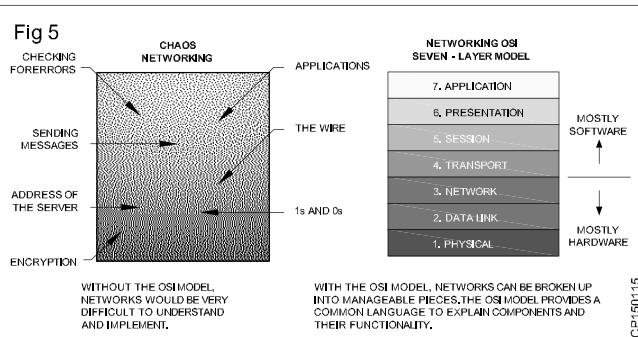
- In LAN, the computer terminals and peripheral devices are connected with wires and coaxial cables. In WAN there is no physical connection. Communication is done through telephone lines and satellite links.
- Cost of data transmission in LAN is less because the transmission medium is owned by a single organisation. In case of WAN the cost of data transmission is very high because the transmission medium used is hired either telephone lines or satellite links.
- The speed of data transmission is much higher in LAN than in WAN. The transmission speed in LAN varies from 0.1 to 100 megabits per second. In case of WAN the speed ranges from 1800 to 9600 bits per second (bps).
- Few data transmission errors occur in LAN compared to WAN. It is because in LAN the distance covered is negligible.

Open Systems Interconnection (OSI)

The Open Systems Interconnection (OSI) model is a reference tool for understanding data communications between any two networked systems. It divides the communications processes into seven layers. Each layer both performs specific functions to support the layers above it and offers services to the layers below it. The three lowest layers focus on passing traffic through the network to an end system. The top four layers come into play in the end system to complete the process.

An Overview of the OSI Model (Fig 5)

Application Layer (Layer 7): This layer interfaces directly to and performs common application services for the application processes. The common application services provide semantic conversion between associated application processes. Examples of common applica-



tion services include the virtual file, virtual terminal (for example, Telnet), and "Job transfer and Manipulation protocol" (JTM, standard ISO/IEC 8832)

Presentation Layer (Layer 6): The Presentation layer relieves the Application layer of concern regarding syntactical differences in data representation within the end-user systems. MIME encoding, encryption and similar manipulation of the presentation of data are done at this layer. An example of a presentation service would be

the conversion of an EBCDIC-coded text file to an ASCII-coded file.

Session Layer (Layer 5): The Session layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes check pointing, adjournment, termination, and restart procedures. This layer is responsible for setting up and tearing down TCP/IP sessions.

Transport Layer (Layer 4): The purpose of the Transport layer is to provide transparent transfer of data between end users, thus relieving the upper layers from any concern with providing reliable and cost-effective data transfer. The transport layer controls the reliability of a given link. Some protocols are stateful and connection oriented. This means that the transport layer can keep track of the packets and retransmit those that fail. The best known example of a layer 4 protocol is TCP.

Network Layer (Layer 3): The Network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service requested by the Transport layer. The Network layer performs network routing, flow control, segmentation/desegmentation, and error control functions. The router operates at this layer - sending data throughout the extended network and making the Internet possible, although there are layer 3 (or IP) switches. This is a logical addressing scheme - values are chosen by the network engineer. The addressing scheme is hierarchical.

Data Link Layer (Layer 2): The Data link layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical layer. The addressing scheme is physical which means that the addresses (MAC) are hard-coded into the network cards at the time of manufacture. The addressing scheme is flat.

Physical Layer (Layer 1): The physical layer defines all electrical and physical specifications for devices. This includes the layout of pins, voltages, and cable specifications. Hubs and repeaters are physical-layer devices. The major functions and services performed by the physical layer are:

- Establishment and termination of a connection to a communications medium.
- Participation in the process whereby the communication resources are effectively shared among multiple users. For example, contention resolution and flow control.
- Modulation or conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications

channel. These are signals operating over the physical cabling - copper and fiber optic, for example. SCSI operates at this level.

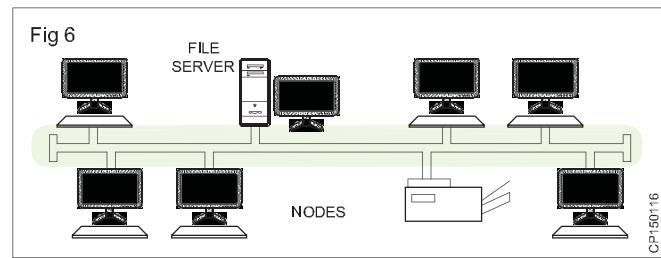
Network Topology

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations.

Main Types of Physical Topologies

- LINEAR BUS
- STAR
- RING
- TREE
- MESH

Linear Bus Topology



A linear bus topology (Fig 6) consists of a main run of cable with a terminator at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable.

Advantages of a Linear Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

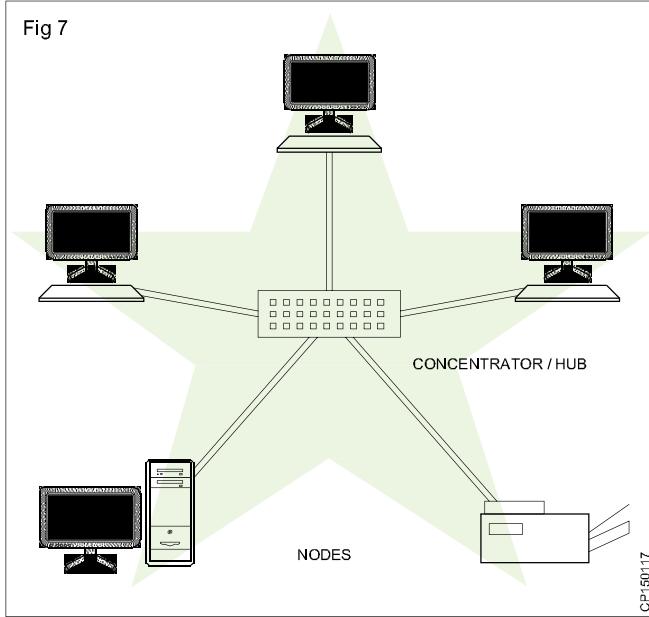
Disadvantages of a Linear Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star Topology

A star topology (Fig 7) is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub, switch, or concentrator

Fig 7



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Data on a star network passes through the hub, switch, or concentrator before continuing to its destination. The hub, switch, or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.

This configuration is common with twisted pair cable; however, it can also be used with coaxial cable or fiber optic cable.

Advantages of a Star Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

Disadvantages of a Star Topology

- Requires more cable length than a linear topology.
- If the hub, switch, or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the hubs, etc.

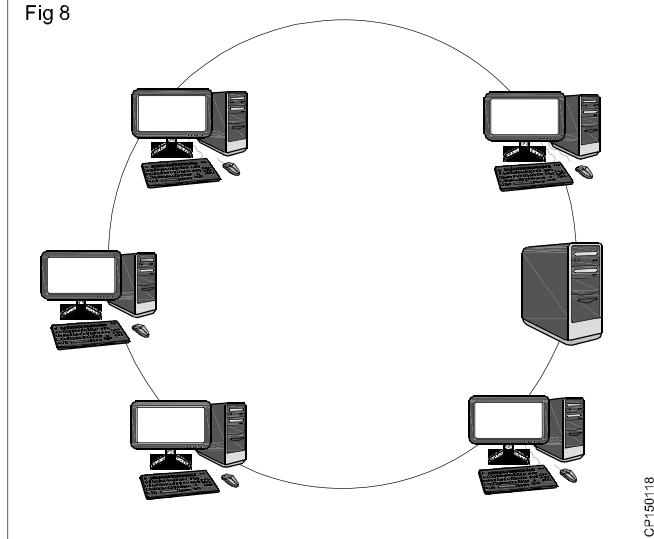
Ring Topology

The ring topology (Fig 8) is one which the network is a loop where data is passed from one workstation to another.

Advantages of Ring Topology

- This is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

Fig 8



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- There is no need for network server to control the connectivity between workstations.
- Additional components do not affect the performance of network.
- Each computer has equal access to resources.

Disadvantages of Ring Topology

- Each packet of data must pass through all the computers between source and destination.
- If one workstation or port goes down, the entire network gets affected.
- Network is highly dependent on the wire which connects different components.
- MAU's and network cards are expensive as compared to Ethernet cards and hubs.

Tree or Expanded Star

A tree topology (Fig 9) combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable. Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.

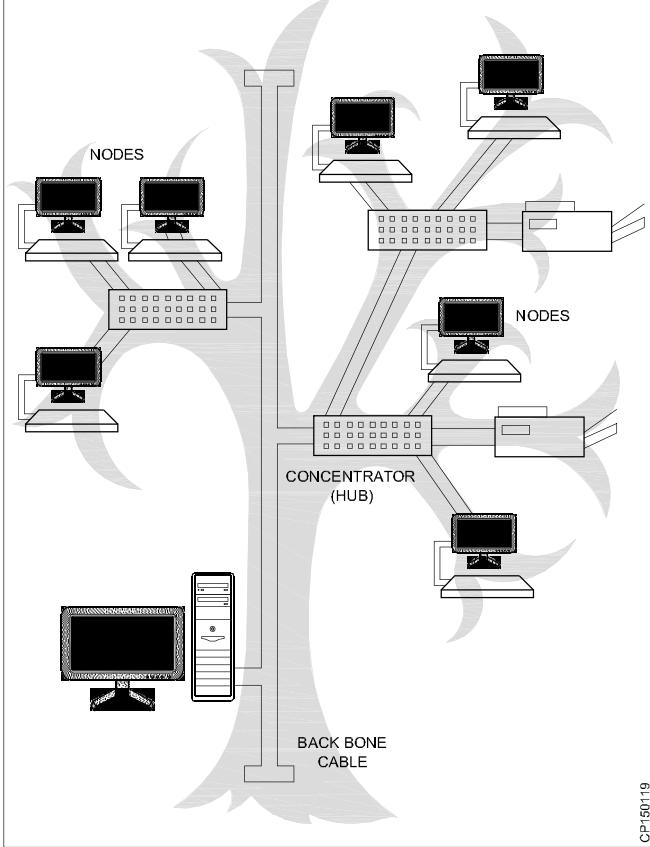
Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.

Disadvantages of a Tree Topology

- Overall length of each segment is limited by the type

Fig 9



of cabling used.

- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

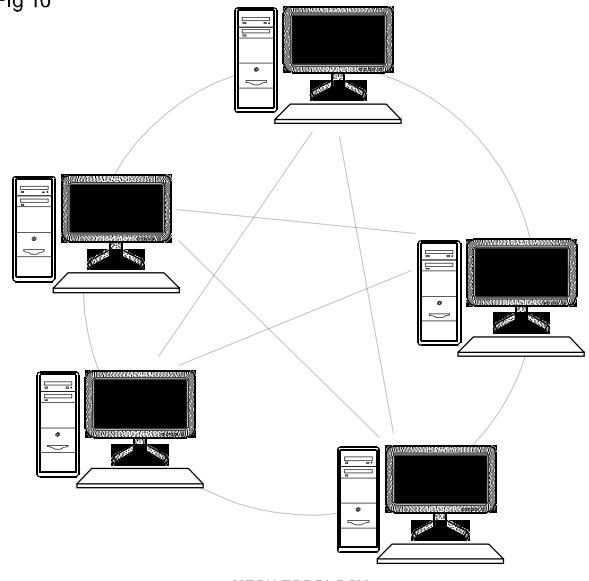
Mesh Topology

A network setup where each of the computers and network devices are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this topology is commonly used for wireless networks (Fig 10).

Advantages of Mesh topology

- Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected.
- Expansion and modification in topology can be done without disrupting other nodes.

Fig 10



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Disadvantages of Mesh topology

- There are high chances of redundancy in many of the network connections.
- Overall cost of this network is way too high as compared to other network topologies.
- Set-up and maintenance of this topology is very difficult. Even administration of the network is tough.

PROTOCOLS

Network Protocol

A **network protocol** defines rules and conventions for communication between network devices. Protocols for computer networking all generally use packet switch techniques to send and receive messages in the form of packets. Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received. Some protocols also support message acknowledgement and data compression designed for reliable and/or high-performance network communication. Hundreds of different computer network protocols have been developed each designed for specific purposes and environments.

Parameters of Protocol

- 1 Physical cable or transmission media.
- 2 Number of bits transmitted on the media.
- 3 When to transmit the data on the network.
- 4 Volume of data to be transmitted.
- 5 Interact with a network with different cable type or topology.
- 6 Ensure that the message has been delivered intact

Network Topology Comparison

Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
Star Bus Each computer connects to a central connection device.	All information passes through the central network connection.	Each computer must be close to the central device. 100 meters maximum cable length. Up to 24 computers per network.	Add a new computer by plugging in a new cable from the computer to the connection device.	When one computer goes down, the rest of the network is unaffected. If the connection device goes down, then the network is down.	More expensive of the simple topologies, it requires costly connection device. Usually cheaper than a hybrid network.	Uses twisted pair cable. Requires large amounts of cable. No more than 100 meters from the computer to the connection device.
Bus Single cable connects everything.	One computer at a time sends information. Information goes along the cable and the computer accesses the information off the cable.	Connect the cable from one computer to the next and so on to the end. A terminator is placed at each end of the network.	To add a computer, you must shut down the network and disconnect the cable from the existing computers.	If one computer malfunctions, the entire network goes down.	A cheaper network since there is usually one continuous copper cable.	Single continuous cable connects the devices. Terminator is required at each end of the cable. Uses coaxial or twisted pair cabling.
Ring Single cable configured in a ring.	Information goes in one direction around the ring and passes along the ring until it reaches the correct computer.	Computers are located close to each other. Setup is easy. There is no connector. The ring has no beginning and no end.	Cable between the computers must be broken to add a new computer, so the network is down until the new device is back online.	If there's a break in the cable or an error in the network, information continues to transfer through the rest of the ring until reaching the point of the break. This makes troubleshooting easy.	One of the more expensive topologies due to high cable costs.	Requires more cabling than other topologies. Uses twisted pair.

Network Topology Comparison						
Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
H y b r i d Mesh Combines two or more different structures.	Often used across long distances. Information transfer can happen in different ways, depending on the other topologies.	Often created when expanding an existing network. Can use a variety of connection devices.	Connection devices make combining different networks and different topologies easy.	Troubleshooting is most difficult in this topology because of the variety of technologies.	Expensive, large, and usually complicated.	Cabling depends on the types of networks. Can use twisted pair and coaxial cable. Also incorporates fiber optic cabling over long distances.

and in a proper manner.

List of Network Protocols

1 TCP/IP: Transmission Control Protocol / Internet Protocol is an industry standard protocol widely used. It is used for inter operating among different types of computers. Almost all types of networks support TCP/IP. It is the protocol used by the Internet. It uses a 32 - bit addressing scheme.

IP Address

IP defines an addressing scheme that is independent of the underlying physical address (e.g. 48-bit MAC address). IP specifies a unique 32-bit number for each host on a network.

This number is known as the **Internet Protocol Address**, the **IP Address** or the **Internet Address**. These terms are interchangeable. Each packet sent across the internet contains the IP address of the source of the packet and the IP address of its destination.

2 UDP - User Datagram Protocol - is a simple OSI transport layer protocol for client/server network applications based on Internet Protocol (IP). UDP is the main alternative to TCP and one of the oldest network protocols in existence, introduced in 1980. UDP is often used in videoconferencing applications or computer games specially tuned for real-time performance.

3 FTP: File Transfer Protocol (**FTP**) is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet.

FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves using a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that hides (encrypts) the username and password, and encrypts the content, FTP is often secured with SSL/TLS ("FTPS"). **SSH File Transfer Protocol (SFTP)** is sometimes also used instead.

4 SMTP

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (**IP**) networks.

While electronic mail servers and other mail transfer agents use SMTP to send and receive mail messages, user-level client mail applications typically only use SMTP for sending messages to a mail server for relaying.

For receiving messages, client applications usually use either the **Post Office Protocol (POP)** or the **Internet Message Access Protocol (IMAP)** or a proprietary system (such as Microsoft Exchange or Lotus Notes/ Domino) to access their mail box accounts on a mail server.

5 Telnet

Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal

connection. User data is interspersed in-band with Telnet control information in an 8-bitbyte oriented data connection over the **Transmission Control Protocol (TCP)**.

Telnet provided access to a command-line interface (usually, of an operating system) on a remote host. Most network equipment and operating systems with a TCP/IP stack support a Telnet service for remote configuration (including systems based on Windows NT). Because of security issues with Telnet, its use for this purpose has waned in favour of SSH.

6 HTTP

The **Hypertext Transfer Protocol (HTTP)** is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

Hypertext is a multi-linear set of objects, building a network by using logical links (the so-called hyperlinks) between the nodes (e.g. text or words). HTTP is the protocol to exchange or transfer hypertext.

7 SSH File Transfer Protocol

In computing, the **SSH File Transfer Protocol** (also **Secure File Transfer Protocol**, **Secure FTP**, or **SFTP**) is a network protocol that provides file access, file transfer, and file management functionalities over any reliable data stream.

It was designed by the **Internet Engineering Task Force (IETF)** as an extension of the **Secure Shell Protocol (SSH)** version 2.0 to provide secure file transfer capability, but is also intended to be usable with other protocols.

The IETF of the Internet Draft states that even though this protocol is described in the context of the SSH-2 protocol, it could be used in a number of different applications, such as secure file transfer over **Transport Layer Security (TLS)** and transfer of management information in VPN applications.

This protocol assumes that it is run over a secure channel, such as SSH, that the server has already authenticated the client, and that the identity of the client user is available to the protocol.

8 Post Office Protocol

In computing, the **Post Office Protocol (POP)** is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection. POP and IMAP (Internet Message Access Protocol) are the two most prevalent Internet standard protocols for e-mail retrieval.

Virtually all modern e-mail clients and servers support both. The POP protocol has been developed through several versions, with version 3 (POP3) being the current standard. Most webmail service providers such as Hotmail, Gmail and Yahoo! Mail also provide IMAP and POP3 service.

Networking Components

- **Gateway:** A device sitting at a network node for interfacing with another network that uses different protocols. Works on OSI layers 4 to 7.
- **Router:** A specialized network device that determines the next network point to which it can forward a data packet towards the destination of the packet. Unlike a gateway, it cannot interface different protocols. Works on OSI layer 3.
- **Switch:** A device that allocates traffic from one network segment to certain lines (intended destination(s)) which connect the segment to another network segment. So unlike a hub a switch splits the network traffic and sends it to different destinations rather than to all systems on the network. Works on OSI layer 2.
- **Bridge:** A device that connects multiple network segments along the data link layer. Works on OSI layer 2.
- **Hub:** It connects multiple Ethernet segments together making them act as a single segment. When using a hub, every attached device shares the same broadcast domain and the same collision domain. Therefore, only one computer connected to the hub is able to transmit at a time.

Depending on the network topology, the hub provides a basic level 1 OSI model connection among the network objects (workstations, servers, etc.). It provides bandwidth which is shared among all the objects, compared to switches, which provide a connection between individual nodes.

- **Repeater:** A device to amplify or regenerate digital signals received while sending them from one part of a network into another. Works on OSI layer 1.
- **Modem (MoDem):** A device that modulates an analog "carrier" signal (such as sound), to encode digital information, and that also demodulates such a carrier signal to decode the transmitted information, as a computer communicating with another computer over the telephone network

Types of MODEM

External Modem: This is a modem separated from the system unit in the computer case. It is connected to the serial port of the computer by means of a cable. It is connected to the telephone wall jack by another cable.

Internal Modem: An internal modem is a circuit board (a modem card) that can be added to the system unit of the computer. It takes one of the expansion slots.

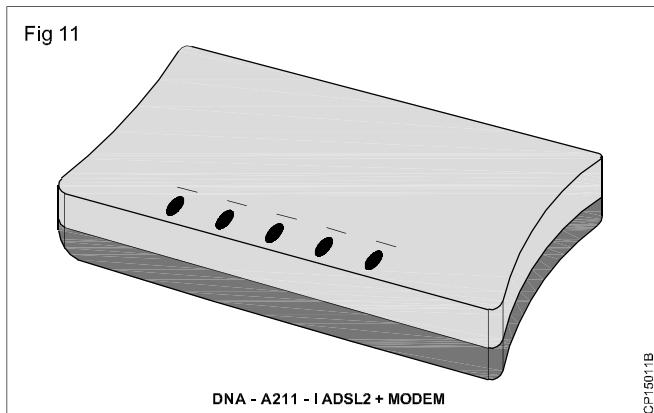
Wired Modem / Standard Modem

Most modem's used today are called standard modems. These modems are usually operated by commands entered from a microcomputer keyboard. Users control the functions (dialling, etc.) of a modem through the keyboard. Modems may use different command languages to control their functions,

Wireless Modems: Wireless modems transmit the data signals through the air instead of by using a cable. They sometimes are called a radiofrequency modem. This type of modem is designed to work with cellular technology, and wireless local area networks. Wireless modems are not yet perfected, but the technology is rapidly improving.

ADSL Modem

Asymmetric Digital Subscriber Line, ADSL (Fig 11) is a type of DSL broadband communications technology used for connecting to the Internet. ADSL allows more data to be sent over existing copper telephone lines POTS, when compared to traditional modem lines. A special filter, called a micro filter, is installed on a subscriber's telephone line to allow both ADSL and regular voice (telephone) services to be used at the same time. ADSL requires a special ADSL modem and subscribers must be in close geographical locations to the provider's central office to receive ADSL service. Typically this distance is within a radius of 2 to 2.5 miles. ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the up-stream rate).



Network Interface Card (NIC)

NIC (Fig. 12) provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card. Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or Wi-Fi wireless standards.



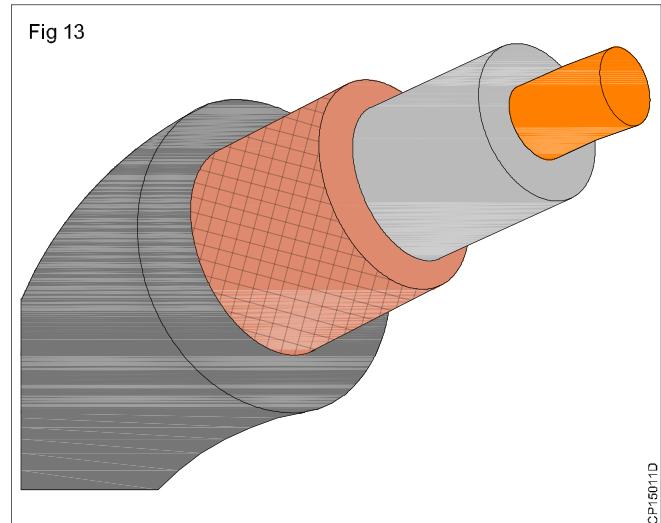
Ethernet NICs plug into the system bus of the PC and include jacks for network cables, while Wi-Fi NICs contain built-in transmitters / receivers (transceivers). In new computers, many NICs are now pre-installed by the manufacturer. All NICs feature a speed rating such as 11 Mbps, 54 Mbps or 100 Mbps that suggest the general performance of the unit.

Network Cables Standards

Cable is the medium through which information usually moves from one network device to another. There are several types of cable which are commonly used with LANs. In some cases, a network will utilize only one type of cable, other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol, and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

Cable standards

A wide range of cabling types are been used to run Ethernet systems. Therefore, different types of cabling standards are being used for the networks involved in connecting devices together using different types of cabling system.



Coaxial cable (Fig 13) is the kind of copper cable used by companies between the community antenna and user homes and businesses. Coaxial cable is sometimes used by telephone companies from their central office to the telephone poles near users. It is also widely installed for use in business and corporation and other types of.

Coaxial cable is called "coaxial" because it includes one physical that carries the signal surrounded (after a layer of insulation) by another concentric physical channel, both running along the same axis. The outer channel serves as a ground. Many of these cables or pairs of coaxial tubes can be placed in a single outer sheathing and, with repeaters, can carry information for a great distance.

10BASE-T Cable Standard: 10Base-T is one of the Ethernet standards for cabling in a network environment. 10BaseT uses a twisted pair cable with a maximum length

of 100 meters. Standard 10BaseT operates at 10 Mbps. It is commonly used in a star topology.

10BASE-FL Cable Standard: 10BaseFL is a fiber optic cable standard designed to run at 10 Mbps. It is similar to 10Base-T, though the media type is fiber. For use up to 2000 meters.

100BASE-TX Cable Standard: 100 Mbps Fast Ethernet over category 5 twisted pair cable. Maximum cable length of 100 meters.

100BASE-FX Cable Standard: 100 Mbps Fast Ethernet standard over fiber cable. Can transmit data up to 2000 meters.

1000BASE-T Cable Standard: Gigabit Ethernet over twisted pair copper wires. Transmit up to 1000 Mbps. 100 meter maximum cable length. Cat5 or better required (Cat6 cabling recommended).

1000BASE-CX Cable Standard: Gigabit Ethernet over a special copper twinax cable. Up to 25 meters in length. Typically used in a wiring closet or data center as a short jumper cable.

1000BASE-SX Cable Standard: Gigabit Ethernet using a short-wavelength laser device over multimode fiber optic cable. 50 µm core (max 300 meters) or 62.5 µm core (max 500 meters). 1000Mbps maximum transfer speed.

1000BASE-LX Cable Standard: Gigabit Ethernet using long-wavelength laser transmitters over fiber optic cable. Up to 3,000 meters. Uses single mode fiber and requires SC connectors for terminating the cable.

10 GBASE-SR Cable Standard: 802.3ae standard. 33 meters for 62.5µm fiber optic cable, 300 meters for 50µm cables. 10 Gbps (Gigabit per second) transfer rate.

10 GBASE-LR Standard: 10 Gbps transfer rate. 10 kilometres maximum distance. Fiber optic cable.

10 GBASE-ER Standard: 10 Gbps transfer rate. 40 kilometres maximum cable length. Fiber optic cable.

Media types

A cable is a device which contains a number of signal conductors usually in the form of separate wires. It is the medium through which information usually moves from one system to another through the network. There are several types of cable which are commonly used with the local area network. In some cases, a network utilizes only one type of cable, whereas other network uses a variety of cable types. The type of cable chosen for a network is related to network topology, protocol and size.

Twisted Pair

Twisted pair cable is the most common type of network medium used in LAN today. A transmission media consists of colour coded pairs of two shielded insulated copper wires which are arranged in a spiral pattern. The spiral pattern is an important aspect of twisted - pair cables in order to minimize cross talk of interference between

adjoining wires.

The advantage of using twisted pair cables are

- It is lighter, thinner and more flexible
- Easy to install
- It is inexpensive

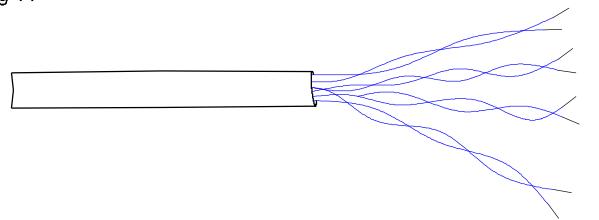
There are two varieties of twisted pair cabling, they are

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**

Unshielded twisted pair (UTP)

Unshielded twisted pair (Fig 14) cabling consists of two unshielded wires twisted around each other that contain no shielding. It is commonly used in the telephone wires and is common for computer networking because of high flexibility of the cables. It is a plastic connector that looks like a large telephone-style connector. The standard connector for unshielded twisted pair cabling is RJ-45 connector.

Fig 14



CP15011E

UTP has five categories of cable standards defined by the Electronic Industries Association and Telecommunications Industry Association (commonly known as EIA/TIA). The five categories of unshielded twisted pair are:

Categories of Unshielded Twisted Pair

In order to manage the network cabling, you need to be familiar with the standards that may be used on modern networks. The categories of the unshielded twisted pair cable are described below.

Category 1

- It is a form of UTP that contains two pairs of wire.
- CAT 1 is suitable for voice communications but not for data.
- It can carry up to 128 kilobits per second (Kbps) of data.
- It is usually used for telephone wire Data rate - 1 Mbps. This type of wire is not capable of supporting computer network traffic and is not twisted.

Category 2

- It contains four wire pairs and can carry up to 4 Mbps of data.
- CAT 2 is rarely found on modern networks.
- Category 2 or CAT 2 is capable of transmitting data up to 4 Mbps. This type of cable is seldom used.

Category 3

- CAT 3 made up of four twisted - pair wires, each twist is three times per foot. It is certified to transmit data up to 10 Mbps.
- CAT 3 has typically been used for 10 Mbps Ethernet or 4 Mbps Token Ring networks.
- The CAT 3 cabling is gradually replaced with CAT5 to accommodate higher throughput.

Category 4

- CAT 4 is made up of four twisted-pair wires, specialized to transmit data up to 16 Mbps and is rarely used in new installations.
- CAT 4 may be used for 16Mbps Token Ring or 10 Mbps Ethernet networks. It is guaranteed for signals as high as 20 MHz and Provides More protection against crosstalk and attenuation than CAT1, CAT2, orCAT 3.

Category 5

- CAT 5 is the most popular twisted pair Ethernet cabling designed for high signal integrity which is in common use today.
- CAT 5 contains four wire pairs and supports up to 100 Mbps throughout.
- It is the most popular form of UTP for new network installations and upgrades to Fast Ethernet.
- In addition to 100 Mbps Ethernet, CAT 5 wiring can support other fast networking technologies.
- It is popular because it is both affordable and high speed for today's local area networks Cat 5 cables are often used in structured cabling for computer networks such as fast Ethernet.

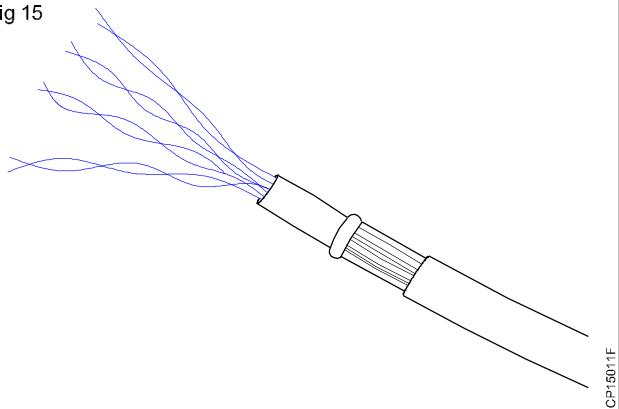
Category 6

- CAT 6 cable was originally designed to support gigabit Ethernet. It is similar to CAT 5 wire, but contains a physical separator between the four Twisted copper wires pairs to further reduce the electromagnetic interference.
- It is a twisted-pair cable that contains four wire pairs, each wrapped in foil insulation. Additional foil insulation covers the bundle of wire pairs, and a fire-resistant plastic sheet covers the second foil layer.
- The foil insulation provides excellent resistance to crosstalk and enables CAT 6 to support at least six times the throughput supported by regular CAT 5.
- When the CAT 6 is used as a patch cable, it is usually terminated in RJ-45 Electrical connectors.

Shield Twisted Pair (Fig 15)

A type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires.

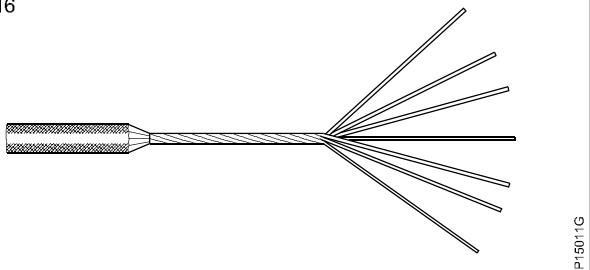
Fig 15



The extra covering in shielded twisted pair wiring protects the transmission line from leaking into or out of the cable. STP cabling often is used in networks, especially fast data rate Ethernets.

Fiber Optic Cable (Fig 16)

Fig 16



A technology that uses glass (or plastic) threads (fibers) to transmit. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages on to light waves.

Fibre optics has several advantages over traditional metal lines:

- Fibre optic cables have a much greater than metal cables. This means that they can carry more data.
- Fibre optic cables are less susceptible than metal cables to interference.
- Fibre optic cables are much thinner and lighter than metal wires.
- Data can be transmitted (the natural form for data) rather than analogically.

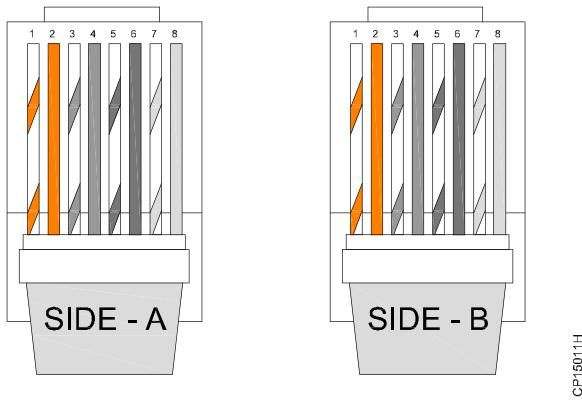
The main disadvantage of fibre optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

In addition, telephone companies are steadily replacing traditional telephone lines with fibre optic cables. In the future, almost all communications will employ fibre optics.

Straight Cable

A straight cable (Fig 17) is to connect different type of devices. This type of cable will be used most of the time and can be used to:

Fig 17



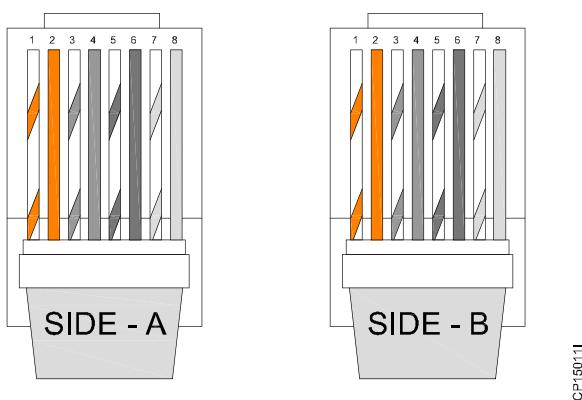
- 1 Connect a computer to a switch/hub's normal port.
- 2 Connect a computer to a cable/DSL modem's LAN port.
- 3 Connect a router's WAN port to a cable/DSL modem's LAN port.
- 4 Connect a router's LAN port to a switch/hub's uplink port. (Normally used for expanding network)
- 5 Connect 2 switches/hubs with one of the switch/hub using an uplink port and the other one using normal port.

If you need to check how straight cable looks like, it's easy. Both sides (side A and side B) of cable have wire arrangement with same colour.

Crossover Cable

A crossover cable (Fig 18), it's usually used to connect same type of devices. A crossover cable can be used to:

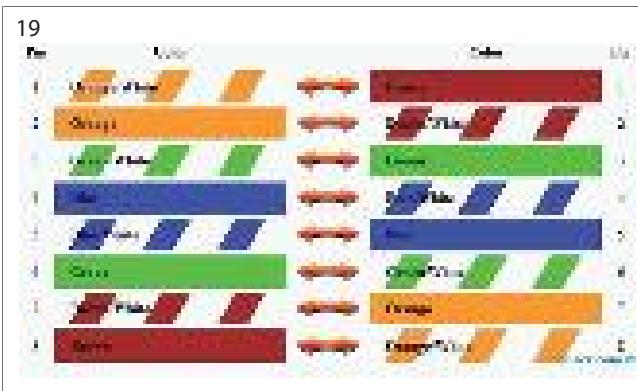
Fig 18



- 1 Connect 2 computers directly.
- 2 Connect a router's LAN port to a switch/hub's normal port. (Normally used for expanding network).
- 3 Connect 2 switches/hubs by using normal port in both switches/hubs.

If you need to check how crossover cable looks like, both side (side A and side B) of cable have wire arrangement with following different colour.

Rollover Cable (Fig 19)



Rollover cable (also known as **Cisco Console Cable** or a **Yost Cable**) is a type of cable that is often used to connect a computer terminal to a router's port. This cable is typically flat (and has a light blue colour) to help distinguish it from other types of network cabling. It gets the name rollover because the pin outs on one end are reversed from the other, as if the wire had been rolled over and you were viewing it from the other side.

Connectors

The media connectors are the physical devices that help to transfer the data between the systems.

RJ11: Registered Jack-11 (Fig 20) a four- or six-wire used primarily to connect telephone equipment. RJ-11 connectors are also used to connect some types of some types of Local area network.



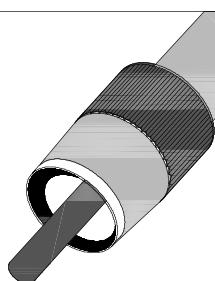
RJ45: RJ45 (Fig 21) connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable.

ST: ST stands for **Straight Tip** (Fig 22) - a quick release bayonet style developed by AT&T. STs were predominant in the late 80s and early 90s.

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Fig 22



CP-5011M

ST Connectors are among the most commonly used fiber optic connectors in networking applications. They are cylindrical with twist lock coupling, 2.5mm keyed ferrule. ST connectors are used both short distance applications and long line systems.

SC: SC stands for **S**ubscriber **C**onnecto**r** (Fig 23) - a general purpose push/pull style Connector developed by NTT. SC has an advantage in keyed duplexility to support send/receive channels.

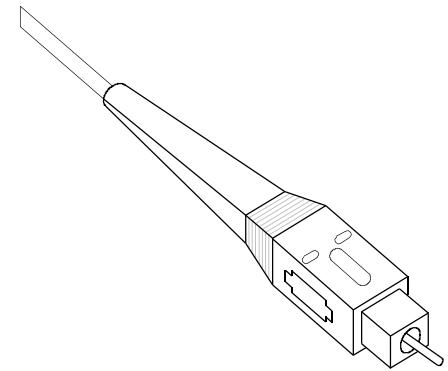
SC Connectors are frequently used for newer Network applications. The SC is a snap-in connector that is widely used in single mode systems for its performance. The SC connector is also available in a Duplex configuration. They offer low cost, simplicity, and durability. SC connectors provide for accurate alignment via their ceramic ferrules.

The square, snap-in connector latches with a simple push-pull motion and is keyed. They feature a 2.5mm Ferrule and molded housing for protection. Typical matched SC connectors are rated for 1000 mating cycles and have an Insertion Loss of 0.25 dB.

LC: LC stands for **L**ucent **C**onnecto**r** (Fig 24). The LC is a small form factor fiber optic connector.

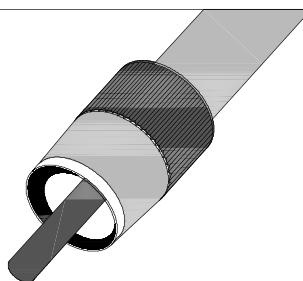
The LC Connector uses a 1.25 mm ferrule, half the size of the ST. Otherwise, it is a standard ceramic Ferrule connector. The LC has good performance and is highly favoured for single mode.

Fig 23



CP-5011N

Fig 22



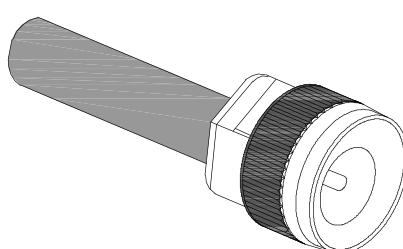
CP-5011M

USB: The USB 2.0 Standard-A type of USB plug is a flattened rectangle which inserts into a "downstream-port" receptacle on the USB host, or a hub, and carries both power and data. This plug is frequently seen on cables that are permanently attached to a device, such as one connecting a keyboard or mouse to the computer via USB connection.

A Standard-B plug-which has a square shape with bevelled exterior corners-typically plugs into an "upstream receptacle" on a device that uses a removable cable, e.g. a printer. A Type B plug delivers power in addition to carrying data. On some devices, the Type B receptacle has no data connections, being used solely for accepting power from the upstream device. This two-connector-type scheme (A/B) prevents a user from accidentally creating an Electrical loop.

BNC: Bayonet Neill Concelman (Fig 25) connector, (sometimes erroneously called a British Naval Connector or Bayonet Nut Connector, a type of connector used with coaxial cable such as the RG-58 A/U cable used with the 10Base2. The basic BNC connector is a male type mounted at each end of a cable.

Fig 25



CP-5011P

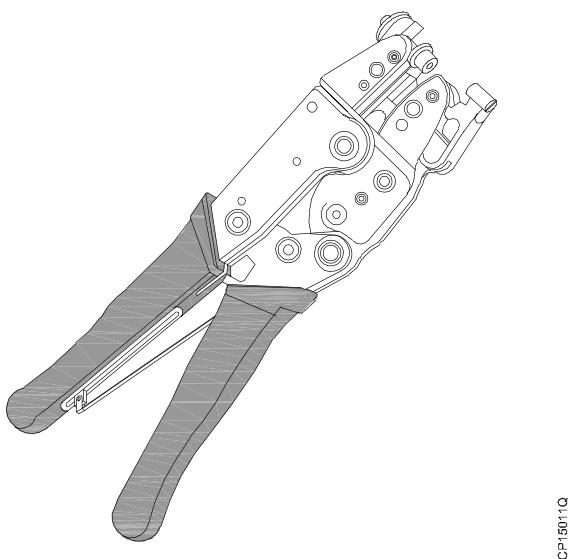
This connector has a center pin connected to the center cable conductor and a metal tube connected to the outer cable shield. A rotating ring outside the tube locks the cable to any female connector.

BNC T-connectors (used with the 10Base-2 system) are female devices for connecting two cables to a NIC. A BNC barrel connector allows connecting two cables together.

BNC connectors can also be used to connect some monitor, which increases the accuracy of the signals sent from the adapter.

Crimping Tool: A crimping tool (Fig 26) is a tool designed to crimp or connect a connector to the end of a cable. For example, network cables and phone cables are created using a crimping tool to connect the RJ45 and RJ11 connectors to the end of the cable. In the picture to the right, is an example of what a crimping tool looks like. This shows a tool capable of crimping both RJ-11 and RJ-45 connectors.

Fig 26



How to Crimp RJ45

1 Strip 1 to 2 inches (2.5 to 5.1 cm) of the outer skin at the end of the cable wire by making a shallow cut in the skin with a utility knife. Run the knife around the cable, and the jacket should slide off easily. There will be 4 pairs of twisted wires exposed, each of them a different color or colour combination.

Orange-white striped and solid orange

Green-white striped and solid green

Blue-white striped and solid blue

Brown-white striped and solid brown

2 Fold each pair of wires backwards to expose the core of the cable.

3 Cut off the core and discard.

4 Straighten the twisted wires using 2 pair of tweezers. Grasp a wire beneath a bend with 1 pair of tweezers, and use the other pair to gently straighten the bend. The straighter your wires, the easier your job will be

5 Arrange the untwisted wires in a row, placing them into the position, running from right to left, in which they will go into the RJ-45 connector:

- Orange with a white stripe
- Orange
- Green with a white stripe
- Blue
- Blue with a white strip
- Green
- Brown with a white stripe
- Brown

6 Trim the untwisted wires to a suitable length by holding the RJ-45 connector next to the wires. The insulation on the cable should be just inside the bottom of the RJ-45 connector. The wires should be trimmed so that they line up evenly with the top of the RJ-45 connector.

- Trim the wires in small increments, checking frequently to ensure a correct fit. It's better to cut the untwisted wires a few times than have to go back and start all over again because you trimmed off too much.

7 Insert the wires into the RJ-45 connector, making sure that they stay aligned and each color goes into its appropriate channel. Make sure that each wire goes all the way to the top of the RJ-45 connector. If you don't make these checks, you will find that your newly crimped RJ-45 connector is useless.

8 Use the crimping tool to crimp the RJ-45 connector to the cable by pressing the jacket and cable into the connector so that the wedge at the bottom of the connector is pressed into the jacket.

Re crimp the cable once more to ensure proper connection.

9 Follow the instructions above to crimp an RJ-45 connector to the opposite end of the cable

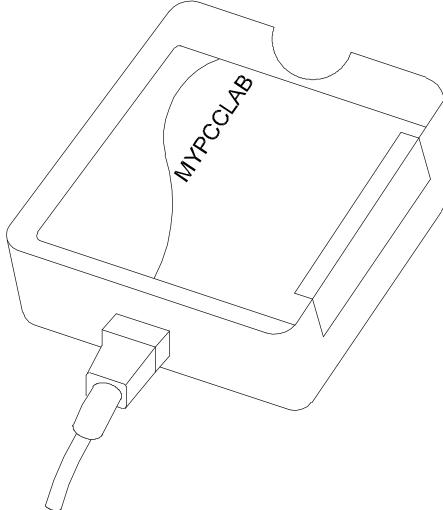
10 Use a cable tester to assure that your cable is working properly when both ends are crimped.

Cable Tester (Fig 27)

When connected to an Ethernet cable, a network cable tester tells if the cable is capable of carrying an Ethernet signal. If the cable carries the signal, this indicates that all the circuits are closed, meaning that electric current can move unimpeded through the wires, and that there are no short circuits, or unwanted connections, in the wire.

Network cable testers vary in complexity and price, but a basic tester consists of a source of electrical current, a measuring device that shows if the cable is good, and a connection between the two, usually the cable itself.

Fig 27



CP15011R

Computer networks use Ethernet cables to allow computers in the network to "talk" to each other. An Ethernet cable has eight wires that are arranged in four pairs. For current to flow correctly, the wire pairs must be connected in the proper order.

A network cable tester can identify if the wires are paired correctly. It can also show if there is a break in the insulation, a situation which allows crosstalk between two wires that should not be connected. The tester can also tell whether the cable has the proper level of resistance.

A network cable tester can be a simple apparatus that merely identifies whether current flows through the cable, or it may be a professional-level, complex device that gives additional information that helps identify the problem.

Professional-level network cable testers may not only tell if an open circuit exists, but may identify where the break is located. Some also identify the gauge of wire used and can generate their own signal to test for interference.

How to Check with the Tester

- 1 Turn on your network cable tester.
- 2 Plug one end of the Ethernet cable you are trying to test into the "IN" Ethernet input on the network cable tester.
- 3 Plug the other end of your Ethernet cable you are trying to test into the "OUT" input on the network cable tester.
- 4 Press the "Test" button. The network cable tester will send a signal across the Ethernet cable. If the signal gets from one end of the cable to the other, a green light will appear on the device, letting you know that the test was successful. If the signal does not get from one end of the cable to the other, a red light will appear on the device, letting you know that the test was not successful and that the cable is bad.

Switch

A **Network Switch** (Fig 28) is a small hardware device that joins multiple computers together within one Local Area Network. Technically, network switches operate at layer two (Data Link Layer) of the OSI.

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Network switches appear nearly identical to hub, but a switch generally contains more intelligence (and a slightly higher price tag) than a hub. Unlike hubs, network switches are capable of inspecting data packet as they are received, determining the source and destination device of each packet, and forwarding them appropriately.

By delivering messages only to the connected device intended, a network switch conserves bandwidth and offers generally better performance than a hub.

Availability of Switches

- 1 8 Port Switches
- 2 16 port switches
- 3 24 port switches
- 4 32 port switches

Hub: A Hub (Fig 29) is a small, simple, inexpensive device that joins multiple computers together. Many network hubs available today support the Ethernet standard. Other types including USB hubs also exist, but Ethernet is the type traditionally used in home networking.

To network a group of computers using an Ethernet hub,

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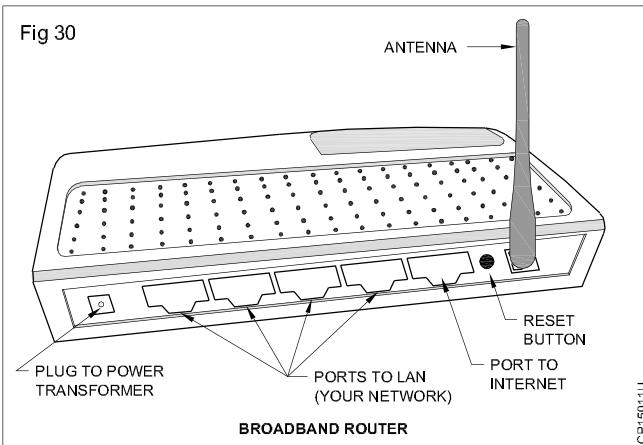


first connect an Ethernet cable into the unit, and then connect the other end of the cable to each computer's NIC. All Ethernet hubs accept the RJ45 connectors of standard Ethernet cables.

Ethernet hubs vary in the speed (network data rate or bandwidth they support. Some years ago, Ethernet hubs offered only 10 Kbps rated speeds. Newer types of hubs offer 100 Mbps Ethernet. Some support both 10 Mbps and 100 Mbps (so-called dual-speed or 10/100 hubs).

Routers

Routers (Fig 30) are physical devices that join multiple wired or wireless networks together. Technically, a wired or wireless router is a Layer 3 gateway, meaning that the wired/wireless router connects networks (as gateways do), and that the router operates at the network layer of the OSI model.



Home networkers often use an Internet Protocol (IP) wired or wireless router, IP being the most common OSI network layer protocol. An IP router such as a DSL or cable modem router joins the home's LAN to the WAN of the Internet.

Bridges

A bridge (Fig 31) device filters data traffic at a network boundary. Bridges reduce the amount of traffic on a LAN by dividing it into two segments.



Bridges operate at the data link layer (Layer 2) of the OSI model. Bridges inspect incoming traffic and decide whether to forward or discard it. An Ethernet bridge, for example, inspects each incoming Ethernet frame - including the source and destination MAC addresses, and sometimes the frame size - in making individual forwarding decisions.

ISP: Internet Service Provider, it refers to a company that provides Internet services, including personal and business access to the internet. For a monthly fee, the service provider usually provides a software package, Username, password and access phone number.

Equipped with a modem you can then log on to the Internet and browse the world wide web and USENET and send and receive email. For broadband access you typically receive the broadband modem hardware or pay a

monthly fee for this equipment that is added to your ISP account billing.

In addition to serving individuals, ISPs also serve large companies, providing a direct connection from the company's networks to the Internet. ISPs themselves are connected to one another through Network Access Point (NAPs). ISPs may also be called IAPs (Internet Access Provider).

State Owned ISP's

- **BSNL** - Servicing all of India except Mumbai and Delhi. Triple-play Broadband Services provided by ADSL and VDSL. Also providing internet services over GPRS, 3G, as well as WiMax
- **MTNL** - Servicing Mumbai and Delhi. Triple-play Broadband Services provided by ADSL under the "Tri-Band" brand. Also providing GPRS and 3G internet services.

Private Owned nationwide ISP's

- Airtel - ADSL, GPRS, 3G & 4G LTE
- Skynet Broadband - Internet Service Provider
- Aircel - GPRS & 3G
- Hathway - Broadband over Cable
- Idea - GPRS & 3G
- MTS India - CDMA/EV-DO
- O-Zone Networks Private Limited - Pan - India Public Wi-Fi hotspot provider
- Reliance Communications - ADSL, GPRS & 3G, Metro-Ethernet, CDMA/EV-DO, Wimax
- Reliance Industries - LTE (to be launched)
- Sify - Broadband over cable
- Tata DoCoMo - GPRS & 3G
- Tata Indicom - ADSL, CDMA/EV-DO, Metro-Ethernet, WiMax
- Vodafone - GPRS & 3G

NSP: Network Service Providers (**NSP**) is a business or organization that sells bandwidth or network access by providing direct Internet backbone access to the Internet and usually access to its **Network Access Point (NAPs)**.

Network service providers may consist of Telecommunications companies, data carriers, wireless communications providers, Internet service provider, and Cable television operators offering high-speed Internet access.

Dial up: Dial-up access is really just like a phone connection, except that the parties at the two ends are computer devices rather than people. Because dial-up access uses normal telephone lines, the quality of the connection is not always good and data rate are limited.

In the past, the maximum data rate with dial-up access was 56 Kbps (56,000 bits per second), but new technologies such as ISDN are providing faster rates.

Broadband: The term broadband refers to a telecommunications signal or device of greater Bandwidth (signal processing), in some sense, than another standard or usual signal or device (and the broader the band, the greater the capacity for traffic).

Wireless (Wi-Fi): Wireless broadband is high-speed Internet service via wireless technology. Wireless broadband is available in Internet cafés, local "hot spots" within many cities, private businesses and many homes.

The advantage of wireless broadband is that the computer receiving the Internet signal need not be tethered by an Ethernet or network cable to the broadband modem or router.

A wireless broadband modem receives the service and transmits it via radio waves to the immediate surrounding area. Any computer equipped with wireless capacity within receiving distance can pick up the signal, making the Internet 'portable.' The most common way to take advantage of wireless broadband is by using a laptop computer.

Mobile Broadband: The term mobile broadband refers to high-speed wireless Internet connections and services designed to be used from arbitrary locations.

Cellular networks normally provide broadband connections suitable for mobile access. The technologies in use today fall into two categories -3G (third generation cell networks) and 4G (fourth generation).

Introduction to TCP/IP

Objectives : At the end of this lesson you shall be able to

- explain TCP/IP, addresses and subnets.

Introduction to TCP/IP : TCP and IP were developed by Department of Defense (DOD) research project to connect a number different networks designed by different vendors into a network of networks (the “Internet”). It was initially unsuccessful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems. Several computers in a small department can use TCP/IP (along with other protocols) on a single LAN. The IP component provides routing from the department to the enterprise network, then to regional networks, and finally to the global internet. On the battlefield a communications network will sustain damage, so the DOD designed TCP/IP to be robust and automatically recover from any node or phone failure. This design allows the construction of very large networks with less central management. However, because of the automatic recovery, network problems can go undiagnosed and uncorrected for long periods of time.

As with all other communications protocol, TCP/IP is composed of layers:

IP is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organisations. The organisations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organisation to region and then around the world.

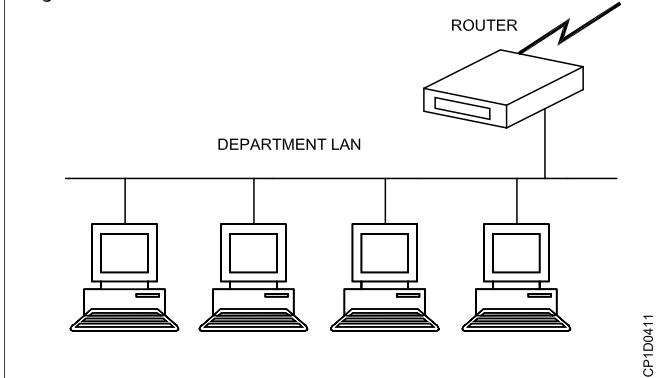
TCP is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

Sockets is a name given to the package of subroutines that provide access to TCP/IP on most systems.

The Internet Protocol was developed to create a Network of Networks (the “Internet”). Individual machines are first connected to a LAN (Ethernet or Token Ring). TCP/IP shares the LAN with other users (a Novell file server, Windows for Workgroups peer systems). One device provides the TCP/IP connection between the LAN and the rest of the world. (Refer Fig 1)

To insure that all types of systems from all vendors can communicate, TCP/IP is absolutely standardised on the LAN. However, larger networks based on long distances and phone lines are more volatile. In US, many large corporations would wish to reuse large internal networks based on IBM's SNA. In Europe, the national phone

Fig 1



companies traditionally standardize on X.25. However, the sudden explosion of high speed microprocessors, fiber optics and digital phone systems has created a burst of new options: ISDN, frame relay, FDDI, Asynchronous Transfer Mode (ATM). New technologies arise and become obsolete within a few years. With cable TV and phone companies competing to built the National Information Superhighway, no single standard can govern citywide, nationwide, or worldwide communications.

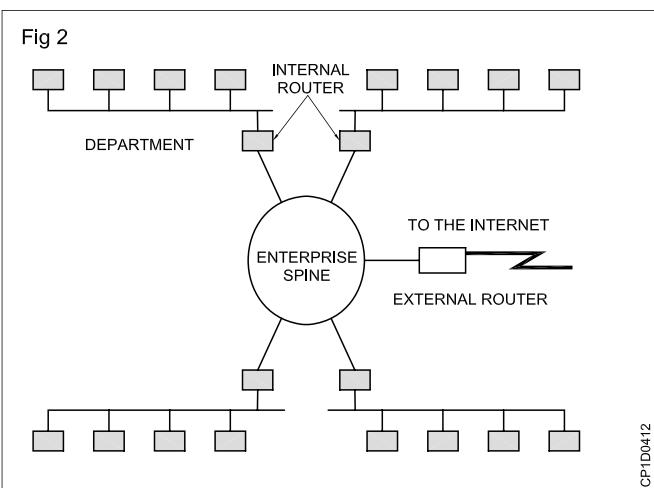
The original design of TCP/IP as a Network of Networks fits nicely within the current technological uncertainty. TCP/IP data can be sent across a LAN or it can be carried within an internal corporate SNA network or it can piggyback on the cable TV service. Furthermore, machines connected to any of these networks can communicate to any other network through gateways supplied by the network vendor.

Addresses : Each technology has its own convention for transmission messages between two machines within the same network. On a LAN, messages are sent between machines by supplying the six byte unique identifier (the “MAC” address). In an SNA network, every machine has Logical Units with their own network address. DECNET, Appletalk and Novell IPX all have a scheme for assigning numbers to each local network and to each workstation attached to the network.

On top of these local or vendor specific network addresses, TCP/IP assigns a unique number to every workstation in the world. This “IP number” is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. For example, a server IP is like 130.132.59.234

Subnets: Although the individual subscribers do not need to tabulate network numbers or provide explicit routing, it is convenient for most Class B networks to be internally manage as much smaller and simpler version

of the larger network organisations. It is common to subdivide the two bytes available for internal assignment into a one byte department number and a one byte workstation ID. (Refer Fig 2)



The enterprise network is built using commercially available TCP/IP router boxes. Each router has small tables with 255 entries to translate the one byte department number into selection of a destination Ethernet connected to one of the routers.

TCP treats the data as a stream of bytes. It logically assigns a sequence number to each byte. The TCP packet has a header that says, in effect, "This packet starts with byte 379642 and contains 200 bytes of data." The receiver can detect missing or incorrectly sequenced packets. TCP acknowledges data that has been received and retransmits data that has been lost. The TCP design means that error recovery is done end-to-end between the Client and Server machine. There is no formal standard for tracking problems in the middle of the network, though each network has adopted some adhoc tools.

There are three levels of TCP/IP knowledge. Those who administer a regional or national network must design a system of long distance phone lines, dedicated routing devices and very large configuration files. They must know the IP numbers and physical locations of thousands of subscriber networks. They must also have a formal network monitor strategy to detect problems and respond quickly.

Each large company or university that subscribes to the Internet must have an intermediate level of network organisation and expertise. A half dozen routers might be configured to connect several dozen departmental LANs in several buildings. All traffic outside the organisation would typically be routed to a single connection to a regional network provider.

However, the end user can install TCP/IP on a personal computer without any knowledge of either the corporate or regional network. Three pieces of information are required:

- 1 The IP address assigned to this personal computer.
- 2 The part of the IP address (the subnet mask) that distinguishes other machines on the same LAN (messages can be sent to them directly) from machines in other departments or elsewhere in the world (which are sent to a router machine)
- 3 The IP address of the router machine that connects this LAN to the rest of the world.

Transmission media and network components

Objectives : At the end of this lesson you shall be able to

- explain cable media, wireless media and network adapter.

Network media : Media are what the message is transmitted over. Different media have different properties and are most effectively used in different environments for different purposes.

In computer networking, the medium affects nearly every aspect of communication. Most important, it determines how quickly and to whom a computer can talk and how expensive the process is.

Cable media : Cables have a central conductor that consists of a wire or fiber surrounded by a plastic jacket. Three types of cable media are twisted-pair, coaxial and fiber-optic cable. Two types of twisted-pair cable are used in networks: unshielded (UTP) and shielded (STP).

Table summarizes the characteristics of these types of cable media, which are discussed in the following sections.

Factor	UTP	STP	Coaxial	Fiber-optic
Cost	Lowest	Moderate	Moderate	Highest
Installation	Easy	Fairly easy	Fairly easy	Difficult
Bandwidth capacity	1- to 155 Mbps (typically 10 Mbps)	1- to 155Mbps (typically 16 Mbps)	Typically 10 Mbps	2 Gbps (typically 100 Mbps)
Node capacity per segment	2	2	30 (10base 2) 100 (10 base 5)	2
Attenuation	High (range of hundreds of meters)	High (range of hundreds of meters)	Lower (range of a few kilometers)	Lowest (range of tens of kilometers)
EMI	Most vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Not affected by EMI or eavesdropping

Twisted-pair cable : Twisted-pair cable uses one or more pairs of two twisted copper wires to transmit signals. It is commonly used as telecommunications cable.

When copper wires that are close together conduct electric signals, there is a tendency for each wire to produce interference in the other. One wire interfering with another in this way is called crosstalk. To decrease the amount of crosstalk and outside interference, the wires are twisted. Twisting the wires allows the emitted signals from one wire to cancel out the emitted signals from the other and protects them from outside noise.

Twisted pairs are two color-coded, insulated copper wires that are twisted around each other. A twisted-pair cable consists of one or more twisted pairs in a common jacket. Fig 1 shows a twisted-pair cable.

The two types of twisted-pair cable are unshielded and shielded.

Fig 1

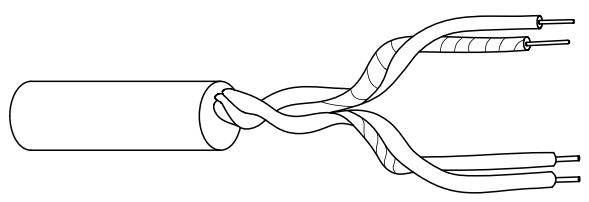


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Unshielded twisted-pair cable : Unshielded twisted-pair (UTP) cable consists of a number of twisted pairs with a simple plastic casing. UTP is commonly used in telephone systems. Fig 2 shows a UTP cable.

The Electrical Industries Association (EIA) divides UTP into different categories by quality grade. The rating for each category refers to conductor size, electrical characteristics and twists per foot. The following categories are defined.

Fig 2



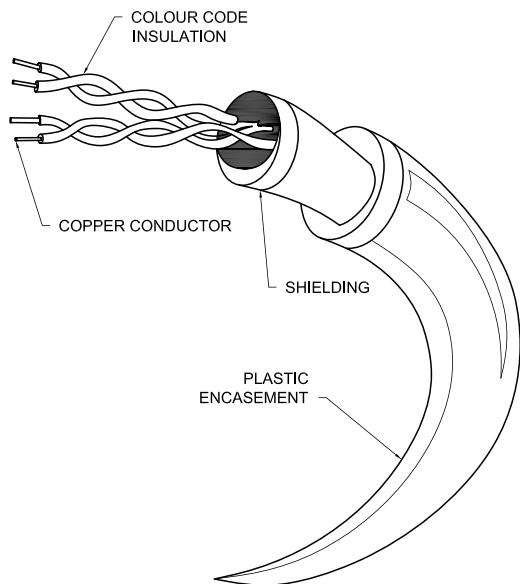
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The other side of the punch-down block is wired to a patch panel. The patch panel provides connectivity through patch cables to other user devices and connectivity devices.

UTP's popularity is partly due to the, first usage of the same in telephone systems. In many cases a network can be run over the already existing wires installed for the phone system, at a great savings in installation cost.

Shielded twisted-pair cable : The only difference between shielded twisted pair (STP) and UTP is that STP cable has a shielded usually aluminium/polyester between the outer jacket or casing and the wires. Fig 4 shows STP cable.

Fig 4



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The shield makes STP less vulnerable to EMI because the shield is electrically grounded. If a shield is grounded correctly, it tends to prevent signals from getting into or out of the cable. It is a more reliable cable for LAN environments. STP was the first twisted-pair cable to be used in LANs. Although many LANs now use UTP, STP is still used.

Transmission media specifications from IBM and Apple Computer use STP cable. IBM's Token Ring network uses STP and IBM has its own specifications for different qualities and configurations of STP. A completely different type of STP is the standard for Apple's Apple Talk networks. Networks that conform to each vendor's specifications have their own special requirements, including connector types and limits on cable length.

STP has the following characteristics

Cost : Bulk STP is fairly expensive. STP costs more than UTP and thin coaxial cable but less than thick coaxial or fiber-optic cabling.

Installation : The requirement for special connectors can make STP more difficult to install than UTP. An electrical ground must be created with the connectors. To simplify installation, use standardised and prewired cables.

Because STP is rigid and thick (up to 1.5 inches in diameter), it can be difficult to handle.

Bandwidth capacity : With the outside interference reduced by the shielding, STP can theoretically run at 500 Mbps for a 100 meter cable length. Few installations run at data rates higher than 155 Mbps. Currently, most STP installations have data rates of 16 Mbps.

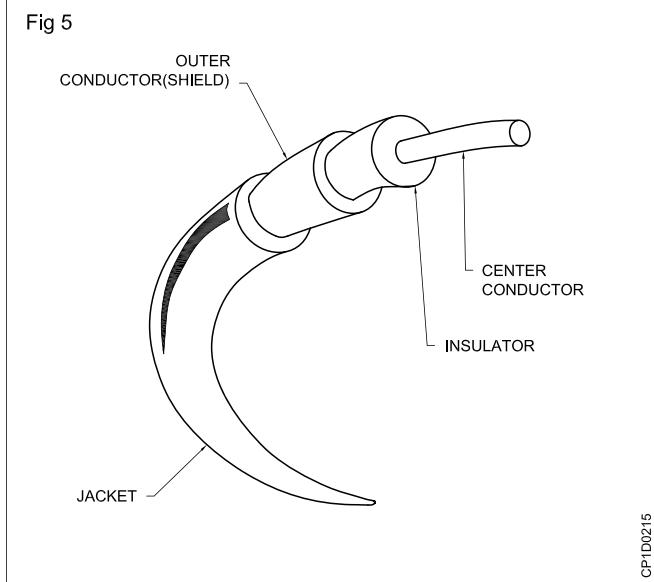
Node capacity : Since only two computers can be connected together by an STP cable, the number of computers in an STP network is not limited by the cable. Rather, it is limited by the hub or hubs that connect the cables together. In a Token Ring network, which is the most common type of STP network, the useful upper limit is around 200 nodes in a single ring, but it depends on the type of data traffic in your network. There is a specified maximum limit of 270, but you will probably never reach this limit.

Attenuation : STP does not outperform UTP by much in terms of attenuation. The most common limit is 100 meters.

EMI : The biggest difference between STP and UTP is the reduction of EMI. The shielding blocks a considerable amount of the interference. However, since it is copper wire, STP still suffers from EMI and is vulnerable to eavesdropping.

Coaxial cable : Coaxial cable commonly called coax has two conductors that share the same axis. A solid copper wire or stranded wire runs down the center of the cable and this wire is surrounded by plastic foam insulation. The form is surrounded by a second conductor, a wire mesh tube, metallic foil or both. The wire mesh protects the wire from EMI. It is often called the shield. A tough plastic jacket forms the cover of the cable, providing protection and insulation. Fig 5 shows a coaxial cable.

Fig 5



Coaxial cable comes in different sizes. It is classified by size (RG) and by the cable's resistance to direct or alternating electric currents (measured in ohms also called impedance)

The following are some coaxial cables commonly used in networking:

50 ohm, RG-8 and RG-11 used for thick ethernet.

50 ohm, RG-58 used for thin ethernet.

75 ohm, RG-59 used for cable TV.

93 ohm, RG-62 used for ARCnet.

PVC and plenum cable : Polyvinyl chloride (PVC) is commonly used in coaxial cabling because it is a flexible, inexpensive plastic well suited for use as insulation and cable jacketing. PVC is often used in the exposed areas of an office.

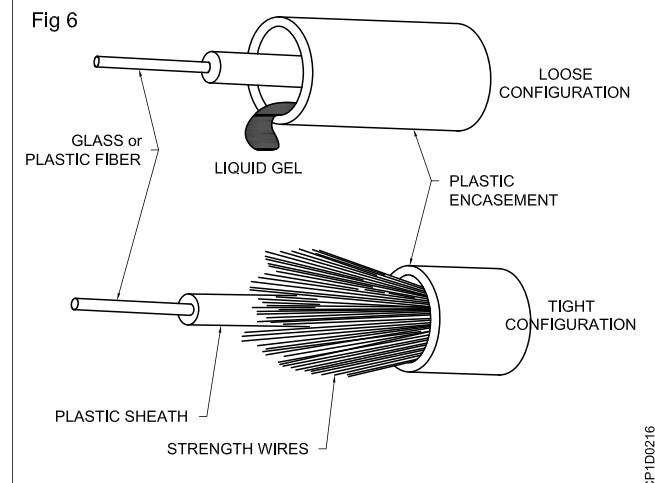
A plenum is the space between the false ceiling of an office and the floor above. The air in the plenum circulates with the air in the rest of the building, and there are strict fire codes about what can be placed in a plenum environment.

Because PVC gives off poisonous gases when burned, you cannot use it in a plenum environment. You must use plenum grade cable instead. Plenum grade cable is certified to be fire resistant to produce a minimum amount of smoke. Plenum cable is also used in vertical runs (walls) without conduit (a tube to hold the cable). Plenum cable is more expensive and less flexible than PVC.

Fiber-optic cable : Fiber-optic cable transmits light signals rather than electrical signals. It is enormously more efficient than the other network transmission media. As soon as it comes down in price (both in terms of the cable and installation costs) fibre optic will be the choice for network cabling.

Each fiber has an inner core of glass or plastic that conducts light. The inner core is surrounded by cladding, a layer of glass that reflects the light back into the core. Each fiber is surrounded by a plastic sheath. The sheath can be either tight or loose. Fig 6 shows examples of these two types of fiber optic cables.

Fig 6

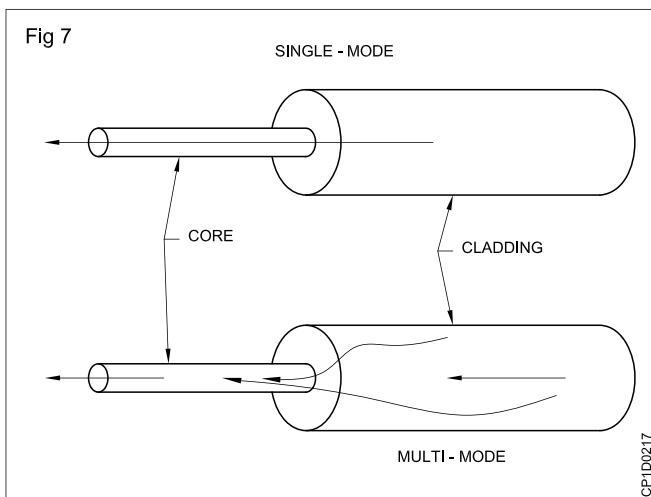


Tight configurations completely surround the fibers with a plastic sheath and sometimes include wires to strengthen the cable (although these wires are not required). Loose configurations leave a space between the sheath and the

outer jacket, which is filled with a gel or other material. The sheath provides the strength necessary to protect against breaking or extreme heat or cold. The gel, strength wires and outer jacket provide extra protection.

A cable may contain a single fiber, but often fibers are bundled together in the center of the cable. Optical fibers are smaller and lighter than copper wire. One optical fiber is approximately the same diameter as a human hair.

Optical fibers may be multimode or single mode. Single mode fibers allow a single light path and are typically used with laser signaling. Single mode fiber can allow greater bandwidth and cable runs than multimode but is more expensive. Multimode fibers use multiple light paths. The physical characteristics of the multimode fiber make all parts of the signal (those from the various paths) arrive at the same time, appearing to the receiver as though they were one pulse. If you want to save money, look into multimode, since it can be used with LEDs (light emitting diodes) which are a more affordable light source than lasers. Fig 7 shows single mode and multi mode fibers.



Optical fibers are differentiated by core/cladding size and mode. The size and purity of the core determine the amount of light that can be transmitted. The following are the common types of fiber-optic cable.

8.3 micron core/125 micron cladding, single mode

62.5 micron core/125 micron cladding, multimode

50 micron core/125 micron cladding, multimode

100 micron core/140 micron cladding, multimode

A typical LAN installation starts at a computer or network device that has a fiber-optic network interface and (NIC). This NIC has an incoming interface and an outgoing interface. The interfaces are directly connected to fiber-optic cables with special fibre-optic connectors. The opposite ends of the cables are attached to a connectivity device or splice center.

Wireless media : Wireless media do not use an electrical or optical conductor. In most cases, the earth's atmosphere is the physical path for the data. Wireless media is therefore useful when distance or obstructions make

bounded media difficult. There are three main types of wireless media: radio wave, micro wave and infrared.

Radio wave transmission systems : Radio waves have frequencies between 10 kilohertz (KHz) and 1 gigahertz (GHz). The range of the electromagnetic spectrum between 10 KHz and 1 GHz is called radio frequency (RF).

Radio wave include the following types.

Short wave

Very high frequency (VHF) television and FM radio

Ultra-high frequency (UHF) radio and television

Radio waves can be broadcast omnidirectionally or directionally. Various kinds of antennas can be used to broadcast radio signals.

Microwave transmission systems : Microwave communication makes use of the lower gigahertz frequencies of the electromagnetic spectrum. These frequencies, which are higher than radio frequencies, produce better throughout and performance. There are two types of microwave data communication systems: terrestrial and satellite.

Terrestrial microwave : Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz range. The signals are highly focused and the physical path must be line-of-sight. Relay towers are used to extend signals. Terrestrial microwave systems are typically used when using cabling is cost prohibitive.

Because terrestrial microwave equipment often uses licensed frequencies, additional costs and time constraints may be imposed by licensing commissions or government agencies (the FCC, in the United States).

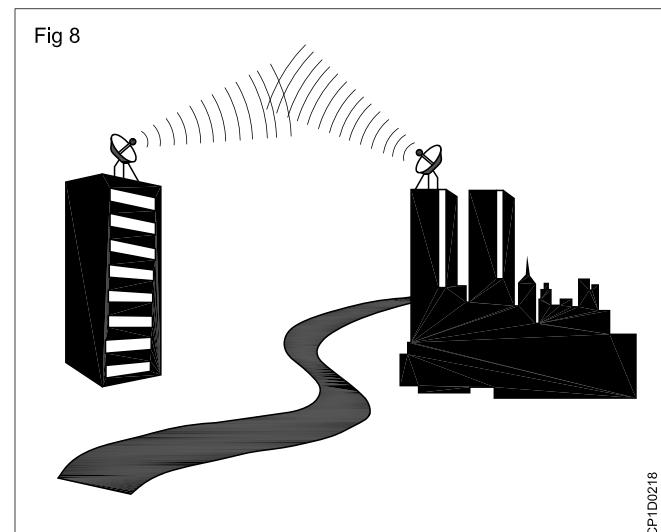


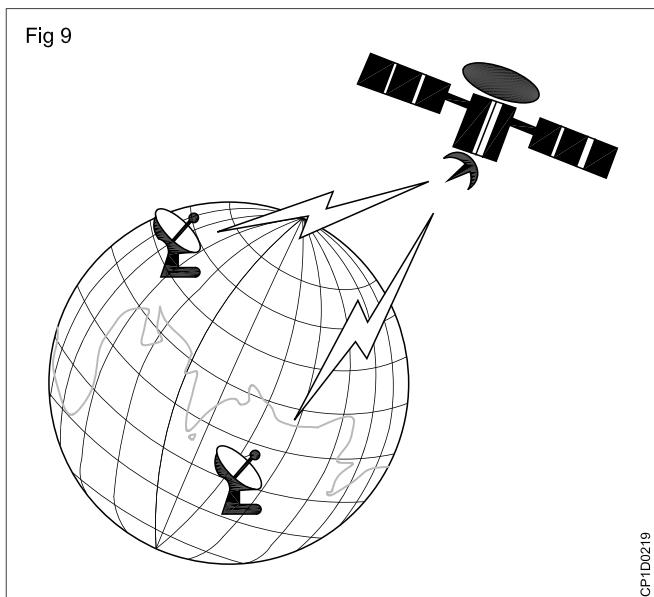
Fig 8 shows a microwave system connecting separate buildings. Smaller terrestrial microwave systems can be used within a building, as well. Microwave LANs operate at low power, using small transmitters that communicate with omnidirectional hubs. Hubs can then be connected to form an entire network.

Satellite : Satellite microwave systems transmit signals between directional parabolic antennas. Like terrestrial microwave systems, they use low gigahertz frequencies and must be in line-of-sight. The main difference with satellite system is that one antenna is on a satellite in geosynchronous orbit about 50,000 kilometers (22,300 miles) above the earth. Because of this, satellite microwave systems can reach the most remote places on earth and communicate with mobile devices.

Here's how it usually works: a LAN sends a signal through cable media to an antenna (commonly known as a satellite dish), which beams the signal to the satellite in orbit above the earth. The orbiting antenna then transmits the signal to the another location on the earth or, if the destination is on the opposite side of the earth, to another satellite, which then transmits to a location on earth.

Fig 9 shows a transmission being learned from a satellite dish on earth to an orbiting satellite and then back to earth.

Fig 9



Because the signal must be transmitted 50,000 kilometers to the satellite and 50,000 kilometers back to earth, satellite microwave transmissions take about as long to cover a few kilometers as they do to span continents. Because the transmission must travel long distances, satellite microwave systems experience delays between the transmission of a signal and its reception. These delays are called propagation delays. Propagation delays range from .5 to 5 seconds.

Infrared transmission systems : Infrared media use infrared light to transmit signals. LEDs or ILDs transmit the signals and photodiodes receive the signals. Infrared media use the tera-hertz range of the electromagnetic spectrum. The remote controls we use for television, VCR and CD players use infrared technology to send and receive signals.

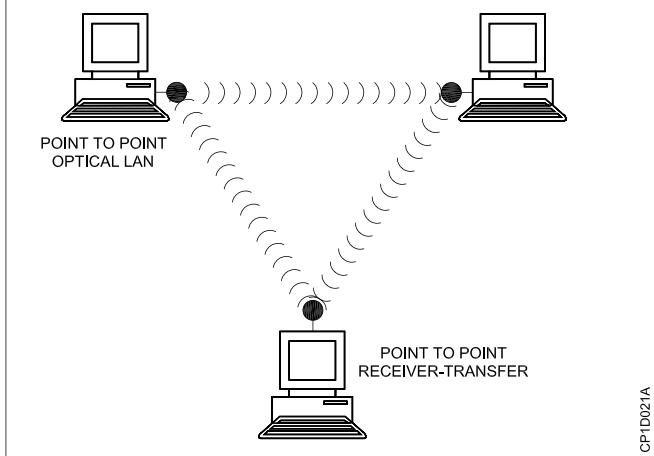
Because infrared signals are in the terahertz (higher-frequency) range, they have good throughout. Infrared signals do have a downside: the signals cannot penetrate walls or other objects and they are diluted by strong light sources.

Infrared media use pure light, normally containing only electromagnetic waves or photons from a small range of the electromagnetic spectrum. Infrared light is transmitted either line-of-sight (point-to-point) or broadcast omnidirectionally, allowing it to reflect off walls and ceilings. Point-to-point transmission allows for better data rates, but devices must remain in their locations. Broadcast, on the other hand, allows for more flexibility but with lower data rates. (Part of the signal strength is lost with each reflection.)

Point-to-point : Infrared beams can be tightly focused and directed at a specific target. Laser transmitters can transmit line-of-sight across several thousand meters.

One advantage of infrared is that an FCC license is not required to use it. Also, using point-to-point infrared media reduces attenuation and makes eavesdropping difficult. Typical point-to-point infrared computer equipment is similar to that used for consumer product with remote controls. Careful alignment of transmitter and receiver is required. Fig 10 shows how a network might use point-to-point infrared transmission.

Fig 10



Broadcast : Broadcast infrared systems spread the signal to cover a wider area and allow reception of the signal by several receivers. One of the major advantage is mobility; the workstations or other devices can be moved more easily than with point-to-point infrared media. Fig 11 shows how a broadcast infrared system might be used.

Because broadcast infrared signals are not as focussed as point-to-point, this type of system cannot offer the same throughout. Broadcast infrared is typically limited to less than 1 Mbps, making it too slow for most network needs.

Network adapters, sometimes called Network Interface Cards (NICs) are peripheral cards that plug into the motherboard of your computer and into a network cable. It is through the network adapter that your computer communicates on the network. Many newer IBM-compatible computers have built-in networking adapters for Ethernet.

Network adapters perform all the functions required to communicate on a network. They convert data from the

form stored in the computer to the form transmitted or received (or transceived) on the cable and provide a physical connection to the network.

Fig 11

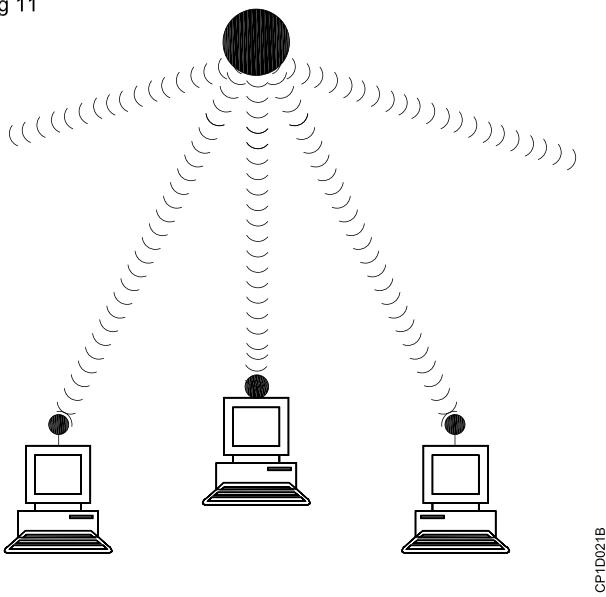
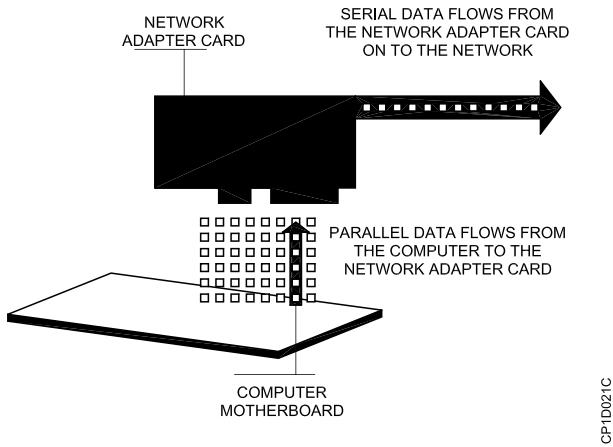


Fig 12 shows how an adapter plugs into a computer and attaches to a network cable.

Fig 12



Adapters in Abstract: Your computer software does not have to be aware of how the network adapter performs its function because the network driver software handles all the specifics for your computer. The applications running on your computer need only address data and hand it to the adapter card.

This is much the way the post office or a parcel delivery service works. You don't care about the details of postal delivery; you simply address your parcel and hand it to the delivery driver. The postal service manages the process of delivering it for you.

This abstraction allows your computer to use a microwave radio transmitter just as easily as a fiber-optic network adapter or an adapter that works over coaxial cable.

Everything in your computer remains the same except for the actual network adapter and the driver software for that adapter.

How network adapters work : Network adapters receive the data to be transmitted from the motherboard of your computer into a small amount of RAM called a buffer. The data in the buffer is moved into a chip that calculates a checksum value for the chunk and adds address information, which includes the address of the destination card and its own address, which indicates where the data is from. Ethernet adapter addresses are permanently assigned when the adapter is made at the factory. This chunk is now referred to as a frame.

For example, in Ethernet, the adapter listens for silence on the network when no other adapters are transmitting. It then begins transmitting the frame one bit at a time, starting with the address information, then the chunk of data and then the checksum.

The network adapter must still convert the serial bits of data to the appropriate media in use on the network. For instance, if the data is being transmitted over optical fiber, the bits are used to light up an infrared LED (light emitting diode) or laser diode, which transmits light pulses down the fiber to the receiving device's APD (avalanche photo diode) or photo-transistor. If the data is being sent over twisted-pair cable, the adapter must convert the bits of data from the 5-volt logic used in computers to the differential logic used for digital twisted-pair transmission.

The circuitry used to perform this media conversion is called a transceiver. Ethernet is the same no matter what type of media you use only the transceiver changes. Transceivers can be external devices attached through the AUI port on an Ethernet adapter, or they can be internal on the card. Some cards (usually called combo cards) have more than one type of transceiver built in so you can use them with your choice of media. AUI interfaces on Ethernet adapters are not transceivers—they are where you attach a transceiver for the different media types.

Because a network signal travels through copper and optical fiber at about 66 percent as fast as the speed of light, there's a chance that one of two adapters far away from each other could still be hearing silence when the other has in fact started transmitting. In this case, they could transmit simultaneously and garble their data. This is referred to as a collision.

While adapters transmit, they listen to the wire to make sure the data on the line matches the data being transmitted. As long as it does, everything is fine. If another adapter has interrupted, the data being, "heard" by the transmitting network adapter will not match the data being transmitted. If this happens, the adapter ceases transmitting and transmits a solid on state instead, which indicates to all computers that it has detected a collision and that they should discard the current frame because it has been corrupted. The network adapter waits a random amount of time and then again attempts to transmit the frame.

Configuring network adapters : Because network adapters have not been around since computers were invented, there is no assigned place for cards to be set to. Most adapter cards require their own interrupt, port address and upper memory range. PCI motherboards automatically assign IRQ and port settings to your PCI card, so you don't need to worry about it.

Unfortunately, network adapters in computers with ISA buses can conflict with other devices, since no two devices

should share the same interrupt or port. No software that comes with your computer will tell you every interrupt and port in use unless your computer is already running Windows NT, so you must be somewhat familiar with the hardware in your computer or use a program that can probe for free resources to find one. Many adapters have test programs that can tell you whether the adapter is working correctly with the settings you've assigned.

Computer name and workgroup - Client server

Objectives : At the end of this lesson you shall be able to

- define computer name
- define workgroup
- explain client-server model, centralised computing and client computing with central file storage
- explain web server.

Computer Name: In network computers are identified by its IP Address, but a name can also be given to identify it easily as remembering IP address is difficult comparing remembering a alphanumeric name.

Client-Server : The term Client-Server can describe hardware, in which case it is referring to network servers and client computers, or it can refer to a way of organising software applications and services on a network. Client-server computing is a powerful way of constructing programs on a network. In order to describe its advantage and how it works, we will first describe two alternatives to client-server computing:

- Centralised computing
- Client computing with central file storage

Centralized computing : Centralized computing originated with mainframe computers and time-sharing. The principle behind centralized computing is that a central computer executes a program, such as a database or a transaction-processing program (for instance, an airline reservations system or a bank records program) and remote terminals merely display data on a screen and convey keyboard data back to the central computer.

In modern networks, personal computers can perform the role of dumb terminals. With Windows software, the PC can appear to the central computer as many terminals, each virtual terminal accessing different data or performing a separate transaction on the mainframe.

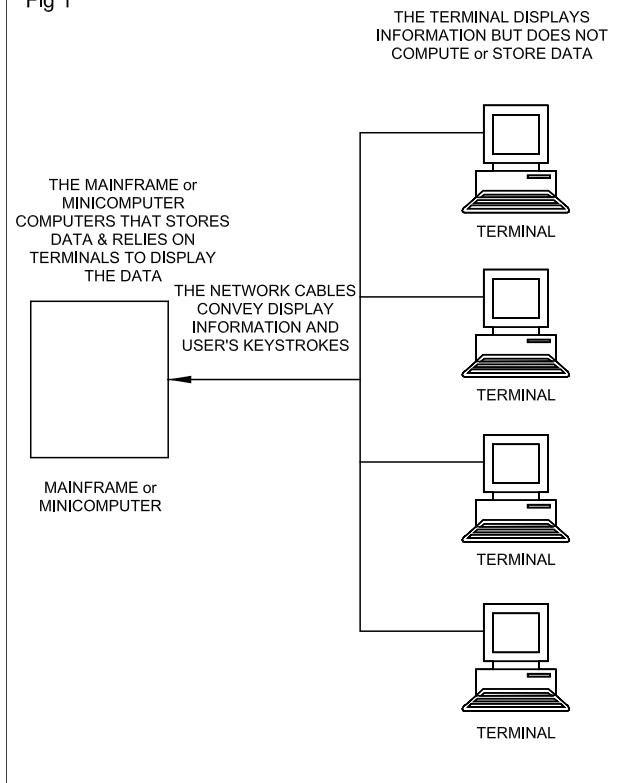
In centralized computing it is the central computer that does all the work. The data resides on the central computer and the program executes on the central computer. The personal computer or dumb terminal only display screen data and accepts keystrokes for the central computer to process. Centralized computing does not fully use the capabilities of today's powerful network clients. Fig 1 illustrates centralized computing.

Client computing with Central file storage : At the opposite end of the spectrum from centralized computing is client computing with central file storage (see Fig 2). In this way of organizing an application, the client computer does all the work. A central file server stores, but that is all.

Workgroup: In a network computers can be grouped together by using workgroup feature. Computers in a particular workgroup will show together when you open a workgroup. Though a computer of one workgroup can access other workgroup computers also.

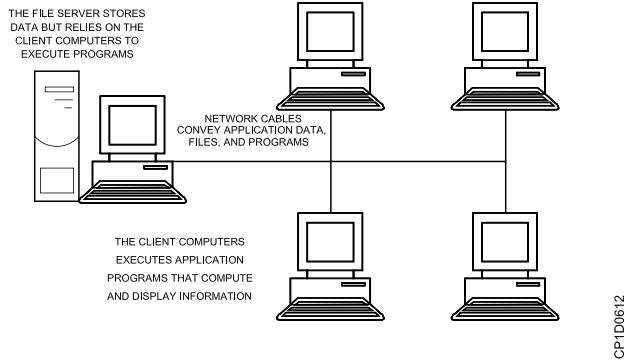
Client computers cooperate to ensure that central files are not corrupted by attempts by several computers to access them at the same time. When a client computer needs to perform an operation, the file is transferred to the client computer to perform the operation. Two examples of this type of application are networked database programs that do not use a SQL. (Structured Query Language) server and any network-aware application that does not communicate with a special program executing on the server, such as network scheduling programs and groupware.

Fig 1



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Fig 2



While it is fully exploits the capabilities of client computers and provides a richer and more customizable environment for the user, this type of program can place heavy demands on the network if the data files in which program works with are large. It also takes time to transmit data from the server to the client, process the data, and transfer it back to the server so other network programs can access the data.

The Client-Server Model : The client-server model combines the advantages of both the centralized computing model and the client model of computing. It does this by performing the operations that are best executed by a central computer on the file server and performing those operations that are best done close to the user on the client computer (see Fig 3). The client-server model works best when many people need access to large amounts of data. Simply stated, a client-server system is any system in which the client computer makes a request over a network to a server computer that then satisfies the request.

The Client : When you use a client-server system, what you see is the client, or front end. It presents the interface to manipulate or search for data. The request you make by manipulating windows, menu, check boxes and so on, is translated into a compact form that the client transmits over the network for the server to perform.

One example of a front end is Microsoft Access when it is used with a SQL back end. (You can also use Access without a SQL back end.) Access displays tables in windows or in forms you can browse. It allows you to modify and search the tables in an easy-to-use graphical environment. All the actual data manipulation, however, occurs on the SQL server. Access translates all the database operations into SQL for the server to perform. The results of the operations are transmitted back to Access to display in an intuitive, graphical form.

SQL is not limited to database programs such as Microsoft Access. User programs such as Microsoft Excel can use SQL to query the back-end data-base server for values to use in spreadsheet calculations. Program tools allow custom programs to store and retrieve data in server-based databases. Query tools provide direct access to the SQL data.

The Server : The server is where data operations in a client-server system occur. The central computer can service many client requests quickly and efficiently, which is the traditional advantage of centralized computing. The central computer can also provide enhanced security by performing only authorized operations on the data.

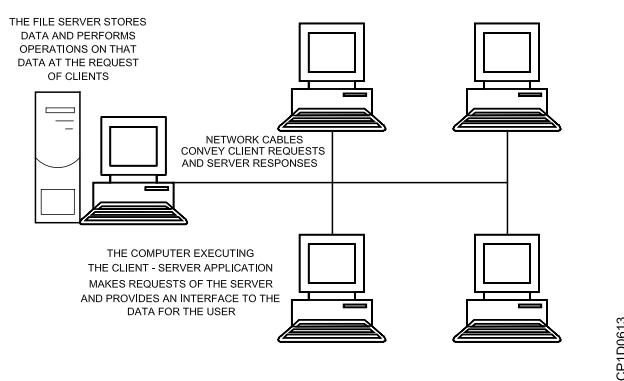
Back-end database software is optimized to perform searches and sorts and the back-end computer is often more powerful than the front-end computer.

Web server : A web server is a program using the client/server model and the World Wide Web's Hyper Text Transfer Protocol (HTTP) serves the files that form web pages to web users.

Every computer on the internet that contains a web site must have a web server program. The most popular web servers are: The Microsoft's Internet Information Server (IIS) which comes with the Microsoft's Windows NT Server; Netscape Fast Track and Enterprises Servers and Apache, a web server for Unix-based operating systems. Other web servers include Novell's Web Server for users of its Netware Operating System and IBM's family of Lotus Domino Servers. Primarily for IBM's OS/390 and AS/400 customers.

Web servers often come as a part of a larger package of Internet related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files and building and publishing web pages. Consideration in choosing a web server include how well it works with the operating system and other servers, its ability to handle server side programming and publishing, search engine and site building tools that may come with it.

Fig 3



DHCP

Objectives : At the end of this lesson you shall be able to

- define DHCP
 - explain DHCP.
-

DHCP: Dynamic Host Control Protocol allows server computers to distribute dynamic IP address when the client establish connection to server. The server maintains a IP address pool and it offer some IP which is not already allotted to some other client. When client disconnects from server its IP then becomes free again and can be given to other client.

It is dynamic as same client can get different IP in different times. It is beneficial as requirement of IP address is less as all the clients are not always connected to server and its saves the time to allocate IP to each client manually.

Dynamic Host Configuration Protocol (DHCP) is a standard protocol defined by RFC 1541 (which is

superseded by RFC 2131) that allows a server to dynamically distribute IP addressing and configuration information to clients. Normally the DHCP server provides the client with at least this basic information:

- IP Address
- Subnet Mask
- Default Gateway

Other information can be provided as well, such as Domain Name Service (DNS) server addresses and Windows Internet Name Service (WINS) server addresses. The system administrator configures the DHCP server with the options that are parsed out to the client.

Concept of proxy server

Objectives : At the end of this lesson you shall be able to

- explain the meaning of proxy server
- explain common connection point
- explain packet filtering, domain filtering and control user access by service
- explain logging and web publishing.

What is a proxy server? To be a “proxy” means to act on behalf of another. This is exactly what a proxy server does; it acts on behalf of its proxy clients to interact with other servers. You could say that a proxy server is a “mediator” for computer communications.

Placing a proxy server on your network gives you several advantages, including security enhancements, caching enhancements and greater control over your network users. The advantages of using Microsoft Proxy Server (MPS) is listed below:

- Common connection point
- Caching
- Packet filtering
- Domain filtering
- Control user access by service
- Logging
- Web publishing

Common connection point : MPS was designed to connect two networks, rather like a gateway. Typically, MPS connects an internal network and the Internet. This configuration gives the internal computers a common connection point to the Internet-through MPS.

When used to provide a common connection, MPS lets clients share a single connection to the Internet. Instead of giving each user on a Local Area Network (LAN) a separate modem, phone line and dial-up account to the Internet, MPS can function as a gateway to the Internet using a single connection. Instead of using separate standard phone line connections, users can share a single higher-speed connection through the proxy server. The net effect is usually an overall cost savings and reduction in administrative overhead. One connection is usually cheaper and easier to maintain than several separate connections.

Caching : Since you can use MPS as a common connection point to the Internet, you can also use it to cache frequently accessed resources. MPS allocates a portion of the server's hard disk space to store frequently accessed objects.

Caching can either be passive or active. Passive caching just stores objects as they are requested so the cache is updated only when users request information. Active caching directs the server to refresh objects in the cache automatically.

You can selectively control MPS caching so that you can limit the size of cached objects, change the expiration limits (control the freshness of objects) and determine whether MPS always caches or always excludes from cache certain content.

Caching only works with the Web Proxy Service in MPS. You will learn more about the Web Proxy Service later in this chapter.

Packet Filtering : To protect internal users from the outside world (in other words to protect the network from outsiders), MPS provides packet-filtering services. A packet filter prevents unauthorized access from the outside by limiting the available connection points coming into the network. To that end, packet filters stop various types of protocols from entering the network.

MPS supports both static and dynamic packet filters. A static filter keeps all traffic of a certain description or type from passing through MPSServer. A dynamic packet filter automatically determines which type of traffic is allowed in or out. With a static filter the administrator defines the port, the protocol and maybe the IP address. With a dynamic filter the administrator just defines the service to be allowed or filtered.

Domain Filtering : MPS also lets you limit the access of your internal clients to the Internet. You can configure filters for a single computer, a group of computers or a domain name. Many companies prefer to have this type of control over their users because they can block access to Internet sites that they believe reduce employee productivity or contain offensive material. Some popular examples of domain filtering are blocking access to Internet game servers or Web sites that contain pornographic material.

You can configure domain filters for a specific IP address, IP address and subnet mask or domain name. IP address filters prevent users from contacting a single computer. Using the IP address and subnet mask as a filter limits access to an entire group (a subnet) of computers. Domain name filters can apply to an entire Web site or to subsections of that site.

Control user access by Protocol or Service : You can also selectively enable and disable ports, services and protocols through MPS. MPS lets you control access to Internet services at the user level. You can also enable or restrict access to protocols on a user or group basis. Many protocols are predefined in the default MPS configuration.

If the protocol or service you would like to enable or disable is not defined in the MPS property sheets, you can create a new sheet. You can define a protocol by TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) port number or range. This gives you the ability to control access by port.

Logging : Because all traffic between networks passes through MPS, MPS has the unique opportunity to log and track communication. You can track the information your internal clients get from other networks or the Internet and monitor inbound communication. You can use this information to help you secure your internal network from attack and unauthorized access. Plus, you can monitor where your users spend their time on the Internet and what information they are downloading.

Web publishing : MPS can also act as a Web server. MPS can service requests from cache on behalf of a Web server, pass requests to the Web server on the local system or pass requests to another Web server on the internal network. The terms "reverse proxying" and "reverse hosting" describe the Web Publishing services that MPS provides.

As a reverse proxy, MPS listens to incoming Web requests for a single Web server on the local network. The incoming requests are simply forwarded to another Web server. Web hosting requires more work on the part of MPS. As a reverse host, MPS can send requests to one of many Web servers. In this case, MPS responds as if the entire site were contained locally, even though the actual data may be coming from several different Web servers.

The main difference between reverse proxying and reverse hosting is that in performing reverse proxying, MPS forwards all requests to the Web server. In performing reverse hosting, MPS selectively forwards requests to multiple Web servers on the internal network. In reverse hosting, the Microsoft Proxy Server routes an external request for a resource (that specifies an Internet domain name) to one or more internal Web servers. For instance, requests for <http://www.hudlogic.com/bios> might be routed to an internal server named "business" (<http://business>), while requests for <http://www.hudlogic.com/pictures> could be sent to a different Web server named "server1" (<http://server1>).

Services : Microsoft Proxy Server 2.0 supports Hypertext Transfer Protocol (HTTP) version 1.1, Windows Sockets version 1.1, SOCKS version 4.3a and Secure Sockets Layer (SSL) 3.0. The MPS services that provide this support are the Web Proxy service, WinSock Proxy service and the SOCKS Proxy service, respectively.

Web Proxy Service : The Web Proxy service provides support for HTTP (a.k.a. Web publishing), FTP, Gopher and secure (SSL) communications. The Web Proxy service works with any CERN-compliant Web browser, such as Internet Explorer or Netscape Navigator. Because the Web Proxy supports only these widely adopted Internet standard communication methods, it isn't operating system dependent. Clients running Unix, Macintosh or Windows operating systems can communicate with the Web Proxy service as long as they're configured with a CERN-compliant Web browser.

Any operating system using a CERN-compliant Web browser can communicate through the Web Proxy server, regardless of its underlying operating system.

WinSock Proxy Service : The WinSock Proxy service supports Microsoft Windows operating systems using Windows Sockets. This support is available for both Transmission Control Protocol/internet Protocol (TCP/IP) and Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocols. The WinSock Proxy service applies mainly to Windows clients including Windows 3.x, Windows 95 and Windows NT.

Windows Sockets is an interprocess communication mechanism derived from the Berkeley Sockets interface (originally designed for Unix systems). The Sockets interface was extended to support Windows-based clients running Microsoft implementations of TCP/IP. The name given to this Sockets interface for Windows was WinSock (for Windows Sockets).

The WinSock Proxy Service doesn't support 16-bit IPX/SPX clients such as the Windows 3.x 16-bit Netware clients.

SOCKS Proxy Service : The SOCKS Proxy service supports SOCKS version 4.3a client applications such as FTP, Gopher and Telnet. Operating systems like Macintosh and Unix can run SOCKS 4.3a and access the SOCKS Proxy service when communicating through the Microsoft Proxy Server. One limitation of the SOCKS proxy service on MPS is that it does not support UDP-based protocols.

UDP-based protocols aren't supported through the SOCKS Proxy service, but the WinSock Proxy service does support UDP for Windows clients.

Video conferencing

Objectives: At the end of this lesson you shall be able to

- define video conferencing
- list the advantages of video conferencing
- list the disadvantages of video conferencing.

Video Conferencing

Definition: Videoconferencing is the conduct of a conference by a set of telecommunication technologies which allow two or more remotely located teams to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Video conferencing is a very useful technique to cut down various costs as well as travel time when meetings and conferences are concerned. Video conferencing connects individuals in real time through audio and video communication over broadband networks. It enables visual meetings and collaboration on digital documents and shared presentations. New technologies allow participants to connect remotely over a network through multiple devices like laptops, desktops, smartphones and tablets.

Advantages

- 1 Significant Travel Savings
- 2 Not only is video conferencing a direct replacement for many in-person business trips, but because there is virtually no cost to add additional key employees to a virtual meeting, it is a cost effective solution.
- 3 Improved Communication
- 4 Audio conferencing and e-mail may be used for communication but there is a lack of visual connection

and eye contact in these. Video conferencing allows users to successfully convey, creating essential social bonds and shared understandings.

- 5 Increased Productivity
- 6 Important meetings are shorter and more effective. But it is a well-known fact that many meetings take longer than the necessary time of the participants. Video conferencing users can save a minimum of two hours a week with the technology. The interactivity of group collaboration and document sharing greatly increases productivity.
- 7 Conferencing Quality
- 8 The present day state-of-the-art technology delivers excellent, reliable audio and video quality, making conferencing very effective and interesting too.

Disadvantages

- 1 Absence of Physical Presence
- 2 Initial installation costs
- 3 Not yet popular with a large size of users.

Network security

Objectives: At the end of this lesson you shall be able to

- **define network security**
- **explain network security concepts.**

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator.

Network security concepts

Network security refers to any activities designed to protect your network. Specifically, these activities protect the usability, reliability, integrity, and safety of your network and data. Effective network security targets a variety of threats and stops them from entering or spreading on your network.

Network security starts with authenticating, commonly with a username and a password. Since this requires just one detail authenticating the user name -i.e. the password- this is sometimes termed one-factor authentication. With two-factor authentication, something the user needs a 'dongle', an ATM card, or a mobile phone, and with three-factor authentication, something the user needs a fingerprint or retinal scan.

Once authenticated, a firewall decides what services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component may fail to check potentially harmful content such as computer worms or Trojans being transmitted over the network.

Anti-virus software or an intrusion prevention system (IPS) helps detect and inhibit the action of such malware.

Encrypting the communication between two hosts using a network helps maintain privacy.

Surveillance and early-warning tools sometimes referred to as Honeypots can be employed.

Honeypot is a trap set to detect, deflect, or, in some manner, counteract attempts at unauthorized use of information systems. Generally, a honeypot consists of a computer, data, or a network site that appears to be part of a network, but is actually isolated and monitored, and which seems to contain information or a resource of value to attackers. This is similar to the police baiting a criminal and then conducting undercover surveillance.

The Foundations of Security

Security relies on the following elements:

- **Authentication**

Authentication addresses the question: who are you? It is the process of uniquely identifying the clients of your applications and services. These might be end users, other services, processes, or computers. In security parlance, authenticated clients are referred to as principals.

- **Authorization**

Authorization addresses the question: what can you do? It is the process that governs the resources and operations that the authenticated client is permitted to access. Resources include files, databases, tables, rows, and so on, together with system-level resources such as registry keys and configuration data. Operations include performing transactions such as purchasing a product, transferring money from one account to another, or increasing a customer's credit rating.

- **Auditing**

Effective auditing and logging is the key to non-repudiation. Non-repudiation guarantees that a user cannot deny performing an operation or initiating a transaction. For example, in an e-commerce system, non-repudiation mechanisms are required to make sure that a consumer cannot deny ordering 100 copies of a particular book.

- **Confidentiality**

Confidentiality, also referred to as privacy, is the process of making sure that data remains private and confidential, and that it cannot be viewed by unauthorized users or eavesdroppers who monitor the flow of traffic across a network. Encryption is frequently used to enforce confidentiality. Access control lists (ACLs) are another means of enforcing confidentiality.

- **Integrity**

Integrity is the guarantee that data is protected from accidental or deliberate (malicious) modification. Like privacy, integrity is a key concern, particularly for data passed across networks. Integrity for data in transit is typically provided by using hashing techniques and message authentication codes.

- **Availability**

From a security perspective, availability means that systems remain available for legitimate users. The goal for many attackers with denial of service attacks is to crash an application or to make sure that it is sufficiently overwhelmed so that other users cannot access the application. Threats, Vulnerabilities, and Attacks Defined

A threat is any potential occurrence, malicious or otherwise, that could harm an asset. In other words, a threat is any bad thing that can happen to your assets.

A vulnerability is a weakness that makes a threat possible. This may be because of poor design, configuration mistakes, or inappropriate and insecure coding techniques. Weak input validation is an example of an application layer vulnerability, which can result in input attacks.

An attack is an action that exploits a vulnerability or enacts a threat. Examples of attacks include sending malicious input to an application or flooding a network in an attempt to deny service.

How Do You Build a Secure Web Application?

It is not possible to design and build a secure Web application until you know your threats. An increasingly important knowledge needed is about threat modeling. The purpose of threat modeling is to analyze your application's architecture and design and identify potentially vulnerable areas that may allow a user, perhaps mistakenly, or an attacker with malicious intent, to compromise your system's security.

After you know your threats, design with security in mind by applying proven security principles. You must follow secure coding techniques to develop secure, robust, and hack-resilient solutions. The design and development of application layer software must be supported by a secure network, host, and application configuration on the servers where the application software is to be deployed.

E-mail

Objectives : At the end of this lesson you shall be able to

- state the hotmail services offered
- explain MSN outlook express and its tools
- explain popular search engines
- state the FAQs about hotmail.

Hotmail: MSN Hotmail is the world's largest provider of free Web-based e-mail. Hotmail is based on the premise that e-mail access should be easy and possible from any computer connected to the World Wide Web.

By adhering to the universal HyperText Transfer Protocol (HTTP) standard, Hotmail eliminates the disparities that exist between different e-mail programs. Sending and receiving e-mail from Hotmail is as easy as going to the Hotmail web site at <http://www.hotmail.com>, or by clicking on the Hotmail link at <http://www.msn.com>, signing in, and sending an e-mail message.

Hotmail is the web-based e-mail provider, which means you can send and receive messages from any computer connected to the Internet. You can use Hotmail from home, work, school, an Internet cafe, a friend's house or any other computer in the world with an Internet connection. Your messages are stored in a central location, so your Inbox will always be up to date. This is great for people who use more than one computer, travel frequently, or don't even own a computer.

Advantages of Hotmail

Get a permanent e-mail address: When you create a Hotmail account, you choose a permanent e-mail address that will never change as long as you continue to use Hotmail. This is great for people who: Want to switch Internet Service Providers. Your Hotmail address will be the same no matter how you access the Internet, so you don't have to worry about retrieving messages from your old address or notifying friends, family and associates of a new e-mail address. You are free to select any Internet Service Provider that suits your needs.

When you leave town for travel, you may no longer have access to your ISP's e-mail account. But with Hotmail, your friends will always know where to reach you.

Your e-mail is private and secure: When you sign up for Hotmail, you choose your personal ID and password. The only way you can access your account is by using the password you selected. This means that only you will have access to your Hotmail account, even if you use a computer at a public terminal or a friend's house. Because the messages in your Hotmail account are stored securely at a central location, you don't have to worry about losing important information if something happens to your computer. Hotmail is strongly committed to keeping your personal information confidential.

Hotmail is fast and easy to use: Hotmail is recognized world wide as the best Web-based e-mail service. It is also stated that 'while others provide similar services, none can match Hotmail's general ease of use'. If everything is fine, it takes less than a minute to get started on Hotmail and its pages are so worked out to load quickly knowing that the users time is valuable.

Get an additional e-mail account for FREE: Hotmail offers everyone the opportunity to get a free e-mail account. Hotmail can offer e-mail accounts for free because it places banner advertising on some of its pages. Some Internet Service Providers charge a monthly fee for additional e-mail accounts. Hotmail lets an unlimited number of people use a single Internet Service Provider account and have a free, personal e-mail account.

Keep your personal e-mail separate from your work e-mail: People who use e-mail for work will find it convenient to keep their personal messages separate from their work messages. You can use Hotmail for your personal correspondence and your company's e-mail system only for business messages. Additionally, you don't have to store personal e-mail on your company's servers. All messages in your Hotmail account are securely stored in a central location that you access via the Internet with the password you select.

Outlook Express

Microsoft Outlook Express puts the world of online communication on your desktop. Whether you want to exchange e-mail with colleagues and friends or join newsgroups to trade ideas and information. Some of the tools offered by outlook express are;

Manage multiple mail and news accounts: If you have several mail or news accounts, you can use them all from one window. You can also create multiple users, or identities, for the same computer. Each identity gets its own mail folders and Address Book. The ability to create multiple accounts and identities makes it easy for you to keep work separate from personal mail and also between individual users.

Browse through messages quickly & easily: Using the message list and preview pane, you can view a list of messages and read individual messages at the same time. The Folders list contains mail folders, news servers, and newsgroups, and you can easily switch between them. You can also create new folders to organize and sort messages, and then set up message rules so that

incoming mail that meets your criteria automatically goes to a specific folder. You can also create your own views to customize the way you look at your mail.

Keep your mail on a server so you can view it from more than one computer: If your ISP uses an IMAP mail server for incoming mail, you can read, store, and organize your messages in folders on the server without downloading the messages to your computer. That way, you can view messages from any computer that can connect to that server.

Use the Address Book to store and retrieve e-mail addresses: You can save names and addresses in your Address Book automatically by simply replying to a message or by importing them from other programs, by typing them in, by adding them from e-mail messages you receive, or by searching popular Internet directory services (white pages). The Address Book supports Lightweight Directory Access Protocol (LDAP) for accessing Internet directory services.

Add a personal signature or stationery to your messages: You can insert essential information into outgoing messages as part of your personal signature, and you can create multiple signatures to use for different purposes. For more detailed information, you can include a business card. To make your messages look more attractive, you can add stationery patterns and backgrounds, and you can change the color and style of the text.

Send and receive secure messages: You can digitally sign and encrypt messages by using digital IDs. Digitally signing your message assures recipients that the message is really from you. Encryption ensures that only intended recipients can read a message.

Find newsgroups that interest you: Looking for a newsgroup that matches your interests? You can search for newsgroups that contain keywords or browse through all of the newsgroups available from your Usenet provider. When you find a newsgroup you want to view regularly, add it to your Subscribed list so you can find it again easily.

View newsgroup conversations efficiently: You can view a newsgroup message and all of the responses without reading an entire message list. When you view the list of messages, you can expand and collapse conversations to make it easier to find what interests you. You can also use views to display only the messages you want to read.

Download newsgroup messages for offline reading: To use your online time efficiently, you can download messages or entire newsgroups, so you don't have to be connected to your ISP to read messages. You can also download message headers only for offline viewing and then mark the headers of the messages you want to read; then the next time you are connected, Outlook Express downloads the message text. You can also compose messages offline and send them the next time you reconnect.

Some important (Top 8) recommendations for staying safe and secure when you're online are listed below;

- Change your password often. The quick act of changing your password can ensure your e-mail remains private. In addition, passwords that use both letters and numbers are harder to break.
- Don't share your password. Most e-mail administrators will not ask for your password. Do not be duped by malicious e-mails asking you for your password. This is a well-known, although not-too-common trick designed to fool you into sharing your password. As a rule, never share it with anyone.
- Never open attachments from unknown sources. They may contain what are known as "letterbombs" or "viruses," which can damage your PC.
- Always remember to sign out when you are done. It's quick, easy and may save your account from unwanted trespassers. If you are using a public terminal, at an internet cafe for example, it is advised that you close the browser you were using when you are ready to end your Internet session.
- Don't reply to unsolicited messages ("spam") mail, or other harassing or offensive mail. By responding, you only confirm that you are a person with an active e-mail address who can be plagued with constant unwanted e-mail solicitations. Instead, forward the unsolicited message to the customer service department of the source's e-mail (usually of a form similar to abuse@[implicateddomain].com). To help control spam, Hotmail provides members with "filters" for incoming mail. These can easily be set up to send certain messages (such as those that include certain words) directly to your online trash can.
- Make sure that you are using the most up-to-date Internet software (e.g. browsers such as Microsoft Internet Explorer or Netscape Navigator). More recent versions often offer enhanced security protection.
- Always use a secure network. Most corporate networks and Internet service providers are protected by administrators who watch for potential security problems and act to protect users from "hackers" (malicious users) who may try to steal personal information that is transferred through the network. Although the risk is small, use caution when on any unfamiliar network.
- Use stations maintained by sources you trust, or ask if the Internet terminal you are using is protected against security break-ins.

A SMALL LIST OF Search Engines

Yahoo.com (<http://www.Yahoo.com>)

Search.com (<http://search.com>)

EasySearcher (<http://www.easysearcher.com>)

AltaVista (<http://www.altavista.com>)

Excite (<http://www.excite.com>)

Google (<http://www.google.com>)
Hotbot (<http://www.hotbot.com>)
Infoseek (<http://www.infoseek.com>)
Lycos (<http://www.lycos.com>)
WebCrawler (<http://www.webcrawler.com>)
www.all4one.com (This useful tool queries four search engines at once)
www.av.com (Very powerful search engine which gives plenty of results)
www.askjeeves.com (Instead of entering words to search for, just type in your question)
www.rediff.com (Search for anything)
www.bigfoot.com (Looking for someone's email address ? Try here)
www.sawaal.com (All your questions answered)
www.hotbot.com (Useful search engine which helps to find pictures, video or music)
www.indiainfo.com (Info lets you search the web easily)
www.yahoo.com (Search engine which is also the most popular)
mp3.lycos.com (The place to start if you're after music files in the mp3 format)
www.metacrawler.com (Metacrawler puts your search through a host different engines)
www.mirago.co.uk (A search engine with an excellent selection of shopping links)
www.webferret.com (One of the easiest way to search the web)
www.indiatimes.com (The portal's search engine)
www.webcrawler.com (Let the webcrawler spider to do the searching for you)
www.indonet.net (Excellent Indian search engine with loads of useful search categories)
www.satyamonline.com (On ISP's site and has good search options)

COMPILED LIST OF INTERESTING FAQ's about HOTMAIL

1 How much e-mail storage space do I get with Hotmail?

Hotmail offers 2MB of storage space. If you do not keep your account below this limit, Hotmail may remove some messages, which cannot be recovered.

If you need additional storage space, there are a few options. You can use the latest version of Microsoft Internet Explorer v5 or above, which includes Outlook Express, which offers you the ability to store e-mails locally. You can send a blank e-mail message to hmoex@hotmail.com for more information on how to use the beta (pre-release) process to store Hotmail messages on your local PC, using Outlook Express.

Also, MSN has introduced Preview 2 of MSN Explorer as an integrated client for MSN services, such as MSN Hotmail. This client allows you to also store Hotmail locally on your machine. This too reduces the amount of storage that you need on hotmail.

2 Can I get Hotmail in different languages?

MSN Hotmail can now be viewed in a variety of languages.

You can make the language of a Hotmail session match the language of the Sign In page used to begin that session. You have your choice of the following languages: English, French, German, Italian, Japanese, Portuguese (Brazilian), and Spanish, and more to come.

3 Can I use Hotmail as a business address?

No. You may not use your Hotmail address as your primary business address. If, however, you work for a company with which you have an e-mail address and you want to use your Hotmail account to send and receive e-mail while away from your computer at work, you are encouraged to do so.

Example of Prohibited Use:

You are an individual who runs a business. You and your employees want to use Hotmail accounts rather than registering and administering your account through a paid ISP.

Example of Allowed Use:

You are a businessperson who travels. You have an account with your company (**yourname@yourcompany.com**). You use your Hotmail account to read and send solicited messages while you are traveling.

Hotmail prohibits account sharing. Since Hotmail is accessible from everywhere in the world, each individual is able to sign up for his or her own personal account. You are encouraged to sign up for an account of your own, to which only you have access. Sharing an account compromises the privacy and security of your e-mail. Each Hotmail user must have his or her individual e-mail account.

4 Is my e-mail really private and secure? (SSL)?

Secure connections (often called SSL, or Secure Sockets Layer) is the industry standard in Web security. It is used primarily for transmitting sensitive information over the Internet. When you have a secure connection between your browser and a Web site, no one else can easily access the data that you send across the connection. Hotmail uses SSL to encrypt your sign-in name, and password, when you log in to give you a high level of security.

It is Hotmail's policy to respect the privacy of its users. Therefore, Hotmail will not monitor, edit, or disclose the contents of a user's private communications unless required to do so by law or in the good faith belief that such action is necessary to:

- conform to the edicts of the law or comply with legal process served on Hotmail;
- protect and defend the rights or property of Hotmail; or
- act under exigent circumstances to protect the personal safety of its users or the public.

5 Can Hotmail protect its users from e-mail viruses?

MSN Hotmail is pleased to offer users McAfee VirusScan for free. Whenever you receive attachments in your Hotmail account, it will automatically scan them with McAfee's popular VirusScan before downloading.

MSN Hotmail recently added the ability to have all attachments you want to send scanned before they can be attached to your outgoing e-mail. So before you upload file to send to another user, it will also be scanned for viruses before you send it, reducing the spread of viruses to Hotmail users and the other recipients of your e-mail.

Remember, to ensure safety, Hotmail recommends that you never open attachments from unknown sources.

6 How do I send images and use e-mail stationery to make e-mail I send more colorful and fun?

(Emoticons/Stationery/RTF)

MSN Hotmail offers users stationery to send fun, colorful messages to family and friends! Always capture the right mood for your messages by selecting one of the many different stationery templates. Use the Stationery Chooser button on the Compose page to view the available stationery choices.

You can also accent your messages by using Rich Text Formatting. The Rich Text Formatting option, also allows you to add emoticons to your e-mail. This new feature allows you to add selected symbols or emoticons to your message. These icons help you convey emotion or add flair within a message.

7 What does it mean when my account is marked "inactive"?

Currently, if you do not sign in to your Hotmail account for 60 days, or if you do not sign-in within the first 10 days, your account will be marked "inactive." Stored e-mail and addresses will be deleted, and inbound mail will be refused. Your Passport will still function, and your Hotmail e-mail name will be reserved. To re-activate your account, simply go to <http://www.hotmail.com> and enter your Sign-In name and password. You will then be able to once again send and receive e-mail using hotmail. If your account stays "inactive" for over a period of 90 days, it may be permanently deleted.

8 Can I send and receive attachments on Hotmail?

Yes, you can send and receive as many files as you want to a message - up to 1MB (1024K) of attachments.

Attachments sent to your Hotmail account can be downloaded to your personal computer by clicking them. GIF and JPEG images and HTML files are automatically displayed in the browser window.

Chatting, video chatting and using social network sites

Objectives : At the end of this lesson you shall be able to

- explain chating process
- explain video chating process
- explain social network services.

Chatting Process

A web chat is a system that allows users to communicate in real time using easily accessible web interfaces. It is a type of internet online chat distinguished by its simplicity and accessibility to users who do not wish to take the time to install and learn to use specialized chat software. This trait allows users instantaneous access and only a web browser is required to chat. Users will always get the latest version of a chat service because no software installation or updates are required.

Video Chat

In video chat video of both caller and receiver can be seen on screen of both user along with audio. So it gives an impression of face to face interaction though the caller and receiver can be thousands of mile apart.

Social Networking services

A social networking service is a platform to build social networks or social relations among people who, share interests, activities, backgrounds or real-life connections. A social network service consists of a representation of each user (often a profile), his social links, and a variety of additional services. Social networking is web-based services that allow individuals to create a public profile, to create a list of users with whom to share connection, and view and cross the connections within the system. Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Social network sites are varied and they incorporate new information and communication tools such as, mobile connectivity, photo/video/sharing and blogging. Online community services

are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, pictures, posts, activities, events, interests with people in their network.

The main types of social networking services are those that contain category places (such as former school year or classmates), means to connect with friends (usually with self-description pages), and a recommendation system linked to trust. Popular methods now combine many of these, with American-based services such as Facebook, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr and Twitter widely used worldwide; Nexopia in Canada; Badoo, Bebo, Vkontakte (Russia), Delphi (also called Delphi Forums), Draugiem.lv (mostly in Latvia), Hi5 (Europe), Hyves (mostly in The Netherlands), iWiW (mostly in Hungary), Nasza-Klasa, Soup (mostly in Poland), Glocals in Switzerland, Skyrock, The Sphere, StudiVZ (mostly in Germany), Tagged, Tuenti (mostly in Spain), and XING in parts of Europe; Hi5 and Orkut in South America and Central America; Mxit in Africa; and Cyworld, Mixi, Orkut, renren, weibo and Wretch in Asia and the Pacific Islands.

There have been attempts to standardize these services to avoid the need to duplicate entries of friends and interests (see the FOAF standard and the Open Source Initiative). According to experts, the largest social networking users are Asian-Pacific regions with 615,9 million people. A 2013 survey found that 73% U.S adults use social networking sites.

Explaining threats to computers connected to Internet & process of protecting computers from it.

Objectives : At the end of this lesson you shall be able to

- **explain threats to computers connected to Internet**
- **process of Protecting computers from Internet.**

A web threat is any threat that uses the World Wide Web to facilitate cybercrime. Web threats use multiple types of malware and fraud, all of which utilize HTTP or HTTPS protocols, but may also employ other protocols and components, such as links in email or IM, or malware attachments or on servers that access the Web. They benefit cybercriminals by stealing information for subsequent sale and help absorb infected PCs into botnets.

Web threats pose a broad range of risks, including financial damages, identity theft, loss of confidential information/data, theft of network resources, damaged brand/personal reputation, and erosion of consumer confidence in e-commerce and online banking.

It is a type of threat related to information technology (IT). The IT risk, i.e. risk affecting has gained and increasing impact on society due to the spread of IT processes.

Web threats can be divided into two primary categories, based on delivery method - push and pull. Push-based threats use spam, phishing, or other fraudulent means to lure a user to a malicious (often spoofed) website which then collects information and/or injects malware. Push attacks use phishing, DNS poisoning (or pharming), and other means to appear to originate from a trusted source.

Precisely-targeted push-based web threats are often referred to as spear phishing to reflect the focus of their data gathering attack. Spear phishing typically targets specific individuals and groups for financial gain. In other push-based web threats, malware authors use social engineering such as enticing subject lines that reference holidays, popular personalities, sports, pornography, world events and other hot topics to persuade recipients to open the email and follow links to malicious websites or open attachments with malware that accesses the Web.

Pull-based web threats are often referred to as "drive-by" threats by experts (and more commonly as "drive-by downloads" by journalists and the general public), since they can affect any website visitor. Cybercriminals infect legitimate websites, which unknowingly transmit malware to visitors or alter search results to take users to malicious websites. Upon loading the page, the user's browser passively runs a malware downloader in a hidden HTML frame (IFRAME) without any user interaction.

Internet security

Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet. The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing. Different methods have been used to protect the transfer of data, including encryption.

Types of security

Network layer security

TCP/IP which stands for Transmission Control Protocol (TCP) and Internet Protocol (IP) aka Internet protocol suite can be made secure with the help of cryptographic methods and protocols. These protocols include Secure Sockets Layer (SSL), succeeded by Transport Layer Security (TLS) for web traffic, Pretty Good Privacy (PGP) for email, and IPsec for the network layer security.

Internet Protocol Security (IPsec)

This protocol is designed to protect communication in a secure manner using TCP/IP aka Internet protocol suite. It is a set of security extensions developed by the Internet Task force IETF, and it provides security and authentication at the IP layer by transforming data using encryption. Two main types of transformation that form the basis of IPsec: the Authentication Header (AH) and ESP. These two protocols provide data integrity, data origin authentication, and anti-replay service. These protocols can be used alone or in combination to provide the desired set of security services for the Internet Protocol (IP) layer.

The basic components of the IPsec security architecture are described in terms of the following functionalities:

- Security protocols for AH and ESP
- Security association for policy management and traffic processing
- Manual and automatic key management for the internet key exchange (IKE)
- Algorithms for authentication and encryption

The set of security services provided at the IP layer includes access control, data origin integrity, protection against replays, and confidentiality. The algorithm allows these sets to work independently without affecting other parts of the implementation. The IPsec implementation is operated in a host or security gateway environment giving protection to IP traffic.

Security token

Some online sites offer customers the ability to use a six-digit code which randomly changes every 30-60 seconds on a security token. The keys on the security token have built in mathematical computations and manipulate numbers based on the current time built into the device. This means that every thirty seconds there is only a certain array of numbers possible which would be correct to validate access to the online account. The website that the user is logging into would be made aware of that devices' serial number and would know the computation and correct time built into the device to verify that the number given is indeed one of the handful of six-digit numbers that works in that given 30-60 second cycle. After 30-60 seconds the device will present a new random six-digit number which can log into the website.

Electronic mail security (E-mail)

Background

Email messages are composed, delivered, and stored in a multiple step process, which starts with the message's composition. When the user finishes composing the message and sends it, the message is transformed into a standard format: an RFC 2822 formatted message. Afterwards, the message can be transmitted. Using a network connection, the mail client, referred to as a mail user agent (MUA), connects to a mail transfer agent (MTA) operating on the mail server. The mail client then provides the sender's identity to the server. Next, using the mail server commands, the client sends the recipient list to the mail server. The client then supplies the message. Once the mail server receives and processes the message, several events occur: recipient server identification, connection establishment, and message transmission. Using Domain Name System (DNS) services, the sender's mail server determines the mail server(s) for the recipient(s). Then, the server opens up a connection(s) to the recipient mail server(s) and sends the message employing a process similar to that used by the originating client, delivering the message to the recipient(s).

Pretty Good Privacy (PGP)

Pretty Good Privacy provides confidentiality by encrypting messages to be transmitted or data files to be stored using an encryption algorithm such Triple DES or CAST-128. Email messages can be protected by using cryptography in various ways, such as the following:

- Signing an email message to ensure its integrity and confirm the identity of its sender.
- Encrypting the body of an email message to ensure its confidentiality.

- Encrypting the communications between mail servers to protect the confidentiality of both message body and message header.

The first two methods, message signing and message body encryption, are often used together; however, encrypting the transmissions between mail servers is typically used only when two organizations want to protect emails regularly sent between each other. For example, the organizations could establish a virtual private network (VPN) to encrypt the communications between their mail servers over the Internet. Unlike methods that can only encrypt a message body, a VPN can encrypt entire messages, including email header information such as senders, recipients, and subjects. In some cases, organizations may need to protect header information. However, a VPN solution alone cannot provide a message signing mechanism, nor can it provide protection for email messages along the entire route from sender to recipient.

Multipurpose Internet Mail Extensions (MIME)

MIME transforms non-ASCII data at the sender's site to Network Virtual Terminal (NVT) ASCII data and delivers it to client's Simple Mail Transfer Protocol (SMTP) to be sent through the Internet. The server SMTP at the receiver's side receives the NVTASCII data and delivers it to MIME to be transformed back to the original non-ASCII data.

Message Authentication Code

A Message authentication code (MAC) is a cryptography method that uses a secret key to encrypt a message. This method outputs a MAC value that can be decrypted by the receiver, using the same secret key used by the sender. The Message Authentication Code protects both a message's data integrity as well as its authenticity.

Firewalls

A firewall (computing) controls access between networks. It generally consists of gateways and filters which vary from one firewall to another. Firewalls also screen network traffic and are able to block traffic that is dangerous. Firewalls act as the intermediate server between SMTP and Hypertext Transfer Protocol (HTTP) connections.

Role of firewalls in web security

Firewalls impose restrictions on incoming and outgoing Network packets to and from private networks. Incoming or outgoing traffic must pass through the firewall; only authorized traffic is allowed to pass through it. Firewalls create checkpoints between an internal private network and the public Internet, also known as choke points(borrowed from the identical military term of a combat limiting geographical feature). Firewalls can create choke points based on IP source and TCP port number. They can also serve as the platform for IPsec. Using tunnel mode capability, firewall can be used to implement VPNs. Firewalls can also limit network

exposure by hiding the internal network system and information from the public Internet. Also, WE HAVE A LOT OF BIG WAYE to deal with it.

Types of firewalls

Packet filter

A packet filter is a first generation firewall that processes network traffic on a packet-by-packet basis. Its main job is to filter traffic from a remote IP host, so a router is needed to connect the internal network to the Internet. The router is known as a screening router, which screens packets leaving and entering the network.

Stateful packet inspection

In a stateful firewall the circuit-level gateway is a proxy server that operates at the network level of an Open Systems Interconnection (OSI) model and statically defines what traffic will be allowed. Circuit proxies will forward Network packets (formatted unit of data) containing a given port number, if the port is permitted by the algorithm. The main advantage of a proxy server is its ability to provide Network Address Translation (NAT), which can hide the user's IP address from the Internet, effectively protecting all internal information from the Internet.

Application-level gateway

An application-level firewall is a third generation firewall where a proxy server operates at the very top of the OSI model, the IP suite application level. A network packet is forwarded only if a connection is established using a known protocol. Application-level gateways are notable for analyzing entire messages rather than individual packets of data when the data are being sent or received.

Malicious software

Malware

A computer user can be tricked or forced into downloading software onto a computer that is of malicious intent. Such programs are known as malware and come in many forms, such as viruses, Trojan horses, spyware, and worms. Malicious software is sometimes used to form botnets.

Viruses

Computer Viruses are programs that can replicate their structures or effects by infecting other files or structures on a computer. The common use of a virus is to take over a computer to steal data.

Worms

Computer worms are programs that can replicate themselves throughout a computer network, performing malicious tasks throughout.

Trojan horse

A Trojan horse commonly known as a Trojan is a general term for malicious software that pretends to be harmless, so that a user willingly allows it to be downloaded onto the computer.

Ransomware and Scareware

Botnet

A botnet is a network of zombie computers that have been taken over by a robot or bot that performs large-scale malicious acts for the creator of the botnet.

Spyware

The term spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

Denial-of-service attack

A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of the concerted efforts to prevent an Internet site or service from functioning efficiently or at all, temporarily or indefinitely.

Browser choice

Web browser statistics tend to affect the amount a Web browser is exploited. For example, Internet Explorer 6, which used to own a majority of the Web browser market share, is considered extremely insecure because vulnerabilities were exploited due to its former popularity. Since browser choice is more evenly distributed (Internet Explorer at 28.5%, Firefox at 18.4%, Google Chrome at 40.8%, and so on) and vulnerabilities are exploited in many different browsers.

Application vulnerabilities

Applications used to access Internet resources may contain security vulnerabilities such as memory safety bugs or flawed authentication checks. The most severe of these bugs can give network attackers full control over the computer. Most security applications and suites are incapable of adequate defense against these kinds of attacks.

Internet security products

Antivirus

Antivirus programs and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Before 2000 a user would pay for antivirus software, 10 years later however, computer users can choose from a host of free security applications on the Internet.

Security Suites

So called "security suites" were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more. They may now offer theft protection, portable storage device safety check, private internet browsing, cloud anti-spam, a file shredder or make security-related decisions (answering popup windows) and several were free of charge as of at least 2012.

Outlook Express & Google+

Objectives : At the end of this lesson you shall be able to

- explain outlook express
 - explain Google+
-

Microsoft Outlook

Microsoft Outlook is a personal information manager from Microsoft, available as a part of the Microsoft Officesuite. Although often used mainly as an email application, it also includes a calendar, task manager, contact manager, note taking, journal, and web browsing. It can be used as a stand-alone application, or can work with Microsoft Exchange Server and Microsoft SharePoint Server for multiple users in an organization, such as shared mailboxes and calendars, Exchange public folders, SharePoint lists, and meeting schedules. There are third-party add-on applications that integrate Outlook with devices such as BlackBerry mobile phones and with other software such as Office and Skype internet communication. Developers can also create their own custom software that works with Outlook and Office components using Microsoft Visual Studio. In addition, Windows Mobile devices can synchronize almost all Outlook data to Outlook Mobile.

Google+

Google+ (pronounced and sometimes written as Google Plus) is a social networking and identity service that is owned and operated by Google Inc. Google has described Google+ as a "social layer" that enhances many of its online properties, and that it is not simply a social networking website, but also an authorship tool that associates web-content directly with its owner/author. It is the second-largest social networking site in the world after Facebook. 540 million monthly active users are part of the Identity service site, by interacting socially with Google+'s enhanced properties, like Gmail, +1 button, and YouTube comments. In October 2013, Google counted 540 million active users who used at least one Google+ service, of which 300 million users are active in "the stream".

Creation

Google launched the Google+ service as an invitation-only "field test" on June 28, 2011, but soon suspended early invites due to an "insane demand" for new accounts. On August 6, each Google+ member had 150 invitations to give out until September 20, 2011, when Google+ opened to everyone 18 years of age or older without the need for an invitation. It was opened for a younger age group (13 years or older in US and most countries, 14 or older in South Korea and Spain, 16 or older in the Netherlands) on January 26, 2012. Google+ is available as a website and on mobile devices.

Before the launch, Google referred to Google+ as Google Circles, a name alluding to its emphasis on organising friendship information. Google+ is considered the company's fourth foray into social networking, following Google Buzz (launched 2010, retired in 2011), Google Friend Connect (launched 2008, retired by March 1, 2012) and Orkut (launched in 2004, as of 2013 operated entirely by subsidiary Google Brazil). Sources such as The New York Times have declared it Google's biggest attempt to rival the social network Facebook, which has over 1 billion users.

Web designing

Objectives : At the end of this lesson you shall be able to

- explain web sites and web pages
 - explain static and dynamic web pages
 - explain HTML, DHTML and XML
 - explain the concept of web hosting, web server, application server and database server.
-

Introduction

The World Wide Web (WWW) was created in 1990 by CERN physicist Tim Berners-Lee. On 30 April 1993, CERN announced that the World Wide Web would be free to use for anyone. Before the introduction of HTML and HTTP, other protocols such as File Transfer Protocol and the Gopher Protocol were used to retrieve individual files from a server. These protocols offer a simple directory structure which the user navigates and chooses files to download. Documents were most often presented as plain text files without formatting, or were encoded in word processors formats.

Websites

A website, also written as Web site, web site, or simply site, is a set of related web page containing content (media) such as written language, Image, video, sound, etc. A website is hosted on at least one web server, accessible via a network such as the internet or a private local area network through an Internet address known as a uniform resource locator. All publicly accessible websites collectively constitute the world wide web.

A webpage is a document, typically written in plain text interspersed with formatting instructions of Hypertext Mark-up Language (HTML) XHTML. A webpage may incorporate elements from other websites with suitable HTML anchor.

Web pages are accessed and transported with the Hypertext Transfer Protocol (HTTP), which may optionally employ encryption secure, HTTPS to provide security and privacy for the user of the webpage content. The user's application, often a web browser, renders the page content according to its HTML Mark-up instructions onto a Computer monitor.

The pages of a website can usually be accessed from a simple Uniform Resource Locator (URL) called the web address. The URLs of the pages organize them into a hierarchy, although hyperlink between them conveys the reader's perceived sitemap and guides the reader's navigation of the site which generally includes a Home page with most of the links to the site's web content, and a supplementary about page, contact page and link page.

Some websites require a subscription to access some or all of their content. Examples of subscription websites include many business sites, parts of news websites, Academic journal websites, gaming websites, file-sharing websites, Internet forum, web-based Email, Social networking websites, websites providing real-time Stock market data, and websites providing various other services (e.g., websites offering storing and/or sharing of images, files and so forth).

A website may be

- Personal website
- Commercial website
- E-Government
- Non-profit organization website.

Static Website

A static website is one that has web pages stored on the server in the format that is sent to a client web browser. It is primarily coded in Hypertext Markup Language (HTML).

Simple forms or marketing examples of websites, such as classic website, a five-page website or a brochure website are often static websites, because they present pre-defined, static information to the user. This may include information about a company and its products and services through text, photos, animations, audio/video and interactive menus and navigation.

This type of website usually displays the same information to all visitors. Similar to handing out a printed brochure to customers or clients, a static website will generally provide consistent, standard information for an extended period of time. Although the website owner may make updates periodically, it is a manual process to edit the text, photos and other content and may require basic website design skills and software.

Advantages

- Static Websites are easier to develop
- Can be developed quickly
- They are indexed easily by search engines as all the web pages actually exist on the server, which is not the case with dynamic websites.

Disadvantages

- Static websites cannot do complex tasks required by many online services.
- Updating a whole site can be cumbersome and time consuming.
- An isolation of Data and Design is not provided in static websites.

Dynamic Website

A dynamic website is one that changes or customizes itself frequently and automatically, based on certain criteria.

Dynamic websites can have two types of dynamic activity: Code and Content. Dynamic code is invisible or behind the scenes and dynamic content is visible or fully displayed

Advantages

- Can do more complex task required by online services.
- They are easier to update.
- Isolation of data and design allows programmers and content writers to work independently.

Disadvantages

- Can take more time to build.
- Can be difficult to build.
- Dynamic websites are not indexed by search engines easily, since they do not have actual web pages present on the web server. With continuous improvements in search engine technology, this problem is now very much eliminated and you can find that many dynamic websites are very well indexed by search engines now a days.

A few such classifications are:

- Affiliate: enabled portal that renders not only its custom CMS but also syndicated content from other content providers for an agreed fee. There are usually three relationship tiers. Affiliate Agencies (e.g., Commission Junction), Advertisers (e.g., eBay) and consumer (e.g., Yahoo!).
- Archive site: used to preserve valuable electronic contents that are on verge of extinction. For examples: Internet Archive, which since 1996 has preserved billions of old and new web pages; and Google Groups, which in early 2005 had preserved over 845,000,000 messages posted to Usenet news/discussion groups.
- Blog Site: sites generally used to post online diaries, comments or views that may include discussion forums (e.g., blogger, Xanga).

- Content Site: these sites create and sell of original content to end-user. (e.g., Slate, About.com).
- Corporate website: used to provide information regarding business, organization, or service.
- Commerce site (or eCommerce site): these sites are designed for purchasing or selling goods, such as Amazon.com, CSN Stores, and Overstock.com.
- Community site: sites where persons with similar interests communicate to each other through chatting and messaging or through soci message boards, such as MySpace or Facebook.
- City Site: A site that shows information about a certain city or town and events that takes place in that town. Usually created by the city council. For example, Richmond.com is the geodomain for Richmond, Virginia.
- Information site: contains content that is intended to inform visitors, but not necessarily for commercial purposes, such as: RateMyProfessors.com, Free Internet Lexicon and Encyclopaedia. Most government, educational and non-profit institutions have an informational site.
- Mirror site: A complete reproduction of a website.
- News site: similar to an information site, but dedicated to dispensing news and commentary.
- Personal homepage: run by an individual or a small group such as a family that contains information or any content that the individual wishes to include. These are usually uploaded using a web hosting service such as Geocities.
- Phish Site: a website created to fraudulently acquire sensitive information, such as passwords and credit card details, by disguising as a trustworthy person or business (such as Social Security Administration, PayPal) in an electronic communication.
- Political site: A site on which people may voice political views.
- Rating site: A site on which people can praise or disparage what is featured.
- Review site: A site on which people can post reviews for products or services.
- School site: a site on which teachers, students, or administrators can post information about current events at or involving their school.
- Video sharing: A site that enables user to upload videos, such as YouTube and Google Video.
- Search engine site: a site that provides general information and is intended as a gateway for retrieving other sites. Google, Yahoo and MSN are the most widely known search engines.
- Shock site: includes images or other material that is intended to be offensive to most viewers (e.g. rotten.com).

- Warez: a site designed to host and let users download copyrighted materials illegally.
- Web portal: a site is vehicle that provides a gateway to other resources on the Internet or an intranet.

Web Pages

A web page or webpage is a Document or information resource that is suitable for the world wide Web and can be accessed through a web browser and displayed on a computer display or mobile device. This information is usually in HTML or XHTML format, and may provide navigation bar to other web pages via Hyper text Hyper link. Web pages frequently subsume other resources such as Cascading Style Sheet, Client-side-scripting and Images into their final presentation.

Web pages may be retrieved from a local computer or from a remote Web server. The web server may restrict access only to a private network, e.g. a corporate Intranet or it may publish pages on the World Wide Web. Web pages are requested and served from web. Web server using Hypertext Transfer Protocol (HTTP).

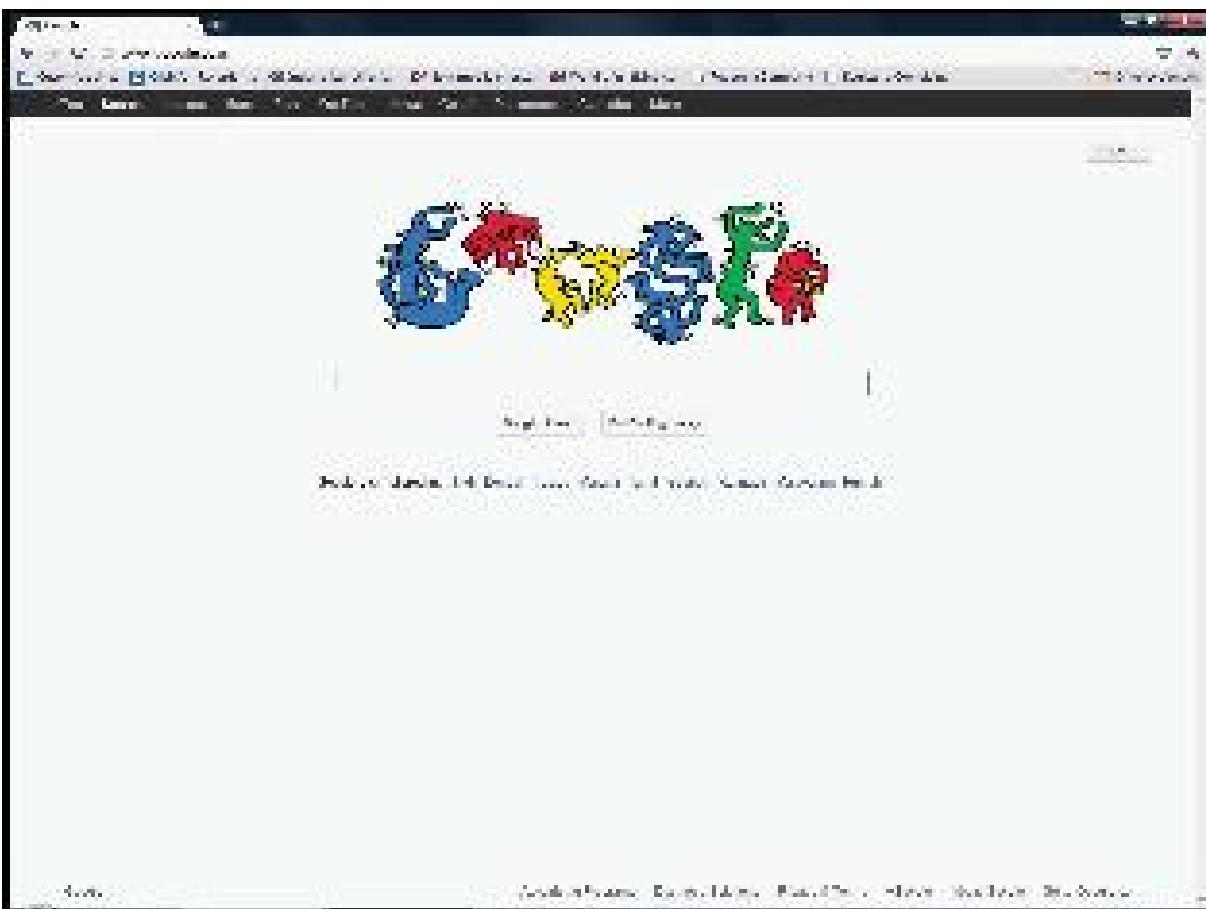
Web pages may consist of files of static text and other Web content stored within the Web server's file system(Static Web page), or may be constructed by Server-side scripting when they are requested (Dynamic web page). Client-side scripting can make web pages more responsive to user input once on the client browser.

Web Browser

A Web browser can have a Graphical User Interface, like Internet Explorer, Mozilla Firefox, Google Chrome and Opera (web browser), or can be Command Line Interface, like Lynx (web browser) (Fig 1) or Links (web browser). Web users with disabilities often use assistive technologies and adaptive strategies to Web accessibility web pages. Users may be colour blind, may or may not want to use a mouse perhaps due to repetitive stress injury or motor-neurone problems, may be deaf and require audio to be captioned, may be blind and using a Screen reader or display, may need screen magnification, etc. Disabled and able-bodied users may disable the download and viewing of images and other media, to save time, network bandwidth or merely to simplify their browsing experience.

Users of mobile devices often have restricted displays and bandwidth. Anyone may prefer not to use the fonts, font sizes, styles and colour schemes selected by the web page designer and may apply their own CSS styling to the page. The World Wide Web Consortium (W3C) and Web Accessibility Initiative (WAI) recommend that all web pages should be designed with all of these options in mind.

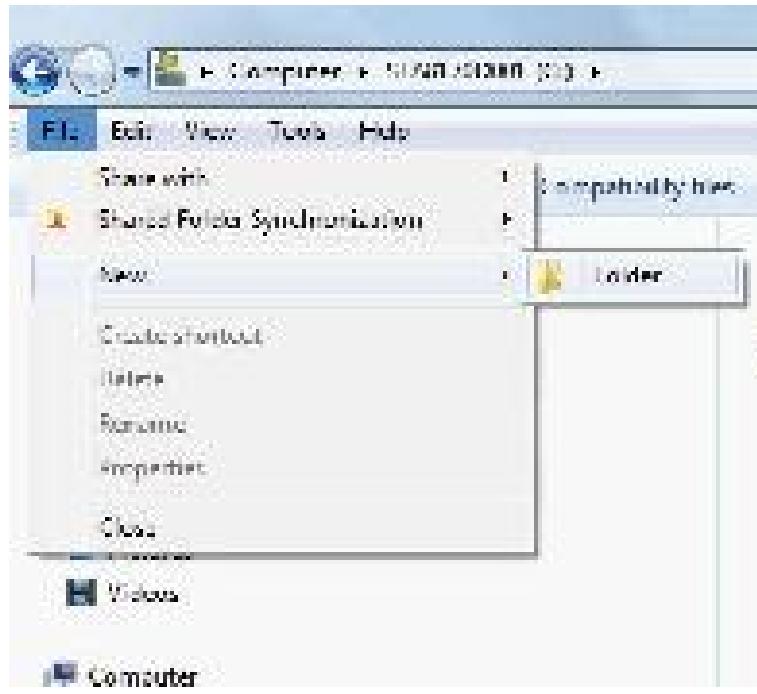
Fig 1



Downloading a Software from Internet

- 1 Create a Temporary Files folder by opening My Computer, double click on your hard drive (typically the C: drive), then select File/New/Folder as on Fig 2.

Fig 2



- 2 Type "Temporary File" and name it as on Fig 3.
- 3 Type "My SQL 5. 1 free download " from freeware software website on internet.

Note: As an example Choose "<http://dev.mysql.com/downloads/>" select "My SQL Community server" in download from the opened site as on Fig 4

Fig 3

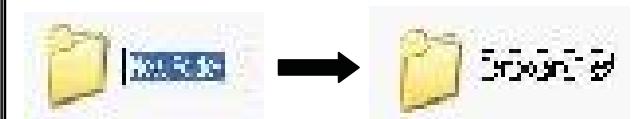


Fig 4



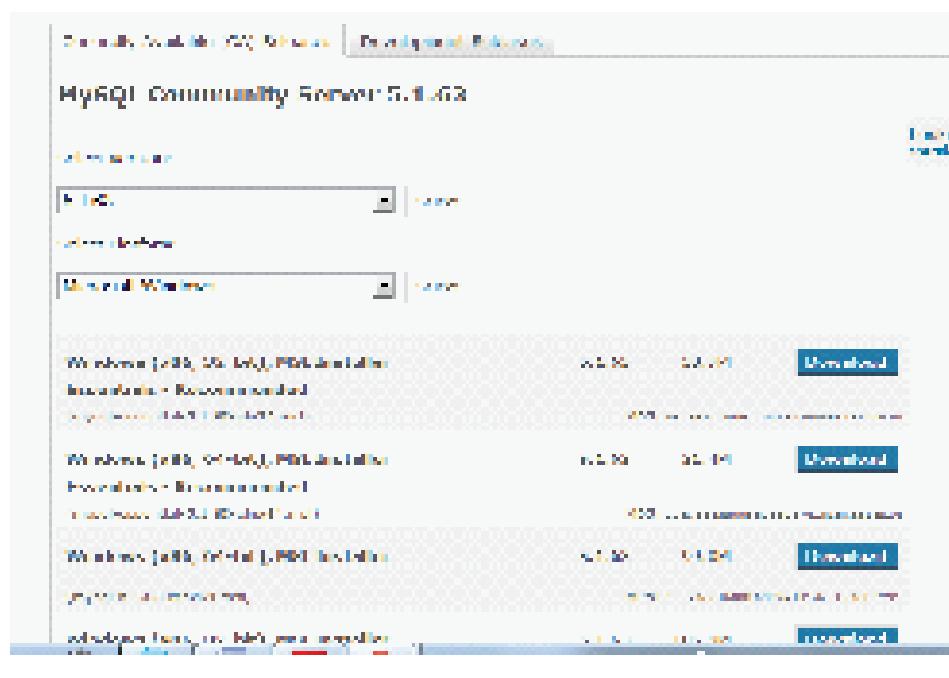
4 Click "MySQL Community Server 5.1 " from looking for previous version option as on Fig 5

Fig 5

A screenshot of the 'Download MySQL Community Server' page. The page title is 'Download MySQL Community Server'. It features two main sections: 'MySQL Community Edition' and 'MySQL Standard Edition'. Under 'MySQL Community Edition', there is a note about the end-of-life date of MySQL 5.1 and a link to 'MySQL 5.7'. Below this, there's a 'Recommended' section with a button labeled 'Download MySQL Community Server 5.1'. The 'MySQL Standard Edition' section contains a note about the end-of-life date of MySQL 5.5 and a link to 'MySQL 5.7'. There are also sections for 'Windows (x86, 32-bit), MSI Installer Essentials - Recommended' and 'Windows (x86, 32-bit), ZIP Archive'.

5 Choose "Windows (x86, 32-bit), MSI Installer Essentials - Recommended" and click download (Fig.6).

Fig 6



Note: Save the "My SQL 5.1.63" in the created Folder name " Temporary Folder"

- 6 Burn the Downloaded "My SQL 5.1.63" in a CD ROM for Installation.

WEB LANGUAGES

Web languages are called as Markup languages are designed for the processing, definition and presentation of text. The language specifies code for formatting, both the layout and style, within a text file. The code used to specify the formatting are called tags

Four Types of Markup languages

- 1 BML
- 2 HTML
- 3 DHTML
- 4 XML

BML (Better markup language)

BML is essentially a simple macro language. Macros are called blocks in BML. Blocks are defined in look files, and are invoked in BML files. Blocks accept parameters and are divided into several types, according to how parameters are transmitted and how the definition of the block is able to make use of them.

HTML (Hyper text markup Language)

HTML or HyperText Markup Language is the language of the web. All web pages are written in HTML. HTML defines the way that images, multimedia, and text are displayed in web browsers. It includes elements to connect the

documents (hypertext) and make web documents interactive (such as with forms).

HTML is a defined standard markup language. That standard was developed by the World Wide Web Consortium (W3C). It is based upon SGML (Standard Generalized Markup Language). It is a language that uses tags to define the structure of your text. Elements and tags are defined by the < and > characters.

DHTML

Dynamic HTML is not really a new specification of HTML, but rather a new way of looking at and controlling the standard HTML codes and commands.

When thinking of dynamic HTML, we need to remember the qualities of standard HTML, especially that once a page is loaded from the server, it will not change until another request comes to the server. Dynamic HTML give more control over the HTML elements and allows them to change at any time, without returning to the Web server.

There are four parts to DHTML:

- Document Object Model (DOM) (definition)
- Scripts
- Cascading Style Sheets (CSS)
- XHTML

DOM

The DOM is allows to access any part of Web page to change it with DHTML. Every part of a Web page is specified by the DOM and using its consistent naming conventions can access them and change their properties.

Scripts

Scripts written in either JavaScript or ActiveX are the two most common scripting languages used to activate DHTML. You use a scripting language to control the objects specified in the DOM.

Cascading Style Sheets

CSS is used in DHTML to control the look and feel of the Web page. Style sheets define the colors and fonts of text, the background colors and images, and the placement of objects on the page. Using scripting and the DOM, we can change the style of various elements.

XHTML

XHTML or HTML 4.x is used to create the page itself and build the elements for the CSS and the DOM to work on. There is nothing special about XHTML for DHTML - but having valid XHTML is even more important, as there are more things working from it than just the browser.

Features of DHTML

There are four primary features of DHTML:

- 1 Changing the tags and properties
- 2 Real-time positioning
- 3 Dynamic fonts (Netscape Communicator)
- 4 Data binding (Internet Explorer)

Changing the tags and properties

This is one of the most common uses of DHTML. It allows to change the qualities of an HTML tag depending on an event outside of the browser (such as a mouse click, time, or date, and so on). we can use this to preload information onto a page, and not display it unless the reader clicks on a specific link.

Real-time positioning

Objects, images, and text moving around the Web page. This can allow we to play interactive games with the readers or animate portions of the screen.

Dynamic Fonts

This is a Netscape only feature. Netscape developed this to get around the problem designers had with not knowing what fonts would be on a reader's system. With dynamic fonts, the fonts are encoded and downloaded with the page, so that the page always looks how the designer intended it to.

Data binding

This is an IE only feature. Microsoft developed this to allow easier access to databases from Web sites. It is very similar to using a CGI to access a database, but uses an ActiveX control to function.

XML

Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services

Creating an HTML document

Before start writing code to write a web page, it is a good practice to plan ahead the appearance of the web page. An HTML document has two elements:

- 1 Document Content
- 2 Tags

Document content is the information on a web page that the user will see. That information could be text or graphics.

Tags are the HTML codes that control how the document content will appear. The tags, in other words, will determine whether the text will be bold, black or blue, or of font type Time New Roman or Arial.

Start Notepad

To start Notepad go to:

Start

All Programs

Accessories

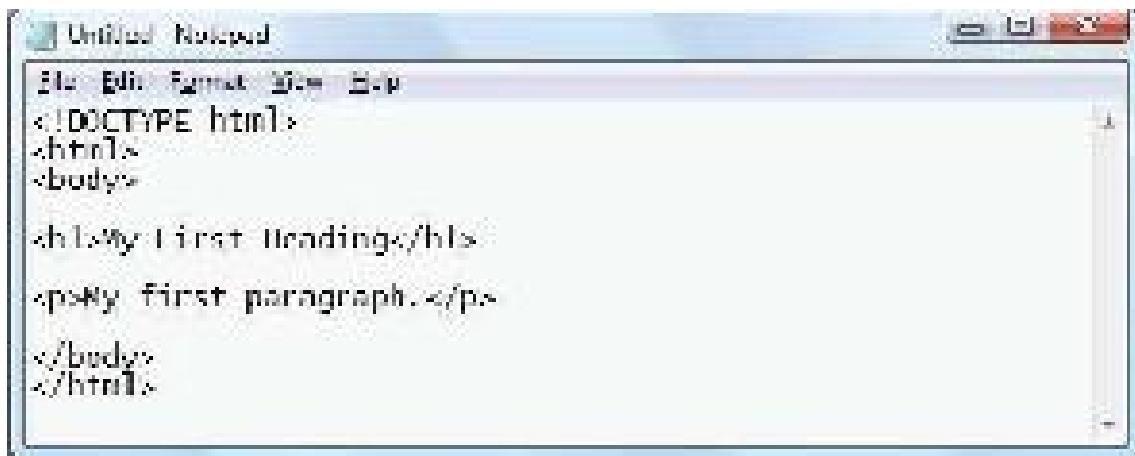
Notepad

Edit Your HTML with Notepad (Fig 7)

Type your HTML code into your Notepad:

Save Your HTML

Fig 7



```
Untitled - Notepad
File Edit Format View Help
<!DOCTYPE html>
<html>
<body>
<h1>My First Heading</h1>
<p>My first paragraph.</p>
</body>
</html>
```

Select Save as.. in Notepad's file menu.

When you save an HTML file, you can use either the .htm or the .html file extension.

Save the file in a folder that is easy to remember

Run the HTML in Your Browser

Start your web browser and open your html file from the File, Open menu, or just browse the folder and double-click your HTML file.

The result should look much like this: (Fig 8)

Fig 8



Structure of Markup Language

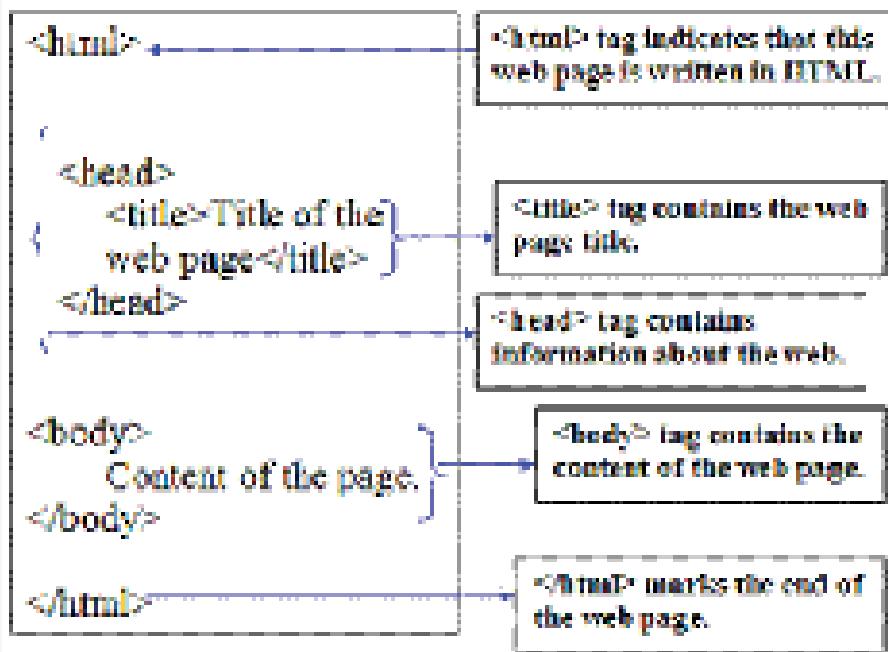
An HTML document has two* main parts:

- 1 head. The head element contains title and meta data of a web document.
- 2 body. The body element contains the information that you want to display on a web page.

To make your web pages compatible with HTML 4, you need to add a document type declaration (DTD) before the HTML element. Many web authoring software add DTD and basic tags automatically when you create a new web page.

In a web page, the first tag (specifically, <html>) indicates the markup language that is being used for the document. The <head> tag contains information about the web page. Lastly, the content appears in the <body> tag. (Fig 9)

Fig 9



The <!DOCTYPE> Declaration

There are many different documents on the web. A browser can only display a document correctly, if it knows what kind of document it is.

There are also many different versions of HTML, and a browser can only display an HTML page 100% correctly if it knows the exact HTML version used in the page. This is what <!DOCTYPE> is used for.

<!DOCTYPE> is not an HTML tag. It is an information (a declaration) to the browser about what version the HTML is written in.

The HTML <head> Element

The <head> element is a container for all the head elements. Elements inside <head> can include scripts, instruct the browser where to find style sheets, provide meta information, and more.

The following tags can be added to the head section: <title>, <base>, <link>, <meta>, <script>, and <style>.

The HTML <title> Element

The <title> tag defines the title of the document.

The title element is required in all HTML/XHTML documents.

The title element:

- Defines a title in the browser toolbar.

- Provides a title for the page when it is added to favorites.
- Displays a title for the page in search-engine results.

HTML Element Syntax

- An HTML element starts with a start tag / opening tag
- An HTML element ends with an end tag / closing tag
- The element content is everything between the start and the end tag
- Some HTML elements have empty content
- Empty elements are closed in the start tag
- Most HTML elements can have attributes

HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

Examples

```

<html>
  <body>
    <h1>This is heading 1</h1>
    <h2>This is heading 2</h2>
    <h3>This is heading 3</h3>
    <h4>This is heading 4</h4>
    <h5>This is heading 5</h5>
    <h6>This is heading 6</h6>
  </body>
</html>

```

Result

This is heading 1

This is heading 2

This is heading 3

This is heading 4

This is heading 5

This is heading 6

HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag.

```
<html>
<body>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
</body>
</html>
```

Examples

This is a paragraph.

This is a paragraph.

This is a paragraph.

HTML Links

HTML links are defined with the `<a>` tag.

```
<html>
<body>
<a href="http://www.facebook.com">
This is a link</a>
</body>
</html>
```

Result

This is a link

By clicking the link it shows the facebook login page

HTML Images

HTML images are defined with the `` tag.

```
<html>
<body>

</body>
</html>
```

Result (Fig 10)

Fig 10



HTML Attributes

- HTML elements can have attributes
- Attributes provide additional information about an element
- Attributes are always specified in the start tag
- Attributes come in name/value pairs like: `name="value"`

Attribute Example

HTML links are defined with the `<a>` tag. The link address is specified in the `href` attribute:

```
<html>
<body>
<a href="http://www.yahoo.com">
This is a link</a>
</body>
</html>
```

Result

This is the link

By clicking the link yahoo home page appears (Fig 11).

Formatting

Create Line Breaks - The `
` Element:

Whenever the `
` element, anything following it starts on the next line. This tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Fig 11



Example:

```
Hello<br/>
You come most carefully upon your hour.<br/>
Thanks<br/>
Mahnaz
```

Result

```
Hello
You come most carefully upon your hour.
Thanks
Mahnaz
```

To Become

Centring Content - The <center> Element:

You can use <center> tag to put any content in the center of the page or any table cell.

Example:

```
<p>This is not in the center.</p>
<center>
<p>This is in the center.</p>
</center>
```

This will produce following result:

```
This is not in the center.
This is in the center.
```

Soft Hyphens:

Occasionally, you will want to allow a browser to hyphenate long words to better justify a paragraph. For example, consider the following code and its resulting output.

```
<p style="text-align: justify;"> The morbid fear of
the number 13, or triskaidekaphobia, has plagued
some important historic figures like Mahamiya and
Nanao.</p>
```

This will produce following result:

```
Example for soft hyphen - The morbid fear of the
number 13, or triskaidekaphobia, has plagued some
important historic figures like Mahamiya and Nanao.
```

Preserve Formatting - The <pre> Element:

Sometimes you want your text to follow the exact format of how it is written in the HTML document. In those cases, you can use the preformatted tag (<pre>).

Any text between the opening <pre> tag and the closing </pre> tag will preserve the formatting of the source document.

```
<pre>
function testFunction( strText ){
alert (strText)
}
</pre>
```

This will produce following result:

```
function testFunction( strText ){
alert (strText)
}
```

Horizontal Rules - The `<hr />` Element

Horizontal rules are used to visually break up sections of a document. The `<hr>` tag creates a line from the current position in the document to the right margin and breaks the line accordingly.

For example you may want to give a line between two paragraphs as follows:

```
<p>This is paragraph one and should be on top</p>
<hr />
```

```
<p>This is paragraph two and should be at bottom</p>
```

This will produce following result:

This is paragraph one and should be on top

This is paragraph two and should be at bottom

Again `<hr />` tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Note: The `<hr />` element has a space between the characters hr and the forward slash. If you omit this space, older browsers will have trouble rendering the line break, while if you miss the forward slash character and just use `<hr>` it is not valid XHTML

Presentational Tags:

If you use a word processor, you are familiar with the ability to make text bold, italicized, or underlined; these are just three of the ten options available to indicate how text can appear in HTML and XHTML.

Bold Text - The `` Element:

Anything that appears in a `...` element is displayed in bold, like the word bold here:

```
<p>The following word uses a <b>bold</b>
typeface.</p>
```

This will produce following result:

The following word uses a bold typeface.

Italic Text - The `<i>` Element:

Anything that appears in a `<i>...</i>` element is displayed in italicized, like the word italicized here:

```
<p>The following word uses a <i>italicized</i>
typeface.</p>
```

This will produce following result:

The following word uses a italicized typeface.

Underlined Text - The `<u>` Element:

Anything that appears in a `<u>...</u>` element is displayed with underline, like the word underlined here:

```
<p>The following word uses a <u>underlined</u>
typeface.</p>
```

This will produce following result:

The following word uses a underlined typeface.

Strike Text - The `<strike>` Element:

Anything that appears in a `<strike>...</strike>` element is displayed with strikethrough, which is a thin line through the text:

```
<p>The following word uses a
<strike>strikethrough</strike> typeface.</p>
```

This will produce following result:

The following word uses a strikethrough typeface.

Monospaced font - The `<tt>` Element:

The content of a `<tt>` element is written in monospaced font. Most fonts are known as variable-width fonts because different letters are of different widths (for example, the letter m is wider than the letter i). In a monospaced font, however, each letter is the same width.

```
<p>The following word uses a
<tt>monospaced</tt> typeface.</p>
```

This will produce following result:

The following word uses a monospaced typeface.

Superscript Text - The `<sup>` Element:

The content of a `<sup>` element is written in superscript; the font size used is the same size as the characters surrounding it but is displayed half a character's height above the other characters.

```
<p>The following word uses a
<sup>superscript</sup> typeface.</p>
```

This will produce following result:

The following word uses a superscript typeface.

Subscript Text - The `<sub>` Element:

The content of a `<sub>` element is written in subscript; the font size used is the same as the characters surrounding it, but is displayed half a character's height beneath the other characters.

```
<p>The following word uses a
<sub>subscript</sub> typeface.</p>
```

This will produce following result:

The following word uses a subscript typeface.

Larger Text - The **<big>** Element:

The content of the **<big>** element is displayed one font size larger than the rest of the text surrounding it.

```
<p>The following word uses a <big>big</big>  
typeface.</p>
```

This will produce following result:

The following word uses a big typeface.

Smaller Text - The **<small>** Element:

The content of the **<small>** element is displayed one font size smaller than the rest of the text surrounding it.

```
<p>The following word uses a <small>small</  
small> typeface.</p>
```

This will produce following result:

The following word uses a small typeface.

Styling HTML with CSS

CSS was introduced together with HTML 4, to provide a better way to style HTML elements.

CSS can be added to HTML in the following ways:

- Inline - using the **style** attribute in HTML elements
- Internal - using the **<style>** element in the **<head>** section
- External - using an external CSS file

```
<html>  
<body style="background-color:PowderBlue;">  
<h1>Look! Styles and colors</h1>  
<p style="font-family:verdana;color:red;">  
This text is in Verdana and red</p>  
<p style="font-family:times;color:green;">  
This text is in Times and green</p>  
<p style="font-size:30px;">This text is 30 pixels high</p>  
</body>  
</html>
```

Result:

Look! Styles and colors

This text is in Verdana and red

This text is in Times and green

This text is 30 pixels high

HTML Hyperlinks (Links)

A hyperlink (or link) is a word, group of words, or image that you can click on to jump to a new document or a new section within the current document.

When you move the cursor over a link in a Web page, the arrow will turn into a little hand.

Links are specified in HTML using the **<a>** tag.

The **<a>** tag can be used in two ways:

- 1 To create a link to another document, by using the **href** attribute
- 2 To create a bookmark inside a document, by using the **name** attribute

The HTML code for a link is simple. It looks like this:

```
<a href="url">Link text</a>
```

The **href** attribute specifies the destination of a link.

```
<a href="http://www.yahoo.com/">Visit yahoo</a>
```

which will display like this: Visit yahoo.com

Clicking on this hyperlink will send the user to Yahoo homepage.

The "Link text" doesn't have to be text. It can be an image or any other HTML element.

HTML Links - The target Attribute

The target attribute specifies where to open the linked document.

The example below will open the linked document in a new browser window or a new tab:

Example

```
<a href="http://www.yahoo.com/" target="_blank">Visit  
yahoo !</a>  
<html>  
<body>  
<a href="http://www.yahoo.com" target="_blank">Visit  
yahoo.com!</a>  
<p>If you set the target attribute to "_blank", the link will  
open in a new browser window/tab.</p>  
</body>  
</html>
```

Result

Visit yahoo.com!

If you set the target attribute to "_blank", the link will open in a new browser window/tab.

HTML Images - The Tag and the Src Attribute

In HTML, images are defined with the tag.

The tag is empty, which means that it contains attributes only, and has no closing tag.

To display an image on a page, you need to use the src attribute. Src stands for "source". The value of the src attribute is the URL of the image you want to display.

Syntax for defining an image:

```

```

The URL points to the location where the image is stored. An image named "bamboo.gif", located in the "images" directory on "www.w3schools.com" has the URL: <http://www.backgrounlabs.com/index.php?search=bamboo>.

The browser displays the image where the tag occurs in the document. If you put an image tag between two paragraphs, the browser shows the first paragraph, then the image, and then the second paragraph.

HTML Images - The Alt Attribute

The required alt attribute specifies an alternate text for an image, if the image cannot be displayed.

The value of the alt attribute is an author-defined text:

```

```

The alt attribute provides alternative information for an image if a user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader).

HTML Images - Set Height and Width of an Image

The height and width attributes are used to specify the height and width of an image.

The attribute values are specified in pixels by default:

```

```

Note: It is a good practice to specify both the height and width attributes for an image. If these attributes are set, the space required for the image is reserved when the page is loaded. However, without these attributes, the browser does not know the size of the image. The effect will be that the page layout will change during loading (while the images load).

If an HTML file contains ten images - eleven files are required to display the page right. Loading images takes time, so my best advice is: Use images carefully.

When a web page is loaded, it is the browser, at that moment, that actually gets the image from a web server and inserts it into the page. (Fig 12) Therefore, make sure that the images actually stay in the same spot in relation to the web page, otherwise your visitors will get a broken link icon. The broken link icon is shown if the browser cannot find the image.

Fig 12



```

<html>
<body>
<h2>Friendship Card</h2>

</body>
</html>

```

HTML Tables

Tables are defined with the `<table>` tag.

A table is divided into rows (with the `<tr>` tag), and each row is divided into data cells (with the `<td>` tag). `td` stands for "table data," and holds the content of a data cell. A `<td>` tag can contain text, links, images, lists, forms, other tables, etc.

Table Example

```

<table border="1">
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in a browser:

row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Tables and the Border Attribute

If you do not specify a border attribute, the table will be displayed without borders. Sometimes this can be useful, but most of the time, we want the borders to show.

To display a table with borders, specify the border attribute:

```

<table border="1">
<tr>
<td>Row 1, cell 1</td>
<td>Row 1, cell 2</td>
</tr>
</table>

```

HTML Table Headers

Header information in a table are defined with the `<th>` tag.

All major browsers display the text in the `<th>` element as bold and centered.

```

<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in your browser:

Header 1	Header 2
row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Unordered Lists

An unordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with bullets (typically small black circles).

```

<ul>
<li>Coffee</li>
<li>Milk</li>
</ul>

```

How the HTML code above looks in a browser:

- Coffee
- Milk

HTML Ordered Lists

An ordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with numbers.

```

<ol>
<li>Coffee</li>
<li>Milk</li>
</ol>

```

How the HTML code above looks in a browser:

- 1 Coffee

- 2 Milk

HTML Definition Lists

A definition list is a list of items, with a description of each item.

The `<dl>` tag defines a definition list.

The `<dl>` tag is used in conjunction with `<dt>` (defines the item in the list) and `<dd>` (describes the item in the list):

```
<dl>
<dt>Coffee</dt>
<dd>- black hot drink</dd>
<dt>Milk</dt>
<dd>- white cold drink</dd>
</dl>
```

How the HTML code above looks in a browser:

Coffee - black hot drink
Milk- white cold drink

Note : Inside a list item you can put text, line breaks, images, links, other lists, etc.

HTML List Tags

Tag	Description
<code></code>	Defines an ordered list
<code></code>	Defines an unordered list
<code></code>	Defines a list item
<code><dl></code>	Defines a definition list
<code><dt></code>	Defines an item in a definition list
<code><dd></code>	Defines a description of an item in a definition list

HTML elements can be grouped together with `<div>` and ``

HTML Block Elements

Most HTML elements are defined as block level elements or as inline elements.

Block level elements normally start (and end) with a new line when displayed in a browser.

Examples: `<h1>`, `<p>`, ``, `<table>`

HTML Inline Elements

Inline elements are normally displayed without starting a new line.

Examples: ``, `<td>`, `<a>`, ``

The HTML `<div>` Element

The HTML `<div>` element is a block level element that can be used as a container for grouping other HTML elements.

The `<div>` element has no special meaning. Except that, because it is a block level element, the browser will display a line break before and after it.

When used together with CSS, the `<div>` element can be used to set style attributes to large blocks of content.

Another common use of the `<div>` element, is for document layout. It replaces the "old way" of defining layout using tables. Using tables is not the correct use of the `<table>` element. The purpose of the `<table>` element is to display tabular data.

The HTML `` Element

The HTML `` element is an inline element that can be used as a container for text.

The `` element has no special meaning.

When used together with CSS, the `` element can be used to set style attributes to parts of the text.

HTML Grouping Tags

Tag	Description
<code><div></code>	Defines a div
<code></code>	Defines a span

HTML Layout

Website Layouts

Most websites have put their content in multiple columns (formatted like a magazine or newspaper).

Multiple columns are created by using `<div>` or `<table>` elements. CSS are used to position elements, or to create backgrounds or colorful look for the pages.

HTML Layouts - Using `<div>` Elements

The `div` element is a block level element used for grouping HTML elements.

The following example uses five `div` elements to create a multiple column layout, creating the same result as in the previous example:

Example

```
<div>
<!DOCTYPE html>
<html>
<body>
<div id="container" style="width:500px">
<div id="header" style="background-color:#FFA500;">
<h1 style="margin-bottom:0;">Main Title of Web Page</h1></div>
<div id="menu" style="float:left; width:100px; height:200px; background-color:#FFD700; margin-right:10px;">
<b>Menu</b><br />
</div>
<div id="content" style="float:left; width:300px; height:200px; background-color:#FFFFE0;">
<h2>Content Area</h2>
</div>
</div>
<script>
document.getElementById("header").style.backgroundColor = "#FFA500";
document.getElementById("menu").style.backgroundColor = "#FFD700";
document.getElementById("content").style.backgroundColor = "#FFFFE0";
</script>

```

```

<div id="content" style="background-color:#EEEEEE;height:200px;width:400px;float:left;">
Content goes here</div>
<div id="footer" style="background-color:#FFA500;clear:both;text-align:center;">

```

```

</div>
</div>
</body>
</html>

```

Result (Fig 13)

Fig 13



HTML Forms

HTML forms are used to pass data to a server.

A form can contain input elements like text fields, checkboxes, radio-buttons, submit buttons and more. A form can also contain select lists, textarea, fieldset, legend, and label elements.

The <form> tag is used to create an HTML form:

<form>

input elements.

</form>

HTML Forms - The Input Element

The most important form element is the input element.

The input element is used to select user information.

An input element can vary in many ways, depending on the type attribute. An input element can be of type text field, checkbox, password, radio button, submit button, and more.

The most used input types are described below.

Text Fields

<input type="text" /> defines a one-line input field that a user can enter text into:

<form>

First name: <input type="text" name="firstname" />

Last name: <input type="text" name="lastname" />
</form>

How the HTML code above looks in a browser:

First name:

Last name:

Note: The form itself is not visible. Also note that the default width of a text field is 20 characters.

Password Field

<input type="password" /> defines a password field:

<form>

Password: <input type="password" name="pwd" />

</form>

How the HTML code above looks in a browser:

Password:

Note: The characters in a password field are masked (shown as asterisks or circles)

Radio Buttons

<input type="radio" /> defines a radio button. Radio buttons let a user select ONLY ONE of a limited number of choices:

```
<form>
<input type="radio" name="sex" value="male" /> Male<br/>
<input type="radio" name="sex" value="female" /> Female
</form>
```

How the HTML code above looks in a browser:

- Male
- Female

Checkboxes

<input type="checkbox" /> defines a checkbox. Checkboxes let a user select ONE or MORE options of a limited number of choices.

```
<form>
<input type="checkbox" name="vehicle" value="Bike" />
I have a bike<br />
<input type="checkbox" name="vehicle" value="Car" />
I have a car
</form>
```

How the HTML code above looks in a browser:

- I have a bike
- I have a car

Submit Button

<input type="submit" /> defines a submit button.

A submit button is used to send form data to a server. The data is sent to the page specified in the form's action attribute. The file defined in the action attribute usually does something with the received input:

```
<form name="input" action="html_form_action.asp"
method="get">
```

Username: <input type="text" name="user" />

```
<input type="submit" value="Submit" />
</form>
```

How the HTML code above looks in a browser:

Username: Submit

If you type some characters in the text field above, and click the "Submit" button, the browser will send your input to a page called "html_form_action.asp". The page will show you the received input.

HTML Iframes

Syntax for adding an iframe:

```
<iframe src="URL"></iframe>
```

The URL points to the location of the separate page.

Iframe - Set Height and Width

The height and width attributes are used to specify the height and width of the iframe.

The attribute values are specified in pixels by default, but they can also be in percent (like "80%").

Example

```
<!DOCTYPE html>
<html>
<body>
<iframe src="demo_iframe.htm" width="200"
height="200"></iframe>
</body>
</html>
```

It will appear as shown in Fig 14.

Iframe - Remove the Border

The frameborder attribute specifies whether or not to display a border around the iframe.

Set the attribute value to "0" to remove the border:

Example

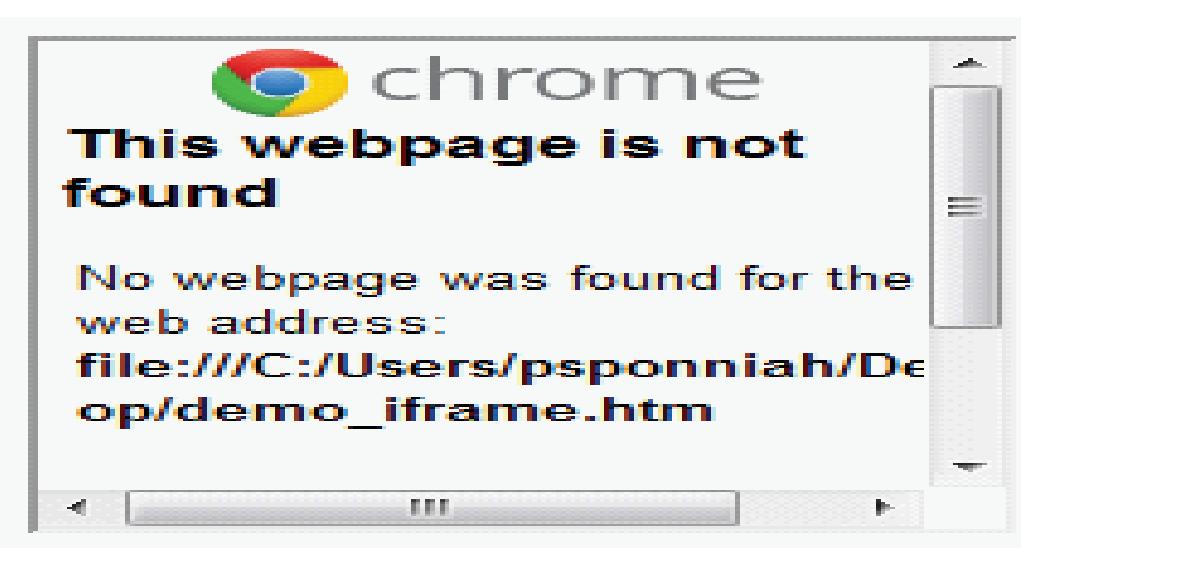
```
<iframe src="demo_iframe.htm" frameborder="0"></
iframe>
```

Use iframe as a Target for a Link

An iframe can be used as the target frame for a link.

The target attribute of a link must refer to the name attribute of the iframe:

Fig 14



Example

```
<iframe src="demo_iframe.htm" name="iframe_a"></iframe>  
<p><a href = "http://www.yahoo.com" target="iframe_a">yahoo.com</a></p>
```

HTML iframe Tag

Tag	Description
<iframe>	Defines an inline sub window (frame)

HTML Colour

Color Values

HTML colors are defined using a hexadecimal notation (HEX) for the combination of Red, Green, and Blue color values (RGB).

The lowest value that can be given to one of the light sources is 0 (in HEX: 00). The highest value is 255 (in HEX: FF).

HEX values are specified as 3 pairs of two-digit numbers, starting with a # sign.

Color Values (Fig 15)

Fig 15

Color	Color HEX	Color RGB
Black	#000000	rgb(0,0,0)
Red	#FF0000	rgb(255,0,0)
Green	#00FF00	rgb(0,255,0)
Blue	#0000FF	rgb(0,0,255)
Yellow	#FFFF00	rgb(255,255,0)
Cyan	#00FFFF	rgb(0,255,255)
Magenta	#FF00FF	rgb(255,0,255)
Grey	#C0C0C0	rgb(192,192,192)
White	#FFFFFF	rgb(255,255,255)

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<p style="background-color:#FFFF00">
```

Color set by using hex value

```
</p>
```

```
<p style="background-color:rgb(255,255,0)">
```

Color set by using rgb value

```
</p>
```

```

<p style="background-color:yellow">
Color set by using color name
</p>
</body>
</html>

```

Result

Color set by using hex value
 Color set by using rgb value
 Color set by using color name

DHTML

The HTML script Element

The <script> tag is used to define a client-side script, such as a JavaScript.

The script element either contains scripting statements or it points to an external script file through the src attribute.

The required type attribute specifies the MIME type of the script.

Common uses for JavaScript are image manipulation, form validation, and dynamic changes of content.

The script below writes Hello World! to the HTML output:

Example

```

<script type="text/javascript">
document.write("Hello World!")
</script>

```

The HTML noscript Element

The <noscript> tag is used to provide an alternate content for users that have disabled scripts in their browser or have a browser that doesn't support client-side scripting.

The noscript element can contain all the elements that you can find inside the body element of a normal HTML page.

The content inside the noscript element will only be displayed if scripts are not supported, or are disabled in the user's browser:

Example

```

<!DOCTYPE html>
<html>
<body>
<script type="text/javascript">
document.write("Hello World!")
</script>

```

<noscript>Sorry, your browser does not support JavaScript!</noscript>

<p>A browser without support for JavaScript will show the text in the noscript element.</p>

</body>

</html>

Result

Hello World!

A browser without support for JavaScript will show the text in the noscript element.

HTML Script Tags

Tag	Description
<script>	Defines a client-side script
<noscript>	Defines an alternate content for users that do not support client-side scripts

HTML Entities

Some characters are reserved in HTML.

It is not possible to use the less than (<) or greater than (>) signs in your text, because the browser will mix them with tags.

To actually display reserved characters, we must use character entities in the HTML source code.

A character entity looks like this:

&entity_name;

OR

&#entity_number;

Non-breaking Space

A common character entity used in HTML is the non-breaking space ().

Browsers will always truncate spaces in HTML pages. If you write 10 spaces in your text, the browser will remove 9 of them, before displaying the page. To add spaces to your text, you can use the character entity.

HTML Useful Character Entities

Note: Entity names are case sensitive!

HTML Uniform Resource Locators

A **URL** is another word for a web address.

Result	Description	Entity Name	Entity Number
	non-breaking space	 	
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
•	euro	€	€
§	section	§	§
©	copyright	©	©
®	registered trademark	®	®
™	trademark	™	™

A URL can be composed of words, such as "w3schools.com", or an Internet Protocol (IP) address: 192.68.20.50. Most people enter the name of the website when surfing, because names are easier to remember than numbers.

Scheme	Short for...	Which pages will the scheme be used for...
http	HyperText Transfer Protocol	Common web pages starts with http://. Not encrypted
https	Secure HyperText Transfer Protocol	Secure web pages. All information exchanged are encrypted
ftp	File Transfer Protocol	For downloading or uploading files to a website. Useful for domain maintenance
file		A file on your computer

URL Encoding

URLs can only be sent over the Internet using the ASCII character-set.

Since URLs often contain characters outside the ASCII set, the URL has to be converted into a valid ASCII format.

URL encoding replaces non ASCII characters with a "%" followed by two hexadecimal digits.

URLs cannot contain spaces. URL encoding normally replaces a space with a + sign.

URL - Uniform Resource Locator

When you click on a link in an HTML page, an underlying <a> tag points to an address on the world wide web.

A Uniform Resource Locator (URL) is used to address a document (or other data) on the world wide web.

Explanation:

- **Scheme** - defines the **type** of Internet service. The most common type is http
- **Host** - defines the **domain host** (the default host for http is www)
- **Domain** - defines the Internet **domain name**, like w3schools.com
- **Port** - defines the **port number** at the host (the default port number for http is 80)
- **Path** - defines a **path** at the server (If omitted, the document must be stored at the root directory of the web site)
- **Filename** - defines the name of a document/resource

Common URL Schemes

The table below lists some common schemes:

XML Structure

The XML structure including the document parts, the prologue, and provides a simple XML example document.

Document Parts

- Prolog
- Document Element (root element)

The Prologue

The prologue, equivalent to the header in HTML, may include the following:

- An XML declaration (optional) such as:

```
<?xml version="1.0"?>
```
- A DTD or reference to one (optional). An example reference to an external DTD file:

```
<!DOCTYPE LANGLIST SYSTEM "langlist.dtd">
```
- Processing instructions - An example processing instruction that causes style to be determined by a style sheet:

```
<?xml-stylesheet type="text/css" href="xmlstyle.css"?>
```

An XML Example

Therefore a complete well formed XML document may look like:

```
<?xml version="1.0"?>

<LAND>
  <FOREST>
    <TREE>Oak</TREE>
    <TREE>Pine</TREE>
    <TREE>Maple</TREE>
  </FOREST>
  <MEADOW>
    <GRASS>Bluegrass</GRASS>
    <GRASS>Fescue</GRASS>
    <GRASS>Rye</GRASS>
  </MEADOW>
</LAND>
```

The LAND element, above, is the root element.

Result

Oak Pine Maple Bluegrass Fescue Rye

Web Elements

A web page, as an information set, can contain numerous types of information, which is able to be seen, heard or interact by the End-user

Web Hosting

A web hosting service is a type of Internet hosting service that allows individuals and organizations to make their Website accessible via the World Wide Web. Web hosts are companies that provide space on a Server (computing) owned or leased for use by clients, as well as providing Internet connectivity, typically in a data centre. Web hosts can also provide data centre space and connectivity to the Internet for other servers located in their data centre, called Collocation.

TYPES OF Web Hosting

There are four types of Web hosting

- 1 Free hosting
- 2 Dedicated hosting
- 3 Shared (Virtual) hosting
- 4 Collocated Hosting

Free hosting

Free web hosting is best suited for small sites with low traffic, like personal sites. It is not recommended for high traffic or for real business. Technical support is often limited, and technical options are few.

Dedicated Hosting

With dedicated hosting, your web site is hosted on a dedicated server. Dedicated hosting is the most expensive option. This option is best suited for large web sites with high traffic, and web sites that use special software. Dedicated hosting to be very powerful and secure, with almost unlimited software solutions.

Shared (Virtual) Hosting

Shared hosting is very cost effective.

With shared hosting, your web site gets its own domain name, and is hosted on a powerful server along with maybe 100 other web sites. Shared solutions often offer multiple software solutions like e-mail, database, and different editing options. Technical support tends to be good.

Collocated Hosting

Collocation means "co-location". Collocated hosting lets place own web server on the premises (locations) of a service provider. This is pretty much the same as running own server in your own office, only that it is located at a place better designed for it. Most likely an ISP will have dedicated resources like high-security against fire and vandalism, regulated backup power, dedicated Internet connections and more.

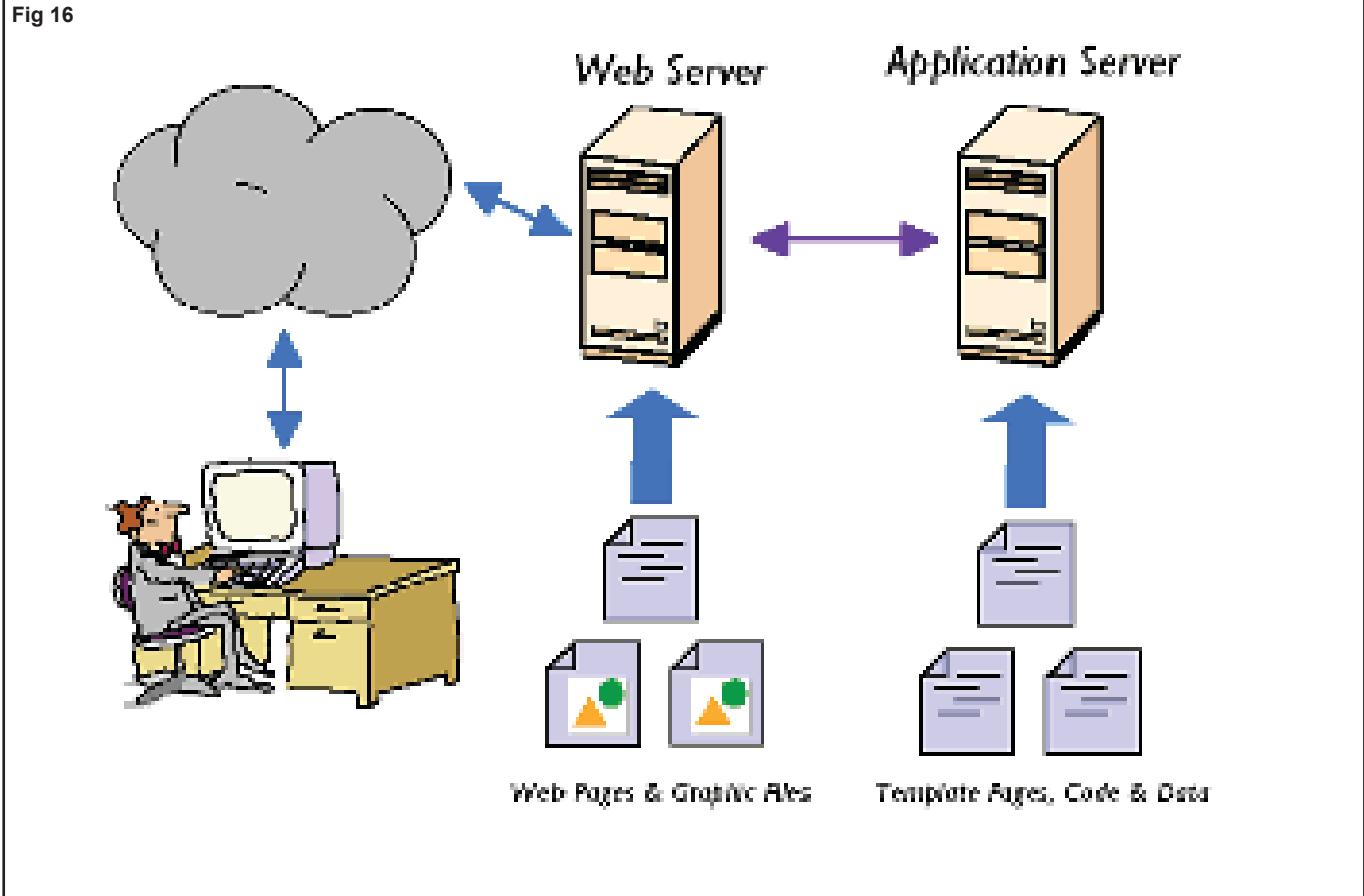
Web Server

A Web server is a program that, using the client server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web servers are Apache, the most widely-installed Web server, and Microsoft's Internet Information Server (IIS). Other Web servers include Novell's Web Server for users of its Netware operating system and IBM's family of Lotus Domino servers, primarily for IBM's OS390 and AS-400 customers.

Web servers often come as part of a larger package of Internet- and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, security characteristics, and publishing, search engine, and site building tools that may come with it.

Application Server

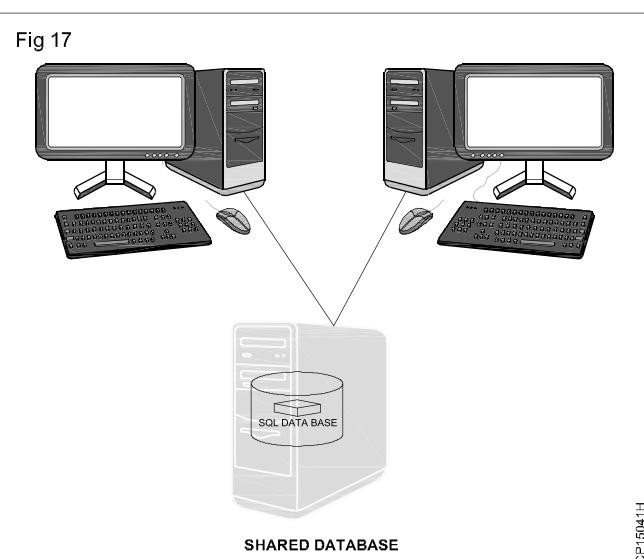
Also called an appserver, and application server (Fig 16) is a program that handles all application operations between users and an organization's backend business applications or database. An application server is typically used for complex transaction-based applications. To support high-end needs, an application server has to have built-in redundant, monitor for high-availability, high-performance distributed application services and support for complex database access.



Database Server

Database server (Fig 17) is the term used to refer to the back-end system of a database application using client-

server architecture. The back-end, sometimes called a database server, performs tasks such as data analysis, storage, data manipulation, archiving, and other non-user specific tasks.



Introduction to CMS and web authoring tools

Objectives: At the end of this lesson you shall be able to

- explain the meaning of content management System.
 - list some of the popular CMSes.
 - explain the use and main features of kompozer web authoring tool.
-

Definition of CMS:

CMS Stands for "Content Management System." A CMS is a software tool that allows you to create, edit, and publish content.

Description of CMS:

The goal of a CMS is to provide an intuitive user interface for building and modifying webpage content. Each CMS also provides a web publishing tool that allows one or more users to publish updates live on the Web. The editing component is called the content management application (CMA), while the publishing tool is called the content delivery application (CDA). These two components are integrated together in a CMS to streamline the web development process.

In terms of web publishing, content can be simple text, photos, music, video, documents, or just about anything you can think of. While early CMS software was used to manage documents and local computer files, most CMS systems are now designed exclusively to manage content on the Web. A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage.

Content management systems are available as installable applications and web-based user interfaces. The use of a web interface simplifies the website updating process. Additionally, most web-based CMSes are updated automatically, ensuring all users have the latest tools to manage their content.

A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage. Since the CMS manages all your content, you don't have to.

There are several web-based CMS tools available today. The following are some of the most popular ones:

- WordPress - free web software designed for creating template-based websites or blogs
- Blogger - Google's blogging tool designed specifically for maintaining a blog
- Joomla - a flexible web publishing tool that supports custom databases and extensions
- Drupal - an open source platform often used for developing community-based sites

- Weebly - a web-based platform for building simple personal and business websites
- Wix - a collection of web publishing tools for creating a highly customizable website

Introduction to WYSIWYG web authoring tools

WYSIWYG stands for "What You See Is What You Get". In such editors you edit not directly the source code of your documents, but its presentation as it will appear in the final document. So instead of writing blocks of code manually (as you e.g. would do it in Word or Notepad), you manipulate with design components using an editor window. This means that you view something very similar to the final result while the document or image is being created.

There are many easy-to-use WYSIWYG programs having all the tools needed to create a complex and fully functional websites, even by beginners. These sites even have options to work with HTML code be it design or editing. It is easier to create a Web site with an HTML editor, as software developers continue to add tools that let you develop advanced features with style. Many WYSIWYG web authoring tools offer advanced features to integrate Dynamic HTML or many other features into a site with an elegant and consistent design.

Introduction to Kompozer

KompoZer is a complete Web Authoring System that combines web file management and easy-to-use WYSIWYG web page editing capabilities found in Microsoft FrontPage, Adobe DreamWeaver and other high end programs. With kompozer you can create web pages and manage a website with no technical expertise or knowledge of HTML.

A useful feature of Kompozer is that you can use it to publish your web pages to a web hosting server. You just need to know your FTP account username and password as well as the site URL and Kompozer will log in and place your web pages on the server.

KompoZer's File Menu contains menu items for all major operations possible while using it. KompoZer's tool bar user interface consists of:

- Composition Toolbar
- Format Toolbar
- Tab Browser Toolbar
- Edit Mode Toolbar
- Status Toolbar

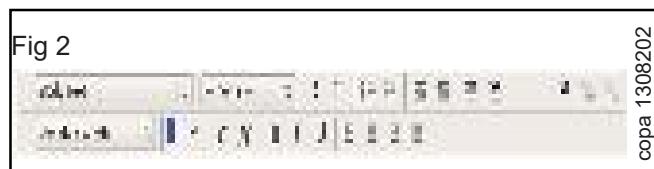
Composition Toolbar

The Composition Toolbar consists of buttons for the most used major operations. Below is the a snapshot of the default Composition Toolbar with text below each button indicating the respective button's function. (Refer Fig.1)



Format Toolbar(Refer Fig.2)

The Format Toolbar is a very useful tool while editing web pages with KompoZer. With the Format Toolbar you can apply paragraph format, choose a font, change foreground or background colour, increase or decrease size, and emphasize a block of text. You can also create ordered or unordered lists and justify a block of text to left, right or centre. To know which button does what just hover your mouse over the button and a tool tip will appear indicating the function of the button.



Tab Browser Toolbar(Refer Fig.3)

KompoZer allows you to simultaneously edit multiple web documents using different tabs for each opened document. Having multiple tabs gives a cleaner look to your desktop as it is not cluttered when multiple windows are used for each document. As a visual indicator a "red floppy icon" icon appears for pages which have been edited but not saved yet.



Edit Mode Toolbar(Refer Fig.4)

The Edit Mode Toolbar indicates the viewing mode which is presently active for the current document. Available viewing modes are the Normal view, HTML Tags view, HTML source view and the Preview mode. You can easily change your viewing mode by simply clicking any of the other three with the mouse.



Status Toolbar(Refer Fig.5)

KompoZer's status bar shows the position of the cursor with respect to the HTML tag hierarchy. You can easily edit/assign the properties of any particular tag in the status bar just by right clicking and choosing the desired option. Simple left-click of the mouse on a tag in status bar selects the text surrounded by that tag.



COMPUTER OPERATOR AND PROGRAMMING ASSISTANT

NSQF LEVEL - 4

1ST Semester

TRADE THEORY

SECTOR: IT & ITES



Directorate General of Training

**DIRECTORATE GENERAL OF TRAINING
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
GOVERNMENT OF INDIA**



**NATIONAL INSTRUCTIONAL
MEDIA INSTITUTE, CHENNAI**

Post Box No. 3142, CTI Campus, Guindy, Chennai - 600 032

Sector : IT & ITES

Duration : 1 - Year

**Trade : Computer Operator and Programming Assistant 1st Semester - Trade Theory
NSQF level 4**

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FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Computer Operator and Programming Assistant Trade Theory 1st Semester in IT & ITES Sector**. The NSQF Level - 4 Trade Theory will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 4 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 4 the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

RAJESH AGGARWAL

Director General/ Addl. Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

New Delhi - 110 001

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PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

R. P. DHINGRA
EXECUTIVE DIRECTOR

Chennai - 600 032

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National Instructional Media Institute (NIMI) sincerely acknowledges with thanks for the co-operation and contribution extended by the following Media Developers and their sponsoring organisations to bring out this **Instructional Material (Trade Theory)** for the trade of **Computer Operator and Programming Assistant** under the IT & ITES Sector

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NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

TRADE THEORY

The manual of trade theory consists of theoretical information for the First Semester course of the COPA Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade Theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise atleast one class before performing the related skills in the system lab. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.

TRADE PRACTICAL

The trade practical manual is intended to be used in workshop . It consists of a series of practical exercises to be completed by the trainees during the First Semester course of the COPA trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered.

The manual is divided into twelve modules to maintain completeness of learning process in a stipulated time basis.

The skill training in the computer lab is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

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LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

- **Install and setup operating system and related software in a computer.**
- **Create, format and edit document using word processing application software.**
- **Create, edit and develop a workbook by using spreadsheet application software.**
- **Create and customize slides for presentation.**
- **Create and manage database file by using MS Access**
- **Install, setup/ configure, troubleshoot and secure computer network including Internet.**
- **Develop static webpages using HTML.**

SYLLABUS

First Semester

Duration: Six Month

Week No.	Ref. Learning Outcome	Professional Skills (Trade Practical) with Indicative hours	Professional Knowledge (Trade Theory)
1.	<ul style="list-style-type: none"> • Apply safe working practices • Install and setup operating system and related software in a computer. 	<p>Safe working practices</p> <ol style="list-style-type: none"> 1. Visit COPA Lab. of the institutes and locate the electrical connections with computer system setup (6 hrs) 2. Identifying safety symbols and hazard identification.(4 Hrs) 3. Practice safe methods of fire fighting in case of electrical fire. (4 hrs) 4. Use of fire extinguishers. (4 Hrs) <p>Computer components</p> <ol style="list-style-type: none"> 5. Identify computer peripherals and internal components of a disassembled desktop computer. (6 Hrs) 6. Assemble components of desktop computer. (6 Hrs) 	<p>Safe working practices</p> <ul style="list-style-type: none"> • Scope of the COPA trade. • Safety rules and safety signs. • Types and working of fire extinguishers. <p>Introduction to Computer components</p> <ul style="list-style-type: none"> • Introduction to computer system. Concepts of hardware and Software. • Function of motherboard components and various processors. • Various Input / Output devices in use and their features.
2.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Using Windows Operating System</p> <ol style="list-style-type: none"> 7. Practice on Windows interface and navigating windows. (9 Hrs) 8. Practice on managing files and folders using removable drives. (6 Hrs) 9. Customize the desktop settings and manage user accounts. (6 Hrs) 10. View system properties and control panel details. (6 Hrs) 11. Work with keyboard shortcut commands. (6 Hrs) 12. Print and scan document using different commands.(3 Hrs) 	<p>Introduction Windows Operating System</p> <ul style="list-style-type: none"> • Introduction to operating System • Main features of Windows OS • Concept of various shortcut commands.
3.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Computer basics and Software Installation</p> <ol style="list-style-type: none"> 13. View the BIOS settings and their modifications. (3 Hrs) 14. Install Windows OS (5 Hrs) 15. Format Hard Disk and create partition (3 Hrs) 16. Identify and rectify common hardware and software issues during OS installation. (4 Hrs) 17. Install necessary application software for Windows i.e. Office Package, PDF Reader, Media Player etc. (5 Hrs) 18. Configure Bluetooth and wi-fi settings. (3 Hrs) 19. Install Drivers for printer, scanner, webcam and DVD etc. (4 Hrs) 20. Burn data, video and audio files on CD/DVD using application software. (3 Hrs) 	<p>Computer basics and Software Installation</p> <ul style="list-style-type: none"> • Introduction to the booting process. • Introduction to various types of memories and their features. • Basic Hardware and software issues and their solutions. • Usage of Application software and Antivirus.

4 - 5	<ul style="list-style-type: none"> Install and setup OS and related software in a computer. 	<p>DOS Command Line Interface & Linux Operating Systems</p> <p>21. Use basic DOS commands for directory listing (10 hrs) 22. Manage files and folders using DOS commands (6 hrs) 23. Install Linux operating system.(6 Hrs) 24. Install necessary application software for Linux i.e. Office Package, PDF Reader, MediaPlayer etc. (6 Hrs) 25. Use Basic Linux commands for directory listing, file and folder management, password etc. (10Hrs) 26. Use the Linux GUI for file and folder management, exploring the system etc. (10 Hrs) 27. Customize desktop settings and manage user accounts in Linux. (6 Hrs) 28. View system properties and manage system setting in Linux (6 Hrs)</p>	<p>Introduction to DOS Command Line Interface & Linux Operating Systems</p> <ul style="list-style-type: none"> Introduction to basic DOS Internal and External Commands. Introduction to Open Source Software. Introduction to Linux Operating System features, structure, files and processes. Basic Linux commands.
6 - 8	Create, format and edit document using word processing application software.	<p>Using Word Processing Software</p> <p>29. Open MS Word and familiarise with basic word components. (3 Hrs) 30. Practice creating, saving and renaming of word documents.(3 Hrs) 31. Edit document using basic formatting tools. (8 Hrs) 32. Practice Inserting and formatting tables and other objects. (12 Hrs) 33. Work with Page layout settings and printing documents. (6 Hrs) 34. Use templates, autocorrect tools, and record and execute a macro. (6 Hrs) 35. Use Mail merge tool. Use conditional Mail Merge, External Data Source. Practice Letters, Label & Envelop printing using Mail Merge (10 Hrs). 36. Use Table of Context, Indexing, Hyperlink, Bookmark, Comment, equation,symbols,citation, crossreference, footnote, translate, synonyms, thesaurus, spell check & grammer, compare etc. (6 Hrs) 37. Practice Typing using open source tutor. (24 Hrs) 38. Practice of using shortcut keys and use Open Office as word processor. (12 Hrs)</p>	<p>Word Processing Software</p> <ul style="list-style-type: none"> Introduction to the various applications in MS office. Introduction to Word features, Office button, toolbars. Creating, saving and formatting and printing documents using Word. Working with objects, macro, mail merge, templates and other tools in Word.
9 - 11	<ul style="list-style-type: none"> Create, format, edit and develop a workbook by using spreadsheet application software. 	<p>Using Spread Sheet Application</p> <p>39. Open MS Excel and familiarise with basic application components. (4 Hrs) 40. Practice create, save and format excel sheets. (9 Hrs) 41. Use absolute and relative referencing, linking sheets, conditional formatting etc. (9 Hrs) 42. Practice Excel functions of all major categories i.e. Financial, Logical, Text, date & time, Lookup, Math, Statistical etc. (12 Hrs) 43. Use various data types in Excel, sorting, filtering and validating data. (8 Hrs) 44. Create and format various static and dynamic charts. (10 Hrs) 45. Practice Importing & exporting excel data. (4 Hrs) 46. Perform data analysis using "what if" tools and Pivot Table and record and execute a macro. (10 Hrs) 47. Modify Excel page setup and printing and use open office as Spreadsheet application. (4 Hrs) 48. Execute simple projects using Excel & Word. (20 Hrs)</p>	<p>Spread Sheet Application</p> <ul style="list-style-type: none"> Introduction to Excel features and Data Types. Cell referencing and linking Sheets. Introduction to various functions in all categories of Excel. Concepts of sorting, filtering and validating data. Analyzing data using charts, data tables, pivot tables, goal seek and scenarios.

12 - 13	Create and customize slides for presentation.	<p>Image editing and creating Presentations</p> <p>49. Use Windows Paint or image editing software like Open Office Draw, GIMP, IrfanView or a similar tool. (6 Hrs)</p> <p>50. Perform Image editing using open source applications. (12 Hrs)</p> <p>51. Open power point presentation and familiarise with basic application components. (6 Hrs)</p> <p>52. Create Slide shows, Insert picture and theme. (6 Hrs)</p> <p>53. Add new slide, format text, link with word and excel documents. (5 Hrs)</p> <p>54. Practice animating slide transitions and objects. (4 Hrs)</p> <p>55. Create slide shows by inserting audio & video and sync with presentation. (6 Hrs)</p> <p>56. Modify slide page setup and print the slides. (3 Hrs)</p> <p>57. Create a simple presentation project using open office. (12 Hrs)</p>	<p>Image editing, Presentations</p> <ul style="list-style-type: none"> • Introduction to Open Office. • Introduction to the properties and editing of images. • Introduction to different formats of images and their uses. • Introduction to Power Point and its advantages. • Creating Slide Shows. • Fine tuning the presentation and good presentation technique.
14 - 15	Create and manage database file by using MS Access.	<p>Database Management with MS Access</p> <p>58. Create database and design a simple tables in Access. (6 Hrs)</p> <p>59. Practice enforcing integrity constraints and modify properties of tables and fields. (6 Hrs)</p> <p>60. Create relationships and join tables. (6 Hrs)</p> <p>61. Create and format Forms. (6 Hrs)</p> <p>62. Create simple queries with various criteria and calculations. (12 Hrs)</p> <p>63. Create Simple update, append, make table, delete and crosstab queries. (9 Hrs)</p> <p>64. Modify form design with controls, macros and events. (6 Hrs)</p> <p>65. Import and export data to/from Access and create and format types of reports. (6 Hrs)</p> <p>66. Compress and Encrypt databases. (3 Hrs)</p>	<p>Database Management Systems</p> <ul style="list-style-type: none"> • Concepts of Data and Databases. • Overview of popular databases, RDBMS, OODB and NOSQL. • Rules for designing good tables. Integrity rules and constraints in a table. • Relationships in tables. • Introduction to various types of Queries and their uses. • Designing Access Reports and Forms. • Introduction to macros, designer objects controls, their properties and behaviour.
16 - 17	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Configuring and using Network</p> <p>67. View Network connections. (3 Hrs)</p> <p>68. Connect a computer to a n/w and share Devices i.e. Printers, files, folders and drives. (6 Hrs)</p> <p>69. Work with various Network devices, connectors/cables. Create straight/cross cable and punch a UTP cable in the patch socket and test the connectivity. (6 Hrs)</p> <p>70. Practice IP Addressing and Subnet masking for IPV4/ IPV6 and pinging to test networks. (6 Hrs)</p> <p>71. Configure Hub and Switch. (6 Hrs)</p> <p>72. Set up and configure wired and wireless LAN in a Computer Lab within at least three computers. Use patch panel & I/O Box for wired LAN and installing & configuring Internet connection in a single PC and in a LAN. (12 Hrs)</p>	<p>Networking Concepts</p> <ul style="list-style-type: none"> • Introduction to Computer Networks, Necessity and Advantages. • Client Server and peer to Peer networking concepts. • Concept of Proxy Server and proxy firewall server. • Concept of DHCP Server. • Introduction to LAN, WAN and MAN. • Network topologies. Network components, viz. Modem, Hub, Switch, Router, Bridge, Gateway etc. • Network Cables, Wireless networks and Blue Tooth technology. • Concept of ISO - OSI 7 Layer Model. • Overview of Network protocols Viz.TCP/IP, FTP, Telnet etc.

		<p>73. Setup a proxy server/DHCP Server with firewall.(9 Hrs)</p> <p>74. Setup video conferencing using open source s/w(6 Hrs)</p> <p>75. Use various tools (by open source /free) for network troubleshooting, maintenance and security for both Wired and Wireless(6 Hrs)</p>	<ul style="list-style-type: none"> • Concept of Logical and Physical Addresses, Subnetting and Classes of Networks.
18	Install, setup/ configure, troubleshoot and secure computer network including Internet.	<p>Using Internet</p> <p>76. Browse the Internet for information (use at least 3 popular browsers). (3 Hrs)</p> <p>77. Create and use e-mail for communication with attachment, priority setting, address book. (3 Hrs)</p> <p>78. Communicate with text, video chatting and social networking sites. (6 Hrs)</p> <p>79. Use online dictionary, translation software, storage space, share files with e-mail links, download manager, download & upload YouTube files, google map & earth etc. Update windows & other software. (6 Hrs)</p> <p>80. Configure Outlook, mail service in mobile phones. Use tools like Skype, Google+ etc. (6 Hrs)</p> <p>81. Browser setting for Bookmark, cookies, favourites and pop ups, default website, trusted site, restricted site, content, history and advanced setup. (6 Hrs)</p>	<p>Internet Concepts</p> <ul style="list-style-type: none"> • Introduction to www, Concept of Internet, Web Browsers, internet servers and search engines. • Concepts of Domain naming Systems and E mail communication. • Introduction to video chatting tools and Social Networking concepts.
19-21	Develop static web pages using HTML.	<p>Designing Static Web Pages</p> <p>82. Practice with basic HTML elements (e.g. head, title, body), tag and attributes. (3 Hrs)</p> <p>83. Design simple web page with text, paragraph and line break usingHTML tags. (5 Hrs)</p> <p>84. Format text, change background colour and insert pictures in web page. (6 Hrs)</p> <p>85. Design simple web page with tables and lists. (6 Hrs)</p> <p>86. Use marquees, hyperlinks and mailto link in designing web pages.(6 Hrs)</p> <p>87. Create frames, add style and design layout. (10 Hrs)</p> <p>88. Insert text, check and combo box in web page. (6 Hrs)</p> <p>89. Design web page using password field, submit button, reset button and radio button etc. (6 Hrs)</p> <p>90. Design a web page adding flash file, audio and video files. (10 Hrs)</p> <p>91. Design web page with forms and form controls using HTML tags.(8 Hrs)</p> <p>92. Create web page using Cascading Style Sheet (CSS). (12 Hrs)</p> <p>93. Use WYSIWYG (Kompozer) web design tools to design and edit web pages with various styles. (12Hrs)</p>	<p>Web Design Concepts</p> <ul style="list-style-type: none"> • Concepts of Static and Dynamic Web pages. • Introduction to HTML and various tags in HTML. • Concepts of different controls used in Web Pages. • Concepts of CSS and applying CSS to HTML. • Introduction to open source CMS viz, Joomla, Word press etc. and Web authoring tools viz. Kompozer, Front Page etc. • Concept of good web page designing techniques.
22-23	Industrial Visit/Project work	<p>1. Create a simple web site of at least 5 web pages which will include Images, tables, charts, lists and hyperlink on any topic like Student Information System, Book Store, and Organisations etc.</p> <p style="text-align: center;">OR</p> <p>2. Setup and configure a LAN using at least 3 computers connected with wire and 3 computers connected with wireless and secure it.)</p>	
24-25		Revision	
26		Examination	

Electrical safety

Objective : At the end of this lesson you shall be able to

- explain how to rescue a person who is in contact with a live wire.

The severity of an electric shock will depend on the level of current which passes through the body and the length of time of contact. Do not delay, act at once. Make sure that the electric current has been disconnected.

If the casualty is still in contact with the supply - break the contact either by switching off the power, removing the plug or wrenching the cable free. If not, stand on some insulating material such as dry wood, rubber or plastic, or using whatever is at hand to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)

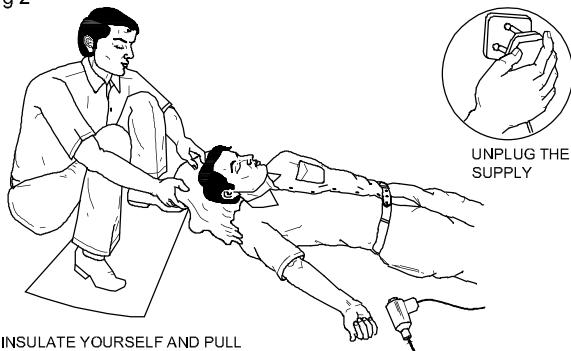
If you remain un-insulated, do not touch the victim with your bare hands until the circuit is made dead or person is moved away from the equipment.

Fig 1



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Fig 2



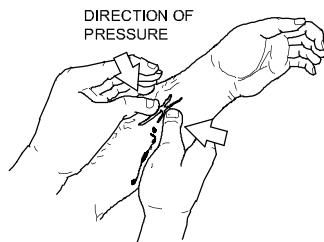
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If the victim is aloft, measures must be taken to prevent him from falling or atleast make him fall safe.

Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

If the casualty is unconscious but is breathing, loosen the clothing about the neck, chest and waist and place the casualty in the recovery position.(Fig 3)

Fig 3



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Keep a constant check on the breathing and pulse rate.

Keep the casualty warm and comfortable. (Fig 4)

Send for help.

Do not give an unconscious person anything by mouth.

Do not leave an unconscious person unattended.

If the casualty is not breathing - Act at once - don't waste

Fig 4



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Safety practice - fire extinguishers

Objectives : At the end of this lesson you shall be able to

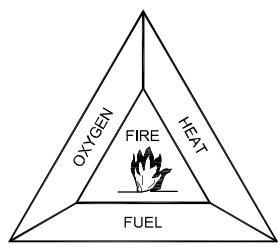
- explain how to rescue a person who is in contact with a live wire
- distinguish the different types of fire extinguishers
- determine the correct type of fire extinguisher to be used based on the class of fire
- describe the general procedure to be adopted in the event of a fire.

Fire is the burning of combustible material. A fire in an unwanted place and on an unwanted occasion and in an uncontrollable quantity can cause damage or destroy property and materials. It might injure people, and sometimes cause loss of life as well. Hence, every effort must be made to prevent fire. When a fire outbreak is discovered, it must be controlled and extinguished by immediate corrective action.

Is it possible to prevent fire? Yes, fire can be prevented by eliminating anyone of the three factors that causes fire.

The following are the three factors that must be present in combination for a fire to continue to burn. (Fig 1)

Fig 1



Accumulation of combustible refuse (cotton waste soaked with oil, scrap wood, paper, etc.) in odd corners are a fire risk. Refuse should be removed to collection points.

The cause of fire in electrical equipment is misuse or neglect. Loose connections, wrongly rated fuses, overloaded circuits cause overheating which may in turn lead to a fire. Damage to insulation between conductors in cables causes fire.

Clothing and anything else which might catch fire should be kept well away from heaters. Make sure that the heater is shut off at the end of the working day.

Highly flammable liquids and petroleum mixtures (thinner, adhesive solutions, solvents, kerosene, spirit, LPG gas etc.) should be stored in the flammable material storage area.

Blowlamps and torches must not be left burning when they are not in use.

Extinguishing fires: Fires are classified into four types in terms of the nature of fuel.

Different types of fires (Fig 2, Fig 3 Fig 4 & Fig 5) have to be dealt with in different ways and with different extinguishing agents.

An extinguishing agent is the material or substance used to put out the fire, and is usually (but not always) contained in a fire extinguisher with a release mechanism for spraying into the fire.

It is important to know the right type of agent for extinguishing a particular type of fire; using a wrong agent can make things worse. There is no classification for 'electrical fires' as such, since these are only fires in materials where electricity is present.

Fuel: Any substance, liquid, solid or gas will burn, if there is oxygen and high enough temperatures.

Heat: Every fuel will begin to burn at a certain temperature. It varies and depends on the fuel. Solids and liquids give off vapour when heated, and it is this vapour which ignites. Some liquids do not have to be heated as they give off vapour at normal room temperature say 15°C, eg. petrol.

Oxygen: Usually exists in sufficient quantity in air to keep a fire burning.

Extinguishing of fire: Isolating or removing any of these factors from the combination will extinguish the fire. There are three basic ways of achieving this.

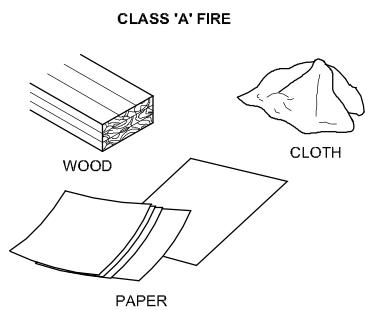
- **Starving** the fire of fuel removes this element.
- **Smothering** - ie. isolate the fire from the supply of oxygen by blanketing it with foam, sand etc.
- **Cooling** - use water to lower the temperature. Removing any one of these factors will extinguish the fire.

Preventing fires: The majority of fires begin with small outbreaks which burn unnoticed until they have a secure hold. Most fires could be prevented with more care and by following some simple common sense rules.

Fuel

Extinguishing

Fig 2

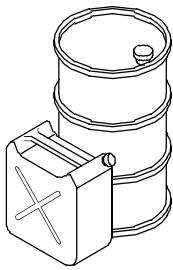


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Most effective ie. cooling with water. Jets of water should be sprayed on the base of the fire and then gradually upwards.

Fig 3

CLASS 'B' FIRE



FLAMMABLE LIQUIDS AND LIQUIFIABLE SOLIDS

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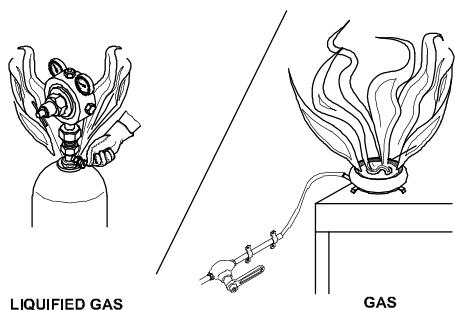
Should be smothered. The aim is to cover the entire surface of the burning liquid. This has the effect of cutting off the supply of oxygen to the fire.

Water should never be used on burning liquids.

Foam, dry powder or CO₂ may be used on this type of fire.

Fig 4

CLASS 'C' FIRE



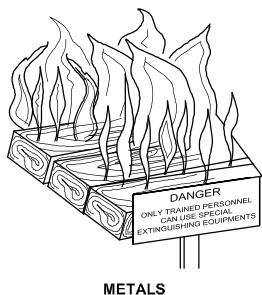
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Extreme caution is necessary in dealing with liquefied gases. There is a risk of explosion and sudden outbreak of fire in the entire vicinity. If an appliance fed from a cylinder catches fire - shut off the supply of gas. The safest course is to raise an alarm and leave the fire to be dealt with by trained personnel.

Dry powder extinguishers are used on this type of fire.

Fig 5

CLASS 'D' FIRE



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Special powders have now been developed which are capable of controlling and/or extinguishing this type of fire.

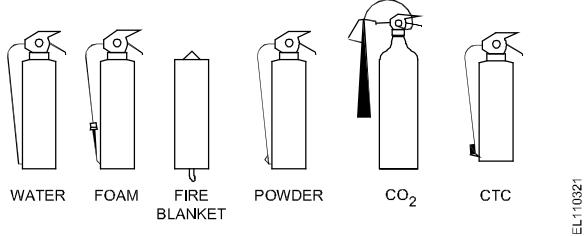
The standard range of fire extinguishing agents is inadequate or dangerous when dealing with metal fires.

Fire on electrical equipment.

Halon, Carbon dioxide, dry powder and vapourising liquid (CTC) extinguishers can be used to deal with fires in electrical equipment. Foam or liquid (eg. water) extinguishers must not be used on electrical equipment under any circumstances.

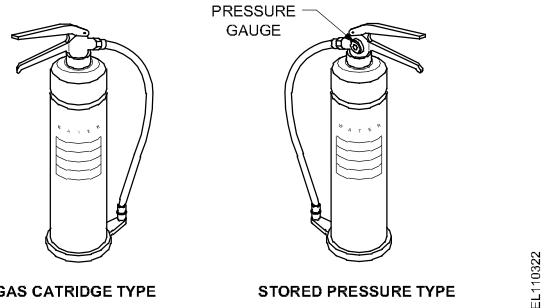
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)

Fig 1



Water-filled extinguishers: There are two methods of operation. (Fig 2)

Fig 2

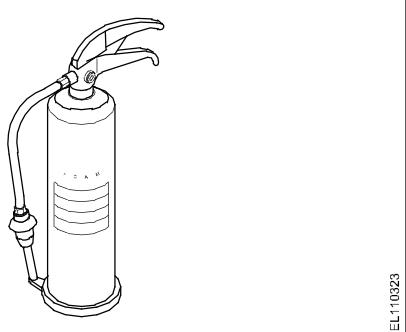


- Gas cartridge type
- Stored pressure type

With both methods of operation the discharge can be interrupted as required, conserving the contents and preventing unnecessary water damage.

Foam extinguishers (Fig 3): These may be of stored pressure or gas cartridge types. Always check the operating instructions on the extinguisher before use.

Fig 3



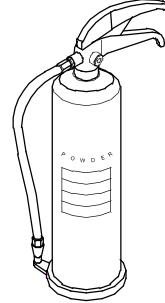
Most suitable for

- flammable liquid fires
- running liquid fires.

Must not be used on fires where electrical equipment is involved.

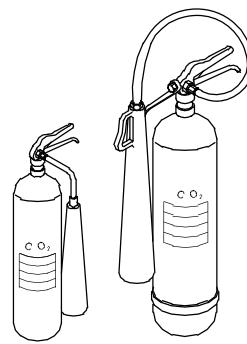
Dry powder extinguishers (Fig 4): Extinguishers fitted with dry powder may be of the gas cartridge or stored pressure type. Appearance and method of operation is the same as that of the water-filled one. The main distinguishing feature is the fork shaped nozzle. Powders have been developed to deal with class D fires.

Fig 4



Carbon dioxide (CO₂): This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5).

Fig 5

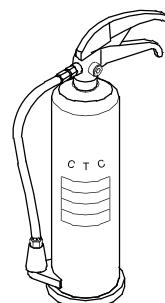


Suitable for Class B fires. Best suited where contamination by deposits must be avoided. Not generally effective in open air.

Always check the operating instructions on the container before use. Available with different gadgets of operation such as - plunger, lever, trigger etc.

Halon extinguishers (Fig 6): These extinguishers may be filled with carbon-tetrachloride and Bromochlorodifluoro methene (BCF). They may be either gas cartridge or stored pressure type.

Fig 6



They are more effective in extinguishing small fires involving pouring liquids. These extinguishers are particularly suitable and safe to use on electrical equipment as the chemicals are electrically non-conductive.

The fumes given off by these extinguishers are dangerous, especially in confined space.

The general procedure in the event of a fire:

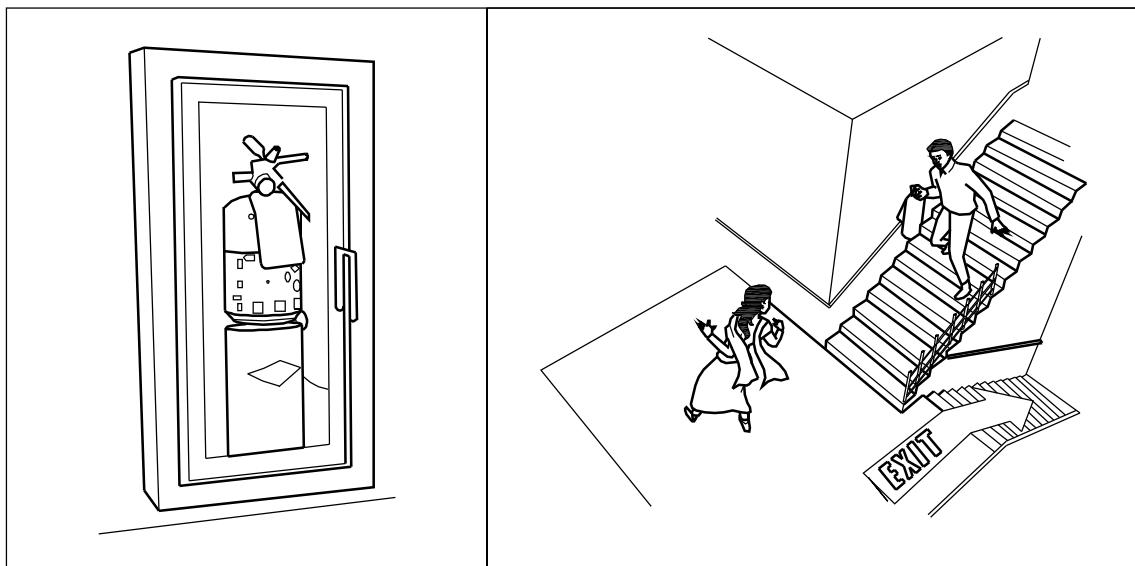
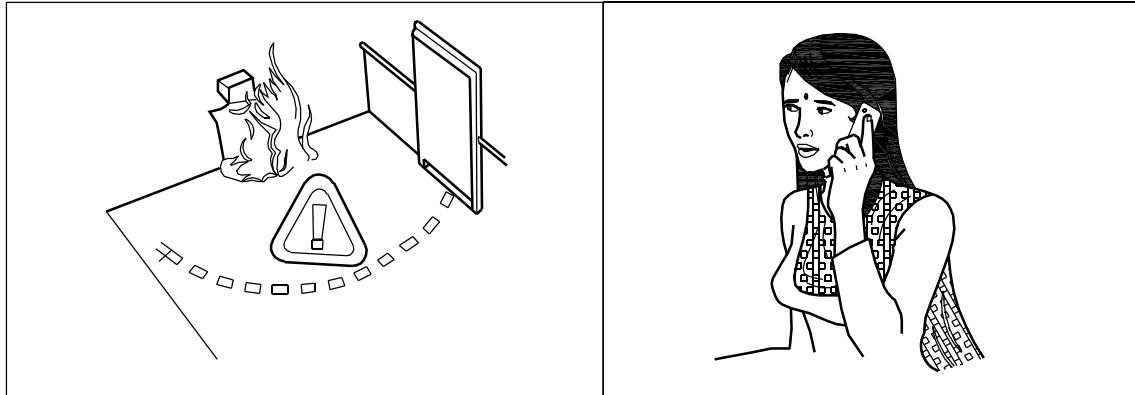
- Raise an alarm.
- Turn off all machinery and power (gas and electricity).

- Close the doors and windows, but do not lock or bolt them. This will limit the oxygen fed to the fire and prevent its spreading.
- Try to deal with the fire if you can do so safely. Do not risk getting trapped.
- Anybody not involved in fighting the fire should leave calmly using the emergency exits and go to the designated assembly point. Failure to do this may mean that some person being unaccounted for and others may have to put themselves to the trouble of searching for him or her at risk to themselves.

Practice on fire extinguishers

Objectives: At the end of this lesson you shall be able to

- state about the selection of the fire extinguishers according to the type of fire
- state the method of operation of the fire extinguisher
- explain how to extinguish the fire.



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PROCEDURE (Fig 1)

- Alert people surrounding by shouting fire, fire, fire when observe the fire.
- Inform fire service or arrange to inform immediately.
- Open emergency exist and ask them to go away.
- Put "off" electrical power supply.

Don't allow people to go nearer to the fire

- Analyze and identify the type of fire. Refer Table1.

Table-1

Class 'A'	Wood, paper, cloth, solid material
Class 'B'	Oil based fire (grease, gasoline, oil) liquefiable gases
Class 'C'	Gas and liquefiable gases
Class 'D'	Metals and electrical equipment

Assume the fire is 'B' type (flammable liquefiable solids)

- Select CO₂ (Carbon di oxide) fire extinguisher.
- Locate and pickup, CO₂ fire extinguisher. Click for its expiry date.
- Break the seal (Fig 2)

Fig 2

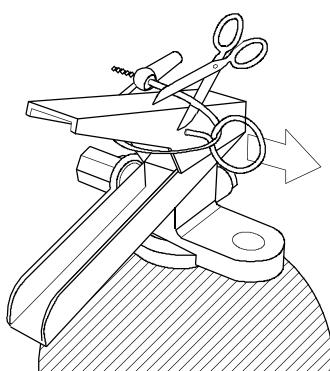


Fig104-H2

- Pull the safety pin from the handle (Pin located at the top of the fire extinguisher) (Fig 3)

Fig 3

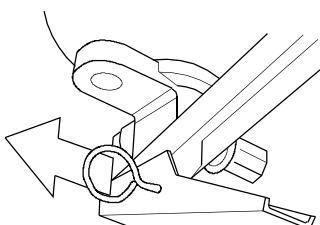


Fig104-H3

- Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 4)

Fig 4

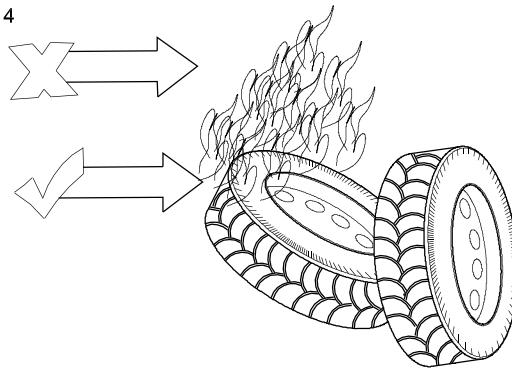


Fig104-H4

Keep your self low

- Squeeze the handle lever slowly to discharge the agent (Fig 5)
- Sweep side to side approximately 15 cm over the fuel fire until the fire is put off (Fig 5)

Fig 5

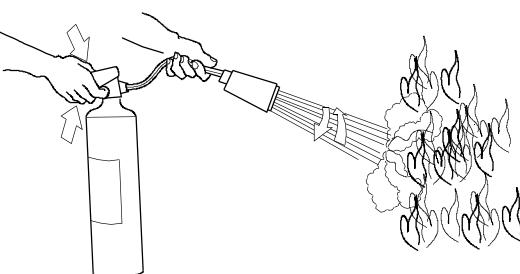


Fig104-H5

Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up
- Do not be panick belong as it put off promptly.
- If the fire doesn't respond well after you have used up the fire extinguisher move away yourself away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke leave it for the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of the extinguisher. Remember P.A.S.S. This will help you to use the fire extinguisher.

P for Pull

A for Aim

S for Squeeze

S for Sweep

Introduction to computers

Objectives : At the end of this lesson you shall be able to

- define and classify computers
- list the advantages and limitations of computers
- list the applications of computer
- describe the voltages and currents in the computer.

Computer - Definitions

A computer is an electronic machine, operating under the control of instructions stored in its own memory that can accept data (input), manipulate the data according to specified rules (process), produce results (output), and store the results for future use.

Technically, a computer is a programmable machine. This means it can execute a list of programmed instructions and respond to new instructions that it is given.

History of Computer

Charles babbage's machine

The working principles of today's computers were provided by an English mathematician Charles Babbage around 1833's invented a machine called the "Analytical Engine". A machine which could calculate and print tables of functions using limited techniques.

The Analytical Engine had four parts. A mill, which was the section which did the calculations, essentially the CPU; the store, where the information was kept recorded, essentially the memory; the reader, which would allow data to be entered using punched cards, essentially the keyboard, and the printer.

Hence, Charles Babbage is considered as the "Father of the Computer" as in fig-1.

The generations of computers are characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices. The various generations of computers are listed below:

First Generation (1946-1954): In 1946 the digital computer using **electronic valves** (Vacuum tubes) are known as first generation computers. The first '**computer**' to use electronic valves i.e. vacuum tubes. The high cost of vacuum tubes prevented their use for main memory. They stored information in the form of propagating sound waves.

The vacuum tube consumes a lot of power. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

Fig 1



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Mark I :The IBM Automatic Sequence Controlled Calculator (ASCC), called the Mark I by **Harvard University**, was an **electro-mechanical computer**. Mark I is the first machine to successfully perform a long series of **arithmetic and logical operation**. Mark I is the **First Generation Computer**.

ENIAC: It was the first electronic computer built in 1946 at University of Pennsylvania, USA by John Eckert and John Mauchy. It was named Electronic Numerical Integrator and Calculator (ENIAC). The ENIAC was 30-50 feet long, weighted 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors and required 150,000 watts of electricity. Today computer is many times as powerful as ENIAC, still size is very small.

EDVAC: It stands for **Electronic Discrete Variable Automatic Computer** and was developed in 1950. The concept of storing data and instructions inside the computer was introduced here. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantage of storing instruction was that computer could do logical decision internally. The EDVAC was a **binary serial computer** with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.

EDSAC: It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes at Cambridge University in 1949.** The **EDSAC** is the first **stored-program computer.** The EDSAC performed computations in the three millisecond range. It performed arithmetic and logical operations without human intervention. The key to the success was in the stored instructions which it depended upon solely for its operation.

This machine marked the beginning of the computer age.

UNIVAC-1: It stands for **Universal Automatic computer** and it was the First commercial computer developed by United States In 1951. The machine was 25 feet by 50 feet in length, contained 5,600 tubes, 18,000 crystal diodes, and 300 relays. It utilized serial circuitry, 2.25 MHz bit rate, and had an internal storage capacity 1,000 words or 12,000 characters.

The UNIVAC was used for **general purpose computing** with large amounts of input and output. The UNIVAC was also the first computer to come equipped with a magnetic tape unit and was the **first computer to use buffer memory.**

Limitations of First Generation Computer

Followings are the major drawbacks of First generation computers.

- They used valves or vacuum tubes as their main electronic component.
- They were large in size, slow in processing and had less storage capacity.
- They consumed lots of electricity and produced lots of heat.
- Their computing capabilities were limited.
- They were not so accurate and reliable.
- They used machine level language for programming.
- They were very expensive.

Second Generation (1955-1964): The second-generation computer used **transistors** for CPU components and **ferrite cores for main memory&magnetic disks** for secondary memory. They used high-level languages such as **FORTRAN (1956), ALGOL (1960) & COBOL (1960 - 1961).** Input Output (I/O)processor was included to control I/O operations.

Manufacturing cost was also very low. Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. Some of the second generation computers are IBM 1620, IBM 1401,CDC 3600.

- Transistors were used instead of Vacuum Tube.
- Processing speed is faster than First Generation Computers (Micro Second)
- Smaller in Size (51 square feet)
- The input and output devices were faster.

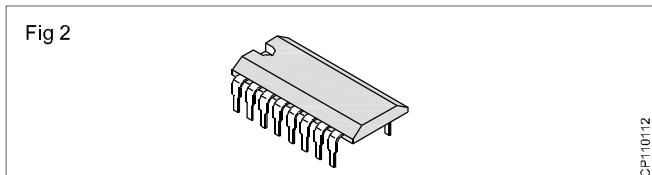
Third Generation (1964-1977): By the development of a small chip consisting of the capacity of the **300 transistors.** These Integrated Circuits (IC)s are popularly known as **Chips.**

A single IC has many transistors, registers and capacitors built on a single thin slice of silicon. So it is quite obvious that the size of the computer got further reduced. Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750.** Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high. Very soon ICs were replaced by **LSI (Large Scale Integration)**, which consisted about 100 components.

An IC containing about 100 components is called LSI as in (Fig 2).

Features



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- They used Integrated Circuit (IC) chips in place of the transistors.
- Semiconductor memory devices were used.
- The size was greatly reduced, the speed of processing was high, and they were more accurate and reliable.
- Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) were also developed.
- The mini computers were introduced in this generation.
- They used high level language for programming.

Fourth Generation (1978 - present): An IC containing about 100 components is called LSI (Large Scale Integration) and the one, which has more than 1000 such components, is called as VLSI (Very Large Scale Integration).

It uses large scale Integrated Circuits(LSIC) built on a single silicon chip called microprocessors. Due to the development of microprocessor it is possible to place computer's central processing unit(CPU) on single chip. These computers are called microcomputers.

Later very large scale Integrated Circuits(VLSIC) replaced LSICs. Thus the computer which was occupying a very large room in earlier days can now be placed on a table. The personal computer (PC) that you see in your school is a Fourth Generation Computer Main memory used fast semiconductors chips up to 4 M bits size. Some of the Fourth generation computers are IBM PC, Apple-Macintosh, etc.

Hard disks were used as secondary memory. Keyboards, dot matrix printers etc. were developed. Operating System (OS)-such as MS-DOS, UNIX, Apple's Macintosh were available. Object oriented language, C++ etc were developed.

Features

- They used Microprocessor (VLSI) as their main switching element.
- They are also called as micro computers or personal computers.
- Their size varies from desktop to laptop or palmtop.
- They have very high speed of processing; they are 100% accurate, reliable, diligent and versatile.
- They have very large storage capacity.

Fifth Generation (PRESENT AND FUTURE): 5th generation computers use ULSI (Ultra-Large Scale Integration) chips. Millions of transistors are placed in a single IC in ULSI chips.

64 bit microprocessors have been developed during this period.. Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed (fig. 3).

Fig 3



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Fifth generation computing devices, based on Artificial Intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. Artificial intelligence includes:

- **Games Playing:** Programming computers to play games such as chess and checkers
- **Expert Systems:** Programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms)
- **Natural Language:** Programming computers to understand natural human languages
- **Neural Networks:** Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains
- **Robotics:** programming computers to see and hear and react to other sensory stimuli

Table - 1

GENERATION	ELECTRONIC COMPONENT	ADVANTAGES	DISADVANTAGES
First	Vaccum tube	Helped in calculation and computational work	1.Big size 2.Very costly 3.Slow speed 4.Low accuracy 5.Low storage 6.High power requirements 7.High heat generation 8.High failure rate 9.Used machine language 10.No operating system
Second	Transistor	1.Smaller size 2.Less cost 3.Better speed 4.Low power consumption and less heat generation 5.Better storage capacity 6.Better accuracy and more reliability	1.Need air conditioning 2.Constant maintenance 3.No operating systems 4.Later stage computers used assembly languages
Third	Integrated Circuits(IC) small & medium scale	1.Better in all aspects compared to I & II 2.Used operating systems and high level language	1.Initial problem with manufacturers 2.No insight obtained into internal working
Fourth	VLSI or Microprocessor	1.Low cost 2.Excellent speed and reliability 3.Computers close to man	1.Less powerful than main frame computers
Fifth (Knowledge Information Processing Systems)	ULSI or Bio-Chips	1.Very cheap 2.super speeds 3.Very high storage capacity 4.Highly sophisticated OS 5.posses intelligence and decision making ability	1.New low level language needed

Classification of computers

Computers are classified according to the following criteria:

- Principle of Operation
- Computing Power, Memory Capacity and cost
- Technological Development
- Principle of operation
 - Analog computer
 - Digital Computer
 - Hybrid Computer

It is a computer that measures continuously changing physical quantities such as current, temperature, pressure etc. and converts them into quantities which can be used as data for computation. As these computers deal with continuously varying quantities they will give only approximate results. Its output is usually displayed on a meter or scale. Analog computer has low memory and fewer functions. These are used for engineering and scientific applications.

- Thermometer
- Speedometer
- Analog clock

Analog Computer

Digital Computer

A digital computer works with digital data. Digital computer uses binary number system. Binary number system consists of only two digits '0' and '1'. A digital computer represents data in digital signals. A '0' represents OFF and a '1' represents ON. Digital computer performs arithmetic and logical operations on data. It gives output in digital form.

Digital computers are very fast. These computers can

store results. They have large Memory (that is data storing capacity). Today most of the computers used in offices and homes are Digital computers.

The digital computers are further divided into the following two groups:

- Special purpose computers
- General purpose computers

Table 2

Analog Computers	Digital Computers
<p>1. Analog Computers Work on continuous values.</p> <p>2 Analog Computers have low memory.</p> <p>3 Analog computers have Slow speed.</p> <p>4 Analog computers are less reliable.</p> <p>5 Analog computers used in engineering</p> <p>6 Analog computers are used to calculate / measure analog quantities like speed and temperature.</p> <p>7 Analog computers provide less accurate results.</p> <p>8 Normally Analog Computers are specific purpose</p> <p>9 Normally Analog Computers are specific purpose</p> <p>10 Examples of Analog computers are: thermometer, analog clock, speedometer etc.</p>	<p>Digital computers Work on discrete values.</p> <p>Digital computers have a very large memory</p> <p>Digital computers have fast speed.</p> <p>Digital computers are more reliable.</p> <p>Digital computers are used in all fields of life, science and medical fields.</p> <p>Digital computers are used to calculate mathematical and logical operations. It can solve addition, subtraction, division, multiplication and other mathematical and statistical operations.</p> <p>Digital computers provide 100% accurate results.</p> <p>Digital Computers are general purpose</p> <p>Digital Computers are general purpose</p> <p>Examples of digital computers are:</p> <p>Personal Computer, laptops, smart phones etc.</p>

Special Purpose Computers

It is a computer designed to solve specific type of problem. The computers used in ships and aircrafts, etc.

General Purpose computers

It is a computer designed to solve a wide variety of problems. A General purpose Computer can store different programs and process them.

The differences between analog and digital computers are listed in table 2

Hybrid Computer (Fig. 4)

A hybrid computer is a combination of both analog and digital computer. Hybrid computer can handle both analog and digital data. A hybrid computer combines the best characteristics of both the analog and digital computer. It can accept data in both analog and digital form.

Applications

Hybrid computer devices are used in hospitals that may calculate patient's heart function, temperature and blood pressure etc. This calculation may be converted into



numbers and shown in digital form. For example, The Vital Signs Monitoring unit also called (VSM) in short. It has Blood Pressure monitor, ECG monitor, respiratory monitor, and is also used for monitoring anesthesia.

- Hybrid computers are also used in spaceships and missile system.

- Hybrid Computer Machines are generally used in scientific applications
- Hybrid computers are used for controlling industrial processes.

Computers are classified on the basis of computing power, memory capacity and cost.

- Microcomputer or Personal Computer.
- Mini Computer.
- Mainframe Computer.
- Super Computer.

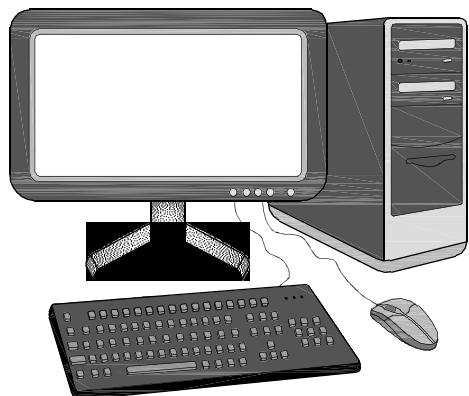
Micro Computers

Micro computer is also called personal computer. It was introduced in 1970. Examples of personal computers are PC and Apple Macintosh. The major types of personal computers are desktop computer and portable computer.

Desktop Computer

These computers can easily fit on a table or desktop, hence the name. These computers come in two models or casings. In Desktop model, the system unit is placed on the desktop or table. Monitor is placed on the system unit. In Tower model, both monitor and system unit are placed on the table as in (Fig 5).

Fig 5



TOWER MODEL COMPUTER

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Portable computer

Portable is a personal computer that can be carried from one place to other easily. Notebook computer and handheld computer (smart phone) are examples of portable computers. Notebook computer is also called laptop computer. Laptop computers are very small in size and can be placed easily on lap.

Lap top computer or notebook computer

The laptop computer or notebook computer will be as shown in fig 6a and fig 6b. It is also called as tower model computer.

Palmtop Computer/Digital Diary /Notebook /PDAs:

A handheld computer (like smart phone) is also portable. Hand held computer is known as palmtop computer.

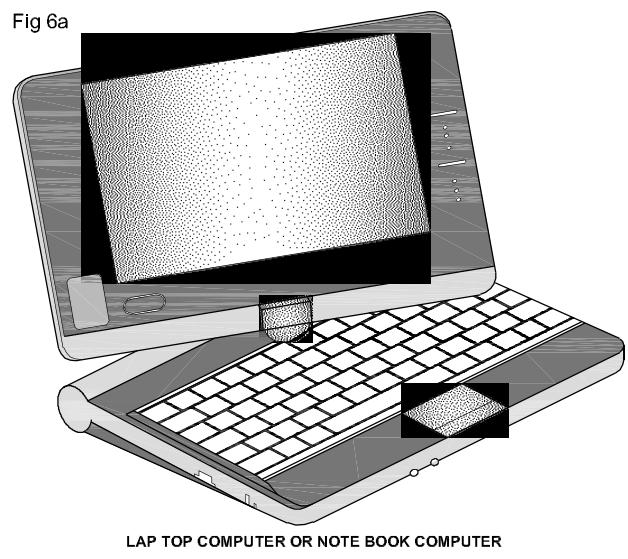


Fig 6



Palmtops have no keyboard but the screen serves both as an input and output device. It easily fits in the hand of the user.

Uses of Micro Computer

The PC is the most common type of computer used in the office. It is now widely used in many homes. These are also used for business and engineering application.

Mini Computer

Mini computers were introduced in the 1960s. Minicomputer is larger and more powerful computer than personal computer. It can execute five million instructions per second. It generally consists of two or more processors.

Minicomputer can serve up to 4000 connected users simultaneously. It is normally accessed by users via personal computer or terminal. A device with a monitor and keyboard is called terminal. It is also known as dumb terminal. It has no processing power and cannot work as stand-alone computer. Some of the minicomputers models are VAX-8800, AS400

Uses of Mini Computer

Mini computers are often used by small and medium-sized companies to provide centralized store of information.

Mainframe Computer

Mainframe computers were introduced in 1975. A mainframe computer is a very large computer in size. It is processors. It is designed to perform multiple tasks for multiple users at the same time. Mainframe computers can serve up to 50,000 users at the same time.

The users access a mainframe computer through terminal or personal computer. A typical mainframe computer can execute 16 million instructions per second. Some of the main computers models are

- NEC 610
- DEC 10

Uses of Mainframe Computer

Mainframe computers are used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, and transaction processing.

Super computer

Super computers were introduced in 1980s. Super computer is the fastest computer. Super computer is the biggest in size and the most expensive in price than any other computers.

It is the most sophisticated, complex and advanced computer. It has a very large storage capacity. It can process trillions of instructions in one second. Super Computer is the fastest and most powerful computer of a time. Supercomputers are very expensive. Supercomputers are used for highly calculation-intensive tasks. Super computers are also used for specialized applications that require immense amounts of mathematical calculations.

Applications of Super Computer

- Weather forecasting,
- Animated graphics like in Hollywood movies,
- Fluid dynamic calculations
- Nuclear energy research
- Space science
- Weapon and missile design
- Petroleum exploration, and etc.

Today, supercomputers are produced by traditional companies such as Cray, IBM and Hewlett- Packard. Since October 2010, the Tianhe-1A supercomputer has been the fastest in the world; it is located in China.

The main difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a single program as fast as possible, whereas a mainframe uses its power to execute many

programs concurrently. The modern super computer consists of thousands of microprocessors. Super computer uses high-speed facilities such as satellite for online processing.

Sum of the super computers models are CRAY-XP, ETA-10, Param and Deep Blue .

Advantages of computers

- A computer has a very high processing speed with high reliability.
- Large volume of information can be stored in the memory any particular data/program can be retrieved immediately.
- Solution to a complicated problem is possible at a very high speed.
- Processing of large volume of data saves a lot of clerical work which reduces the processing cost.
- Computers perform operations efficiently at environments where presence of human being is not possible such as furnace, poisonous atmosphere, vacuum, unmanned satellite, etc.

Limitation of computers

- High initial cost.
- Input information has to be prepared in the form of statements called program which requires a considerable amount of knowledge.
- usage of computers will be economical only when there is clerical data processing for large volume of data and are repetitive in nature
- It is a merely a machine it cannot correct errors on its own.

Functions of Computers

All computers are made up of following basic units as shown in fig (7). They are as follows:-

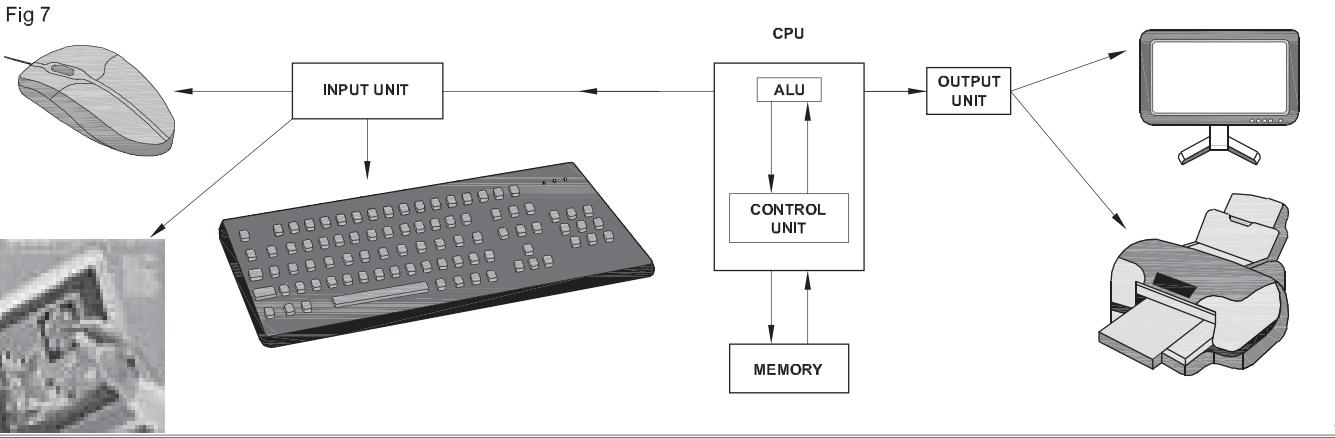
- 1 Input Unit
- 2 Central processing Unit (CPU)
 - a) Arithmetic Logic Unit(ALU)
 - b) Control Unit (CU)
- 3 Memory
- 4 Output Unit

Input Unit

Computers need to receive data and instruction in order to solve any problem. Therefore we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Some of the input devices are listed in table 1.

Input devices perform the following functions.

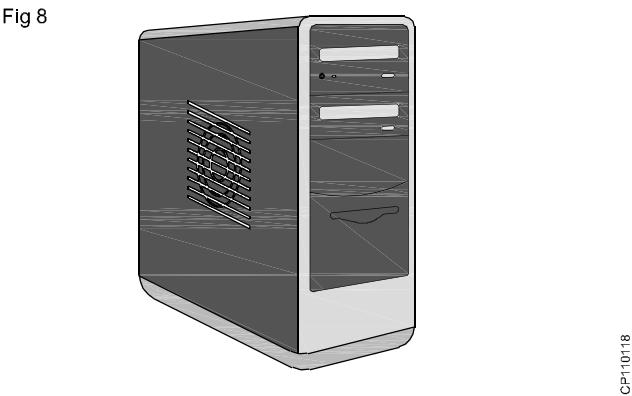
- Accept the data and instructions from the outside world.



- Convert it to a form that the computer can understand.
- Supply the converted data to the computer system for further processing.

Central Processing Unit (CPU) (Fig. 8)

The central processing unit (CPU) is the electronic brain



of the computer as in fig-8. The CPU in a personal computer is usually a single chip. It organizes and carries out instructions that come from either the user or from the software. The processor is made up of many components. CPU performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

Two typical components of a **CPU** are the following:

The arithmetic logic unit (ALU), which performs arithmetic and logical operations.

The control unit (CU), which extracts instructions from memory and decodes and executes them, calling on the ALU when necessary.

Memory

Memory refers to the physical device used to store the program or data on the temporary or permanent basis for

use in a computer or other digital electronic device. There are two types of memory in computer.

- Primary Memory
- Secondary Memory

Output Unit

Output unit receive the informations from the processing unit and provide the results in human readable form.

Output Devices

The some of the output devices are

- Monitor
- Printer
- Plotter
- Speaker

Applications of computers

Science: Scientists have been using computers to develop theories and to analyse and test the data. The high speed and accuracy of the computer allow different scientific analyses to be carried out. They can be used to generate detailed studies of how earthquakes affect buildings or pollution affects weather pattern. Satellite-based applications have not been possible without the use of computers. Moreover, it would not be possible to get the information of the solar system and the cosmos without computers.

Education: Computers have also revolutionized the whole process of education. Currently, the classrooms, libraries and museums are efficiently utilizing computers to make the education much more interesting. Unlike recorded television shows, computer-aided education (CAE) and computer-based training (CBT) packages are making learning much more interactive.

Medicine and Health Care: There has been an increasing use of computers in the field of medicine. Now, doctors are using computers right from diagnosing the illness to monitoring a patient's status during complex surgery. By using automated imaging techniques, doctors are able to look inside a person's body and can study



each organ in detail (e.g. CT scans or MRI scans), which was not possible few years ago. There are several examples of special-purpose computers that can operate within the human body such as cochlear implant, a special kind of hearing aid that makes it possible for deaf people to hear.

Engineering/Architecture/Manufacturing: The architects and engineers are extensively using computers in designing and drawings. Computers can create objects

that can be viewed from all the three dimensions. By using techniques like virtual reality, architects can explore houses that have been designed but not built. The manufacturing factories are using computerized robotic arms to perform hazardous jobs. Besides, computer-aided manufacturing (CAM) can be used in designing the product, ordering the parts and planning production. Thus, computers help in coordinating the entire manufacturing process.

Entertainment: Computers are finding greater use in entertainment industry. They are used to control the images and sounds. The special effects, which mesmerize the audience, would not have been possible without the computers. In addition, computerized animation and colourful graphics have modernized the film industry.

Communication: E-mail or electronic mail is one of the communication media in which computer is used. Through e-mail, messages and reports are passed from one person to one or more persons with the aid of computer and telephone line. The advantage of this service is that while transferring the messages it saves time, avoids wastage of paper and so on. Moreover, the person who is receiving the messages can read the messages whenever he is free and can save it, reply it, forward it or delete it from the computer.

Business Application: This is one of the important uses of the computer. Initially, computers were used for batch-processing jobs, where one does not require the immediate response from the computer. Currently, computers are mainly used for real-time applications (like at the sales counter) that require immediate response from the computer. There are various concerns where computers are used such as in business forecasting, to prepare pay bills and personal records, in banking operations and data storage, in various types of life insurance business and as an aid to management. Businesses are also using the networking of computers, where a number of computers are connected together to share the data and the information. Use of e-mail and the Internet has changed the ways of doing business.

Publishing: Computers have created a field known as desktop publishing (DTP). In DTP, with the help of computer and a laser printer one can perform the publishing job all by oneself. Many of the tasks requiring long manual hours such as making table of contents and index can be automatically performed using the computers and DTP software.

Banking: Computers are extensively used in the field of banking and finance. People can use the ATM (automated teller machine) services 24 hours a day to deposit and withdraw cash. When different branches of the bank are connected through computer networks, the inter branch transactions such as cheque and draft can be performed without any delay.

Railway Reservation System

Using this system, the user can perform following operations through online. (web site: www.irctc.co.in)

- search the train and its timings
- check seats and birth availability
- booking and cancelling tickets
- status of PNR (Passenger Name Record)

Telephone / Electricity Board Billing:

The users can do the following operations through online by using this system. (Web site: portal.bsnl.in - BSNL)

- Register the telephone / electricity board number
- Check and pay the bill amount
- Register the complaints

E-Governance

E-Governance implies technology driven governance. E-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between Government-to-Citizens (G2C), Government-to-Business(G2B),Government-to-Government(G2G) as well as back office processes and interactions within the entire government frame work.

E-Governance covers all the sectors with a view to providing hassle free, transparent and efficient service to the common man (both in urban and rural areas).

Introduction to CPU architecture and motherboard

Objectives: At the end of this lesson you shall be able to

- state what is hardware and test the internal and external hardware
- brief the listed hardware
- state what is partitions and their types
- explain the booting and its procedures.

Computer Hardware

The physical units of a computer are called as the hardware of a computer.

Internal hardware examples

- Blu-Ray, CD-ROM, and DVD
- CPU
- Hard drive
- Motherboard
- RAM
- Sound card
- Video card
- SMPS

External hardware examples

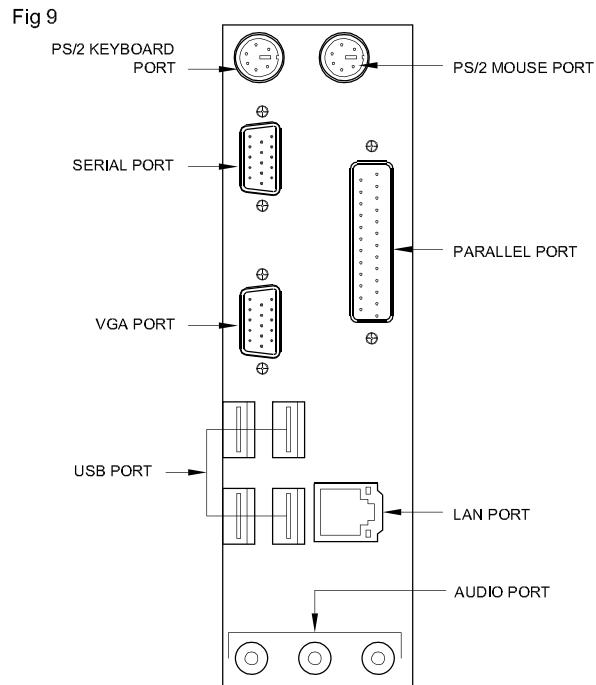
- Flat-panel, Monitor, and LCD
- Keyboard
- Mouse
- Printer
- Scanner

CPU & ALU

Central Processing Unit (CPU) is the heart of the Computer. It is the hardware that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system.

CPU Ports and Connectors

A port is a connector at the back of a Computer cabinet where you plug in an external device such as a printer, keyboard, scanner, modem etc. This allows instructions and data to flow between the computer and the device. The computer ports are also commonly referred to as the Input/output ports (I/O ports). These ports can be either serial or parallel. Fig 1 shows the commonly available ports on a personal computer.



Most connectors are separated, permitting the cable to be plugged in only in the correct direction. The keyboard and mouse use "PS2" (Personal System 2) connectors. The PS2 connectors are color-coded. The purple connector is for the keyboard. The green connector is for the mouse.

- **PS/2 Ports:** Standard keyboards and mouse often connect to the computer via the PS/2 ports. To plug in a keyboard or mouse cable, first match the cable to the connector. Then push the cable into the connector. Be sure not to force the connector because you will end up bending the pins
- **Serial & Parallel Ports:** The serial port and parallel port allow connections to printers and other external devices. To transfer a byte through a serial port, eight bits are queued and sent bit by bit. However, in a parallel port, all the eight bits are transferred simultaneously
- The parallel port, serial port, and video port all use "D" type connectors (DB-25M, DB-9M and DB-15F respectively). These are called D connectors because of their shape, which permits the cables to be plugged in only one way.

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USB (Universal serial bus) Ports

Devices like digital cameras, scanners and printers often connect to the motherboard via the USB ports. A USB connector's distinctive rectangular shape makes it easily recognizable.

USB has a number of features that makes it particularly popular on PCs. First, USB devices are hot swappable. You can insert or remove them without restarting your system

LAN(Local Area Network) Port: The LAN port is used to connect the PC to a local network or to high speed Internet services.

VGA (Video Graphics Array) Ports: The VGA port provides access to integrated video.

Audio ports: It provides access to integrated audio.

The audio jacks are the most confusing connectors on the back panel. Although the jacks are sometimes color-coded, the devices that plug into them rarely.

CPU front Panel shown Fig 2.

Fig 2



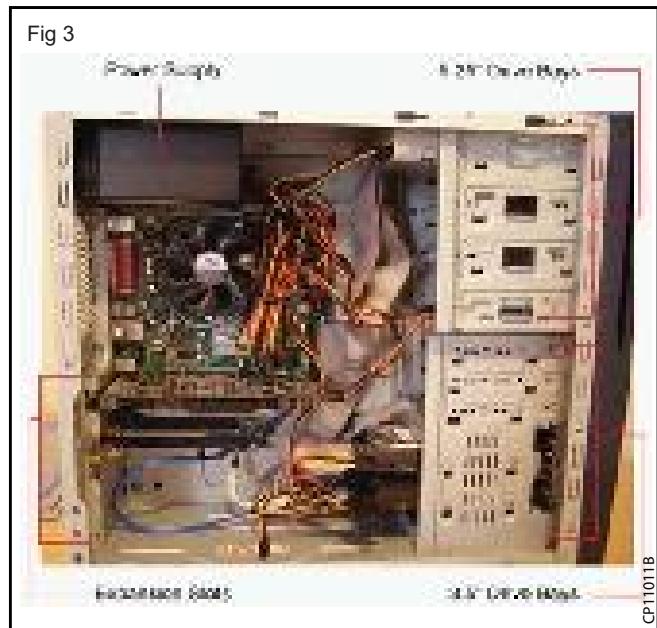
It may contain the following parts.

- Power On/Off Switch
- Power Indicator
- CD/DVD Drive
- CD/DVD Drive Open/Close Button
- CD/DVD Drive indicator
- Floppy Disk Drive
- Floppy Disk Drive Indicator
- USB Ports
- Audio and Mic connectors

Design of CPU Cabinets may vary based on the manufacturer.

The System Unit and Its Components

The system unit is a box-like unit filled with a number of useful components, each performing a discrete function. These components work together to accomplish the main function of the computer, viz. accept and process input and deliver output. This section will elaborate on these components one by one. Fig 3 shows the various components of the system unit.



Power Supply

The power supply connects to nearly every device in the PC to provide power. It is located at the rear of the case. The system unit draws power from the AC mains through a power protection device.

This power is not directly supplied to the internal components. Instead, one of the components, called the internal power supply, converts the AC input into DC output of 5 and 12 volts. Normally, the **internal power supply** is referred to as **Switched Mode Power Supply (SMPS)**.

The SMPS provides cable connectors to supply the required voltage to the other internal components like the floppy drives, the hard disk drive, the motherboard and external device such as the keyboard. The ON/OFF switch of the system unit is actually a part of the SMPS.

Fan

The **SMPS** has a small fan, called the exhaust fan, attached to **SMPS(Fig. 4)**. This fan rotates as long as the computer is switched on. Its function is to cool the **SMPS** unit.

Drive Bays: The 5.25" and 3.5" drive bays house the many kinds of storage devices a computer might contain.

Expansion Slots: An expansion slot is a slot located inside a computer mother board that allow additional peripherals to be connected to it.

Fig 4

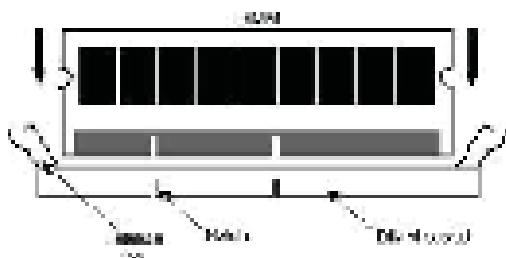


CP1010C

Memory Slot

Memory Slot is used to insert a Random Access Memory(RAM) shown in fig 5

Fig 5



CP1010D

Storage Drivers

Storage drivers such as hard drives, optical drives and floppy drives all connect to the motherboard via cables and is mounted inside the computer.

IDE & SATA Cables: Fig 6 shows two hard disk drives that connect in different ways to the motherboard. One uses the older IDE cable connection while the other uses SATA(Serial Advanced Technology Attachment) cable which provides for faster hard drive access.

Fig 6



CP1010E

Power Port: Power is delivered to drives via cables that plug into the power port on the drives.

Peripheral cards slot

The peripheral cards are the spare expansion slots available on the mother board on which peripheral cards can be inserted.

The following are the peripheral cards

- Sound card
- Video card
- Modem
- Wireless network

Fig. 7 shows the peripheral card, designed with a PCI (Peripheral component interconnect) connector.

Fig 7

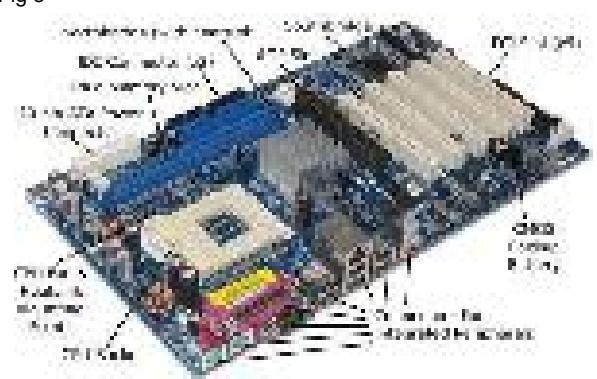


CP1010F

Motherboard

The motherboard is a printed circuit that is the foundation of a computer and allows the CPU, RAM, and all other computer hardware components to function with each other as on fig 8.

Fig 8



CP1010G

The motherboard is the primary component of the entire system. A mother board is a large board containing a number of tiny electronic circuits and other components are visible. All peripheral devices are connected to the motherboard. The components of the motherboard are:

- Keyboard / mouse port
- Parallel and Serial port
- Processor Socket
- AGP Slot
- PCI Slots
- ISA Slot
- CMOS Battery
- Data Card Connector
- Memory Slots
- Floppy Port
- Fan Header
- Main Power Connector

Floppy Port :The floppy drive connects to the computer via a 34-pin ribbon cable, which in turn connects to the motherboard. A floppy controller is one that is used to control the floppy drive.

RAM slots: Random-Access Memory (RAM) stores programs and data currently being used by the CPU.

RAM is measured in units called bytes. RAM has been packaged in many different ways

- SIMM-Single inline memory module -32 or 72 Pin
- DIMM- Dual Inline Memory module -168 pin.

In most of the PC's uses of the DIMM module

ROM BIOS Chip: This means Read Only Memory Basic Input-Output System.

The built-in software that determines what a computer can do without accessing programs from a disk. On PCs, the **BIOS** contains all the code required to control the keyboard, display screen, disk drives, serialcommunications, and a number of miscellaneous functions.

The BIOS is typically placed in a **ROM** chip that comes with the computer (it is often called a **ROM BIOS**). This ensures that the **BIOS** will always be available and will not be damaged by disk failures.

It also makes it possible for a computer to boot itself. Because RAM is faster than **ROM**, though, many computer manufacturers design systems so that the BIOS is copied from **ROM** to **RAM** each time the computer is booted. This is known as shadowing.

Many modern PCs have flash **BIOS**, which means that the **BIOS** have been recorded on a flash memory chip, which can be updated if necessary. The PC **BIOS** is fairly standardized, so all PCs are similar at this level (although there are different **BIOS** versions). Additional **DOS** functions are usually added through software modules.

This means you can upgrade to a newer version of DOS without changing the **BIOS**. PC **BIOS** that can handle Plug-and-Play (PnP) devices are known as PnPBIOS. These BIOS are always implemented with flash memory rather than ROM.

CMOS Battery

CMOS (Complementary Metal-Oxide-Semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the **BIOS** settings.

Most **CMOS** batteries will last the lifetime of a motherboard (up to 10 years in most cases) but will sometimes need to be replaced. Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery.

ISA slot: (Industry Standard Architecture) It is the standard architecture of the Expansion bus. Motherboard may contain some slots to connect ISA compatible cards.

PCI slot : Intel introduced the Peripheral Component Interconnect bus protocol. The PCI bus is used to connect I/O devices to the main logic of the computer. **PCI** bus has replaced the ISA bus. PC motherboards have one PCI slot but generally more than one.

The **PCI** bus architecture is a processor-independent bus specification that allows peripherals to access system memory directly without using the CPU.

AGP slot: The Accelerated Graphics Port (AGP) is a high-speed point-to-point channel for attaching a video card to a computer's motherboard.

Power supply plug in

The Power supply, as its name implies, provides the necessary electrical power to make the PC (Personal Computer) operate. The power supply takes standard 110-V AC power and converts into +/-12-Volt, +/-5-Volt, and 3.3-Volt DC power. The power supply connector has 20-pins, and the connector can go in only one direction.

Hard Disk and Partitions

Partitioning is a process of dividing the Hard disk into several chunks, and uses any one of the portion or partition to install OS or use two or more partitions to install multiple OS..

But it can always have one partition, and use up the entire Hard disk space to install a single OS, but this will become data management nightmare for users of large Hard disks.

Now, because of the structure of the Master Boot Record (MBR), has only four partitions, and these four partitions are called **Primary Partitions**.

Extended Partition is not a usable partition by itself, but it's like a "container" and it is used to hold **Logical Drives**! That is this Extended Partition can be subdivided into multiple logical partitions.

In order to boot into a Partition, **it must be designated as bootable partition** or Active Partition. Active Partition is that partition which is flagged as bootable or which contains OS, this is generally a Primary Partition.

Types of Partitions:

- Master
- Partition
- Extended and
- Logical Extended

Master Boot Record (MBR): MBR is a small 512 bytes partition which is at the first physical sector of the hard disk. The location is denoted as CHS 0,0,1 meaning 0th Cylinder, 0th Head and 1st Sector.

MBR contains a small program known as bootstrap program which is responsible for booting into any OS. MBR also contains a table known as Partition Table.

This Partition Table is a table which lists the available Primary Partitions in the hard disk. Partition table considers whole Extended Partition as one Primary partition and lists it in the table!

So a Partition table can have two possible entries:-

- Up to 4 Primary Partitions.
- Up to 3 Primary Partitions and 1 Extended Partition.(Total not exceeding 4) .

Partition Boot Sector (PBR): This is the logical first sector, that is sector at the start of a Primary Partition. This is also 512 byte area, which contains some programs to initialize or run OS files. All Primary Partitions have its own PBRs.

Extended Boot Sector (EBR): This is the logical first sector, that is the sector at the start of the Extended Partition. This EBR contains a Partition Table, which lists the available Logical Partitions inside Extended Partition. That is it contains the Starting addresses of each Logical Partitions.

Logical Extended Boot Sector (LEBR): This is the logical first sector residing at the start of each Logical Partition. This is similar to PBR for Primary Partitions.

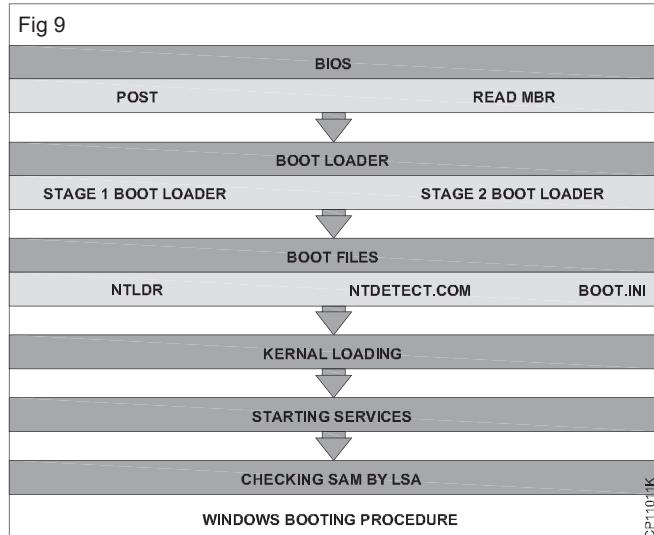
Booting

Booting is a process of loading the operating system (OS) and checking all the system software and hardware those are installed in the computer.

Booting procedure of Windows operating system

Functions of BIOS

The first process starts, when the computer switched on Basic Input Output System (BIOS) perform two functions, to conduct POST and read MBR (Fig 9).



POST - POST stands for Power On Self Test. POST checks all the hardware devices connected to a computer like RAM, hard disk etc and make sure that the system can run smoothly with those hardware devices. If the POST is a failure the system halts with a beep sound.

Now BIOS checks the **boot priority**. We can set the boot priority as CD drive, hard disk or floppy drive.

MBR - The next duty of BIOS is to read the MBR. MBR stands for Master Boot Record and it's the first sector on a hard disk. MBR contains the partition table and boot loader.

Functions of Boot loader

Now BIOS has passed the control to boot loader and boot loader is a small program which loads kernel to computers memory. Actually there are two stages of boot loaders, stage 1 boot loader and stage 2 boot loader.

The stage 1 boot loader is a link to the stage 2 boot loader. The stage 2 boot loader resides in the boot partition and it loads the kernel to memory.

Boot files and functions

There are three boot files in a Windows operating system and they are NTLDR, NTDETECT.COM and Boot.ini. The boot files are found in the active partition of hard disk and its normally C drive in a Windows machine.

NTLDR - NTLDR stands for NT Loader and it's the second stage boot loader. The path of NTLDR is C:\Windows\i386\NTLDR.

Boot.ini - Boot.ini contains the configuration files of NTLDR. When the operating system is loaded we cannot pass any arguments to kernel, so those arguments are passed through boot.ini. You can edit boot.ini by opening through notepad. The path of Boot.ini is C:\boot.ini.

NTDETECT.COM

This file detects hardware's and passes information to NTLDR. Using the collected information the NTLDR creates a hardware key and this key is used to detect hardware's.

A new hardware key is generated after each reboot of the operating system and that's why system asks to reboot after installation of a new hardware. The hardware keys created by NTLD.R can be found in Windows registry at HKEY_LOCAL_MACHINE\HARDWARES.

Kernel and its functions

After executing the functions of boot files the control is passed to Kernel. ntoskrnl.exe is the kernel file in a Windows machine and its path is C:\Windows\system32\ntoskrnl.exe.

Kernel acts as a layer between software and hardware. The library file hal.dll (C:\Windows\system32\hal.dll) helps Kernel to interact with hardware's. HAL stands for Hardware Abstraction Layer and this hal.dll file is machine specific.

Now the drivers for hardware's are loaded from the file C:\Windows\system32\config\system and the Kernel is loaded to primary memory.

Services and log in procedure

When kernel is loaded in the primary memory, services for each process is started and the registry entry for those services can be found at HKEY_LOCAL_MACHINE\System - Current control set - Services.

Winlogon.exe (C:\Windows\system32\winlogon.exe) is the last service started during this process. Winlogon.exe starts the log in procedures of windows machine. It first calls the library file msgina.dll (C:\Windows\system32\msgina.dll).

MSGINA stands for Microsoft Graphics Identification and Authentication and it provides the log in window. Now msginal.dll passes the control to LSA (Local Security Authority), it verifies the username and password from the SAM file. SAM (Security Accounts Manager) contains the information about all users created in a Windows operating system.

Now the booting procedure is over and it has reached the desktop of Windows operating system.

Voltage: Every electric charge is capable of doing work by moving another charge either by attraction or by repulsion. This ability of a charge to do work represents its potential. Voltage is generated by the separation of charges. Voltage or electric potential is the state of separated charges striving to neutralize each other. The unit of electric potential is volt. Potential difference is necessary to cause flow of electric current.

Methods of voltage generation: Voltage can be generated by several ways. Some methods of generating voltage are:

- Voltage from friction
- Voltage from moving magnets or coils
- Voltage from pressure or tension in crystals
- Voltage from heat
- Voltage from light

- Voltage from chemical reactions

Measuring voltage: Voltage exists between any two points with different levels of charge. Voltage between any two points can be measured using an instrument called VOLTMETER. Meters used to measure current is called Ammeter. There are meters which can be used to measure voltage and current and a few other electrical parameters like resistance. Such meters are called MULTIMETERS.

Types of voltage: As discussed in above paragraphs there are several sources by which voltage can be developed. Depending upon the voltage source, the voltage developed can be,

Direct voltage: It is of constant magnitude. It remains at the same amplitude from the moment it is switched ON till the moment it is switched - OFF.

Alternating voltage: In this type, voltage source changes its polarity regularly and therefore the direction of developed voltage.

A mixed voltage is a combination of direct voltage and alternating voltage. The level of voltage is not constant. It varies around a mean value.

Electric Current: Electric current is produced when electric charges move in a definite direction. This movement is not only of negative charges but also of positive charges. The strength of electric current is the quantity of charge which flows across a given cross section of a conductor every second. The unit of current strength is Ampere.

$$\text{Current strength} = \frac{\text{Quantity of charge}}{\text{time}}$$

Measuring current: Electric current is the flow of charge, in a conductor. So, to measure current must pass through the measuring device. The current measuring instrument is called the ammeter or the current meter. There are different types of ammeters used for measuring different quantities of current.

Types of current: Voltage causes electrical current to flow. If the cause of current flow is a direct voltage source, then the current caused by it is called direct current (d.c.). On the other hand, then the current caused is referred as the alternating current. If a mixed voltage AC and DC is applied to an electrical circuit, a mixed current (AC and DC) will flow through the circuit.

Types of power supply: Irrespective of how the electricity is generated, electricity can be classified into two types.

- Alternating current, generally known as AC supply.
- Direct current, generally known as DC supply.

AC supply: The term alternating current supply is given to a supply source that makes current to flow through a circuit which reverses or alternates its direction periodically.

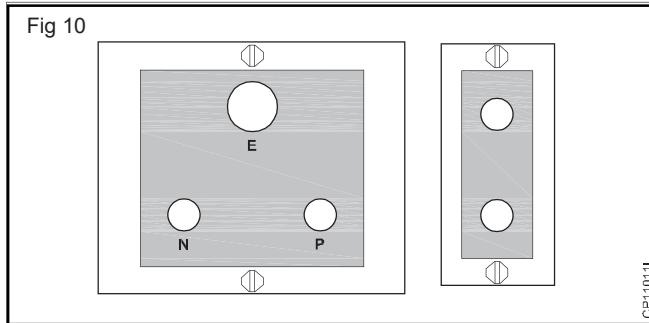
Advantages of AC supply

- Reduced transmission loss over long distances.
- Voltage levels can be changed using simple devices called transformers.
- Reduced severity of electrical shock.
- Generating equipments are simple and cheaper
- Can be easily converted to DC supply.

DC supply: The term direct current supply is given to a supply source that makes current to flow through a circuit in one direction only. Example of DC supply is batteries. Some types of generators are also designed to give d.c. supply. Such generators are called DC generators.

Low tension (LT) voltage: The domestic voltage of 240 volts AC (generated and supplied by hydro or Thermal or Nuclear generating stations) is called the low tension (LT) voltage. LT lines enters residential buildings from electricity poles called as service connection. This 240 volts is used to light up the lamps, run fans etc in homes. To connect electrical appliances at home, 240V AC is available in either two-pin or three - pin sockets. This LT voltage of 240 volts, 50Hz is also used to supply electrical and electronic gadgets such as Iron box, washing machine, personal computer etc.

Phase, Neutral and Earth points of LT supply: The domestic AC mains supply of 240V, 50Hz, is available at consumers residence either in a 2-pin outlet (Phase - Neutral) or in a 3-pin outlet (phase -Neutral and Ground). These are commercially referred to as 2/3 pin sockets. These sockets look similar to the ones shown in Fig. 10.



Phase: The line or phase point in a socket, can be termed as the point from where the electricity starts flowing into a closed circuit.

Neutral: The neutral point in the socket, can be termed as the point which receives electricity from the closed circuit.

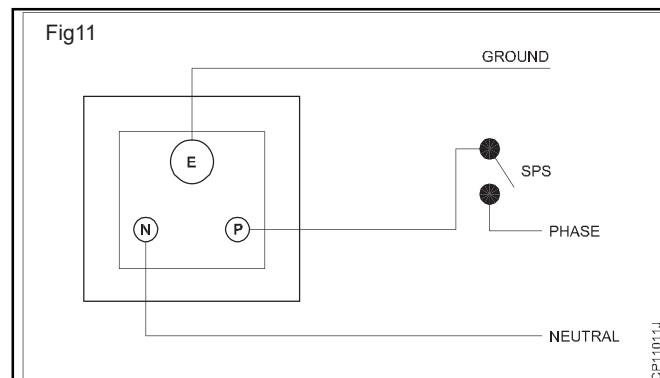
Earth / Ground: The ground (some call it Earth) point in an electrical socket provides the easiest path for the leakage current and other minor electrical defect currents of appliances.

Two pin mains sockets are used to supply main to such equipments or apparatus or gadgets generally having its cabinets/chassis made of plastic such as radio, tape

recorders etc., Hence such gadgets does not need earth pin/point on the socket.

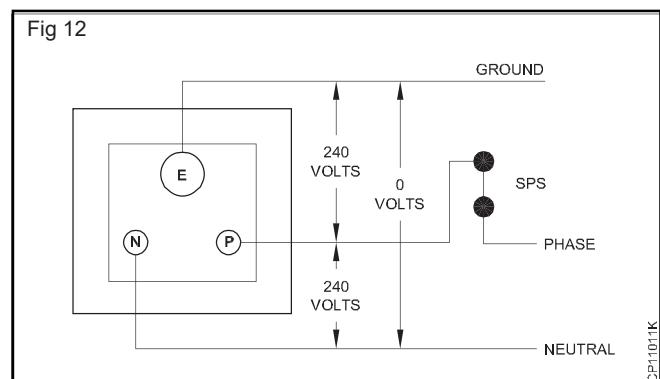
Iron box, washing machines, drill guns, Desk top computer invariably need sockets with provision of earth pin, because of the possibility of shock while using these equipments. Hence such equipments/gadgets make use of AC mains socket with earth.

Connection of 3-pin AC mains socket: Fig 11 shows how the main supply is connected to the socket.



Note that in a AC outlet be it a 2-pin or a 3-pin phase is always connected to the socket through a switch. This prevents the users from getting electrical shock when the switch is put in off position.

The standard voltage appearing across the 3-pin terminals is shown in Fig12



The voltages across the pins of the socket can be measured using an AC voltmeter or a multimeter in AC volts range.

As a quick test to find out whether or not a socket is delivering the AC supply as required, a simple instrument called line tester which looks similar to a small screw driver can be used. This instrument will have a small bulb in it which glows if it is touched to the phase pin in the socket. Ask your instructor to demonstrate the use of such line tester to check a AC mains socket.

Most Desk top computers need AC mains supply for its operation. Although the mains supply available in the 3-pin socket shown above can be used, mostly this AC supply is cleaned fro spikes before connecting to computers. The device used for cleaning the spikes in the mains AC supply are called Spike Arrestors or Spike busters.

Computers are used with spike busters because, AC spikes are likely to damage the costly computers. In addition to spike busters, most computers use other power safety devices called the voltage stabilizers and uninterrupted power supplies.

Power supply in computers: Power supply unit in computers are firmly fitted on the processing unit cabinet using torx screws. Generally there will be four such screws fitted to fix the power supply unit in the cabinet.

Windows Operating System

Objective: At the end of this exercise you shall be able to
 • list out the windows versions and features

Windows versions and its features

Microsoft Windows has seen nine major versions since its first release in 1985. Over 29 years later, Windows looks very different but somehow familiar with elements that have survived the test of time, increases in computing power and - most recently - a shift from the keyboard and mouse to the touchscreen.

Here's a brief look at the history of Windows, from its birth at the hands of Bill Gates with Windows 1 to the latest arrival under new Microsoft chief executive SatyaNadella.

Windows 1

The first version of Windows

This is where it all started for Windows. The original Windows 1 was released in November 1985 and was Microsoft's first true attempt at a graphical user interface in 16-bit.

Development was spearheaded by Microsoft founder Bill Gates and ran on top of MS-DOS, which relied on command-line input.

It was notable because it relied heavily on use of a mouse before the mouse was a common computer input device. To help users become familiar with this odd input system, Microsoft included a game, Reversi (visible in the screenshot) that relied on mouse control, not the keyboard, to get people used to moving the mouse around and clicking onscreen elements.

Windows 2

Windows 2 with overlapping windows.

Two years after the release of Windows 1, Microsoft's Windows 2 replaced it in December 1987. The big innovation for Windows 2 was that windows could overlap each other, and it also introduced the ability to minimise or maximise windows instead of "iconising" or "zooming".

The control panel, where various system settings and configuration options were collected together in one place, was introduced in Windows 2 and survives to this day.

Microsoft Word and Excel also made their first appearances running on Windows 2.

Windows 3

Windows 3.0 got colourful.

The first Windows that required a hard drive launched in 1990. Windows 3 was the first version to see more widespread success and be considered a challenger to

Apple's Macintosh and the Commodore Amiga graphical user interfaces, coming pre-installed on computers from PC-compatible manufacturers including Zenith Data Systems.

Windows 3 introduced the ability to run MS-DOS programmes in windows, which brought multitasking to legacy programmes, and supported 256 colours bringing a more modern, colourful look to the interface.

More important - at least to the sum total of human time wasted - it introduced the card-moving timesink (and mouse use trainer) Solitaire.

Windows 3.1

Windows 3.1 with Minesweeper.

Windows 1 and 2 both had point release updates, but Windows 3.1 released in 1992 is notable because it introduced TrueType fonts making Windows a viable publishing platform for the first time.

Minesweeper also made its first appearance. Windows 3.1 required 1MB of RAM to run and allowed supported MS-DOS programs to be controlled with a mouse for the first time. Windows 3.1 was also the first Windows to be distributed on a CD-ROM, although once installed on a hard drive it only took up 10 to 15MB (a CD can typically store up to 700MB).

Windows 95

Windows 95: oh hello Start menu.

As the name implies, Windows 95 arrived in August 1995 and with it brought the first ever Start button and Start.

It also introduced the concept of "plug and play" - connect a peripheral and the operating system finds the appropriate drivers for it and makes it work. That was the idea; it didn't always work in practice.

Windows 95 also introduced a 32-bit environment, the task bar and focused on multitasking. MS-DOS still played an important role for Windows 95, which required it to run some programmes and elements.

Internet Explorer also made its debut on Windows 95, but was not installed by default requiring the Windows 95 Plus! pack. Later revisions of Windows 95 included IE by default, as Netscape Navigator and NCSA Mosaic were popular at the time.

Windows 98

Windows 98, the last great DOS-based Windows.

Released in June 1998, Windows 98 built on Windows 95 and brought with it IE 4, Outlook Express, Windows

Address Book, Microsoft Chat and NetShow Player, which was replaced by Windows Media Player 6.2 in Windows 98 Second Edition in 1999.

Windows 98 introduced the back and forward navigation buttons and the address bar in Windows Explorer, among other things. One of the biggest changes was the introduction of the Windows Driver Model for computer components and accessories - one driver to support all future versions of Windows.

USB support was much improved in Windows 98 and led to its widespread adoption, including USB hubs and USB mice.

Windows ME

Windows ME was one to skip.

Considered a low point in the Windows series by many - at least, until they saw Windows Vista - Windows Millennium Edition was the last Windows to be based on MS-DOS, and the last in the Windows 9x line.

Released in September 2000, it was the consumer-aimed operating system twinned with Windows 2000 aimed at the enterprise market. It introduced some important concepts to consumers, including more automated system recovery tools.

IE 5.5, Windows Media Player 7 and Windows Movie Maker all made their appearance for the first time. Autocomplete also appeared in Windows Explorer, but the operating system was notorious for being buggy, failing to install properly and being generally poor.

Windows 2000

Windows 2000 was ME's enterprise twin.

The enterprise twin of ME, Windows 2000 was released in February 2000 and was based on Microsoft's business-orientated system Windows NT and later became the basis for Windows XP.

Microsoft's automatic updating played an important role in Windows 2000 and became the first Windows to support hibernation.

Windows XP

Windows XP still survives to this day.

Arguably one of the best Windows versions, Windows XP was released in October 2001 and brought Microsoft's enterprise line and consumer line of operating systems under one roof.

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It was based on Windows NT like Windows 2000, but brought the consumer-friendly elements from Windows ME. The Start menu and task bar got a visual overhaul, bringing the familiar green Start button, blue task bar and vista wallpaper, along with various shadow and other visual effects.

ClearType, which was designed to make text easier to read on LCD screens, was introduced, as were built-in

CD burning, autoplay from CDs and other media, plus various automated update and recovery tools, that unlike Windows ME actually worked.

Windows XP was the longest running Microsoft operating system, seeing three major updates and support up until April 2014 - 13 years from its original release date. Windows XP was still used on an estimated 430m PCs when it was discontinued.

Its biggest problem was security: though it had a firewall built in, it was turned off by default. Windows XP's huge popularity turned out to be a boon for hackers and criminals, who exploited its flaws, especially in Internet Explorer, mercilessly - leading Bill Gates to initiate a "Trustworthy Computing" initiative and the subsequent issuance of Service Pack updates that hardened XP against attack substantially.

Windows Vista

Windows Vista, arguably worse than Windows ME.

Windows XP stayed the course for close to six years before being replaced by Windows Vista in January 2007. Vista updated the look and feel of Windows with more focus on transparent elements, search and security. Its development, under the codename "Longhorn", was troubled, with ambitious elements abandoned in order to get it into production.

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It was buggy, burdened the user with hundreds of requests for app permissions under "User Account Control" - the outcome of the Trustworthy Computing initiative which now meant that users had to approve or disapprove attempts by programs to make various changes.

The problem with UAC was that it led to complacency, with people clicking "yes" to almost anything - taking security back to the pre-UAC state. It also ran slowly on older computers despite them being deemed as "Vista Ready" - a labelling that saw it sued because not all versions of Vista could run on PCs with that label.

PC gamers saw a boost from Vista's inclusion of Microsoft's DirectX 10 technology.

Windows Media Player 11 and IE 7 debuted, along with Windows Defender an anti-spyware programme. Vista also included speech recognition, Windows DVD Maker and Photo Gallery, as well as being the first Windows to be distributed on DVD. Later a version of Windows Vista without Windows Media Player was created in response to anti-trust investigations.

Windows 7

Windows 7 was everything Windows Vista should have been.

Considered by many as what Windows Vista should have been, Windows 7 was first released in October 2009. It was intended to fix all the problems and criticism faced by Vista, with slight tweaks to its appearance and a

concentration on user-friendly features and less "dialogue box overload".

It was faster, more stable and easier to use, becoming the operating system most users and business would upgrade to from Windows XP, forgoing Vista entirely.

Handwriting recognition debuted in 7, as did the ability to "snap" windows to the tops or sides of the screen, allowing faster more automatic window resizing.

Windows 7 saw Microsoft hit in Europe with antitrust investigations over the pre-installing of IE, which led to a browser ballot screen being shown to new users allowing them to choose, which browser to install on first boot.

Windows 8

Windows 8 focused more on touch than a keyboard and mouse.

Released in October 2012, Windows 8 was Microsoft's most radical overhaul of the Windows interface, ditching the Start button and Start menu in favour of a more touch-friendly Start screen.

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The new tiled interface saw programme icons and live tiles, which displayed at-a-glance information normally associated with "widgets", replace the lists of programmes and icons. A desktop was still included, which resembled Windows 7.

Windows 8 was faster than previous versions of Windows and included support for the new, much faster USB 3.0 devices.

The Windows Store, which offers universal Windows apps that run in a full-screen mode only, was introduced. Programs could still be installed from third-parties like other iterations of Windows, but they could only access the traditional desktop interface of Windows.

The radical overhaul was not welcomed by many. Microsoft attempted to tread a fine line between touchscreen support and desktop users, but ultimately desktop users wanting to control Windows with a traditional mouse and keyboard and not a touchscreen felt Windows 8 was a step back.

There were also too few touchscreens in use, or on offer, to make its touch-oriented interface useful or even necessary - despite the parallel rise of tablets such as the iPad, and smartphones, which had begun outselling PCs by the end of 2010.

Windows RT, which runs on ARM-based processors traditionally found in smartphones and non-PC tablets, was introduced at the same time as Windows 8 with the Microsoft Surface tablet.

It looked and felt like Windows 8, but could not run traditional Windows applications, instead solely relying on the Windows Store for third-party apps.

Windows 8.1

Windows 8.1 and the great reappearance of the Start button.

A free point release to Windows 8 introduced in October 2013, Windows 8.1 marked a shift towards yearly software updates from Microsoft and included the first step in Microsoft's U-turn around its new visual interface.

Windows 8.1 re-introduced the Start button, which brought up the Start screen from the desktop view of Windows 8.1. Users could also choose to boot directly into the desktop of Windows 8.1, which was more suitable for those using a desktop computer with a mouse and keyboard than the touch-focused Start screen.

Windows 10

With Windows 10, Microsoft is trying to keep some of the touch and tablet features it created for Windows 8, combine them with the familiar Start menu and desktop, and run it all on top of an improved operating system with more security, a new browser, the Cortana assistant, its own version of Office for on-the-go editing and plenty of new features intended to make life simpler.

Of course, that also means it's very different to use, whether you come from Windows 7, Windows 8 or Windows XP. You have to look in a new place even to turn your PC off.

On top of that, Windows 10 is more than just a PC operating system; it's also what will run on Windows phones - and on small tablets as well, because a 6-inch phone and a 7-inch tablet aren't such very different devices.

Microsoft is expecting people to put Windows 10 on a billion devices (which ought to encourage more app developers to at least take a look at building their apps for Windows phones and tablets, as well as for Xbox One and HoloLens).

The Start menu evolves

The full-screen Start screen of Windows 8 is back to being a Start menu in Windows 10 that tries to combine the best of both options. A scrolling Start menu that's restricted to a single column, with jump lists and flyout menus for extra options, divided into frequently used and recently installed programs, with the option to switch to a scrolling view of all the applications, sorted alphabetically.

Fig 1



Copa 13701

But also get an extra pane ,where can pin Windows 8-style tiles, complete with 'rotating 3D cube' animations of live tiles. drag the Start menu to be a larger size or even set it to be full screen.

Desktop Background

Another component of the Desktop is the Background. This is simply an image that appears at the back of the screen. Most computers come with a pre-selected background, but change it to any image.

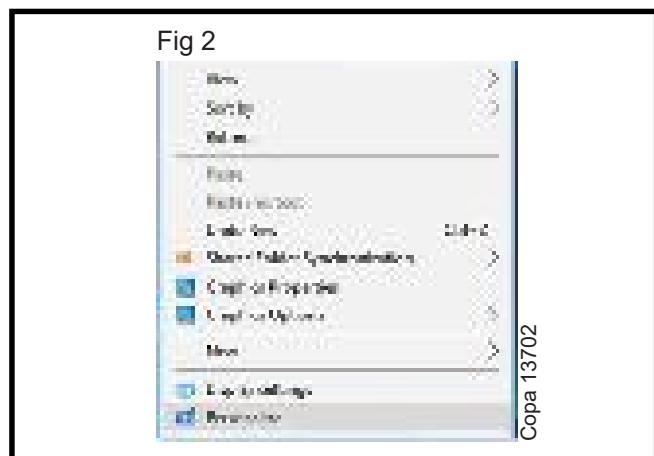
To change the background, follow these steps:

1. Right-click on the background and choose "Personalize"
2. From the Personalization window, choose from a series of pre-selected pictures or browse for your own.

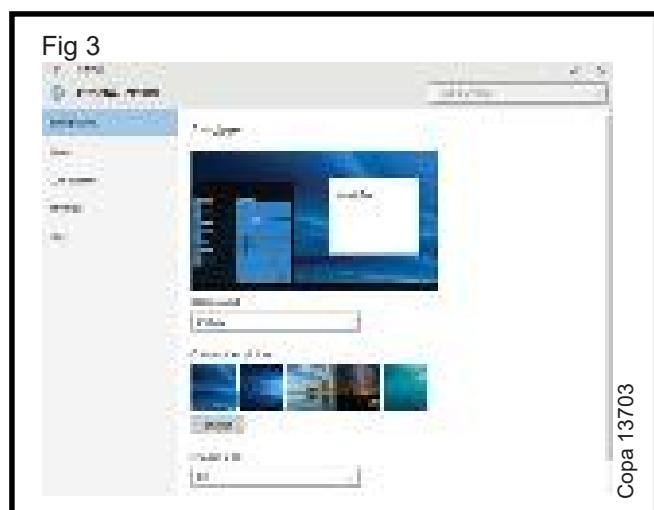
After choosing a picture, the Background will change automatically.

Start Menu

If looking for a specific application, open the Start Menu and click "All Applications". This will open an alphabetical



list of all the applications installed on computer.



File Explorer

If you are looking for a specific document, another

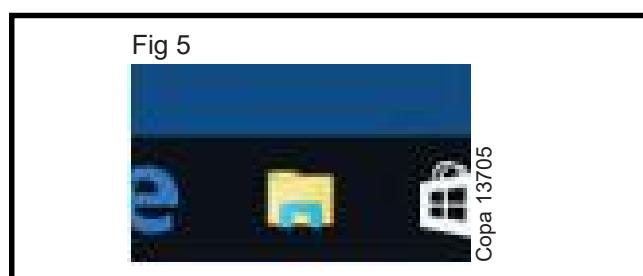
alternative is to use the File Explorer by clicking on the Folder icon on the Taskbar.

In the File Explorer window, browse all the folders and documents.

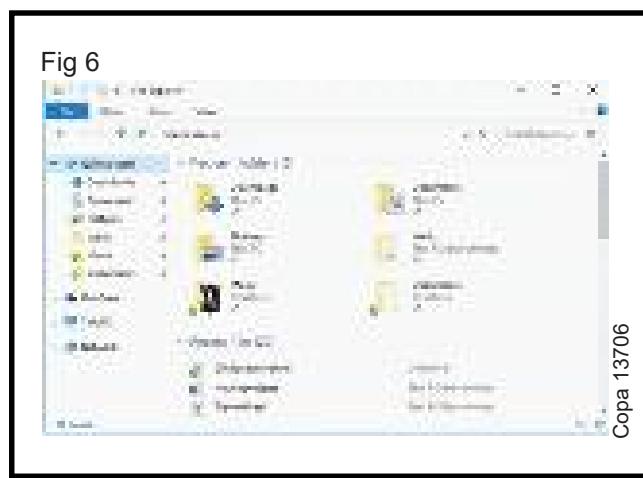


Virtual Desktops

One of the new features of Windows 10 is the addition of Virtual Desktops. This allows you to have multiple desktop screens where to keep open windows organized.



To add a virtual desktop, follow these steps:



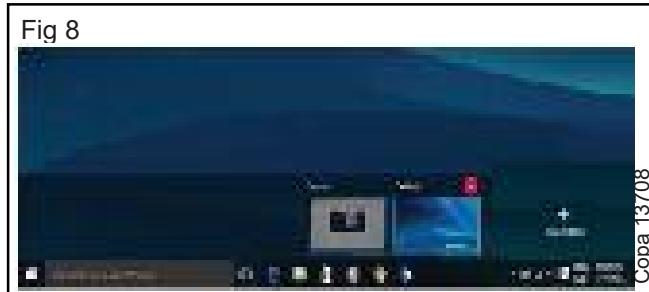
1. Click Task View on the Taskbar
2. Click the "New desktop" option on the lower-right corner. You can access or delete the new Desktop by clicking Task View again.

Cortana helps as with search and control

Cortana, the Windows Phone assistant, shows up in

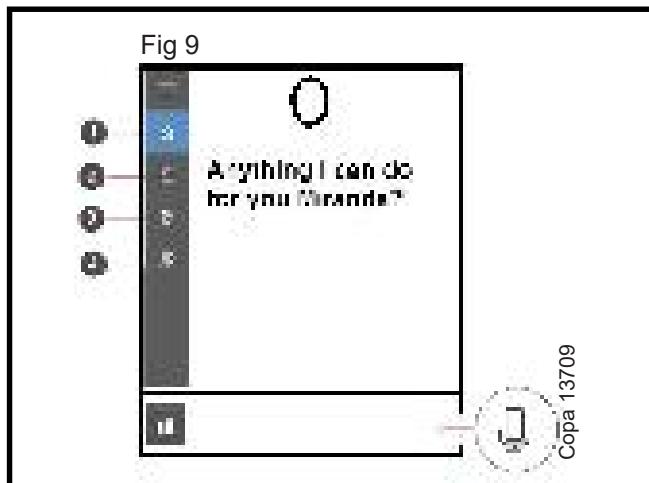


Windows 10 as a search pane on the taskbar, which can also trigger by saying 'Hey Cortana' - and when start searching the Start menu.



That gets the apps have installed, documents access to, apps could install from the Store, search results from the web and a range of other information - including from apps and services that integrate with Cortana.

Activating Cortana



If Cortana isn't active, can turn it on by typing "Cortana" in the Taskbar search to access the Cortana settings, or just clicking the "Gear" icon on the left-side of the menu.

After activating Cortana, it will start gathering information about to personalize the experience.

Task switcher

Most Windows users don't know the Alt-Tab keyboard



combination to see and switch between all running apps, so as well as having a redesigned task switcher with bigger



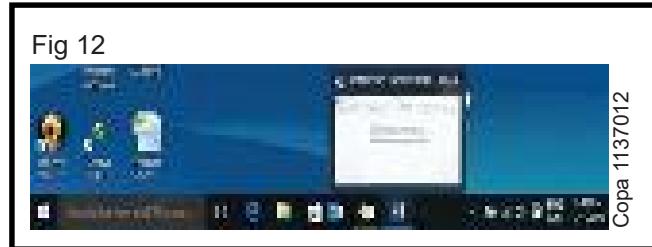
thumbnails, Windows 10 also puts a task view icon in the taskbar to help them find it.

TASKBAR

The Windows 10 taskbar sits at the bottom of the screen giving the user access to the Start Menu, as well as the icons of frequently used applications. On the right-side, the Taskbar features the Notification Area which informs the user of different things like the state of the Internet connection or the charge of the laptop battery.

The icons in the middle of the Taskbar are "pinned" applications, which is a way to have a quick access to

applications you use frequently. "Pinned" applications will stay in the Taskbar until you "unpin" them.



Pin an Application to the Taskbar

Step 1: Search for the application you want to pin in the Start Menu.

Step 2: Right-click on the application.

Step 3: Select "More" option at the top of the menu.

Step 4: Select the "Pin to taskbar" option.

Unpin an Application from the Taskbar

To "unpin" it, just right-click the icon in the Taskbar and select "Unpin from taskbar". You can "pin" it back again



any time you want.

Notification Area

The Notification Area is located at the right side of the



Taskbar. It shows different types of notifications from your computer like your Internet connection, or the volume level.

At first, the Notification Area shows a limited amount of icons. But you can click the upward arrow on its left-side to see other icons as well.

Snap Assist

Because all the apps and programs run in windows on the



desktop, instead of modern apps from the Store being in their own space, and can no longer drag across the left edge of the screen to bring another app on screen and get a split view. Instead, drag windows into the corners of the screen to get the familiar Snap view.

Now use all four corners of the screen if want each window to take up a quarter of the screen instead of half, and the space that isn't filled by the window you just dragged shows thumbnails of your other windows to make it easier to snap the next one into place.

Action Center

If we used Windows Phone 8.1 (or Android and/or iOS), we used to a notification centre can drag down from the top of the screen.

Windows 10 puts that on the right of the screen, where the charms bar was in Windows 8, with notifications from various apps at the top and the choice of various settings buttons at the bottom for quick access.

The command prompt

Those of us that use the command prompt have been stuck with pretty much the same experience since the 1990s, but in Windows 10 can finally resize the command prompt window and use familiar keyboard shortcuts to copy and paste at the command prompt.

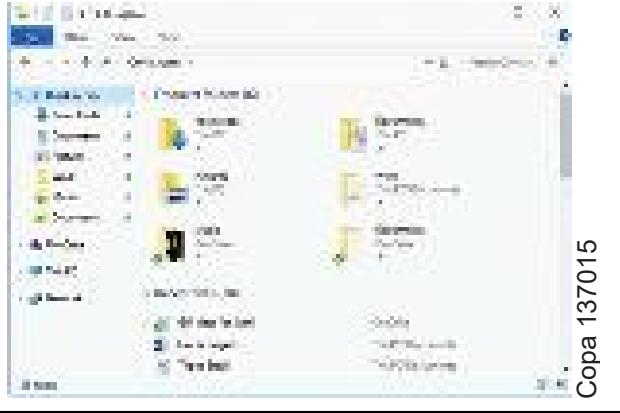
It's far from ground-breaking but it's a very welcome improvement after years of frustration.

FILE EXPLORER

File Explorer is the file management application used by Windows operating systems to browse folders and files. It provides a graphical interface for the user to navigate and access the files stored in the computer.

The main way to access the File Explorer is by clicking the folder icon in the Taskbar. After clicking the icon, the File Explorer window will open.

Fig 15



The initial File Explorer window is comprised of the following sections:

1. The **File Explorer ribbon**, which resembles the ribbon featured in Microsoft Office. The ribbon contains buttons for common tasks to perform with your files and folders.
2. The **Navigation Pane** gives you access to your libraries of documents and pictures, as well as your storage devices. It also features frequently used folders and network devices.
3. The **Frequent folders section** on the right features the folders you've worked with recently to allow for quick access to them.
4. The **Recent files section** in the lower part of the window features files and documents that you've opened recently.

The new Edge browser

To catch up with fast-moving browsers like Chrome and Firefox, Microsoft took its browser back to basics, ripping out years of code that didn't fit with web standards and making a lean, fast browser.

It's a work in progress - it won't get support for things like ad-blocking extensions until a while after Windows 10 launches - but can do plenty of neat things here. For example, and can scribble notes on a web page to send to a friend and Edge has Cortana built in to pull useful information out of web pages, like the phone number of a restaurant, or the opening hours.

Sites like Medium that didn't work properly with IE should look better and have more features in Edge.

Multiple desktops

User need to arrange a lot of windows and don't have multiple monitors, user can put them on multiple virtual desktops. And can use Alt-Tab to move between apps as usual and then Windows-Ctrl and the left and right arrow keys to move between desktops.

Schedule restarts

No more having Windows announce that you have fifteen minutes to get everything done before it restarts to apply an update. Instead of leaving Windows 10 to decide when to do that, if there's an update that will need a restart and can have Windows ask when you want to schedule that for.

user can only do that once the update has been downloaded. If user want to have certain times off-limits for restarts, they will need the features in Windows Update for Business (for Windows 10 Pro and Enterprise) which lets block restarts so they don't happen in working hours, or on certain dates.

Universal apps - including Office

Windows 10 gets a new Windows Store, where download desktop programs as well as modern Windows apps. Many of those apps will be universal apps that are the same code on a PC, a Windows phone, an Xbox One and even on HoloLens, with the interface changing to suit the different screen sizes. The Office for Windows apps like Word and Excel are universal apps, as are the Outlook Mail and Calendar apps.

Settings and control panel

The Windows 8 Settings app has taken over many more of the settings that used to be in Control Panel, and it has a Control Panel-style interface with icons to navigate with. But the old Control Panel interface is still there, for settings that aren't in the new Settings app (or if you're just used to finding things there).

Windows 10 - Keyboard Shortcuts

Like most Windows applications, there are several keyboard shortcuts you can use to make it easier or faster for some to perform certain tasks.

Most of the new Windows shortcuts use the Windows key () combined with other keys to perform several actions. The following are some of the most common or useful shortcuts used in Windows 10.

Keyboard Shortcuts for Navigating Windows 10

Press This	To Do This
Windows Logo	Toggle the Start menu
Windows Logo+A	Open the Notifications pane
Windows Logo+B	Activate the notification area's Show Hidden Icons arrow (press Enter to display the hidden icons)
Windows Logo+C	Open Cortana for voice commands
Windows Logo+D	Minimize all open windows to display the desktop
Windows Logo+E	Run File Explorer
Windows Logo+F	Display the Start menu and activate the Search box
Windows Logo+H	Display the Share pane
Windows Logo+I	Run the Settings app
Windows Logo+K	Display the Devices pane
Windows Logo+L	Lock your computer
Windows Logo+M	Minimize all windows
Windows Logo+O	Turn the tablet orientation lock on and off
Windows Logo+P	Display the Project pane to configure a second display
Windows Logo+Q	Open Cortana for voice commands
Windows Logo+R	Open the Run dialog box
Windows Logo+S	Open Cortana for keyboard commands
Windows Logo+T	Activate the taskbar icons (use the arrow keys to navigate the icons)
Windows Logo+U	Open the Ease of Access Center
Windows Logo+W	Activate the Search box
Windows Logo+X	Display a menu of Windows tools and utilities
Windows Logo+Z	Display an app's commands (although this works in only some Modern apps)
Windows Logo+=	Open Magnifier and zoom in
Windows Logo+-	Zoom out (if already zoomed in using Magnifier)
Windows Logo+,	Temporarily display the desktop
Windows Logo+Enter	Open Narrator
Windows Logo+Left	Snap the current app to the left side of the screen
Windows Logo+Right	Snap the current app to the right side of the screen
Windows Logo+Up	Restore a minimized app; maximize a restored app
Windows Logo+Down	Restore a maximized app; minimize a restored app
Windows Logo+PgUp	Move the current app to the left monitor
Windows Logo+PgDn	Move the current app to the right monitor
Windows Logo+PrtSc	Capture the current screen and save it to the Pictures folder
Windows Logo+Ctrl+D	Create a virtual desktop
Windows Logo+Ctrl+Right	Switch to the next virtual desktop
Windows Logo+Ctrl+Left	Switch to the previous virtual desktop
Windows Logo+Ctrl+F4	Close the current virtual desktop
Windows Logo+Tab	Open Task View, which displays thumbnails for each running app as well as the available virtual desktops

Handling printers

Objectives : At the end of this lesson you shall be able to

- explain about typewriter
- explain about printer
- explain types and cost of printers
- explain programming languages for printers
- explain how to locate printer driver files.

Typewriter

A typewriter is a mechanical or electromechanical device with keys that, when pressed, cause characters to be printed on a medium, usually paper as on Fig 1. Typically one character is printed per keypress, and the machine prints the characters by making ink impressions of type elements similar to the sorts used in movable type letterpress printing.

Fig 1



Fig 2



After their invention in the 1860s, typewriters quickly became indispensable tools for practically all writing other than personal correspondence. They were widely used by professional writers, in offices, and for business correspondence in private homes. By the end of the 1980s, word processors and personal computers had largely displaced typewriters in most of these uses.

Computer printer

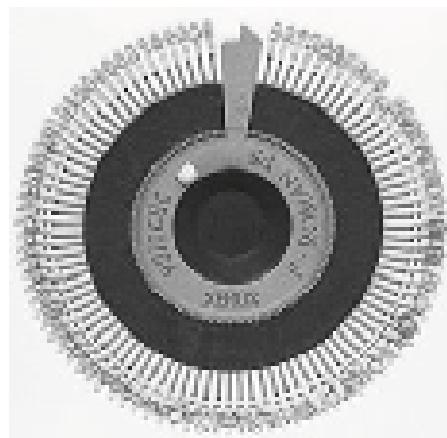
A printer is a piece of hardware for a computer as on Fig 2. It is a device that must be connected to a computer which allows a user to print items on paper, such as letters and pictures. It can also work with digital cameras to print directly without the use of a computer.

Types of printers

Today, the following types of printers are in regular use:

Daisy wheel printing is an impact printing technology invented in 1969 by David S. Lee at Diablo Data Systems as on Fig 3. It uses interchangeable pre-formed type elements, each with typically 96 glyphs, to generate high-quality output comparable to premium typewriters such

Fig 3



as the IBM Selectric, but two to three times faster. Daisy wheel printing was used in electronic typewriters, word processors and computers from 1972. According to Webster's, the daisy wheel is so named because of its resemblance to the daisy flower.

Dot-matrix printers are now almost extinct. They used a ribbon and made a lot of noise. There were models with 9 pins and models with 24 pins as on Fig 4. A dot matrix printer or impact matrix printer is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism on a typewriter.

Fig 4



Inkjet printing is a type of computer printing that creates a digital image by propelling droplets of ink onto paper as on Fig 5. Inkjet printers are the most commonly used type of printer, and range from small inexpensive consumer models to very large professional machines that can cost tens of thousands of dollars.

Fig 5



The concept of inkjet printing originated in the 20th century, and the technology was first extensively developed in the early 1950s. Starting in the late 1970s inkjet printers that could reproduce digital images generated by computers were developed, mainly by Epson, Hewlett-Packard (HP), and Canon. In the worldwide consumer market, four manufacturers account for the majority of inkjet printer sales: Canon, HP, Epson, and Lexmark, a 1991 spin-off from IBM.

The plotter is a computer printer for printing vector graphics as on Fig 6. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. It is now commonplace to refer to

Fig 6



such wide-format printers as "plotters," even though they technically are not.

Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are restricted to line art, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines.

Laser printing is a digital printing process that rapidly produces high quality text and graphics on plain paper. As with digital photocopiers and multifunction printers (MFPs), laser printers employ a xerographic printing process, but differ from analog photocopiers in that the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

A laser beam projects an image of the page to be printed onto an electrically charged rotating drum coated with selenium or, more common in modern printers, organic photoconductors. Photoconductivity allows charge to leak away from the areas exposed to light.

Dry ink (toner) particles are then electrostatically picked up by the drum's charged areas, which have not been exposed to light. The drum then prints the image onto paper by direct contact and heat, which fuses the ink to the paper.

Cost of printers

There are different costs with a printer. Printers that are more expensive to buy will usually be less expensive in the consumables (the ink, toner, or ribbon used by the printer). Therefore, laser printers are often more expensive to buy than inkjet printers, but are not expensive to use over a long period of time.

Inkjet printers on the other hand have a higher cost of consumables because the ink tanks they use are more expensive than the toner for a laser printer.

Laser printers that can print in color are usually more expensive than those that only print in black and white.

Other options, like being able to print on both sides of a sheet of paper, to automatically sort the output, or to staple the output will also make a printer more expensive.

Common programming languages for printers include:

- ESC/P
- Postscript
- PCL
- GDI
- HPGL and HPGL/2
- PDF
- VPS

How to Locate Printer Driver Files

Printers can be connected to a computer by a variety of wired and wireless methods, but all printers require drivers to be installed on a computer. The printer drivers are small programs that help communicate information from the operating system to the printer.

Driver errors can make the printer unusable. Using the Windows device manager, you can look up details about the drivers as well as pinpoint their physical location on your hard drive.

Scanner

A scanner is an electronic device which can capture images from physical items and convert them into digital formats, which in turn can be stored in a computer, and viewed or modified using software applications.

Different types of scanners are available with different resolutions. In the world of electronic data transmission, scanning is considered to be the most cost-effective and reliable way of transmitting images.

The basic principle of a scanner is to analyze an image and reproduce it to a digital one using the optical character recognition techniques.

Fig 7



Copa 110107

Prominent features of a scanner include:

- Reliability - Unlike certain forms of data transmission, scanning involves only transfer of hard images to digital forms. The role of the end-user is limited in case of scanning. And as they are not dependent on two-way communication, they can also help in storing important information or transmitting important information.
- Efficiency - Modern scanners are built for efficiency and speed. And it comes with ease of use as well as convenience.
- Quality - Scanning ensures the best resolution possible for digital images. Compared to fax machines, which may find it difficult to reproduce the accurate details, scanners can reproduce images with high resolution and precision. They are quite useful for photography and engineering arenas.
- Cost saving - One of the biggest advantages of scanning is the replacement of physical files/forms with digital ones. Along with saving physical space, which has to be used for storage, there are also environmental benefits by using scanner.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

The Basic Input/Output System (BIOS), also known as System BIOS, ROM BIOS or PC BIOS is a generally accepted standard defining a firmware interface.

The fundamental purpose of the BIOS is to initialize and test the system hardware components and load an operating system from a mass memory device. The BIOS is special software that interfaces the major hardware components of the computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM. The BIOS is a firmware (software instructions permanently recorded on a chip located on your motherboard). (Refer Fig.1).



Functions of BIOS

The BIOS software has a number of different roles, but its most important role is to load the operating system. The BIOS checks and initializes the PC hardware each time the system powers up or restarts before handing over control to the operating system. Some of the other common tasks that the BIOS performs include:

- A power-on self-test (POST) for all of the different hardware components in the system to make sure everything is working properly
- Activating other BIOS chips on different cards installed in the computer - For example the graphics cards often have their own BIOS chips.
- Providing a set of low-level routines that the operating system uses to interface to different hardware devices. They manage things like the keyboard, the screen, and the ports, especially when the computer is booting.

- Managing a collection of settings for the hard disks, clock, etc.

CMOS Setup

The first thing the BIOS will do is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed.

Configuring BIOS

The BIOS checks the CMOS Setup for custom settings. To change the CMOS settings we need to enter the CMOS setup. To enter the CMOS Setup, a certain key or combination of keys must be pressed during the initial startup sequence. Most systems use "Esc," "Del," "F1," "F2," "Ctrl-Esc" or "Ctrl-Alt-Esc" to enter setup. There is usually a line of text at the bottom of the display that tells "Press ___ to Enter Setup."

The BIOS setup shows a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

- System Time/Date - Set the system time and date
- Boot Sequence - The order that BIOS will try to load the operating system
- Plug and Play - A standard for auto-detecting connected devices; should be set to "Yes" if your computer and operating system both support it
- Mouse/Keyboard - "Enable Num Lock," "Enable the Keyboard," "Auto-Detect Mouse"...
- Drive Configuration - Configure hard drives, CD-ROM and floppy drives
- Memory - Direct the BIOS to shadow to a specific memory address
- Security - Set a password for accessing the computer
- Power Management - Select whether to use power management, as well as set the amount of time for "standby" and "suspend"

- Exit - Save your changes, discard your changes or restore default settings.

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium or Ni-Cad battery can supply enough power to keep the data for years. Major BIOS manufacturers include American Megatrends Inc. (AMI), Phoenix Technologies, Winbond etc. A typical BIOS screenshot is shown in fig. given below.(Refer Fig.2)



Installing the Windows operating System

A hard disk needs to be partitioned (though not mandatory) and formatted before you can store data on it.

Partitioning

A partition, sometimes also called a volume, is an area on a hard disk that can be formatted with a file system and identified with a letter of the alphabet. For example, drive C on most Windows computers is a partition. the first three partitions you create are primary partitions. These can be used to start an operating system. If you want to create more than three partitions, the fourth partition is created as an extended partition.

An extended partition is a container that can hold one or more logical drives. Logical drives function like primary partitions except that they cannot be used to start an operating system.

Many computers are partitioned as a single partition that equals the size of the hard disk. Partitioning a hard disk into several smaller partitions is not required, but it can be useful for organizing data on your hard disk.

Creating more than one partition has the following advantages:

- Separation of the operating system (OS) and program files from user files.
- Having a separate area for operating system virtual memory swapping/paging.
- Keeping frequently used programs and data near each other.

- Use of multi-boot setups, which allow users to have more than one operating system on a single computer. For example, one could install Linux and Microsoft Windows or other operating systems on different partitions of the same HDD and have a choice of booting into any operating system at power-up.
- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected.
- Raising overall computer performance on systems where smaller file systems are more efficient.
- Partitioning for significantly less than the full size available can reduce the time for diagnostic tools such as checkdisk to run.

Formatting

Disk formatting is the process of preparing a data storage device such as a hard disk drive, solid-state drive or USB flash drive for initial use. It is the act of creating a file system on a volume, so that the operating system can store and retrieve data on that volume.

Formatting of a disk is of two categories:

- 1 Low-level formatting (i.e., closest to the hardware) marks the surfaces of the disks with markers indicating the start of a recording block. It also provides information about block checks done for future use by the disk controller to read or write data. This is intended to be the permanent foundation of the disk, and is often completed at the factory. A hard disk needs to be partitioned and formatted before you can store data on it
- 2 High-level formatting creates the file system format within a disk partition or a logical volume. This formatting includes the data structures used by the OS to identify the logical drive or partition's contents. This may occur during operating system installation, or when adding a new disk.

Installing the Windows operating System

The three basic types of windows installation procedures are as follows:

- Install on a brand new disk or computer system
- Erase the disk, format it, and install.
- Install into a new directory for dual-booting

For the first two methods, it must be ensured that the computer can boot from a DVD or any other removable drive. To do this the drive boot order needs to be changed in the BIOS. The latest Windows DVDs are bootable and run the Setup program automatically. Then the installation can be done by following the procedure step by step as indicated on the subsequent screens as in trade practicals.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

Format a hard drive

Fig 1



Copa 110101

There are many reasons why it is required to format a hard drive, such as to install Windows fresh, to get rid of a virus or malware or simply because a pc is refreshed or cleaned up on selling.

The process can be different depending on whether it's an only hard drive and whether there is a spare PC or not.

It cannot be formatted, the hard drive on which Windows is running. In order to do this, it is in need to boot the PC from a Windows installation disc, a USB flash drive or another bootable disc.

Format a disk?

Formatting is the process of deleting all the data on the hard drive, but beware of 'Quick Format' which leaves all data in place and makes the drive appear to be empty. A quick format is ok if there is a brand new hard drive, or need to reinstall Windows, but not if its disposing of the disk or giving it to someone else.

A word of warning: make sure to have successfully backed up any photos, videos, music and other documents from the drive before formatting it. Although deleted files can be recovered in some situations, prevention is always better than cure.

Format hard drive partitions

It's important to understand about partitions before getting started. A hard drive can be divided up into smaller sections, called partitions. It's possible to format one partition while leaving the others untouched.

If it is required to format the entire hard drive and use the entire capacity in one block, delete the partition information.

Format a hard drive from the BIOS?

Many people ask how to format a hard disk from BIOS. The short answer is no.

If it is required to format a disk and you can't do it from within Windows, create a bootable CD, DVD or USB flash drive and run a free third-party formatting tool.

One option is Darik's Boot and Nuke (DBAN), which is free for personal use. This program will totally erase and format your hard disk, allowing for a clean install of a new OS, but the process cannot be undone.

Fig 2



Copa 110102

DBAN is supposedly only able to create a bootable CD/DVD-R, but if don't have any blank discs or a burner, there is a workaround available in the form of a separate third-party program.

Universal USB Installer will quickly and easily convert the DBAN ISO image downloaded to run from a bootable USB. Simply insert a blank USB flash drive, run the Universal USB Installer setup program, and follow the prompts.

It will ask to scroll through and pick the Linux Distribution want to install to USB (in this case, the latest version of DBAN), followed by its location on the computer and the letter of the USB drive like to install it to.

Once that information is complete, click create.

Fig 3



To boot from this USB drive rather than usual boot device (in most cases, this would be the hard drive), it have to be changed some settings in the BIOS.

In the BIOS, navigate to the boot order settings, and change the primary boot device to the USB drive (it shouldn't need to be plugged in to make this selection). After saved the settings and exited the BIOS, insert the bootable USB, restart the computer.

Fig 4



The PC should automatically boot the DBAN software, which will guide through the process of erasing the hard drive, with options for different levels of data-wiping.

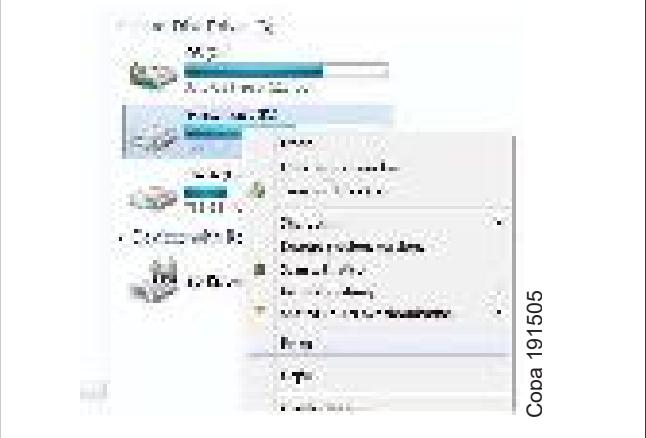
It will treat the USB as another drive so to avoid inadvertently wiping that as well, remove it after booted into DBAN.

Quick format a hard drive?

Yes, but don't use this method if want the data to be permanently erased. A quick format doesn't delete the data but instead erases only the pointers to the files.

Windows Vista, 7, 8 and 10 have a built-in Disk Management tool (see below), but the fastest way to format a hard drive is to click the Start button, then Computer and right-click on the hard drive to wipe. It can't be formatted the drive on which Windows is installed for obvious reasons.

Fig 5



By default Quick Format is checked, and choose the file system and allocation unit size as well as changing the volume label (the drive's name). Typically, leave all settings unchanged and click the Start button. In under a minute the hard drive will be formatted.

Fig 6



Choose NTFS as the file system if it isn't already selected for Windows Vista, 7, 8 or 10 and ensure the Allocation Unit Size is set to 'Default Allocation Size'.

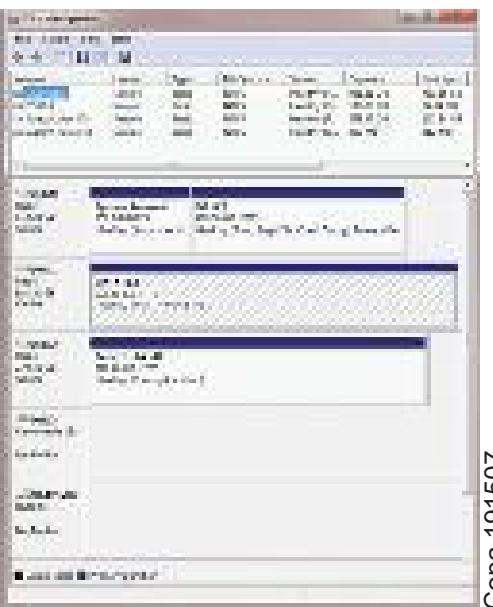
Using the Disk Management tool

Type diskmgmt.msc or Disk Management into the search box in Vista, 7, 8 or 10 and then click on only result that appears in the menu above, with the same name.

This is the easiest way to launch Disk Management, but also find it in the Control Panel if search for 'disk' and select the 'Create and format hard disk partitions'.

Disk Management isn't as powerful as a standalone partition management tool, but it is still capable of formatting data.

Fig 7



Copa 191507

If it is to install a new (additional) hard drive in a PC, it might be a thing to wonder why it doesn't appear in Windows Explorer. The reason is because it needs to be initialised and formatted -which can be done in Disk Management.

When the tool loads, it will analyse all of the computer's drives and will prompt to initialise a new disk that it finds.

Fig 8



Copa 191508

If the disk is larger than 2TB, opt for GPT (GUID Partition Table). This setting also lets to create more than four partitions.

If don't see a prompt, look in the list of drives and see one that says 'Not Initialized'. Right-click on it and choose Initialize Disk.

Once that's done, right-click in the hatched Unallocated space and choose New Simple Volume...

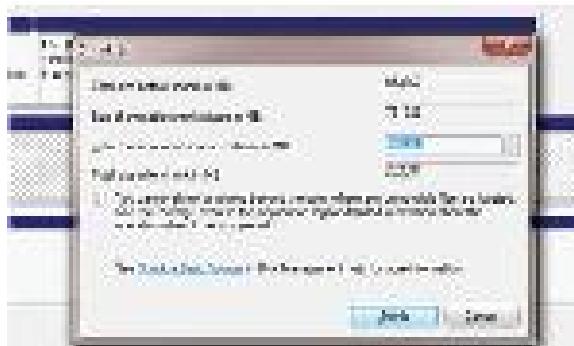
Follow the instructions, choosing how big to want the partition to be (in MB - 1024MB = 1GB), and which drive letter to assign (one will be chosen, but can opt to change it if desired).

If select a size for the partition that's smaller than the total capacity of the drive, say 500B on a 1TB drive, end up with some unallocated space on the drive which can format by repeating the process just completed.

change partition size

Disk Management can be used to expand or shrink a partition. Simply right-click on one and choose the appropriate option from the menu that appears. If shrinking, the partition will be checked to find out how much empty space it contains.

Fig 9



Copa 191509

It's a little confusing as the numbers are displayed in MB rather than GB, but it can be adjusted the amount of space to shrink and the 'Total size after shrink' will be updated, also can't shrink a partition beyond the point where files are located - it may be able to free up space by defragmenting the drive first.

Conversely it can only expand a partition if there is unused space on the drive. If not, the option will be greyed out.

Resetting Windows

If PC is having problems and the user don't wish to lose the personal files by wiping the hard drive, then it might want to refresh or reset the PC which can be done in Windows 8 and 10.

If user looking to keep your personal files and settings, but want to have a fresh Windows install, itsall want to refresh the PC.

Do note that a refresh will remove all programs and apps installed on the machine, but will keep the Windows-default programs intact.

A reset reinstalls Windows and deletes all files, settings and programs, it is suggested performing this if have previously backed up all the files and don't mind transferring user's personal files.

Windows 10 has a slightly different approach and might confuse those coming from Windows 8. Microsoft removed the refresh option and has instead combined the refresh and reset options into one setting.

Fig 10



Copa 1915010

To find the option, open the Start Menu, click on Settings > Update & security > Recovery > Get started (under the Reset this PC option).

Upon selecting the option, it will present with three separate options:

- Keep my files
- Remove everything
- Restore factory settings (not available on all PCs)

'Keep my files' saves personal files but deletes user settings, drivers and programs, whilst also reinstalling Windows 10.

'Remove everything' also gets rid of personal files and 'Restore factory settings' does the same actions as 'Remove everything', but also resets the PC to the version of Windows which came with the machine.

This option will only be available to those who bought a pre-built PC or laptop which came with Windows already pre-installed.

Troubleshooting computer

Objectives: At the end of this lesson you shall be able to

- state the basic steps involved in troubleshooting a PC
- explain the basic approach to solve a problem
- list the probable defects and symptoms in a faulty Computer
- analyse the causes for the complaints
- state the shortest path for servicing the defects.
- list the probable defect and symptoms in the faulty Computer
- analyse the causes for the complaint “When windows is started, system runs surface test and goes to safemode” with the help of a Problem Tree and TSC

Basic Troubleshooting

One of the difficulties while troubleshooting problems on a PC is that in most cases they are not what they seem. The cause behind a frequent hanging of a PC may be due to one of six or more well defined areas or a dozen of unidentified problems. The problem could be due to software or hardware. Even with years of experience and training, PC technicians come out with troubleshooting procedures that do not solve the real problem. For example a personal computer running windows operating system with several i/o cards connected may freeze the screen , mouse, and keyboard and take as long as 3 minutes before responding. After trying out with all the options like replacing a memory module, installing new parallel port and NIC drivers, the technician finally checks the system logs to find that a vital operating system library was corrupted and needed to be reinstalled. The issue to be mentioned here is that if the technician used a systematic approach to troubleshooting, the problem would likely have been solved much sooner. Maintaining a good troubleshooting plan certainly gives us the scope to approach the problem in a more systematic and scientific manner. A troubleshooting plan is nothing but a written check list that we use for any problem. The elements that should be included in any troubleshooting plan are as follows

- Maintenance record
- Identification of possible causes
- Identification of possible solutions
- Application and testing of solutions
- Follow-up

In the maintenance record, record the hardware installed in the PC when it is installed, all preventive maintenance activities, all software updates or additions, and all hardware installations and upgrades. Further any problems that occur and the actions you take to resolve them should be recorded . when it comes to troubleshooting a PC, with the maintenance record one can pin down a problem and devise solution for it. The first entry in such record should be a profile of the PC, which includes its configuration, operating system, and the date each component was installed.

Such tables gives an idea of the type of information one should include in the sytem configuration, as summerised below:

- The processor's make, model and speed.
- Amount of system memory(RAM) and the memory module type, size and configuration of the memory
- Hard disk size and the type of interface
- Make, model and speed of the compact disk (CD) or digital versatile disk (DVD) drive
- Memory size of the video or graphics adapter
- Make, model, type and speed of the modem
- The version number of the operating system
- A list of software applications installed on the PC
- A list of peripheral equipment attached to the PC, indicating the port to which they are attached

The maintenance record should be updated each time any maintenance work is carried over on the PC. Any time new or replacement hardware is installed, record the activity and update the system configuration. The activity entries should include

- Date of the activity or changes made to the system
- The make, model and serial number of any hardware removed or added to the PC
- The name, version and publisher of any software added to the PC
- Detailed information on any configuration changes made to the basic input/output system(BIOS) or other configuration for the new device or software.

Troubleshooting approach

For solving any problems associated with PC, first go through the maintenance record of that PC and follow a systematic procedure for isolating the problem. The standard problem solving process includes the following steps

Identify the problem: This is the most difficult part of the process. To perform this step successfully collect all the data about the problem

Identify possible causes: analyse all the symptoms of the problem and try to list all the causes in order from the most likely to the least likely.

Identify possible solutions: identify solutions for each of the causes that are identified. A possible cause could have more than one possible solution.

Analyze the possible solutions: if two solutions produce the same result, consider the one which is more economic and apply the same.

After following the above steps and on solving the problem update the maintenance record and make necessary entries into it. In some cases the problems may be very clear and the solution is very transparent and even in such cases try to follow the above mentioned steps to make it a practice to follow the systematic approach. Whenever a problem occurs with a PC, while following the steps, try to collect the information about the system by answering questions such as

- Under what circumstances this problem cropped up?
- Were there any indications in the form of beep codes/ error messages or any clear symptoms?
- What softwares were active when the problem happened?
- Has it happened for the first time or occurred in the past also?
- Were there any configuration changes made during the session that required a restart that was not performed?

Optimizing the PC:

APC which was functioning absolutely well and developed a symptom of slowing down or if it is unable to keep pace with the demands of newer software, one of the possible solutions is to consider updating or optimizing the PC to enhance its performance. Optimization steps may cost money , but many involve software you already own or software readily available on the web.

Optimizing the BIOS and Boot process:

BIOS setup configuration includes many settings in the CMOS. How quickly the system boots and performs depends on the these settings. Enabling of valuable features such as system caching or using the quick POST process are very vital for optimum performance.

Optimizing the hard disk: Windows ScanDisk and Disk Defragmenter utilities are the best tools available for optimizing the hard disk in terms of usage and access speeds. ScanDisk is used to check a disk for errors and repair them or remove unrecoverable areas of the disk from the usage tables to prevent future errors. Similarly Disk Defragmenter organizes data file fragments into a more optimized and logical format that provides for faster access times and less head movement.

Optimizing the Expansion cards: The best way to optimize I/O controllers and other expansion cards is to install them in the correct order. No harm is done even if

they are installed out of order, but there is some benefit to be gained from putting them in the proper sequence. On a Pentium system, use PCI cards and avoid ISA cards, if possible. All I/O adapters including video cards, sound cards, NICs, modems and SCSI adapters are available for the PCI expansion bus. Consult the motherboard documentation and install video card in the first PCI slot, followed by the NIC, modem, and sound card, in that order.

Optimizing the processor: One can speed up the processor in the following ways

- Replace it with a faster speed or higher level processor
- Use a utility from the processor manufacturer to apply patches or fixes to the processor's logic
- Overclock the processor

The requirement for replacing the processor with a higher level or faster processor is that your motherboard and chipset will support the new processor both logically and physically. Logically the chipset and motherboard must support the bus speed of the processor and have the supporting circuits it requires. It is often much better to replace the complete motherboard. Some times the manufacturer of the processor may release some utilities that will improve some aspect of processor's capabilities such as video processing, buffer handling, caching and other processor based functions. Overclocking a processor means running a processor at speeds faster than it was released to support. Most processors are capable of running at speeds higher than their nominal speeds. The nominal speed of a processor is the speed at which it has been tuned to run with a certain chipset, motherboard, cooling system, and other components of the PC. Raising the speed of the processor can create heating problems on the processor and lead to frequent system lockups, memory problems and other issues.

Troubleshooting sources of Non-software problems:

Any time pc fails for no apparent software reason, check the following areas

- Ensure proper AC power
- Scan the PC for a computer virus
- Ensure that CPU fan is spinning
- Ensure proper connections of external I/O connectors
- Reseat the expansion cards and check the power and data cables of internal devices
- Most of the boot problems are the result of a recent change, check out the BIOS setup configuration data
- To install any new hardware or software, visit manufacturer's web site for any known conflict or incompatibility
- Check for any resource conflict if any new hardware or software is installed.

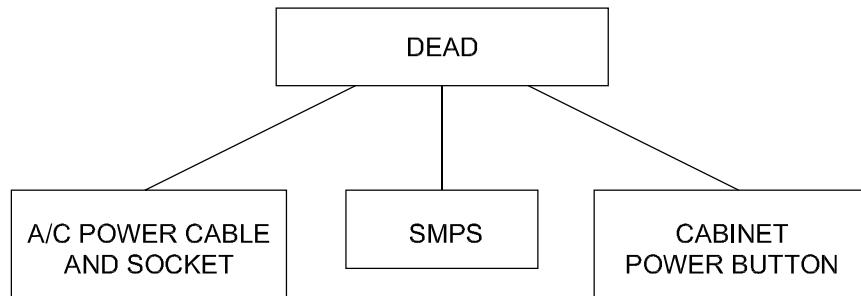
The forth coming lessons on Troubleshooting PC are provided with Problem Trees for different type of problems which a user face normally. Each Tree with a specific

problem gives scope to analyse the areas to be suspected or looked into for fixing the problem. This lesson includes a Problem Tree for a PC which is Dead with no display on monitor.

PROBLEM TREE : PT- 01

Observed symptom : Dead

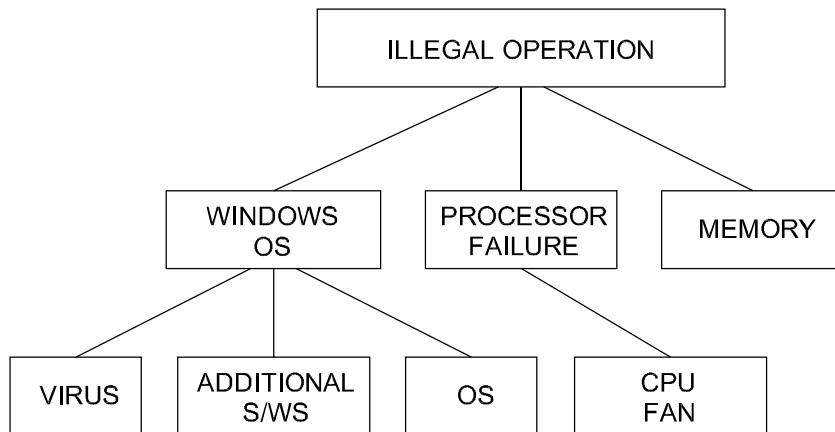
Additional symptom : No display



PROBLEM TREE : PT- 02

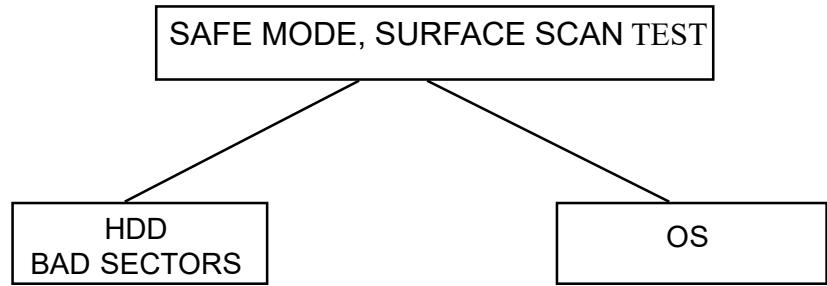
Observed symptom : Windows shows “illegal operation”

Additional symptom : Windows not working



Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”.

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

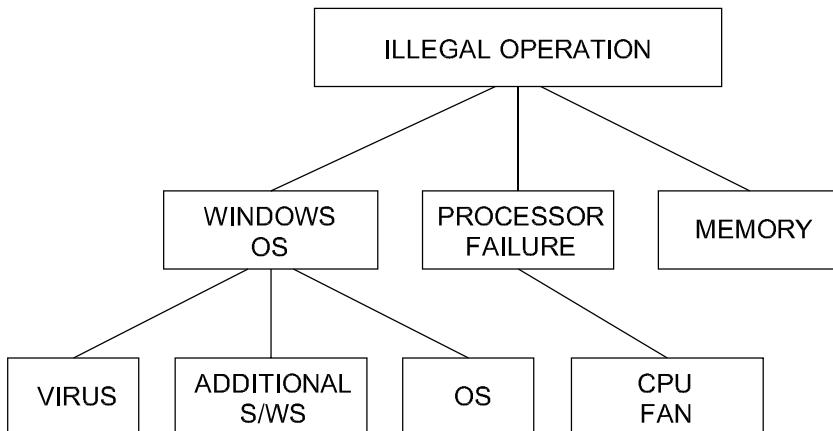


Discuss the Troubleshooting chart (TSC-01) and Service flow sequence (SFS-01) for the complaint “When windows is started system runs surface test and goes to safemode” referring to exercise 2.33

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 02

Observed symptom : Windows shows “illegal operation”
Additional symptom : Windows not working

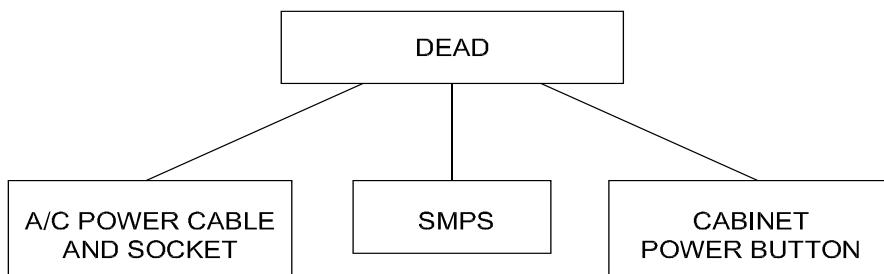


Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 03

Observed symptom : DVD drive can't read
Additional symptom :



Application softwares

Objective: At the end of this lesson you shall be able to

- describe various software types.

Application software

Application software is a term which is used for software created for a specific purpose. It is generally a program or collection of programs used by end users. It can be called an application or simply an app.

In fact all the software other than system software and programming software are application software.

Application software definition

A software which is developed to help the user to perform specific tasks is called application software.

The different types of application software include the following:

Application Software Type	Examples
Word processing software	MS Word, WordPad and Notepad
Database software	Oracle, MS Access etc
Spreadsheet software	Apple Numbers, Microsoft Excel
Multimedia software	Real Player, Media Player
Presentation Software	Microsoft Power Point, Keynotes
Enterprise Software	Customer relationship management system
Information Worker Software	Documentation tools, resource management tools
Educational Software	Dictionaries: Encarta, Britannica Mathematical: MATLAB Others: Google Earth, NASA World Wind
Simulation Software	Flight and scientific simulators
Content Access Software browsers	Accessing content through media players, web
Application Suites	OpenOffice, Microsoft Office
Software for Engineering and Product Development	IDE or Integrated Development Environments

There are various different types of application software such as licensed, sold, freeware, shareware and open source.

Application software's either need to be installed or can run online. Application software's can also be distinguished on the basis of usage into the following:

- Utility programs
- Generic programs
- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software
- Database software
- Presentation software
- Internet Browsers
- Email Programs
- Graphic Programs (Pixel based)
- Graphic Programs (vector based)
- Communication software: Communication through audio, video or chat based means

Bluetooth devices

Objectives : At the end of this lesson you shall be able to

- describe the meaning of Bluetooth
- describe the method of using Bluetooth
- list the major applications of Bluetooth.

Introduction:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the range 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). It is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device.

It can connect up to eight devices (items of electronic equipment) at the same time. The chip can be plugged into items such as computers, digital cameras, mobile phones and faxes. Bluetooth is particularly convenient in certain situations - for example, when transferring files from one mobile phone to another without cables. Sending music and photos between a PC and a mobile phone is another useful application.

Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a quasi optical wireless path must be viable.

Range is power-class-dependent, but effective ranges vary in practice varying from 10 to 100 m.

The name 'Bluetooth' reflects the Scandinavian origins of the technology. It is named after a 10th century Danish viking, King Harald Blåtand (translating as 'Bluetooth' in English). He united and controlled Denmark and Norway, hence the association of uniting devices through Bluetooth.

Using Bluetooth

To use Bluetooth, the device must be Bluetooth enabled. For this purpose a device called "Dongle" may be used. A dongle is a device that plugs into the computer to enable it to use Bluetooth. Every manufacturer of compatible devices will have their own instructions for accessing Bluetooth. For detailed instructions you will need to see the manual, but as a general guide:

To set up Bluetooth:

(Identify the blue tooth icon on devices.)

- 1 Turn on, or enable, Bluetooth. Ensure your device is 'visible' and not 'hidden', so other nearby devices can pick up the signal.
- 2 Give your device a name to identify it when connecting to other compatible equipment.

When devices like mobile phones, laptops, tablets etc. enable Bluetooth the Bluetooth icon is on.

To establish a Bluetooth connection:

- 1 Find the file you wish to send.
- 2 Select the option to send it via Bluetooth - your device will search for other devices within range and display them.
- 3 Scroll to the device you wish to connect with and select it.
- 4 If the other device needs 'pairing', you will need to enter a passcode - a bit like a PIN number - and make sure it is entered on the other device.

When the connection is established, the data will start to send. You do not need worry about a clear line of sight between devices.

List of Bluetooth applications

Some of the Bluetooth applications are as follows:

Wireless control of and communication between a mobile phone and a handsfree headset.(Refer fig. 1)



Fig 1

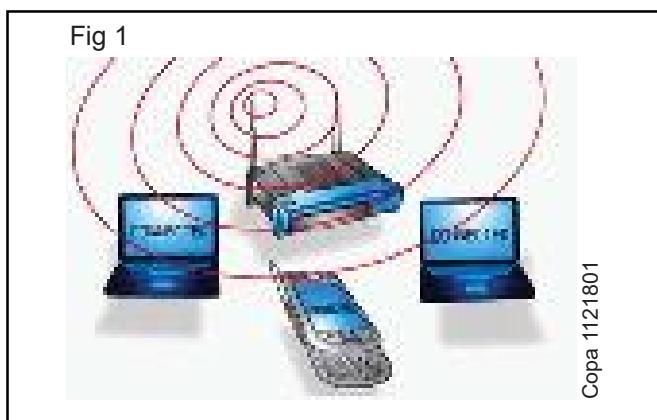
Copa 118290A1

- Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.
- Wireless control of and communication with tablets and speakers such as iPad and Android devices.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being the mouse, keyboard and printer.

- Transfer of files, contact details, calendar appointments, and reminders between devices with OBEX(Objects exchange).
- Replacement of previous wired RS-232 serial communications in test equipment, GPS receivers, medical equipment, bar code scanners, and traffic control devices.
- Wireless bridge between two Industrial Ethernet networks.
- Wireless controllers in gaming consoles.
- Personal security application on mobile phones for prevention of theft or loss of items. The protected item has a Bluetooth marker (e.g., a tag) that is in constant communication with the phone. If the connection is broken (the marker is out of range of the phone) then an alarm is raised.

Wi-Fi:

Wi-Fi is a popular wireless networking technology. Wi-Fi stands for "wireless fidelity". The Wi-Fi was invented by NCR corporation/AT&T in Netherlands in 1991. By using this technology we can exchange the information between two or more devices. Wi-Fi has been developed for mobile computing devices, such has laptops, but it is now extensively using for mobile applications and consumer electronics like televisions, DVD players and digital cameras. There should be two possibilities in communicating with the Wi-Fi connection that may be through access point to the client connection or client to client connection. Wi-Fi is a one type of wireless technology. It is commonly called as wireless LAN (local area network). Wi-Fi allows local area networks to operate without cable and wiring. It is making popular choice for home and business networks. A computer's wireless adaptor transfers the data into a radio signal and transfers the data into antenna for users.

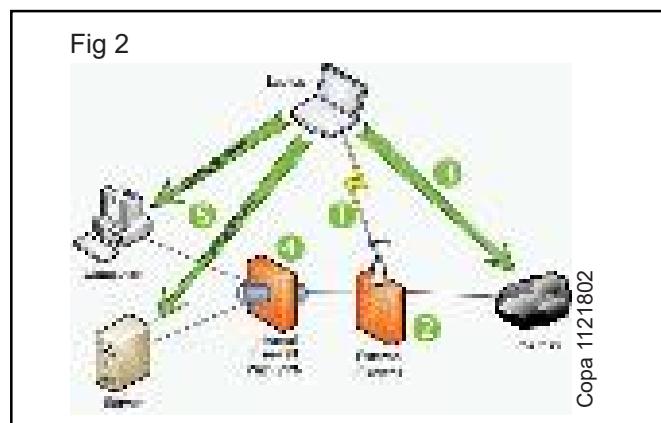


Working Principle:

Wi-Fi is a high speed internet connection and network connection without use of any cables or wires. The wireless network is operating three essential elements that are radio signals, antenna and router. The radio waves are keys which make the Wi-Fi networking possible. The computers and cell phones are ready with Wi-Fi cards. Wi-Fi compatibility has been using a new creation to constituent within the ground connected with community network. The actual broadcast is connected with in sequence in fact it is completed by way of stereo system surf as well as the worth of wires with monitor to classification prone. Wi-Fi allows the person in order to get access to web any place in the actual provided area.

And can now generate a system within Resorts, library, schools, colleges, campus, personal institutes, as well as espresso stores as well as on the open public spot to help to make the company much more lucrative as well as interact with their own customer whenever. Wi-Fi compatibility can make surf with stare to company using their inspiring cable television much a smaller amount force down.

The radio signals are transmitted from antennas and routers that signals are picked up by Wi-Fi receivers, such has computers and cell phones that are ready with Wi-Fi cards. Whenever the computer receives the signals within the range of 100-150 feet for router it connect the device immediately. The range of the Wi-Fi is depends upon the environment, indoor or outdoor ranges. The Wi-Fi cards will read the signals and create an internet connection between user and network. The speed of the device using Wi-Fi connection increases as the computer gets closer to the main source and speed is decreases computer gets further away.



Security:

Security is impairment element in the Wi-Fi technology. Security is our personal decision but having a wireless connection we should pay attention to protect our private details. We can connect easily to unsecured wireless routers. The problem is any one is connected to the wireless router using the data like download games, download apps and planning terrorist activities, sharing illegal music and movie files etc. So it is necessary to provide security to the wireless technologies based devices.

DVDs, CDs and burning DVDs

Objectives : At the end of this lesson you shall be able to

- describe the features of CDs & DVDS
- describe the main formats of DVDs
- describe DVD burning
- describe the features of CDs.

Introduction

DVD (sometimes called as "digital video disc" or "digital versatile disc") is a digital optical disc storage format. DVDs can be used with many types of players, including PCs and standalone players.

These discs are known as DVD-ROM, because data can only be read and not written or erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased multiple times.

DVD features and formats

DVDs are used in DVD-Video consumer digital video format and in DVD-Audio consumer digital audio format. They can also be used in a special AVCHD format (Advanced Video Coding High Definition) often used with AVCHD format camcorders. DVDs containing other types of information may be referred to as DVD data discs.

A typical recordable DVD can hold about 4.7 gigabytes (GB). However, the total amount of disc space that you can use to burn files to the disc is less than the amount that's often listed on the disc itself. This is because the disc capacity is calculated differently when it's used in a computer. For example, a typical DVD-R that has a listed disc capacity of 4.7 GB can only store about 4.37 GB of data on the disc. DVDs offer a storage capacity of approximately 4.7 GB. DVD discs do not deteriorate over time and are unaffected by magnetic fields.

The type of recordable disc to be used depends on a few different factors, such as:

- The types of recordable discs that work with the disc burner.
- The disc drive on the computer or device will read the disc after it is burned.
- The total size of all the files that will be burned on to a disc.

DVD burning

The process of recording source material onto an optical disc (CD or DVD) is called burning / writing or optical disc authoring. Creating an optical disc usually involves first creating a disk image with a full file system designed for the optical disc, and then actually burning the image to the disc. Many programs are available as bundled applications to create the disk image and burn the files.

The speed at which a DVD can be written is expressed as a multiplier: 16X means 16 times faster than just playing it. Speeds up to 52X are also very common.

CD or DVD formats

For burning DVDs, the two main disc formats in use are:

- Live File System and
- Mastered disc formats.

Live File System format :

Discs that use the Live File System format are often more convenient because you can copy selected files immediately and as often as you want, just like you can with a USB flash drive. This is convenient if you want to keep a disc in your CD, DVD, or Blu ray Disc burner and copy files whenever the need arises. In this format you can copy and erase files over and over again. However, the Live File System optical disc format is only readable by Windows 7, Windows Vista, and Windows XP systems. These discs are not blank after they're formatted.

Discs formatted in this format have the option name in the Burn a Disc dialog box: "Like a USB flash drive."

Mastered disc formats:

If we want to create an optical disc that can be used to transfer data files to older versions of the Windows operating system or even to another operating system, we need to use the Mastered optical disc format. Also if we want to burn music or pictures and use the disc in regular CD, DVD, or Blu ray Disc players that can play MP3 files and show digital pictures, we should use the Mastered optical disc format.

The Mastered format works just like burning CDs in Windows XP. In other words, when we write the disc, we copy a file or a group of files to the optical disc all at once. Once this is done, the disc is closed and we cannot copy more files to the disc nor can we delete the existing files. Hence it is recommended not to copy files immediately; it is a good practice to assemble the entire collection of files that needed to be copied to the disc and then burn them all at once.

Discs formatted with the Mastered option have the option in the Burn a Disc dialog box: "With a CD/DVD player."

There are many types of tools available to create data, music, video and audio discs. We can also create

backups that span across multiple discs, rip music tracks from Audio CDs and create or burn disc images in different formats. They may also provide features like automatic audio conversion from WAV, MP3, FLAC, WMA files, disc copying, compressed file backup and restore, disk erasing, VCD/SVCD support, project burning etc..

Blu - ray Discs

Blu-ray, also known as Blu-ray Disc (BD) is the name of a new optical disc format that is rapidly replacing DVD. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc.

The name Blu-ray is derived from the underlying technology, which utilizes a blue-violet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). They are referred to as "Blu-ray" discs or BDs.

The following formats are part of the present day Blu-ray Disc specification:

- 1 BD-ROM - read-only format for distribution of HD movies, games, software, etc.
- 2 BD-R - recordable format for HD video recording and PC data storage.
- 3 BD-RE - rewritable format for HD video recording and PC data storage.

At present, a single-layer disc can hold 25GB and a dual-layer disc can hold 50GB. Over 9 hours of high-definition (HD) video on a 50GB disc. About 23 hours of standard-definition (SD) video on a 50GB disc.

Command line interface with DOS

Objectives: At the end of this lesson you shall be able to

- describe the hierarchical directory system in DOS
- use dos commands to create directories and subdirectories
- use dos commands to change and list directory
- use dos commands to access specific files.

Hierarchical Directory System: Hierarchy in simple terms, is, organisation or an arrangement of entities. Entities can be anything such as objects, files, people, ideas, or any other thing.

Arrangement refers to, for example, Currency can be arranged by denomination. Pebbles can be arranged by their size .

There are many other ways to organize entities besides hierarchically. But, hierarchical organization is special because by this arrangement you can name each entity by its relationship to other entities.

In DOS, entities are the *Directories* in a directory system. Here, the hierarchy begins with the essential *core* or *root entity*. For instance, in a family tree, we may consider great-great-grand father who was the root cause of our existence as the core entity. In DOS , this core entity is referred to as the *the root directory*.

As in the example considered above, if we consider great-great-grandfather as the *root directory*, then, great-grand father, grand father, father are referred as *sub directories*. So the directories under the root directory are called subdirectories in DOS. These subdirectories can trace their paths back to the root directory.

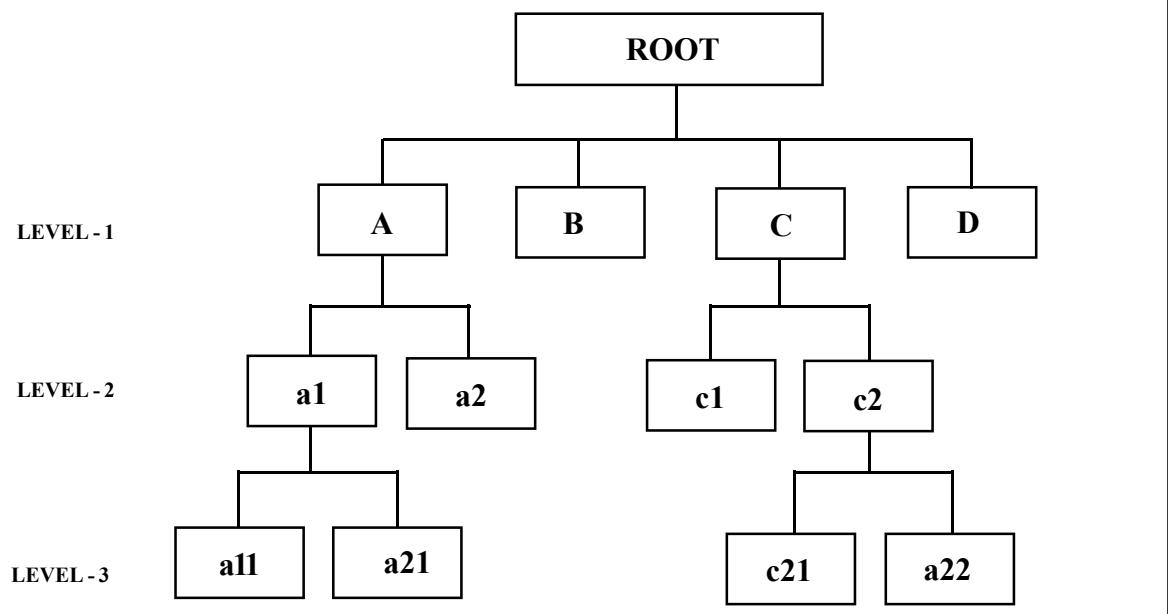
The DOS hierarchical file system is called a *tree-structured file system*. At the base of this tree structure is the root directory.

In a family tree, say, Govinda is the son of Rajappa, who is son of Ramappa who is son of Venkappa. Venkappa is the head or root of the family tree for Govinda.

One can create many directories from the root. The root will then be the parent of each of these directories. You can also create subdirectories that stem from other subdirectories that stem from other subdirectories and so on. These new subdirectories have a subdirectory as their parent directory. How subdirectories are arranged hierarchically from the root is illustrated in Fig 1. The DOS directory system is often called a *tree-structured directory system*.

Three levels of subdirectories are represented in Fig 1. Regardless of the number of levels, the relationship of the subdirectories is important. Each subdirectory, as well as the root directory, can contain user files. Two files can have the same file name and extension as long as the files reside in different directories. This is because, DOS needs to know which of two same-named files your command specifies. For this, DOS needs the name of the directories, starting from the root, that lead to the desired file. This sequence of directory names leading to a file is called a *path*.

Fig 1



A path is a chain of directory names that tell DOS how to find a file that you want. Each directory is separated from the other by a ‘\’ character. This ‘\’ is referred to as the DOS *directory delimiter*. A files full path name including the drive specifier (C: or D: etc.,) is the absolute indicator of where the file is located. Typical path notation are given below;

D:\Animals\Domestic\Pets\Dog.txt
C:\Admin\Accounts\Tours\Bata.txt

Further details of path and directory structure will be discussed at appropriate lessons.

DOS COMMANDS

1 MKDIR Makes or Creates a new Directory.

or

MD

Syntax

MKDIR C:pathname\dirname

Or

MD d:pathname\dirname

Where,

C: is the disk drive for the sub directory

path\ indicates the path to the directory that will hold the subdirectory being created.

dirname is the name of the subdirectory being creating.

Switch

(None)

Important Notes

- **MKDIR or its short form MD makes new subdirectories under the selected root directory.**
- It is possible to create as many subdirectories as you want , but remember: *DOS accepts no more than 63 characters, including backslashes, for the path name.*
- Do not create too many levels of subdirectories and with long names.
- You cannot create a directory name that is identical to a file name in the current directory.

For example, if you have a file named FLIES in the current directory, you cannot create a subdirectory by the name FLIES in this directory. However, if the file FLIES is given an extension FLIES.DOC , then the names will not conflict and you can create a subdirectory by name FLIES.

Examples

To create the subdirectory by name **Drivers** under the **current drive**, the instruction will be,

MKDIR\Drivers

Or

MD\Drivers

C:\Devices>MD \Printers

This instruction creates a subdirectory by name **Printers** under the current drive C:. Note that although the command is issued from another subdirectory named devices, the newly created subdirectory **Printers** does not get created under the directory Devices but directly under the root C:. This may be verified by issuing DIR command under C:\ and under C:\Devices.

To create a subdirectory under the directory Devices the instruction will be,

C:\Devices>MD Printers

Discuss the following different varieties of creating directories:

C:\Devices\Printers>MD C:\Devices\Plotters

2 CHDIR or CD

Changes or shows the path of the current directory.

Syntax

CHDIR d: path

Or, using the short form:

CD d : path

D : path are valid disk drive and directory names.

Switch

(None)

You have two methods for maneuvering through the hierarchical directories with CD: (1) starting at the root , or top, directory of the disk and moving down, or (2) starting with the current directory and moving in either direction.

To start at the root directory of a disk, you must begin the path with the path character (\), as in \ or B:\. When DOS sees \ as the first character in the path, the system starts with the root directory. Otherwise, DOS starts with the current directory.

Changing Drives: Computer will have built in memory, the hard disk and it will also have provision to store/read data from floppy disk, compact disk etc. Every disk is identified by a name such as C drive, A drive, B drive etc. C drive is represented by C: and A drive is represented by A: and so on. DOS allows to change from current or default drive by typing the letter identification of disk drive desired followed immediately by a colon as shown in the example below:

C> a:

This command instructs to change control from **C** drive to **D** drive.

If the disk drive is not accessed due to non availability of floppy or any other reason, DOS will display an error message

Not ready error reading drive A

Abort, Retry, Fail ?

It is required to press either A,R or F keys, which are defined below

A Directs DOS to abort the command that was responsible for the error. If this option is selected DOS will terminate the command and redisplay prompt.

R Directs DOS to retry the command that caused the error. In most cases this option is selected to correct the problem that was causing the error. (Floppy disk might not be inserted).

F Directs DOS to ignore the error and attempt to continue processing. In some cases DOS will have an error when it reads a portion of disk.

DOS COMMAND

DIR Displays a list of files and subdirectories in a directory.

Syntax

```
DIR C:path/filename [/P] [/W] [/A[[:]attribs]] [/O[[:]sortord]]  
[/S] [/B] [/L] [/C[H]]
```

Where,

- **C:** is the disk drive holding the directory for displaying list of files and subdirectories
- **path/** specifies directory and/or files to list.
- **filename** specifies file or list of files to display, if file name is not specified all the files in the directory will be listed.
- **[/P] [/W]** specifies the switches for formatting the output.

Switch

/ P Pauses after each screenful of information and waits to press any key. On pressing any key another screenful or remaining information will be displayed. Command is DIR/P

/ W Uses wide format of 80-column to display file names only and information about file size, date, and time is not displayed. Command is DIR/W

/ A Displays files with specified attributes.

attribs

D Directories

R Read-only files

H Hidden files

S System files

A Files ready to archive - Prefix meaning "not"

/ O List be files in sorted order.

sorted N By name (alphabetic)

S By size (smallest first)

E By extension (alphabetic)

D By date & time (earliest first)

G Group directories first

- Prefix to reverse order

C By compression ratio (smallest first)

/ S Displays files in specified directory and all subdirectories.

/ B Uses bare format (no heading information or summary).

/ L Uses lowercase.

/ C[H] Displays file compression ratio; /CH uses host allocation unit size.

Important Notes:

- In the directory listing similar files can be listed by using wildcards (* and ?), where (*) star and (?) question mark are called wild characters or wild cards. * can replace remaining characters and ? can replace any single character.
- When DIR is used without parameters or switches, It displays the disks volume label and serial number; one directory or filename per line, including the file size in bytes, and the date and time the file was modified; and the total number of files listed, their cumulative size and the free space (in bytes) remaining on the disk.

Examples

DIR *.txt

*.txt instruction will list all files having txt extension in the specified directory.

DIR ???T.*

???T instruction will search for files having four characters which ends with T like TEST, REST etc. And * instructs that these files may have any extension like .txt, .dat etc.

Methods to display the contents of a text file

Objectives: At the end of this lesson you shall be able to

- use DOS commands to display the contents of a text file
- use DOS commands to copy, rename, delete and undelete files.

DOS Commands

TYPE Displays the contents of a text file.

Syntax

TYPE C:path/filename

Where,

- **C:** is the disk drive holding the file for displaying.
- **path/** Specifies the location of file for displaying.
- **filename** specifies file to display.

Switch

(none)

Important notes:

- **TYPE** command provides a quick way to display contents of an ASCII file without having to use another program. The file is stored on the disk as ASCII (American Standard code for Information Interchange) text which is standard way the computer translates binary (ones and zeros) into letters, numbers & symbols. If the information is not stored in the ASCII format, on using TYPE command the information will look like gibberish.
- On issuing command DOS will look in drive specified, moves into the path to reach the filename specified. Then it simply translates ASCII format into the characters, numbers and symbols and displays on the monitor. The video monitor can show 24 lines of information only. If the file contains more than 24 lines starting lines can not be seen since the type command simply scrolls all information on to the screen. Scrolling can be controlled by pressing Control + S keys together (on holding control key press S key and release both the keys is called as Control + S) scrolling of information will stop on the monitor. After viewing the contents on the screen any key can be pressed to scroll through the remaining contents. To view the contents of the file screen page by screen page, MORE command can also be used. which will stop the scrolling of information on the screen exactly after a screen page and in the screen page at 24 line a prompt message — More— is displayed. After pressing any key another screen page will be displayed. MORE is a filter e.g. it is a program that manipulates the stream of standard characters to the file to the standard output (monitor) screen page by screen page.

Examples

1 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt**

C:\COPA\ DOS\ PRACT_3 is the path to the file TEST.txt and TYPE is the command to be executed by DOS.

2 C:\>TYPE C:\COPA\ DOS\ PRACT_3>**TEST1.txt**

This results in the same output as in example1. While working from C: (C drive) this command can be issued without changing the directories.

3 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt | MORE**

This will also result in the same output but displayed screen page by screen page. Screen page can be changed on press of any key. Along with MORE another character is prefixed ‘|’ this is called the piping command, Which will route the output of TYPE command to another command MORE and the MORE filter outputs the information.

Renaming of file(s)

RENAME This command allows to change

Or the name of a file.

REN

Syntax

REN C: PATH\filename1.ex1 filename2.ex2

Where,

- **C:** is the disk drive holding the file for displaying.
- **PATH/** Specifies the location of file for displaying.
- **filename1.ex1** is the file to be renamed
- **filename2.ex2** is the new filename

Important Notes:

- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be renamed.
- A valid file name with appropriate extension is to be given for new filename.
- Wild characters are permitted in the file names by which required group of files can be renamed.

- Only file names will be changed and contents remain same.
- If attempted to change a file name to a name that already exists in the directory.

DOS prompts an error message

Duplicate file name or file not found

- If a invalid file name or the new name is not given, then also DOS prompts an error message

Rules for the file names.

- A File name must have 1 to 8 characters.
- An optional extension of 1 to 3 characters
- A period (.) between the name and extension name, if extension is used
- All letters from A through Z (lower case letters are automatically transferred to uppercase), 0 to 9 numbers and special characters & symbols \$ # & @ ! ^ () _ - { } ' ~ are permitted in the file name.
- The control characters such as Esc, Del, or space bar cannot be used in the file name.
- The characters + = / [] : ; ? * < > : are not permitted.
- Each file name in a directory must be unique.

Examples:

1 C:\COPA\ DOS\ PRACT_3>REN TEST2.txt
CHECKED.txt

C:\COPA\ DOS\ PRACT_3\ is the drive and path to the TEST2.txt file

TEST2.txt is the file name to be renamed

CHECKED.txt is the new filename

2 C:\COPA\ DOS\ PRACT_3>REN *.pic *.jpg the pic extension will be changed to jpg extension files.

Copying files:

COPY Copies one or more files to another location.

Syntax

COPY [/A | /B] source [/A | /B] [+ source [/A | /B] [+ ...]] [destination[/A | /B]] [/V] [/Y | /-Y] source specifies the file or files to be copied. Destination specifies the directory and/or filename for the new file(s).

Switches

/A Indicates an ASCII text file.

/B Indicates a binary file.

/V Verifies that new files are written correctly.

/Y Suppresses prompting to confirm you want to overwrite an existing destination file.

/-Y Causes prompting to confirm you want to overwrite an existing destination file.

Instructor shall discuss the simple switches with at least two examples in each case .

For further details on COPY command switches refer any tutorial or hand book on DOS

Important Notes:

- DOS command COPY can duplicate one or more files. In the same directory with different names or from one directory to other directory either in the same name or in different name.
- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used.
- Exact file name with extension is to be given for the file to be copied
- A valid file name with appropriate extension is to be given for new copied filename
- Wild characters are permitted in the file names by which required group of files can be copied
- On copying, both source and target files will have same contents.
- Copy overwrites the target file with the same name
- Copy will not allow to copy a file to it self that is source and target files should not be same
- If the destination file name is not specified while concatenation the first file name will become the destination name. After the first file name, additional source files must be preceded by a plus (+) sign.

Example

1 C:\COPA\ DOS\ PRACT_3>**COPY TEST2.txt TRIAL.txt**

With the above command C:\COPA\ DOS\ PRACT_3 directory TEST2.txt file will be copied as TRIAL.txt file in the same directory. On listing the directory both the files will have same details and on viewing the contents of both the file will be same. After copying DOS prompts a message 1 file copied

2 C:\COPA\ DOS\ PRACT_3>**COPY *.bmp *.pic**

With the above command C:\COPA\ DOS\ PRACT_3 directory all files with bmp extension file will be copied as pic extension files in the same directory. While copying DOS prompts the name of file it has copied and after completion of copying it prompts the number of files copied.

3 C:\COPA\ DOS\ PRACT_3>**COPY *.pic C:\COPA\ DOS\ PRACT_4**

All files with pic extension in C:\COPA\ DOS\ PRACT_3 directory will be copied to C:\COPA\ DOS\ PRACT_4 directory with same name & extension.

Using *.* after the copy command will copy all files with all extension to the destination.

Copy concatenating: Multiple file can be combined to form a single file by use of + between the source files and is called as concatenation

Example 4 C:\COPA\ DOS\ PRACT_3\ COPYTEST2.txt
+ TRIAL.txt CONCAT1.txt

With the above command TEST2.txt and TRIAL.txt will be combined and CONCAT1.txt file will be created which will have the contents of first two source files.

Deleting file

DEL Deletes the files specified.

or

Erase

Syntax

DEL C: path/filename [/P]

ERASE C: path/filename [/P]

Where,

- **C:** is the disk drive holding the file to be deleted.
- **path/** Specifies the location of file to be deleted.
- **filename** is the file to be deleted

Switch

/P Prompts for confirmation before deleting the specified file. Using the /P switch

If the /P switch is used, DEL displays the name of a file and prompts with a message in the following format:

filename, Delete (Y/N)?

Press Y to confirm the deletion, N to cancel the deletion and display the next filename (if a group of files are specified), or CRTL+C to stop the DEL command.

Important Notes

- If the drive is not specified current disk drive will be used
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be deleted
- Wild characters are permitted in the file names by which required group of files can be deleted
- On deleting, files name(s) will be removed from the directory.
- All the files in a directory can be deleted by typing the DEL command followed by [drive:]path. Wildcard also can be used (*) and (?) to delete more than one file at a time. However, Wildcards should be used cautiously with the DEL command to avoid deleting files unintentionally.

The following command is given for deleting all the files.

del *.*

DEL displays the following prompt:

All files in directory will be deleted! Are you sure (Y/N)?

Press Y and then ENTER to delete all files in the current directory, or

press N and then ENTER to cancel the deletion.

- Directories can not be removed with DEL command a separate command is available for removing the directory.
- Once the file is deleted it can not be recovered if the memory space is occupied by a new file. If accidentally file (s) are deleted immediately it can be recovered by using utility command.
- The space occupied by the deleted file on the disk or diskette is freed.
- Check for the typographic errors in the file names before the press of enter key to activate delete command

Example

1 C:\COPA\ DOS\ PRACT_3>DEL TEST2.txt

With the above command TEST2.txt file will be deleted from the C:\COPA\ DOS\ PRACT_3 directory. On listing the directory TEST2.txt will not be available.

2 C:\COPA\ DOS\ PRACT_4>DEL *.txt

With the above command in the C:\COPA\ DOS\ PRACT_4 directory all files with txt extension will be deleted.

3 C:\COPA\ DOS\ PRACT_3\TEMP > DEL *.*

All files with any extension in C:\COPA\ DOS\ PRACT_3\TEMP directory will be deleted.

Recovering deleted files:

UNDELETE delete protection facility

Syntax

UNDELETE C: path/filename [/DT | /DS | /DOS]

UNDELETE [/LIST | /ALL | /PURGE[DRIVE] | / STATUS | /LOAD | /UNLOAD

/UNLOAD | /S[DRIVE] | /T[DRIVE]-entries]]

Where,

- **C:** is the disk drive holding the files to be undeleted.
- **path/** Specifies the location of file to be undeleted.
- **filename** is the file to be undeleted

Switches

/LIST	Lists the deleted files available to be recovered.
/ALL	Recover files without prompting for confirmation.
/DOS	Recover files listed as deleted by MS-DOS.
/DT	Recover files protected by Delete Tracker.
/DS	Recover files protected by Delete Sentry.
/LOAD	Loads Undelete into memory for delete protection.
/UNLOAD	Unloads Undelete from memory.
/PURGE[drive]	Purges all files in the Delete Sentry directory.
/STATUS	Display the protection method in effect for each drive.
/S[drive]	Enables Delete Sentry method of protection.
/T[drive][-entries]	Enables Delete Tracking method of protection.

Important Notes:

Once a file is deleted from disk, it may not be possible to retrieve it. Although the UNDELETE command can retrieve deleted files, it can do so with certainty only if no other files have been created or changed on the disk. If a file is accidentally deleted and it is required to keep, stop what all other activities on the computer and immediately use the UNDELETE command to retrieve the file.

Example

1 C:\COPA\ DOS\ PRACT_3>UNDELETE TEST2.txt

With the above command TEST2.txt file will be recovered. On listing TEST2.txt file will be available in C:\COPA\ DOS\ PRACT_3 directory.

2 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE

With the above command multiple files can be recovered. DOS will prompt for confirmation of undeletion of each file and asks to type the first letter of the file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

3 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE /ALL

With the above command multiple files can be recovered. DOS will not prompt for confirmation of undeletion of each file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

Introduction to Linux operating system

Objectives: At the end of this lesson you shall be able to

- overview of linux
 - define futures of linux
 - explain application area of linux
 - describe about kernel.
-

Overview of Linux

The operating system

Developers need special tools (like the compilers and command lines found in GNU) to write applications that can talk to the kernel. They also need tools and applications to make it easy for outside applications to access the kernel after the application is written and installed.

This collective set of tools, combined with a kernel, is known as the operating system. It is generally the lowest layer of the computer's software that is accessible by the average user. General users get to the operating system when they access the command line.

Linux provides powerful tools with which to write their applications: developer environments, editors, and compilers are designed to take a developer's code and convert it to something that can access the kernel and get tasks done.

Like the kernel, the Linux operating system is also modular. Developers can pick and choose the operating tools to provide users and developers with a new flavor of Linux designed to meet specific tasks.

Introduction to Linux

Linux (pronounced Lih-nucks) is a UNIX-like operating system that runs on many different computers. Although many people might refer to Linux as the operating system and included software, strictly speaking, Linux is the operating system kernel, which comes with a distribution of software.

Linux was first released in 1991 by its author Linus Torvalds at the University of Helsinki. Since then it has grown tremendously in popularity as programmers around the world embraced his project of building a free operating system, adding features, and fixing problems.

Linux is popular with today's generation of computer users for the same reasons early versions of the UNIX operating system enticed fans more than 20 years ago. Linux is portable, which means you'll find versions running on name-brand or clone PCs, Apple Macintoshes, Sun workstations, or Digital Equipment Corporation Alpha-based computers. Linux also comes with source code, so you can change or customize the software to adapt to your needs. Finally, Linux is a great operating system, rich in features adopted from other versions of UNIX.

Where is Linux?

One of the most noted properties of Linux is where it can be used. Windows and OS X are predominantly found on personal computing devices such as desktop and laptop computers. Other operating systems, such as Symbian, are found on small devices such as phones and PDAs, while mainframes and supercomputers found in major academic and corporate labs use specialized operating systems such as AS/400 and the Cray OS.

Linux, which began its existence as a server OS and has become useful as a desktop OS, can also be used on all of these devices. „From wristwatches to supercomputers,“ is the popular description of Linux' capabilities.

The future of Linux

Linux is already successful on many different kinds of devices, but there are also many technological areas where Linux is moving towards, even as desktop and server development continues to grow faster than any other operating system today.

Linux is being installed on the system BIOS of laptop and notebook computers, which will enable users to turn their devices on in a matter of seconds, bringing up a streamlined Linux environment. This environment will have Internet connectivity tools such as a web browser and an e-mail client, allowing users to work on the Internet without having to boot all the way into their device's primary operating system—even if that operating system is Windows.

At the same time, Linux is showing up on mobile Internet devices (MIDs). This includes embedded devices such as smart phones and PDAs, as well as netbook devices—small laptop-type machines that feature the core functionality of their larger counterparts in a smaller, more energy-efficient package.

The growth of cloud computing is a natural fit for Linux, which already runs many of the Internet's web servers. Linux enables cloud services such as Amazon's A3 to work with superior capability to deliver online applications and information to users.

Related to Linux' growth in cloud computing is the well-known success of Linux on supercomputers, both in the high-performance computing (HPC) and high-availability (HA) areas, where academic research in physics and bioengineering, and firms in the financial and energy

industries need reliable and scalable computing power to accomplish their goals.

Many of the popular Web 2.0 services on the Internet, such as Twitter, Linked In, YouTube, and Google all rely on Linux as their operating system. As new web services arrive in the future, Linux will increasingly be the platform that drives these new technologies.

Current application of Linux operating systems

Today Linux has joined the desktop market. Linux developers concentrated on networking and services in the beginning, and office applications have been the last barrier to be taken down. They don't like to admit that Microsoft is ruling this market, so plenty of alternatives have been started over the last couple of years to make Linux an acceptable choice as a workstation, providing an easy user interface and MS compatible office applications like word processors, spreadsheets, presentations and the like. On the server side, Linux is well-known as a stable and reliable platform, providing database and trading services for companies like Amazon, the well-known online bookshop, US Post Office, the German army and many others. Especially Internet providers and Internet service providers have grown fond of Linux as firewall, proxy- and web server, and you will find a Linux box within reach of every UNIX system administrator who appreciates a comfortable management station. In post offices, they are the nerve centres that route mail and in large search engine, clusters are used to perform internet searches. These are only a few of the thousands of heavy-duty jobs that Linux is performing day-to-day across the world. It is also worth to note that modern Linux not only runs on workstations, mid- and high-end servers, but also on "gadgets" like PDA's, mobiles, a shipload of embedded applications and even on experimental wristwatches. This makes Linux the only operating system in the world covering such a wide range of hardware.

The code

Linux is also unique from other operating systems in that it has no single owner. Torvalds still manages the development of the Linux kernel, but commercial and private developers contribute other software to make the whole Linux operating system.

The kernel

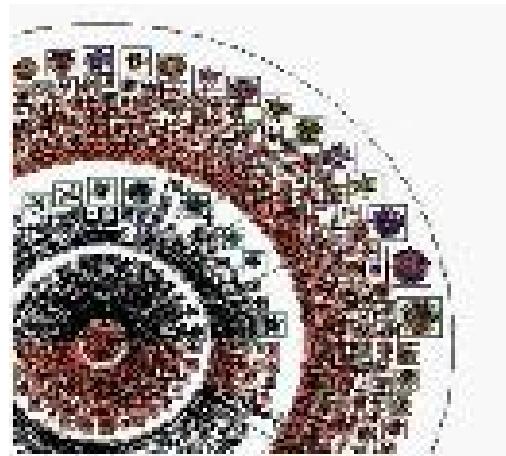
All operating systems have kernels, built around the architectural metaphor that there must be a central set of instructions to direct device hardware, surrounded by various modular layers of functionality. The Linux kernel is unique and flexible because it is also modular in nature.

Modularity is desirable because it allows developers to shed parts of the kernel they don't need to use. Typically a smaller kernel is a faster kernel, because it isn't running processes it does not need.

If a device developer wants a version of Linux to run on a cell phone, she does not need the kernel functionality that deals with disk drives, Ethernet devices, or big monitor screens. She can pull out those pieces (and others), leaving just the optimized kernel to use for the phone.

The kernel of the Window operating system (which few people outside of Microsoft are allowed to look at without

Fig 1



paying for the privilege) is a solidly connected piece of code, unable to be easily broken up into pieces. It is difficult (if not impossible) to pare down the Windows kernel to fit on a phone.

This modularity is significant to the success of Linux. The ability to scale down (or up) to meet the needs of a specific platform is a big advantage over other operating systems constrained to just a few possible platforms.

Modularity also effects stability and security as well. If one piece of the kernel code happens to fail, the rest of the kernel will not crash. Similarly, an illicit attack on one part of the kernel (or the rest of the operating system) might hamper that part of the code, but should not compromise the security of the whole device.

The environments

The windows, menus, and dialog boxes most people think of as part of the operating system are actually separate layers, known as the windowing system and the desktop environment.

These layers provide the human-oriented graphical user interface (GUI) that enables users to easily work with applications in the operating system and third-party applications to be installed on the operating system.

In Linux, there a lot of choices for which windowing system and desktop environment can be used, something that Linux allows users to decide. This cannot be done in Windows and it's difficult to do in OS X.

Like the operating system and kernel, there are tools and code libraries available that let application developers to more readily work with these environments (e.g., gtk+ for GNOME, Qt for KDE).

The applications

Operating systems have two kinds of applications: those that are essential components of the operating system itself, and those that users will install later. Closed operating systems, like Windows and OS X, will not let users (or developers) pick and choose the essential component applications they can use. Windows developers must use Microsoft's compiler, windowing system, and so on.

Linux application developers have a larger set of choices to develop their application. This allows more flexibility to build an application, but it does mean a developer will need to decide which Linux components to use.

The distributions

A Linux distribution is a collection of (usually open source) software on top of a Linux kernel. A distribution (or short, distro) can bundle server software, system management tools, documentation and many desktop applications in a central secure software repository. A distro aims to provide a common look and feel, secure and easy software management and often a specific operational purpose.

Let's take a look at some popular distributions.

Red hat

Red Hat is a billion dollar commercial Linux company that puts a lot of effort in developing Linux. They have hundreds of Linux specialists and are known for their excellent support. They give their products (Red Hat Enterprise Linux and Fedora) away for free. While Red

Hat Enterprise Linux (RHEL) is well tested before release and supported for up to seven years after release, Fedora is a distro with faster updates but without support.

Ubuntu

Canonical started sending out free compact discs with Ubuntu Linux in 2004 and quickly became popular for home users (many switching from Microsoft Windows). Canonical wants Ubuntu to be an easy to use graphical Linux desktop without need to ever see a command line. Of course they also want to make a profit by selling support for Ubuntu.

Debian

There is no company behind Debian. Instead there are thousands of well organised developers that elect a Debian Project Leader every two years. Debian is seen as one of the most stable Linux distributions. It is also the basis of every release of Ubuntu. Debian comes in three versions: stable, testing and unstable. Every Debian release is named after a character in the movie Toy Story.

Other

Distributions like Cent OS, Oracle Enterprise Linux and Scientific Linux are based on Red Hat Enterprise Linux and share many of the same principles, directories and system administration techniques. Linux Mint, Edubuntu and many other ubuntu named distributions are based on Ubuntu and thus share a lot with Debian. There are hundreds of other Linux distributions.

Handling commands and various editors

Objectives: At the end of this lesson you shall be able to

- know about terminal
- explain the command shell
- list out the directory layout of linux
- define the linux commands
- list out the special characters of linux OS
- explain various editors in linux OS.

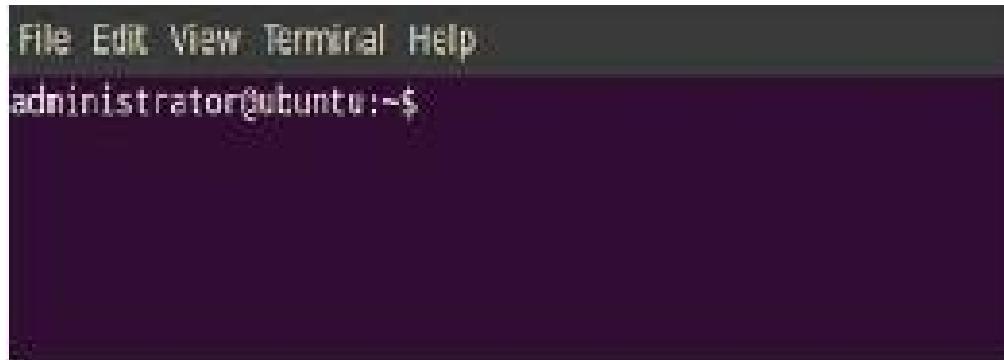
Starting up a terminal

To access the shell we will use a shell-like application, also called a terminal emulator. There is a huge number of good terminal applications out there, including the default ones in GNOME or KDE, or Yakuake, Guake, rxvt and so on. For now let's just stick with the default that

Some of the most popular shells are:

- **bash** - the Bourne-Again Shell, the default shell on most Linux systems.
- **sh** - the Bourne Shell, an older shell which is not so widely used anymore.

Fig 1



comes with your system. If you're using GNOME you can access the terminal by going to **Applications -> Accessories -> Terminal** or pressing Alt+F2 and typing gnome-terminal in the run box that appears, followed by Enter. If you're running KDE you can type instead **console** after pressing Alt+F2.

Depending on the distribution, the prompt may look something like **user@host\$**. The first part before the ampersand is the login username, and the other one is the hostname of the computer.

Command shell

A shell is a **command interpreter** which allows you to interact with the computer. The way things work is pretty simple: you type in commands, the shell interprets them, performs the tasks it was asked to do, and finally it sends the results to the standard output, which is usually the screen.

This is a list of files inside the root directory. The root directory is the first location in the file system tree hierarchy, and it is represented by the **slash** character :/.

- **csh** - the 'C' Shell, which accepts a syntax which resembles the 'C' programming language.
- **tcsh** - an improved version of the 'C' Shell.
- **ksh** - the Korn Shell, initially developed in the early 1980's.
- **dash** - Debian Almquist Shell, a shell created by the Debian distribution.

Listing of shells available in the system

```
$ cat /etc/shells/
```

The above command will display the following output as on Fig 2.

In this tutorial we will focus on **Bash**, since it is the most widely used and also one of the most powerful shells out there. Bash is a modern implementation of the older Bourne Shell (**sh**), developed by the GNU project, which provides a huge amount of tools and which, together with the Linux kernel, desktop environments like GNOME or KDE and applications which run on top of them, comprise the whole Linux platform. On a Debian or Ubuntu distribution, the default shell used by the system is specified in the file **/etc/passwd** (default being Bash).

Fig 2

```
File Edit View Terminal Help
administrator@ubuntu:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/csh
/bin/sh
/usr/bin/es
/usr/bin/ksh
/bin/ksh
/usr/bin/rc
/usr/bin/tcsh
/bin/tcsh
/usr/bin/esh
/bin/dash
/bin/bash
/bin/rbash
/usr/bin/screen
administrator@ubuntu:~$
```

How to display default shell in the system

Type the following command in the terminal

\$ echo \$SHELL

And press Enter key. The default shell will be displayed as on Fig 3.

Fig 3

```
File Edit View Terminal Help
administrator@ubuntu:~$ echo $SHELL
/bin/bash
administrator@ubuntu:~$
```

The Linux directory layout

Directory	Description
	The nameless base of the file system. All other directories, files, drives, and devices are attached to this root. Commonly (but incorrectly) referred to as the "slash" or "/" directory. The "/" is just a directory separator, not a directory itself.
/bin	Essential command binaries (programs) are stored here (bash, ls, mount, tar, etc.)
/boot	Static files of the boot loader
/dev	Device files. In Linux, hardware devices are accessed just like other files, and they are kept under this directory.
/etc	Host-specific system configuration files.
/home	Location of users' personal home directories (e.g. /home/Susan).
/lib	Essential shared libraries and kernel modules.
/proc	Process information pseudo-file system. An interface to kernel data structures
/root	The root (super user) home directory.
/sbin	Essential system binaries (fdisk, fsck, init, etc.).
/tmp	Temporary files. All users have permission to place temporary files here.
/usr	The base directory for most shareable, read-only data (programs, libraries, documentation, and much more).
/usr/bin	Most user programs are kept here (cc, find, du, etc.).
/usr/include	Header files for compiling C programs.
/usr/lib	Libraries for most binary programs
/usr/local	"Locally" installed files. This directory only really matters in environments where files are stored on the network. Locally-installed files go in /usr/local/bin, /usr/local/lib, etc.). Also often used for Software packages installed from source, or software not officially shipped with the distribution.
/usr/sbin	Non-vital system binaries (lpd, useradd, etc.)
/usr/share	Architecture-independent data (icons, backgrounds, documentation, terminfo, man pages, etc.).
/usr/src	Program source code. E.g. The Linux Kernel, source RPMs, etc.
/usr/X11R6	The X Window System
/var	Variable data: mail and printer spools, log files, lock files, etc.

What are Linux commands?

Linux commands are executable binary files which can be ran to perform certain tasks, like for example listing the files in a directory running an entire graphical application. Examples of frequently used commands are ls, cd, pwd, date or cat. With the exception of executable files, there is also a category called shell built-ins, which are commands provided by the shell itself (Bash in our case). We'll deal with those later.

The general form of a Linux command is:

command options(s) filename(s)

Which specifies a command, followed by one or more parameters, and optionally one or more files to apply it on. For example:

```
$ echo -e 'Hello, world!\n'
```

Will output the text 'Hello, world!' followed by a newline character. The **-e** parameter (also called argument, or switch in this case) tells the echo command to interpret escaped characters, like the trailing **\n**, which will add a newline after the text inside the single quotes. Ignore the leading dollar sign, it just signifies the shell prompt.

A command may or may not have arguments. An argument can be an option or a filename.

Special characters in linux operating system

It is important to know that there are many symbols and characters that the shell interprets in special ways. This means that certain typed characters: a) cannot be used in certain situations, b) may be used to perform special operations, or, c) must be "escaped" if you want to use them in a normal way.

Character	Description
\	Escape character. If you want to reference a special character, you must "escape" it with a backslash first. Example: touch /tmp/filename*
/	Directory separator, used to separate a string of directory names. Example: /usr/src/linux
.	Current directory. Can also "hide" files when it is the first character in a filename.
..	Parent directory
~	User's home directory
*	Represents 0 or more characters in a filename, or by itself, all files in a directory. Example: pic*2002 can represent the files pic2002, picJanuary2002, picFeb292002, etc.
?	Represents a single character in a filename. Example: hello?.txt can represent hello1.txt, helloz.txt, but not hello22.txt
[]	Can be used to represent a range of values, e.g. [0-9], [A-Z], etc. Example: hello[0-2].txt represents the names hello0.txt, hello1.txt, and hello2.txt
	"Pipe". Redirect the output of one command into another command. Example: ls more
>	Redirect output of a command into a new file. If the file already exists, over-write it. Example: ls > myfiles.txt
>>	Redirect the output of a command onto the end of an existing file. Example: echo .Mary 555-1234. >> phonenumbers.txt
<	Redirect a file as input to a program. Example: more < phonenumbers.txt
;	Command separator. Allows you to execute multiple commands on a single line. Example: cd /var/log ; less messages

The cd command

The cd command is used to change the current directory (i.e., the directory in which the user is currently working) in Linux and other Unix-like operating systems. It is similar to the CD and CHDIR commands in MS-DOS.

cd's syntax is

cd [option] [directory]

The items in square brackets are optional. When used without specifying any directory name, cd returns the user to the previous current directory. This provides a convenient means of toggling between two directories.

When a directory name is provided, cd changes the current directory to it. The name can be expressed as an absolute pathname (i.e., location relative to the root directory) or as a local pathname (i.e., location relative to the current directory). It is usually more convenient to use a local pathname when changing to a subdirectory of the current directory.

As an example, the following would change the current directory, regardless of where it is on the system (because it is an absolute path), to the root directory (which is represented by a forward slash):

cd /

Likewise, the following would change the current directory, regardless of its location, to the /usr/sbin directory (which contains non-vital system utilities that are used by the system administrator):

cd /usr/sbin

If a user currently in the directory /usr/local/share/man/ desired to change to the directory /usr/local/share/man/man2, which is a subdirectory of the current directory, it would be possible to change by using the absolute pathname, i.e.,

cd /usr/local/share/man/man2

However, it would clearly be much less tedious to use the relative pathname, i.e.,

cd man2

On Unix-like operating systems the current directory is represented by a singledot and its parent directory (i.e., the directory that contains it) is represented by two consecutive dots. Thus, it is possible (and often convenient) to change to the parent of the current directory by using the following:

cd ..

Another convenient feature of cd is the ability for any user to return directly to its home directory by merely using a tilde as the argument. A home directory, also called a login directory, is the directory on a Unix-like operating system that serves as the repository for a user's personal files, directories and programs. It is also the directory that a user is first in after logging into the system. A tilde is a short, wavy, horizontal line character that represents the

home directory of the current user. That is, any user can return immediately to its home directory by typing the following and then pressing the Enter key:

cd ~

This is easier than typing the full name of the user's home directory, for instance, /home/josephine in the case of a user named josephine. (And it is just one of the numerous shortcuts that help make the command line on Unix-like operating systems so easy to use.)

When followed by a space and then a hyphen, cd both returns the user to the previous current directory and reports on a new line the absolute pathname of that directory. This can further enhance the already convenient toggling capability of cd. Toggling is particularly convenient when at least one of the two directories has a long absolute pathname, such as /usr/local/share/man/man2.

cd has only two options, and neither of them are commonly used. The -P option instructs cd to use the physical directory structure instead of following symbolic links. The -L option forces symbolic links to be followed.

The pwd command

The pwd command reports the full path to the current directory.

The current directory is the directory in which a user is currently operating while using a command line interface. A command line interface is an all-text display mode and it is provided via a console (i.e., a display mode in which the entire screen is text only) or via a terminal window (i.e., a text-only window in a GUI).

The full path, also called an absolute path, to a directory or file is the complete hierarchy of directories from the root directory to and including that directory or file. The root directory, which is designated by a forward slash (/), is the base directory on the filesystem (i.e., hierarchy of directories), and it contains all other directories, subdirectories and files on the system. Thus, the full path for any directory or file always begins with a forward slash.

pwd is one of the most basic commands in Linux and other Unix-like operating systems, along with ls, which is used to list the contents of the current directory, and cd, which is used to change the current directory.

pwd's syntax is

pwd [option]

Unlike most commands, pwd is almost always used just by itself, i.e.,

Pwd

That is, it is rarely used with its options and never used with arguments (i.e., file names or other information provided as inputs). Anything that is typed on the same line after pwd, with the exception of an option, is ignored, and no error messages are returned.

As an example, if a user with the username janis is in its home directory, then the above command would typically return /home/janis/ (because, by default, all home

directories are located in the directory /home). Likewise, if a user were currently working in directory /usr/share/config (which contains a number of program configuration files), then the same command would return /usr/share/config.

pwd is useful for confirming that the current directory has actually been changed to what the user intended after using cd. For example, after issuing the cd command to change the current directory from /home/janis to /usr/share/config, pwd could be used for confirmation; that is, the following sequence of commands would be issued:

```
cd /usr/share/config/  
pwd
```

The standard version of pwd has a mere two options, both of which are employed only infrequently. The --help option is used as follows:

```
pwd --help
```

This option displays information about pwd, of which there is very little because it is such a simple command (i.e., it only has two options and accepts no arguments).

The other option is --version, which displays the version number, i.e.,

```
pwd --version
```

Although it is often thought of as standing for present working directory, pwd is actually an acronym for print working directory. The word print is traditional UNIX terminology for write or display, and it originated when computer output was typically printed on paper by default because CRT (cathode ray tube) display monitors were not yet widely available.

The echo command

echo is a built-in command in the bash and C shells that writes its arguments to standard output.

A shell is a program that provides the command line (i.e., the all-text display user interface) on Linux and other Unix-like operating systems. It also executes (i.e., runs) commands that are typed into it and displays the results. bash is the default shell on Linux.

A command is an instruction telling a computer to do something. An argument is input data for a command. Standard output is the display screen by default, but it can be redirected to a file, printer, etc.

The syntax for echo is

```
$ echo $USER  
$ echo "Hello world"
```

The items in square brackets are optional. A string is any finite sequence of characters (i.e., letters, numerals, symbols and punctuation marks).

When used without any options or strings, echo returns a blank line on the display screen followed by the command prompt on the subsequent line. This is because pressing the ENTER key is a signal to the system to start a new

line, and thus echo repeats this signal.

When one or more strings are provided as arguments, echo by default repeats those strings on the screen. Thus, for example, typing in the following and pressing the ENTER key would cause echo to repeat the phrase This is a pen. on the screen:

```
echo This is a pen.
```

It is not necessary to surround the strings with quotes, as it does not affect what is written on the screen. If quotes (either single or double) are used, they are not repeated on the screen.

Fortunately, echo can do more than merely repeat verbatim what follows it. That is, it can also show the value of a particular variable if the name of the variable is preceded directly (i.e., with no intervening spaces) by the dollar character (\$), which tells the shell to substitute the value of the variable for its name.

For example, a variable named x can be created and its value set to 5 with the following command:

```
x = 5
```

The value of x can subsequently be recalled by the following:

```
echo The number is $x.
```

Echo is particularly useful for showing the values of environmental variables, which tell the shell how to behave as a user works at the command line or in scripts (short programs).

For example, to see the value of HOME, the environmental value that shows the current user's home directory, the following would be used:

```
echo $HOME
```

Likewise, echo can be used to show a user's PATH environmental variable, which contains a colon-separated list of the directories that the system searches to find the executable program corresponding to a command issued by the user:

```
echo $PATH
```

echo, by default, follows any output with a newline character. This is a non-printing (i.e., invisible) character that represents the end of one line of text and the start of the next. It is represented by \n in Unix-like operating systems. The result is that the subsequent command prompt begins on a new line rather than on the same line as the output returned by echo.

The -e option is used to enable echo's interpretation of additional instances of the newline character as well as the interpretation of other special characters, such as a horizontal tab, which is represented by \t. Thus, for example, the following would produce a formatted output:

```
echo -e "\n Projects: \n\ntplan \n\tcode \n\nttest\n"
```

(The above command should be written on a single line, although it may render as two lines on smaller display screens.) The -n option can be used to stop echo from adding the newline to output.

By making use of output redirection, echo provides a very simple way of creating a new file that contains text. This is accomplished by typing echo followed by the desired text, the output redirection operator (which is a rightward pointing angle bracket) and finally the name of the new file. The file can likewise be formatted by using special characters. Thus, for example, the formatted output from the above example could be used to create a new file called project1:

```
echo -e "\n Project1: \n\n\tplan \n\twrite \n\ttest\n" > project1
```

The contents of the new file, including any formatting, can be verified by using a command such as cat or less, i.e.,

less project1

echo can likewise be a convenient way of appending text to the end of a file by using it together with the append operator, which is represented by two consecutive rightward pointing angle brackets. However, there is always the risk of accidentally using a single bracket instead of two, thereby overwriting all of the contents of the file, and thus, this feature is best reserved for use in scripts.

echo can also be used with pattern matching, such as the wildcard character, which is represented by the star character. For example, the following would return the phrase The gif files are followed by the names of all the .gif image files in the current directory:

```
echo -e The gif files are *.gif
```

The cal command

Displays calendar of current month.

```
$ cal
```

July 2012

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

'cal' will display calendar for specified month and year.

```
$ cal 08 1991
```

August 1991

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Date command

Display current time and date.

```
$ date
```

```
Fri Jul 6 01:07:09 IST 2012
```

If you are interested only in time, you can use 'date +%T' (in hh:mm:ss):

```
$ date +%T
```

```
01:13:14
```

tty command

Displays current terminal.

```
$ tty
```

```
/dev/pts/0
```

whoami command

This command reveals the current logged in user.

```
$ whoami
```

```
raghu
```

id command

This command prints user and groups (UID and GID) of current user.

```
$ id
```

```
uid=1000(raghu) gid=1000(raghu)
```

groups = 1000 (raghu), 4(adm), 20(dialout), 24(cdrom), 46(plugdev), 112(lpadmin), 120(admin), 122(sambashare)

By default information about current user is displayed. If another username is provided as an argument, information about that user will be printed:

```
$ id root
```

```
uid=0(root) gid=0(root) groups=0(root)
```

Clear command

This command clears the screen.

Getting help command

For all its advantages, a big disadvantage of command line is that there are a lot of commands and even more are their options and usage. But nobody can remember all commands. There are some smarter ways of using command line. Linux provides us with several such resources discussed here:

--help option

With almost every command, '--help' option shows usage summary for that command.

```
$ date --help
```

```
Usage: date [OPTION]... [+FORMAT]
```

or: date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]

Display the current time in the given FORMAT, or set the system date.

The whatis command

The whatis command provides very brief descriptions of command line programs (i.e., all-text mode programs) and other topics related to Linux and other Unix-like operating systems.

It accomplishes this by searching the short descriptions in the whatis database for each keyword provided to it as an argument (i.e., input data). This database contains just the title, section number and description from the NAME section of each page in the man manual that is built into most Unix-like systems.

The syntax for whatis is:

whatis keyword(s)

For example, the following provides a single line summary of the head command (which by default displays the first ten lines of each file that is provided to it as an argument):

whatis head

whatis can be used to simultaneously search for information about multiple topics. For example, the following would provide information about both head and tail (which by default reads the final ten lines of files):

whatis head tail

The output of whatis is limited by the fact that it provides only a single line for each keyword found in the database; thus it supplies incomplete information about even moderately complex commands. For example, the following use of whatis to obtain information about the cat command generates the output "concatenate files and print on the standard output":

whatis cat

However, this omits some important information about cat, particularly the facts that it is very convenient to use for reading files and that it is also used to create and write to files.

whatis is similar to the apropos command. However, apropos is more powerful in that its arguments are not limited to complete words but can also be strings (i.e., any finite sequences of characters) which comprise parts of words. Both commands are unusual in that they have no options.

The man command (which is used to read the built-in manual pages), when used with its -f option, produces the same output as whatis. Thus, for example,

man -f cat

is equivalent to

whatis cat

Info pages

Info documents are sometimes more elaborated than man pages. But for some commands, info pages are just the same as man pages. These are like web pages. Internal links are present within the info pages. These links are called nodes. Info pages can be navigated from one page to another through these nodes.

\$ info date

Word processors in the Linux environment

Text editors are used by many different types of people. Casual users, writers, programmers, and system administrators will all use a text editor at one time or another in Linux.

Use of text editor

A text editor is just like a word processor without a lot of features. All operating systems come with a basic text editor. Linux comes with several. The main use of a text editor is for writing something in plain text with no formatting so that another program can read it. Based on the information it gets from that file, the program will run one way or another.

vi Editor

"vi" (pronounced "vee eye") is a text editor with a deceptively simple appearance that belies its great power and efficiency. New users soon realize that there is far more to this little program than meets the eye.

vi, or one of its clones, is found in almost every version of Linux and Unix, and, in fact, it is the only editor that is available in virtually every Unix installation.

History of vi

The vi editor was developed starting around 1976 by Bill Joy, who was then a graduate student at the University of California at Berkeley. Joy later went on to help found Sun Microsystems and became its Chief Scientist.

"ed" was the original Unix text editor. Like other early text editors, it was line oriented and used from dumb printing terminals. Joy first developed "ex" as an improved line editor that supported a superset of ed commands. He then developed vi as a "visual interface" to ex. That is, it allows text to be viewed on a full screen rather than only one line at a time. vi takes its name from this fact.

vi remains very popular today in spite of the development and widespread availability of GUI (graphical user interface) mode text editors which are far more intuitive and much easier for beginners to use than text-mode text editors such as vi. GUI-mode text editors include gedit and Emacs, both of which have become very common on Linux and other Unixes today.

Features of vi

- It is present in almost every Linux Unix system, even the most minimal.
- It is very small. In fact, some versions have a total code size of less than 100KB. This makes it easy to include vi on even the tiniest versions of Linux, such as those in embedded systems and those that run from a single floppy disk.
- It is typist-friendly, at least once you get used to it. For example, the commands are very short, usually just a few keystrokes. And because vi does not use the mouse, there is never any need to remove one's hands

from the keyboard. This can speed up editing substantially.

- It is very powerful, as just a few very short commands can make sweeping changes to large documents. In fact, vi is more powerful than most of its users realize, and few of them know more than just fraction of all the commands.

Opening and closing file

vi can be used both when your system is in text mode (the entire screen is devoted to text and there are no images) and when your system is in GUI mode (the screen contains windows, images and menus). When it is in GUI mode (usually KDE or Gnome), vi runs in a terminal window. A terminal window is a text-only window, and it can usually be opened by clicking on an icon (small image) of a computer screen.

(In the case of Red Hat Linux, the terminal window can be opened by clicking on the icon of a red hat in the lower left hand corner of the screen, opening the System Tools menu and then selecting Terminal from that menu. It can be convenient to add the icon for the terminal window to the launcher panel along the bottom of the screen, if it is not already there.)

There are at least two ways to use vi to simultaneously create and open a new file. One is by just typing vi at the command line, like this:

vi

This creates an empty file that will not have a name until you save its contents to disk (i.e., transfer the text you typed into it to your hard disk, floppy disk, etc. for long term storage).

A second way to open a new file is by typing vi followed by the name of the file to be created, for example:

vi apple

This creates a new file named "apple" in the current directory (the directory or folder which is currently open on your all-text screen or your terminal window).

If you want, it could create the same file with an extension such as ".txt" added to the end of the file name. In Linux this is merely a matter of convenience (or habit), and it generally makes no real difference for the file because it remains a plain text file in either case. For example:

vi apple.txt

To close a file to which no changes have been made, hit ESC (the Esc key, which is located in the upper left hand corner of the keyboard), then type :q (a colon followed by a lower case "q") and finally press ENTER. (The term "hit" is used here instead of "press" to emphasize that it is not necessary to keep the ESC key held down but just to press it momentarily.)

To close a file to which changes have been made (such as text having been added or removed) without saving the

changes, hit ESC, type :q! and then press ENTER. This is sometimes referred to as a "forced quit."

vi works with a buffer (a block of memory in the RAM chips). When you open an existing file, vi copies that file from the hard disk (or floppy, CDROM, etc.) to a buffer. All changes that you make to a file are initially made only to the copy in the buffer, and they are only made to the file itself when you "save" your changes. "Saving" a file means writing (i.e., transferring) the contents of the buffer to the hard disk (or floppy disk).

Likewise when you open a new file. All text you enter (and subsequent edits you make to it) exists only in the buffer until you save the file to disk.

To save the changes that have been made to a file, hit ESC, type :w and then press ENTER. The "w" stands for "write." An alternative, and perhaps easier, way to save a file and quit at the same time is to hit ESC and then type ZZ (two capital Z's in succession).

After you have created a new text file and closed it, you might want to confirm that nothing went wrong and that the file actually exists. Probably the simplest way to do this is to use the standard Unix ls command, which displays a list of all of the files in the current directory.

Entering text

vi has two basic modes of operation: command mode and text insert mode. How to switch back and forth between them is probably the most confusing thing about vi for beginners. But it is actually very simple, and once you get used to it you might also find it quite efficient.

Command mode is the default mode when a file (existing or new) is opened. (This is the opposite of most text and word processors and therefore may seem counter-intuitive.) Because every file opens initially in command mode, you can not immediately begin typing text. That is, everything that is typed on the keyboard is interpreted by vi to be a command.

Examples of the many types of commands can perform on a file while in command modes are:-

- Switching to text insert mode.
- Moving the cursor around the file.
- Deleting characters or lines.
- Transposing characters.
- Changing case.
- Appending the contents of the file to another (closed) file.
- Setting vi options.
- Saving the file to disk.
- Closing the file and quitting vi.

The other mode, text insert mode, is also referred to as simply "insert mode" or "input mode." It is used for entering text into the buffer memory (and simultaneously onto the screen). In this mode everything that is typed on the keyboard is added to the text and does not become a command (although you can perform some command operations in text mode with vi clones).

The most common way to switch from command mode to the input mode is to use the i (which stands for "insert" or "input") command. This is accomplished by simply typing the letter i while in command mode. Now you are ready to start typing text.

Unlike word processors and even most word editors, there is no automatic word wrap in the traditional version of vi (although you will notice it in some clones). New lines are started by pressing ENTER.

When finished typing text or need to perform some other operation such as moving to a different position in the text or deleting some of it, hit ESC in order to return to the command mode.

Once you have typed some text, you can use the four basic commands for moving the cursor around the text. These commands enable you to go to any desired location in order to modify the text, including making insertions and deletions. The four basic cursor positioning commands are:

- h move cursor one character to left
- j move cursor one line down
- k move cursor one line up
- l move cursor one character to right

Each of these commands can be either used by itself or modified by typing an integer in front of it to indicate the number of characters or lines to move. For example, typing (in command mode, of course)

3j - will move the cursor down three lines. Or typing 2h will move it two characters to the left.

These commands can be repeated by holding the key down. If attempting an impossible movement, such as pressing k when the cursor is on the top line, the screen might flash or a beeping sound might be made (depending on how your computer is set up).

The cursor can be moved directly to any desired line by using the G command preceded by the line number. For example, typing

5G - moves the cursor to the fifth line from the top of the text. Just typing G without any number moves the cursor to the final line of text.

When you switch from command mode to input mode with the i command and then start typing text, each character you type is placed to the left of the character covered by the cursor. This causes the character covered by the cursor as well as everything to its right to be shifted to the right.

There will be times when it needs to place a character to the right of the character under the cursor. This is particularly useful when the cursor is over the last character in a line and you want to append the line. To do this, simply use the a (lower case "a," which stands for "append") command instead of the i command to switch from command mode into insert mode.

After it has saved a file that have created or modified using vi, might want to verify that its contents are really what you had intended. One way to do this is to use cat, the Unix concatenation utility. (No, this has no relationship to the popular domesticated animal whose name has the same spelling). For example, type:

```
cat /home/john/fruit/lemon
```

Editing Text

vi offers a rich assortment of commands for editing text. Among the most basic are those used for deleting or erasing.

The x (lower case "x") command deletes the character immediately under (i.e., covered by) the cursor. To delete any desired character, just switch to the command mode (if you are not already there) and then use an appropriate combination of the h, j, k and l commands (of course, one at a time) to move the cursor to that character. Then type x and the character is deleted.

By pressing x continuously instead of just hitting it once, the cursor continuously moves to the right and each character under it is successively deleted.

The X (upper case "X") command is similar except that it deletes the character to the left of the cursor rather than the character under it.

There are several additional commands for deleting text. The D (upper case "D") command removes the text on the current line from the character under the cursor to the end of the line.

The d (lower case "d") command is very flexible because it can be modified to delete any number of characters, words or lines. Typing d by itself will not do anything, but typing dw causes the character the cursor is resting on and the remaining characters to the right of it in the same word to be deleted. (The "w" stands for "word.")

Typing 2dw causes the character under the cursor, the remaining characters to the right of it in the same word and all of the characters in the next word to be deleted. For example, typing 2dw with the cursor on the "a" of the string "pineapple plantation" causes the string "apple plantation" to be deleted.

As another example, typing 3dw with the cursor on the "j" of the string "the bluejay flew south" causes the string "jay flew south" to be deleted. That is, "jay" and two words to the right of it are deleted.

Deleting an entire line can be accomplished with the dd command. This command can also be used to delete multiple lines by preceding it with an integer representing the number of lines to be removed. For example, typing

2dd will delete two consecutive lines beginning with the current line.

With some terminals, deletion of a line causes it to be replaced on the screen with an "@" character. This character merely represents an empty line and is not inserted into the text. Its purpose is to relieve the processor from having to redraw the screen (i.e., change the whole screen). This character can be removed if desired by typing r (or I on some terminals) while holding down the CTRL key.

The change command c (lower case "c") differs from the delete command in that it not only deletes a section of text but also activates insert mode to allow you to type in replacement text. After you have completed typing in the replacement text, be sure to press ESC to return to the command mode.

As is the case with d, the c command is not used by itself but is only used in combination with another letter after it and an optional integer before it.

For example, the command cw (which stands for "change word") deletes the characters in the current word under and to the right of the cursor and then switches vi to the insert mode so that you can enter text to replace the deleted characters. The number of new characters typed in can be the same as, fewer or more than the number deleted.

The amount of text to be changed can be increased by preceding the command with a number. For instance, typing 2cw will additionally remove the next word for replacement with whatever is typed in. The space between the words is not preserved.

The d and c commands can also be modified by other characters in addition to "w." For example they can be used with "b," which stands for "back." Thus, typing 3bd will delete the characters to the left of the cursor in the current word together with the two words to the left of the current word.

The cc command erases the current line, leaving it blank and awaiting replacement text. Preceding this command with an integer will delete that number of lines, beginning with the current line. For example, typing 5cc will allow you to change five consecutive lines starting with the current line.

Another change command, R, differs from the c commands in that it does not initially delete anything. Rather, it activates insert mode and lets you replace the characters under the cursor one at a time with characters that you type in.

vi supports several types of transposition. Transposing the order of two adjacent characters is easy with the xp command. Just place the cursor on the left-most of the two characters, type x to erase the left character and then type p for the deleted character to be put to the right of the cursor.

Two adjacent words can be transposed with the deep command. To use it, position the cursor in the space just to the left of the word on the left and type deep. Two adjacent

lines can be transposed with the ddp command by placing the cursor on the upper line and typing ddp.

It is also a simple matter to change the case of a letter. When the cursor is over the desired letter, hit the "~" (tilde) key. This will change a capital letter to a small letter and visa versa.

The J (upper case "J") command is used to join the next line to the current line. The opposite operation, splitting a line, is accomplished in insert mode by merely positioning the cursor over what will be the first character of the new line and then hitting ENTER.

vi also has an undo capability. The u (lower case "u") command is used to reverse the effects of an already issued command that has changed the buffer, but which is not yet written to disk. U (upper case "U") undoes all of the changes that have been made to the current line during your current visit to it

Searching Text

vi also has powerful search and replace capabilities. To search the text of an open file for a specific string (combination of characters or words), in the command mode type a colon (:), "s," forward slash (/) and the search string itself. What you type will appear on the bottom line of the display screen. Finally, press ENTER, and the matching area of the text will be highlighted, if it exists. If the matching string is on an area of text that is not currently displayed on the screen, the text will scroll to show that area.

The formal syntax for searching is:

:s/string

For example, suppose you want to search some text for the string "cherry." Type the following and press ENTER:

:s/cherry

The first match for "cherry" in your text will then be highlighted. To see if there are additional occurrences of the same string in the text, type n, and the highlight will switch to the next match, if one exists.

The syntax for replacing one string with another string in the current line is

:s/pattern/replace/

Here "pattern" represents the old string and "replace" represents the new string. For example, to replace each occurrence of the word "lemon" in a line with "orange," type:

:s/lemon/orange/

The syntax for replacing every occurrence of a string in the entire text is similar. The only difference is the addition of a "%" in front of the "s":

%s/pattern/replace/

Thus repeating the previous example for the entire text instead of just for a single line would be:

%s/lemon/orange/

Working with multiple files

It is easy to insert text into an open file from another file. All that is necessary is to move the cursor to the location where you want the text inserted, then type

:r filename

where "filename" is the name of the file to insert.

For example, if you want to copy the contents of the file "peach" into the file "fruit," you would first position the cursor to the desired line in "fruit" and then type

:r peach

Notice that this operation causes no change to the file "peach."

You can also append text from the currently open file to any other file. This is accomplished using the :w (colon + "w") command followed without a space by >>. For example, to append the contents of a currently open file named "pear" to the file named "apple," type

:w>> apple

At times it can be convenient to open multiple files simultaneously. This is efficiently accomplished by just listing all of the files to be opened after the vi command. For example, to simultaneously open files about three kinds of fruit, type:

vi apple pear orange

This allows you to edit "apple" first. After saving "apple," typing :n calls up "pear" for editing.

If you want to simultaneously open all files in the current directory, just type vi * (vi + space + asterisk).

Additional operations

As you have learned, creating and opening files in vi can be a very simple matter. However, many combinations of options are available that can add much power and flexibility for these tasks, as can be seen by looking at the full syntax for opening files:

vi [flags] [cmd] [filename]

The square brackets ([]) around each section of arguments (modifiers) of the command indicates that they are optional. (That is, a file can be opened by just typing vi alone or by typing it with any combination of the three arguments. For instance, the example of vi dog contains only the mandatory vi and the optional third argument, which is the name of the file to open.)

As only one of many possible examples of adding options for opening files, an existing file can be opened with the cursor appearing on any desired line instead of just on the first line. (One situation in which this can be particularly useful is if your file is part of a program which you are writing and the compiler reports an error on a specific line in that file.) This is accomplished by adding the + (plus sign) command followed the desired line number. For example, to open the file "apple" with the cursor located on the third line, type:

vi +3 apple

Use of the + command without any modifying number opens a file with the cursor positioned on the last line of text. This can save some keystrokes when you want to open a file just to append data to the end of it. For example:

vi + apple

You have already learned several commands for switching from command mode to insert mode, including i for inserting to the left of the cursor position, a for inserting to the right of the cursor position and the c commands for changing text. A more complete list is as follows:

a	appends after current cursor position.
A	appends at end of current line.
c	starts a change option.
C	starts a change option from current position to end of current line.
i	inserts to the left of the cursor position.
I	inserts at start of line.
o	cursor moves to new, blank line below its current position.
O	cursor moves to new, blank line above its current position.
R	replaces characters one at a time.

A simple way to obtain basic information about any file that is currently open, including name, size and the current line number, is to hold down CTRL and type g. This data appears on the bottom line of the display.

Summary of commands

The following list contains the basic commands presented in the first eight pages of this tutorial along with occasional examples of usage (shown in parenthesis). They are presented in roughly the same order in which they appear in the tutorial. (All commands that begin with a colon are followed by ENTER.)

vi	typed at the command line to open one or more files in the same directory (vi tomato.txt opens a file named "tomato.txt" in the current directory) (vi parsley sage rosemary opens the three files "parsley," "sage" and "rosemary" in the current directory)
vi *	typed at the command line to open every file in the current directory
:q	closes (quits) a file to which no changes have been made
:q!	quits without saving any changes
:w	writes (i.e., saves) the current file to disk
:wq	writes the buffer contents to disk (i.e., saves changes) and quits
zz	same as :wq
i	activates text insert mode, inserting text immediately under the current position of the cursor.
h	moves the cursor one character to the left (2h moves the cursor two characters to the left)
j	moves the cursor one line down (3j moves the cursor three lines down)
k	moves the cursor one line up
l	moves the cursor one character to the right
G	moves the cursor to the desired line; moves the cursor to the last line of text if not preceded by a modifying integer (5G moves the cursor to the fifth line)
a	switches to insert mode and allows insertion of text immediately to the right of the cursor.
x	deletes the character immediately under the cursor (xxx deletes the character immediately under cursor and then deletes the two characters to its right)
X	deletes a single character to the left of cursor
D	removes the text on the current line from the character under the cursor to the end of the line
dw	deletes the character immediately under the cursor and the remaining characters to the right of it in the same word (2dw deletes the character immediately under the cursor, the remaining characters to the right of it in same word and all of the next word)
dd	deletes the entire line containing the cursor, and the cursor then moves to the next line (2dd deletes two consecutive lines beginning with the current line)
cw	deletes the character under the cursor and to its right in the same word and allows new characters to be typed in to replace them (2cw deletes the character under the cursor and to its right in the same word and in the next word, and then allows replacement characters to be typed in)

cc	erases the current line and allows replacement text to be typed in (2cc erases the current line and the next line and allows replacement text to be typed in for both lines)
cb	deletes the characters to the left of the cursor in the current word and allows replacement characters to be typed in (3cb deletes the characters to the left of the cursor in the current word together with the two words to its left and then allows replacement text to be typed in)
R	activates text input mode allowing text under and to the right of the cursor to be overwritten one character at a time
xp	transposes two adjacent characters
deep	transposes two adjacent words
ddp	transposes two adjacent lines
~	changes case of the character under the cursor
J	joins the current line with the next line
u	reverses the effects of the most recent command that has changed the buffer
U	undoes all changes made to the current line during the current visit to it
:s/	searches the text for the first instance of a designated string (:s/cucumber searches the text for the first instance of the string "cucumber")
n	searches the text for the next instance of a designated string
:s/ / /	replaces the first instance of a designated string (:s/cucumber/radish/ replaces the first instance of the string "cucumber" with the string "radish")
:%s/ / /	replaces every instance of a designated string (:%s/cucumber/radish/ replaces every instance of the string "cucumber" with the string "radish")
:r	inserts text into the currently open file from another file (:r lettuce.txt inserts text into the currently open file from the file named "lettuce.txt")
:w>>	appends the text from the currently open file into another file (:w>> cabbage appends the text from the currently open file into the file named "cabbage")

pico editor

pico is a simple text editor in the style of the pine composer.

Syntax

pico [options] [file]

Description

pico is a simple, display-oriented text editor based on the pine message composer. As with pine, commands are displayed at the bottom of the screen, and context-sensitive help is provided. As characters are typed they are immediately inserted into the text.

Editing commands are entered using control-key combinations. As a work-around for communications programs that swallow certain control characters, you can emulate a control key by pressing ESCAPE twice, followed by the desired control character. For example, "ESC ESC c" would be equivalent to entering a ctrl-c. The editor has five basic features: paragraph justification, searching, block cut/paste, a spelling checker, and a file browser.

Paragraph justification (or filling) takes place in the paragraph that contains the cursor, or, if the cursor is between lines, in the paragraph immediately below. Paragraphs are delimited by blank lines, or by lines beginning with a space or tab. Unjustification can be done immediately after justification using the control-U key combination.

String searches are not sensitive to case. A search begins at the current cursor position and wraps around the end of the text. The most recent search string is

offered as the default in subsequent searches.

Blocks of text can be moved, copied or deleted with creative use of the command for mark (Ctrl-^), delete (Ctrl-k) and undelete (Ctrl-u). The delete command will remove text between the "mark" and the current cursor position, and place it in the "cut" buffer. The undelete command effects a "paste" at the current cursor position.

The spell checker examines all words in the text. It then offers each misspelled word for correction while highlighting it in the text. Spell checking can be cancelled at any time. Alternatively, pico will substitute for the default spell checking routine a routine defined by the SPELL environment variable. The replacement routine should read standard input and write standard output.

The file browser is offered as an option in the "Read File" and "Write Out" command prompts. It is intended to help in searching for specific files and navigating directory hierarchies. Filenames with sizes and names of directories in the current working directory are presented for selection. The current working directory is displayed on the top line of the display while the list of available commands takes up the bottom two. Several basic file manipulation functions are supported: file renaming, copying, and deletion.

Movement commands:

Depending on your system, the arrow keys or the backspace key may not work. Instead, you can use these commands to perform the same tasks.

To	Hold down Ctrl key and press	Instead of
Delete a character	backspace	backspace
Move up a line	p	up arrow
Move down a line	n	down arrow
Move left one space	b	left arrow
Move right one space	f	right arrow
Move to the end of line	e	end

Some pico editor options

^C Cancel allows you to stop a process at any time. If you make a mistake, just hold down the Ctrl key and press c.

^G get help

Get clear and concise assistance from the Pico help, in case something unexpected happens or you need additional information about a command.

^X Exit

Exit Pico at anytime. If made changes to a file or worked on a new file, but you haven't saved the changes, you see this message:

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) (y/n)?

Answering no (press n) will close Pico and bring you back to the prompt without saving your file.

Answering yes (press y) will allow you to save the file you've been working on (see Write Out section below for details).

^O WriteOut

Save the file without hassles or worries. Fill in the name of the file beside the File Name to write: prompt. If the file already has a name, then press enter.

^T To Files option lets to save the text over a file that exists in the directory. By choosing the To Files option, Pico takes you to a directory Browser.

^R Read File

Insert text from another file into your current text file. This option allows you to search through your directories for a file that you would like to add to your text. This option is especially handy if you've saved a document and would like to add its content to the new file you're working on. Text from the file you select is placed on the line directly above your cursor.

At the Insert file : prompt you may either type a file name or use the Browser options.

^T To Files option lets you import a text file directly into the file you're currently typing. By choosing the To Files option, Pico takes you to a directory Browser.

^Y Prev Pg

Move quickly to the previous page. Although you could just as easily press the up arrow key several times, this command quickly jumps your cursor up one page.

^V Next Pg

Move quickly to the next page. Although you could just as easily press the down arrow key several times, this command quickly jumps your cursor down one page.

^K Cut text

Cut a line of text. This option allows you to cut a full line of text. By using the uncut command and your arrow keys, you can then paste the cut text at another location in your document. To cut specific text in a line or to cut several lines of text, first select the text (see Selecting Text on the next page).

Selecting text

To select text for cutting and pasting use the following steps:

Move the cursor to the beginning of the text to select

Hold down the Ctrl key and press ^

Use the right arrow key or hold down Ctrl and press f to highlight text

When you have highlighted the appropriate text, hold down the Ctrl key and press k to cut it.

Paste the text you cut, anywhere in your document, using UnCut Text

^U UnCut Text

Paste text that previously cut. If use this option to undo an accidental cut of text or place cut text at another location in the document. The text you cut is pasted on the line directly above the cursor.

^C Cur Pos

Indicate the current position of the cursor, relative to the entire document. This is a helpful option if you'd like to check exactly where in the document. The status line indicates the following items:

[line 8 of 18 (44%), character 109 of 254 (42%)]

^J Justify

Even out lines of text. This command is handy when accidentally type extra spaces between words or press the key before reaching the end of a line. The option evens the length of text lines automatically.

^U UnJustify

UnJustify lines of text. For the messy line look you can always select the UnJustify option.

^W Where is

Find a particular string of text quickly. This option allows you to do a word search in your text. This option is especially handy for longer documents. If the word you designated at the Search: prompt is found, it places the cursor beside it.

^T To Spell

Check for spelling errors. The spell check option allows to correct spelling errors throughout the document. If spell

checker finds a misspelled word or a word it doesn't recognize (don't worry, this rarely happens), it will correct the word. At the Edit a replacement: prompt, type in the correct spelling of a word. However, if you don't want to make any changes, simply press the enter key.

Any words that have corrected but re-occur in the document can be automatically replaced. At the Replace a with b? [y]: prompt press y to replace all occurrences of the misspelled word or n to ignore.

Pine Editor

pine is a program for accessing email and newsgroups.

Syntax

pine [options] [address, address]

Description

pine is a screen-oriented message-handling tool. In its default configuration, pine offers an intentionally limited set of functions geared toward the novice user, but it also has a growing list of optional power-user and personal-preference features. pine's basic feature set includes:

- View, Save, Export, Delete, Print, Reply and Forward messages.
- Compose messages in a simple editor (pico) with word-wrap and a spelling checker. Messages may be postponed for later completion.
- Full-screen selection and management of message folders.
- Address book to keep a list of long or frequently-used addresses. Personal distribution lists may be defined. Addresses may be taken into the address book from incoming mail without retyping them.
- New mail checking and notification occurs automatically.
- Context-sensitive help screens.

pine supports MIME (Multipurpose Internet Mail Extensions), an Internet Standard for representing multipart and multimedia data in email. pine allows you to save MIME objects to files, and in some cases, can also initiate the correct program for viewing the object. It uses the system's mailcap configuration file to determine what program can process a particular MIME object type. pine's message composer does not have multimedia capability

itself, but any type of data file (including multimedia) can be attached to a text message and sent using MIME's encoding rules. This allows any group of individuals with MIME-capable mail software to exchange formatted documents, spread-sheets, image files, etc, via Internet email.

pine uses the "c-client" messaging API to access local and remote mail folders. This library provides a variety of low-level message-handling functions, including drivers for a variety of different mail file formats, as well as routines to access remote mail and news servers, using IMAP (Internet Message Access Protocol) and NNTP (Network News Transport Protocol). Outgoing mail is usually handed off to the send mail program but it can optionally be posted directly via SMTP.

Examples

Pine

Launch **pine**.

pine address@example.com

Launch pine, and immediately begin composing an email addressed to address@example.com.

Joe editor

'joe'- sounds like a comic strip. Actually, they are two other text editors that I like and I think are a little easier to manage. They're like 'vi' in that you use them to create and edit non-formatted text, but they're a little more user-friendly. Using 'joe' 'joe' was created by Joseph Allen, so that's why it's called Joe.

The majority of joe's commands are based on the CTRL-K keys and a third key. The most important of these is CTRL-K-H which gets 'help'. Help shows the key combinations to use with 'joe'.

The most important thing about 'joe' is the logical concept that you can just start writing if you want. Try writing anything you want.

To save it, press CTRL-K-D. To save and quit, CTRL-K-X.

To quit without saving, CTRL-C, (without the K).

The feature of 'joe' is that if edit a file again, it will save the previous file with a tilde on the end, like 'tryjoe~' That little tilde file has saved times. 'joe' is a very good option for writing those short text files.

Managing files and directories

Objectives: At the end of this lesson you shall be able to

- define manipulating files and directories
- define basic file commands
- explain other file commands
- define additional useful commands in linux OS.

Manipulating files or directories

Using Linux isn't different from any other computer operating system. You create, delete, and move files on your hard drive in order to organize your information and manage how your system works or looks. This section shows you how to do these tasks quickly and easily.

Although the graphical interface for Linux, the X Window System, may offer drag and drop or multiple selections in order to copy or delete files, many of the commands you'll learn here form the base of these operations. It is worth knowing how these programs work, even if you don't use Linux in the console mode.

Working with files

In this chapter we learn how to recognise, create, remove, copy and move files using commands like file, touch, rm, cp, mv and rename, etc...

All files are case sensitive

Files on Linux (or any Unix) are case sensitive. This means that FILE1 is different from

file1, and /etc/hosts is different from /etc/Hosts (the latter one does not exist on a typical Linux computer).

The file command

The file command attempts to classify each filesystem object (i.e., file, directory or link) that is provided to it as an argument (i.e., input). Thus, it can usually provide immediate information as to whether some specified object is, for example, a GIF89a image file, a directory, a GNU tar archive, ASCII English text, a symbolic link, an HTML document, an empty file, bzip2 compressed data, an ELF 32-bit LSB executable, etc.

File accomplishes this by probing each object with three types of tests until one succeeds. The first is a filesystem test, which uses the stat system call to obtain information from the object's inode (which contains information about a file). A system call is a request in a Unix-like operating system for a service performed by the kernel (i.e., the core of the operating system).

The second test checks to see if there is a magic number, which is a number embedded at or near the beginning of many types of files that indicates the file format(i.e., the type of file).

In the event that the first two tests fail to determine the type of a file, language tests are employed to determine if

it is plain text (i.e., composed entirely of human-readable characters), and, if so, what type of plain text, such as HTML (hypertext markup language) or source code (i.e., the original version of a program as written by a human). In this situation, file also attempts to determine the natural language (e.g., English, Turkish or Japanese) that is used in the file.

A simplified version of file's syntax is

file [option(s)] object_name(s)

File has several options, but it is most commonly used without any of them. For example, information about a file named file1 that is located in the current directory (i.e., the directory in which the user is currently working) could be obtained by merely typing the following and pressing the RETURN key:

file file1

Information about the types of all of the files in the current directory can be obtained by using the star wildcard to represent every object in that directory as follows:

file *

Likewise, information about all of the files in another directory can be obtained by using that directory as an argument and following it immediately by a forward slash and the star wildcard. For example, the following classifies all of the objects in the /boot directory:

file /boot/*

The square brackets wildcard can be used together with the star wildcard to show the file types for only those objects whose names begin with specified letters or with a specified range of letters. For example, the following would show only those objects in the current directory whose names begin with letters a through g:

file [a-g]*

The -k option tells file to not stop at the first successful test, but to keep going; this can result in the reporting of additional information about some filesystem objects. The -b (i.e., brief) option tells file to not prepend filenames to output lines, which can be useful when compiling statistics about file types. The -v option returns information about the version of file that is installed.

Creating files and directories command

mkdir command

The mkdir command is used to create new directories.

A directory, referred to as a folder in some operating systems, appears to the user as a container for other directories and files. However, Unix-like operating systems treat directories as merely a special type of file that contains a list of file names and their corresponding inode numbers. Each inode number refers to an inode, which is located in inode tables (which are kept at strategic locations around the filesystem) and which contains all information about a file (e.g., size, permissions and date of creation) except its name and the actual data that the file contains.

mkdir has the following example

```
$ mkdir example
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

directory_name is the name of any directory that the user is asking mkdir to create. Any number of directories can be created simultaneously.

Thus, for example, the following command would create three directories within the current directory (i.e., the directory in which the user is currently working) with the names dir_1, dir_2 and dir_3:

```
mkdir dir_1 dir_2 dir_3
```

If a directory name provided as an argument (i.e., input) to mkdir is the same as that of an existing directory or file in the same directory in which the user is asking mkdir to create the new directory, mkdir will return a warning message such as mkdir: cannot create directory `dir_1': File exists and will not create a file with that name. However, it will then continue to create directories for any other names provided as arguments.

It is necessary for a user to have write permission (i.e., permission from the system to create or change a file or directory) in the parent directory (i.e., the directory in which the new directory is to be created) in order to be able to create a new directory.

Directories created by mkdir automatically include two hidden directories, one representing the directory just created (and represented by a single dot) and the other representing its parent directory (and represented by two consecutive dots). This can be seen by using the ls (i.e., list) command with its -a option, which tells ls to show all directories and files, (including hidden ones) in any directory provided to it as an argument, or in the current directory if there are no arguments, i.e.,

```
ls -a
```

mkdir's -m option is used to control the permissions of new directories. New directories are by default created with the read, write and execute (i.e., run as a program if

a program) permissions enabled for the owner (i.e., the creator of the directory by default) and group and the read and execute permissions enabled for other users. Thus, for example, to create a directory named dir_4 for which all three types of permissions were enabled for all users, the sequence 777 would be employed after -m, for example:

```
mkdir -m 777 dir_4
```

The first digit represents the owner, the second represents the group and the third represents other users. The number 7 represents all three types of permission (i.e., read, write and execute), 6 stands for read and write only, 5 stands for read and execute, 4 is read only, 3 is write and execute, 2 is write only, 1 is execute only and 0 is no permissions.

Thus, for example, to create a new directory named dir_5 for which the owner has read and write permissions, the group has read permission and other users have no permissions, the following would be used:

```
mkdir -m 640 dir_5
```

The -p (i.e., parents) option creates the specified intermediate directories for a new directory if they do not already exist. For example, it can be used to create the following directory structure:

```
mkdir -p food/fruit/citrus/oranges
```

It is very easy to confirm that this series of directories has been created by using the du (i.e., disk usage) command with the name of the first directory as an argument. In the case of the above example this would be

du food

Other options include -v (i.e., verbose), which returns a message for each created directory, --help, which returns brief information about mkdir, and --version, which returns the version number of the currently installed mkdir program

touch command

The touch command updates the access and modification times of each FILE to the current system time.

If you specify a FILE that does not already exist, touch creates an empty file with that name.

If the FILE argument is a dash ("") is handled specially and causes touch to change the times of the file associated with standard output.

```
$ touch file1 file2 file3
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file2
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

A feature of touch is that, in contrast to some commands such as cp (which is used to copy files and directories) and mv (which is used to move or rename files and

directories), it does not automatically overwrite (i.e., erase the contents of) existing files with the same name. Rather, it merely changes the last access times for such files to the current time.

Several of touch's options are specifically designed to allow the user to change the timestamps for files. For example, the -a option changes only the access time, while the -m option changes only the modification time. The use of both of these options together changes both the access and modification times to the current time, for example:

touch -am file3

The -r (i.e., reference) option followed directly by a space and then by a file name tells touch to use that file's time stamps instead of current time. For example, the following would tell it to use the times of file4 for file5:

touch -r file4 file5

The -B option modifies the timestamps by going back the specified number of seconds, and the -F option modifies the time by going forward the specified number of seconds. For example, the following command would make file7 30 seconds older than file6.

touch -r file6 -B 30 file7

The -d and -t options allow the user to add a specific last access time. The former is followed by a string (i.e., sequence of characters) in the date, month, year, minute:second format, and the latter uses a [[CC]YY]MMDDhhmm[.ss] format. For example, to change the last access time of file8 to 10:22 a.m. May 1, 2005, 1 May 2005 10:22 would be enclosed in single quotes and used as follows, i.e.,:

touch -d '1 May 2005 10:22' file8

Partial date-time strings can be used. For example, only the date need be provided, as shown for file9 below (in which case the time is automatically set to 0:00):

touch -d '14 May' file9

Just providing the time, as shown below, automatically changes the date to the current date:

touch -d '14:24' file9

The most commonly used way to view the last modification date for files is to use the ls command with its -l option. For example, in the case of a file named file10 this would be

ls -l file10

The complete timestamps for any file or directory can be viewed by using the stat command. For example, the following would show the timestamps for a file named file11:

stat file11

The --help option displays a basic list of options, and the --version option returns the version of the currently installed touch program.

Copy, move and remove commands

Copy command

The cp command is used to copy files and directories. The copies become independent of the originals (i.e., a subsequent change in one will not affect the other).

cp's basic syntax is

\$cp source destination

As a safety precaution, by default cp only copies files and not directories. If a file with the same name as that assigned to the copy of a file (or a directory with the same name as that assigned to the copy of a directory) already exists, it will be overwritten (i.e., its contents will be lost). However, the owner, group and permissions for the copy become the same as those of the file with the same name that it replaced. The last access time of the source file and the last modification time of the new file are set to the time the copying was performed.

When a copy is made of a file or directory, the copy must have a different name than the original if it is to be placed in the same directory as the original. However, the copy can have the same name if it is made in a different directory. Thus, for example, a file in the current directory (i.e., the directory in which the user is currently working) named file1 could be copied with the same name into another directory, such as into /home/john/, as follows:

cp file1 /home/john/file1

Any number of files can be simultaneously copied into another directory by listing their names followed by the name of the directory. cp is an intelligent command and knows to do this when only the final argument (i.e., piece of input data) is a directory. The files copied into the directory will all have the same names as the originals. Thus, for example, the following would copy the files named file2, file3 and file4 into a directory named dir1:

cp file2 file3 file4 dir1

The -r (i.e., recursive) option, which can also be written with an upper case R, allows directories including all of their contents to be copied. (Directories are not copied by default in order to make it more difficult for users to accidentally overwrite existing directories which have the same name as that assigned to the copy being made and which might contain critical directory structures or important data.) Thus, for example, the following command would make a copy of an existing directory called dir2, inclusive of all its contents (i.e., files, subdirectories, their subdirectories, etc.), called dir3:

cp -r dir2 dir3

The -i (i.e., interactive) option prompts the user in the event that any name assigned to a copy is already in use by another file and that file would thus be overwritten. Entering the letter y (either lower case or upper case) in response to the prompt causes the command to continue; any other answer prevents the command from overwriting the file. Thus, for example, if it is desired to make a copy of a directory called dir4 and call it dir5 and if a directory named

dir4 already exists, the following would prompt the user prior to replacing any files with identical names in the latter directory:

```
cp -ri dir4 dir5
```

The -a option preserves as much of the structure and attributes of the original directory and its contents as possible in the new directory and is thus useful for creating archives. It is similar to the -r option in that it copies directories recursively; however, it also never follows symbolic links. It is equivalent to the -rdp combination of options.

All the files in a directory can be copied to another directory by using the star wildcard. The star character represents any single character or any combination of characters. Thus, for example, the following would copy all of the files in a directory named dir6 into another existing directory called dir7:

```
cp dir6/* dir7
```

cp can also be used with the star wildcard or other pattern matching characters to selectively copy files and directories. For example, to copy all of the files in the current directory that have the filename extension .html into another existing directory called dir8, the following would be used:

```
cp *.html dir8
```

In this case, the star wildcard represents anything whose name ends with the .html extension.

Among the other options for cp are -b, which makes backup copies of each destination file, -f (i.e., force), which removes destination files that cannot be opened and tries again, -s, which makes symbolic links instead of copying, -u (i.e., update), which copies only if the source file is newer than the destination file or if the destination file is missing, -v (i.e., verbose), which makes brief comments about what is going on, and -x, which tells cp to stay on the same filesystem.

Move command

The mv command is used to rename and move files and directories. Its general syntax is:

```
$ mv source destination
```

The arguments are names of files and directories. If two file names are provided as arguments, mv renames the first as the second. If a list of arguments is provided and the final argument in the sequence is the name of an existing directory, mv moves all of the other items into that directory. If the final argument is not an existing directory and more than two arguments are provided, an error message is returned.

If the destination file is located in the same directory as the source file, then the source file can only be renamed. If both are in different directories, then the source file is moved to the directory named in the destination argument, in which it can keep its original name or be assigned a new name. If the target is a directory, then the source file

or directory is moved into that directory and retains its original name.

Thus, for example, the following would rename a file called file1 to file2, while keeping it in the current directory (i.e., the directory in which the user is currently working):

```
mv file1 file2
```

The following would move a file named file3, without changing its name, from the current directory to an existing subdirectory of the current directory named dir1:

```
mv file3 dir1/file3
```

mv can be used to move any number of files and directories simultaneously. For example, the following command moves all files and directories, including all the contents of those directories, from the current directory to the directory /home/alice/new/:

```
mv * /home/alice/new/
```

The asterisk is a wildcard character that represents any string (i.e., sequence of characters). Thus, in the above example it represents the name of every file and directory in the current directory.

mv makes it as easy to move a file or directory up the hierarchy of directories (i.e., closer to the root directory) as down it. For example, the following would move a file named file4, which is currently located in the sub-subdirectory dir/dir/ of the user's home directory, to the top level in the user's home directory:

```
mv dir/dir/file4 ~
```

The root directory is the directory that contains all other directories on a Unix-like operating system and which is at the top of the hierarchy of directories. A user's home directory is the directory in which a user finds itself by default after logging into the system and which can be represented by the tilde (wavy horizontal linecharacter).

By default, mv does not provide any confirmation on the display screen if its action is completed without problems. This is consistent with the rule of silence tenet of the Unix philosophy.

Thus it is wise for users new to Unix-like operating systems to always use the -i option, which makes mv interactive in the situation in which files and/or directories with the same name already exist in the destination directory. For example, the above command would be made interactive as follows:

```
mv -i * /home/alice/new/
```

Among mv's few other options are -b, which tells it to make a backup copy of each file that would otherwise be overwritten or removed, and -v, which tells it to be verbose and display the name of each file before moving it. Detailed information (including all options) about mv can be obtained by using its --help option, and information about the current version can be obtained by using its --version option.

Remove or Delete

\$ rmdir

'rmdir' command removes any empty directories, but cannot delete a directory if a file is present in it. To use 'rmdir' command, you must first remove all the files present the directory you wish to remove (and possibly directories if any).

Remove files and directories

The rm (i.e., remove) command is used to delete files and directories on Linux and other Unix-like operating systems.

The general syntax for rm is:

rm [options] [-r directories] filenames

The items in square brackets are optional. When used just with the names of one or more files, rm deletes all those files without requiring confirmation by the user. Thus, in the following example, rm would immediately delete the files named file1, file2 and file3, assuming that all three are located in the current directory (i.e., the directory in which the user is currently working):

rm file1 file2 file3

Error messages are returned if a file does not exist or if the user does not have the appropriate permission to delete it. Write-protected files prompt the user for a confirmation (with a y for yes and an n for no) before removal. Files located in write-protected directories can never be removed, even if those files are not write-protected.

The -f (i.e., force) option tells rm to remove all specified files, whether write-protected or not, without prompting the user. It does not display an error message or return error status if a specified file does not exist. However, if an attempt is made to remove files in a write-protected directory, this option will not suppress an error message.

The -i (i.e., interactive) option tells rm to prompt the user for confirmation before removing each file and directory. If both the -f and -i options are specified, the last one specified takes affect.

As a safety measure, rm does not delete directories by default. In order to delete directories, it is necessary to use the -r option, which is the same as the -R option. This option recursively removes directories and their contents in the argument list; that is, the specified directories will first be emptied of any subdirectories (including their subdirectories and files, etc.) and files and then removed. The user is normally prompted for removal of any write-protected files in the directories unless the -f option is used.

If a file encountered by rm is a symbolic link, the link is removed, but the file or directory to which that link refers will not be affected. A user does not need write permission to delete a symbolic link, as long as the user has write permission for the directory in which that link resides.

The rm command supports the -- (two consecutive dashes) parameter as a delimiter that indicates the end of the options. This is useful when the name of a file or directory

begins with a dash or hyphen. For example, the following removes a directory named -dir1:

rm -r -- -dir1

Other options include -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rm, and --version, which tells the version of rm that is currently in use. Some differences exist among the various versions of rm, so it is always wise to read the documentation for the particular system.

The rmdir command differs from rm in that it is only used to remove empty directories

The rmdir command

The rmdir command is used to remove empty directories in Linux

The syntax for rmdir is

rmdir [option] directory_names

When used without any options, rm will delete any empty directories whose names are supplied as arguments (i.e., inputs) regardless of whether such directories have write permission or not. Thus, for example, the following command would remove two empty directories named dir1 and dir2 that are located in the current directory (i.e., the directory in which the user is currently working):

rmdir dir1 dir2

The ability to remove only empty directories is a built-in safeguard that helps prevent the accidental loss of data. This is important because once deleted, it is extremely difficult or impossible to recover deleted data on Unix-like operating systems1.

The -p (i.e., parents) option tells rmdir to remove the parent directories of the specified directory if each successive parent directory will, in turn, become empty and if each parent directory has write permission. Thus, for example, the following would remove dir5, dir4 and dir3 if dir5 were empty, dir4 only contained dir5 and dir3 only contained dir4 (which, in turn, contained dir5):

rmdir -p dir3/dir4/dir5

This provides a symmetry with the -p option of the mkdir command, which is used to create directories. Thus, the above set of nested directories could be easily created with the following:

mkdir -p dir3/dir4/dir5

In contrast to the rm command, which is used to delete both files and directories, there is no -r option for rmdir. at least on the GNU version that is standard on Linux. That option allows rm to recursively delete a directory by first deleting all of its contents, beginning with those in the lowest levels of subdirectories. Thus, if a user wants to remove an entire directory structure, it is usually most efficient to use rm with its -r option rather than trying to first remove the contents of each directory, its subdirectories, etc.

Three options that rmdir shares with rm are -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rmdir, and --version, which tells the version of rmdir that is currently in use. Some differences exist among the various versions of rmdir, so it is always wise to read the documentation for the particular system.

Listing and combining files with the cat command

The cat (concatenate file) command is used to send the contents of files to your screen. This

command may also be used to send files' contents into other files. Hour 6 covers terms such as standard input, standard output, and redirection, and this section shows you some basic uses for this command.

Although cat may be useful for reading short files, it is usually used to either combine, create, overwrite, or append files. To use cat to look at a short file, you can enter

\$ cat test.txt

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

The cat command also has a number of options. If you'd like to see your file with line

numbers, perhaps to note a specific phrase, you can use the -n option:

\$ cat -n test.txt

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

and also use cat to look at several files at once, because cat accepts wildcards, for example:

\$ cat -n test*

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.
- This is the first line of test2.txt.
- This file was also created by cat.
- This is the last line of test2.txt.

As you can see, cat has also included a second file in its output, and has numbered each line of the output, not each file. Note that also see both files with

\$ cat test.txt test2.txt

The output will be exactly the same as if had used a wildcard. But looking at several files is only one way to use cat. You can also use the cat command with the redirection operator > to combine files. For example, if you would like to combine test.txt and test2.txt into a third file called test3.txt, you can use

\$ cat test* > test3.txt

check the result with

ls -l test*

In this case, user first decide whether you want the contents of test.txt to go into test2.txt, or the contents of test2.txt to go into test.txt . Then, using cat with the >> redirection operator, you might type

\$ cat test.txt >> test2.txt

This appends the contents of test.txt to the end of the test2.txt . To check the results, use cat again:

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

Note that if you had entered the command.

\$ cat -n test.txt >> test2.txt

The test2.txt file would look like

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

Finally, here's a trick you can use if you want to create a short text file without running a word processor or text editor. Because the cat command can read the standard input (more about this in Hour 6), you can make the cat command create a file and fill it with your keystrokes.

Here's how:

\$ cat > myfile.txt

Now, enter some text:

\$ cat > myfile.txt

This is the cat word processor.

This is the end of the file.

Then, when you're done typing, press Ctrl+D to close the file. To see if this works, try

```
$ ls -l myfile.txt
```

```
-rw-rw-r-- 1 bball bball 61 Nov 12 18:26 myfile.txt
```

```
$ cat myfile.txt
```

This is the cat word processor.

This is the end of the file.

user should also know that the cat command will print out the contents of any file, and not

just text files. Although cat may be useful to look at one or several short files,

Other file commands

The clear Command

The clear command is used to remove all previous commands and output from consoles and terminal windows in Unix-like operating systems.

A console is an all-text mode user interface that occupies the entire screen of the display device and which does not sit on top of a graphical user interface (GUI). A terminal window is a text-only window in a GUI that emulates a console and which can be opened by clicking the appropriate icon (i.e., small image) or menu item.

Clear is one of the very few commands in Unix-like operating systems that accepts neither options nor arguments (i.e., input files). That is, it is only used as follows:

Clear

After the clear command has been issued, all that remains on the display screen is the command prompt in the upper left hand corner. A command prompt, also referred to as a prompt, is a short text message at the start of a line that informs the user that the system is ready for the next command, data element or other input.

The descriptions are rather terse, and they can seem somewhat cryptic to new users. However, users typically find them to be increasingly useful as they become more familiar with them and gain experience in the use of Unix-like operating systems.

The man command itself is extremely easy to use. Its basic syntax is

```
man [option(s)] keyword(s)
```

man is most commonly used without any options and with only one keyword. The keyword is the exact name of the command or other item for which information is desired. For example, the following provides information about the ls command (which is used to list the contents of any specified directory):

```
man ls
```

As another example, the following displays the man page about the man pages:

```
man man
```

man automatically sends its output through a pager, usually the program less. A pager is a program that causes the output of any program to be displayed one screenful at a time, rather than having a large amount of text scroll down the screen at high (and generally unreadable) speed.

less writes a colon at the bottom of the screen to indicate the end of the on-screen page. The user can move to the next page by pushing the space bar and can return to the previous page by pressing the b key. Pressing the q exits the man pages and returns the user to the shell program.

Each man page is a self-contained article that is divided into a number of sections, the headers for which are labeled with upper case letters. The sections for commands are typically something like NAME, SYNOPSIS, DESCRIPTION, OPTIONS, AUTHOR, BUGS, COPYRIGHT, HISTORY and SEE ALSO, although there may be some differences according to the particular command. Some of these might be broken down into subsections, particularly OPTIONS in the case of a command that has numerous options.

Also, the man pages as a whole are organized into sections, each containing pages about a specific category of topics as shown below. The section to which an article belongs is indicated in parenthesis in the top line, before the NAME header.

1. executable programs or shell commands
2. system calls
3. library routines
4. special files (i.e., devices in the /dev directory)
5. file formats
6. games
7. macro packages
8. system administration commands
9. kernel routines

Some topic names will have multiple articles, depending on context. For instance, there are two articles for mount, one corresponding to its use as a command in system management (i.e., to logically attach partition or other devices to the main filesystem) and the other for use in the C programming language. Generally, the most commonly used topic is displayed by default, and there are references to any other topics with the same name in the SEE ALSO section at the bottom of the final on-screen page.

The syntax to specify an article from a particular section is:

```
man section_number keyword
```

Thus, for example, the following would display the article about mount from Section 2 instead of from the default Section 8:

man 2 mount

The -w and -W options tell man to not actually display the man pages, but to provide the location(s) of the file(s) that would be formatted or displayed. If no arguments (i.e., input files) are provided, a list of directories that is searched by man for man pages is returned.

The -f option produces the same output as the whatis command. whatis provides very brief descriptions of commands from a database that is automatically created from the first line of the NAME section of each relevant man page.

The Whoami and who command

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output. Standard output is, by default, the display screen, unless redirected to a file, printer, etc.

whoami is particularly useful when using shells such as ash and sh that do not show the name of the current user in the command prompt (a short text message at the start of the command line on an all-text display). It is also useful for confirming the current owner of a session after using the su (i.e., substitute user) command, which changes the owner of the session without the original owner having to first log out.

A shell is a program that provides the traditional, text-only user interface for Unix-like operating systems. Its primary function is to read commands that are typed into a console (i.e., an all-text display mode) or terminal window (an all-text window in a GUI) and then execute (i.e., run) them.

The formal syntax for whoami is:

whoami [option]

When used without any options or redirection, as it usually is, i.e.,

Whoami

and followed by pressing the ENTER key, whoami displays on the monitor screen the user name of the owner of the current session.

There are only two options for whoami: --help and --version. The former outputs the very brief description that is contained in the man (i.e., built-in system manual) pages, and the latter outputs the number of the version currently installed on the system.

whoami produces the same result as the id command (which by default provides more detailed information about the current user than does whoami) when id is used with its -u and -n options, i.e.,

id -un

The -u option tells id to provide only the identification for the current owner of the session, and the -n option tells it to present that identification as the user name instead of as a number.

The who command differs from whoami in that it provides a list of all users currently logged into the system as well

as additional information about each of those users (including login times and terminal numbers). It also differs in that, in the event of a change in ownership of a login session through the use of the su command, it reports the original owner of the session, whereas whoami provides the user name of the effective (i.e., current) owner of the session.

stat command

File Stat - Display Information About File

For example, to find out more information about 101hacks.txt file, execute the stat command as shown below.

\$ stat 101hacks.txt

File: '/home/sathiyamoorthy/101hacks.txt'

Size: 854 Blocks: 8 IO Block: 4096 regular file

Device: 801h/2049d Inode: 1058122 Links: 1

Access: (0600/-rw-----) Uid: (1000/ sathiya)
Gid: (1000/ sathiya)

Access: 2009-06-28 19:29:57.000000000 +0530

Modify: 2009-06-28 19:29:57.000000000 +0530

Change: 2009-06-28 19:29:57.000000000 +0530

Details of Linux stat command output

- **File:** '/home/sathiyamoorthy/101hacks.txt' - Absolute path name of the file.
- **Size:** 854 - File size in bytes.
- **Blocks:** 8 - Total number of blocks used by this file.
- **IO Block:** 4096 - IO block size for this file.
- **Regular file** - Indicates the file type. This indicates that this is a regular file. Following are available file types.
 - regular file. (ex: all normal files).
 - directory. (ex: directories).
 - socket. (ex: sockets).
 - symbolic link. (ex: symbolic links.)
 - block special file (ex: hard disk).
 - character special file. (ex: terminal device file).
- Device: 801h/2049d - Device number in hex and device number in decimal
- Inode: 1058122 - Inode number is a unique number for each file which is used for the internal maintenance by the file system.
- Links: 1 - Number of links to the file
- Access: (0600/-rw---): Access specifier displayed in both octal and character format. Let us see explanation about both the format.

- **Uid:** (1000/ sathiya) - File owner's user id and user name are displayed.
- **Gid:** (1000/ sathiya) - File owner's group id and group name are displayed.
- **Access:** 2009-06-28 19:29:57.000000000 +0530 - Last access time of the file.
- **Modify:** 2009-06-28 19:29:57.000000000 +0530 - Last modification time of the file.
- **Change:** 2009-06-28 19:29:57.000000000 +0530 - Last change time of the inode data of that file.

Dir Stat - Display Information About Directory You can use the same command to display the information about a directory as shown below.

\$ stat /home/ramesh

File: '/home/ramesh'

Size: 4096 Blocks: 8 IO Block: 4096 directory

Device: 803h/2051d Inode: 5521409 Links: 7

Access: (0755/drwxr-xr-x) Uid: (401/ramesh)
Gid: (401/ramesh)

Access: 2009-01-01 12:17:42.000000000 -0800

Modify: 2009-01-01 12:07:33.000000000 -0800

Change: 2009-01-09 12:07:33.000000000 -0800

head command

The head command reads the first few lines of any text given to it as an input and writes them to standard output (which, by default, is the display screen).

head's basic syntax is:

head [options] [file(s)]

The square brackets indicate that the enclosed items are optional. By default, head returns the first ten lines of each file name that is provided to it.

For example, the following will display the first ten lines of the file named aardvark in the current directory (i.e., the directory in which the user is currently working):

head aardvark

If more than one input file is provided, head will return the first ten lines from each file, precede each set of lines by the name of the file and separate each set of lines by one vertical space. The following is an example of using head with two input files:

head aardvark armadillo

If it is desired to obtain some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, the above example could be modified to display the first 15 lines from each file:

head -n15 aardvark armadillo

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in

between. Thus, the following command would produce the same result:

head -n 15 aardvark armadillo

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell head how many lines to return. Thus, the following would produce the same result as the above commands:

head -15 aardvark armadillo

head can also return any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the start of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, the following would display the first five bytes of each of the two files provided:

head -c 5 aardvark anteater

When head counts by bytes, it also includes the newline character, which is an un-printing (i.e., invisible) character that is designated by a backslash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the start of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or on paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would display the first five kilobytes of the file aardvark:

head -c5k aardvark

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case head would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like head: aardvark: invalid number of bytes:

head -c aardvark

If head is used without any options or arguments (i.e., file names), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the first ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

head -n3

As is the case with other command line (i.e., all-text mode) programs in Linux and other Unix-like operating systems, the output from head can be redirected from the display monitor to a file or printer using the output redirection operator (which is represented by a rightward-pointing angular

bracket). For example, the following would copy the first 12 lines of the file Yuriko to the fileDecember:

head -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two consecutive rightward pointing angle brackets) could be used to add the output from head to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

head -n 12 Yuriko >> December

The output from other commands can be sent via a pipe (represented by the vertical bar character) to head to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to head, which, in turn, displays the first ten lines of the output that it receives from ls:

ls | head

This output could easily be redirected, for example to the end of a file namedfile1 as follows:

ls | head >> file1

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reverse alphabetic order prior to appending file1:

ls | head | sort -r >> file1

The -q (i.e., quiet) option causes head to not show the file name before each set of lines in its output and to eliminate the vertical space between each set of lines when there are multiple input sources. Its opposite, the -v (i.e., verbose) option, causes head to provide the file name even if there is just a single input file.

The tail command is similar to the head command except that it reads the final lines in files rather than the first lines.

As is the case with other commands on Unix-like operating systems, additional information can be obtained about head and tail by using the man and infocommands to reference the built-in documentation, for example

man head

or

info tail

tail command

The tail command reads the final few lines of any text given to it as an input and writes them to standard output (which, by default, is the monitor screen).

The basic syntax for tail is:

tail [options] [filenames]

\$ tail -n 4 /etc/passwd

The square brackets indicate that the enclosed items are optional. By default, tail returns the final ten lines of each file name that is provided to it.

For example, the following command will print (traditional Unix terminology for write) the last ten lines of the file named aardvark in the current directory (i.e., the director in which the user is currently working) to the display screen:

tail aardvark

If more than one input file is provided, tail will print the last ten lines from each file to the monitor screen. Each set of lines will be preceded by the name of the file and separated by one vertical space from other sets of lines. The following is an example of using tail with multiple input files:

tail file1 file2 file3

If it is desired to print some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, to print the final 15 lines from each file in the above example, the command would be modified as follows:

tail -n15 file1 file2 file3

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in between. Thus, the following command would produce the same result:

tail -n 15 file1 file2 file3

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell tail how many lines to print. Thus, the following would produce the same result as the above commands:

tail -15 file1 file2 file3

tail can also print any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the end of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, to view the final five bytes of each of the two files aardvark and anteater, the following command would be used:

tail -c 5 file1 file2

When tail counts by bytes, it also includes the newline character, which is a non-printing (i.e, invisible) character that is designated by a backward slash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the end of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would print the last five kilobytes of the file aardvark:

tail -c5k file1

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case tail would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like tail: aardvark: invalid number of bytes:

tail -c file1

If tail is used without any options or arguments (i.e., inputs), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the final ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

tail -n3

As is the case with other command line (i.e., all-text mode) programs in Unix-like operating systems, the output of tail can be redirected from the monitor to a file or printer using the redirection operator (which is represented by a rightward pointing angular bracket). For example, the following would write the final 12 lines of the file Yuriko to the file December:

tail -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two rightward pointing angular brackets) could be used to add the output from tail to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

tail -n 12 Yuriko >> December

The output from other commands can be piped (i.e., sent) to tail to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to tail, which, in turn, prints the final ten lines of the output that it receives from ls to the monitor screen:

ls | tail

This output could easily be redirected, for example to a file named last_filenames as follows:

ls | tail >> last_filenames

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reversealphabetic order prior to writing to a file:

ls | tail | sort -r >> last_filenames

The -q (i.e., quiet) option causes tail to not print the file name before each set of lines and to eliminate the vertical space between each set of lines when there are multiple input sources. The -v (i.e., verbose) option causes tail to print the file name even if there is just a single input file.

Tail could be viewed as a counterpart of the head command, which always starts reading from the beginning of files and which can continue until any specified distance from the beginning. However, there are a few differences. Perhaps the most useful of these is that tail is somewhat more flexible in that, in addition to being able to start reading any specified distance from the end of a file, it can also start at any specified distance from the beginning of a file.

Tail can be instructed to begin printing from some number of lines or bytes from the start of a file by preceding the number with a plus sign instead of a minus sign. For example, the following would print each of the designated files to the display monitor beginning with the seventh line and until the end:

tail +7 file1 file2 file3

The c option could be used to tell tail to print each of the designated files beginning with the seventh byte instead of the seventh line:

tail +7c file1 file2 file3

A particularly common application for tail is examining the most recent entries in log files. This is because the newest entries are appended to the ends of such files, which tail excels in showing. As log files can be a rather long, this can eliminate a lot of scrolling that would be necessary if some other command were used to read them. For example, the most recent entries to the log /var/log/messages can easily be viewed by using the following:

tail /var/log/messages

wc command

The wc (i.e., word count) command by default counts the number of lines, words and characters in text.

wc defines a word as a set of contiguous letters, numbers and/or symbols which are separated from other characters by one or more spaces, tabs and/or newline characters (which are generated when the RETURN key is pressed). When counting the number of characters, all characters are counted, not only letters, numbers and symbols, but also spaces, tabs and newline characters. A line is only counted if it ends with a newline character.

wc's syntax is

wc [options] [file_name(s)]

The items in square brackets are optional. If no file names are provided, wc reads from its standard input, which by default is text entered at the keyboard.

This can be seen by typing.

wc

at the command line (i.e., in the all-text mode), pressing the ENTER key to move to a new line and then typing some text on one or more lines. The command isexecuted (i.e., run) by pressing the ENTER key again and then pressing the CONTROL and d keys simultaneously. This causes wc to write in a new line (under the lines of text) its count of the numbers of lines, words and characters in the text.

The following command counts the number of lines, words and characters in a file named file1 that resides in the current directory (i.e., the directory in which the user is currently working) and likewise writes them, followed by the name of the file, to standard output, which is by default the display monitor:

wc file1

wc can provide its output for multiple files by listing the name of each separated by a space. For example,

wc file1 file2 file3

The numbers of lines, words and characters for each file along with its name will be displayed on a separate line and in the order that the files are listed as arguments(i.e., input files). In the case of multiple arguments such as this, wc also provides an additional line that shows the total number of lines, words and characters for all the files.

Likewise, wc can provide a count for all of the text files within a directory. This is accomplished by using the star wildcard character, which represents everythingand is designated by an asterisk (*). For example, the following will display the number of lines, words and characters for each file in the current directory (which is represented by a dot) as well as totals for all files in the directory:

wc . *

wc has only a few options, the most commonly used of which restrict the information it provides. The -l option tells wc to count only the number of lines, the -woption tells it to count only the number of words, the -m option tells it to count only the number of characters and the -c option tells wc to count only the number ofbytes. Thus, for example, the following displays just the number of words in a file named file4:

wc -w file4

The following displays the number of characters in the same file:

wc -m file4

As is generally the case with commands in Unix-like operating systems, any combination of options can be used together. For example, the following would count both the numbers of lines and words in a file named file5:

wc -lw file5

Redirection can be used with wc to create more complex commands. For example, the output from the above command can be redirected using the standard output redirection operator (which is designated by a rightward pointing angle bracket) from the display screen to a file named file6 with the following:

wc -lw file5 > file6

If file6 already exists, its contents will be overwritten; if it does not exist, it will be created. The contents of file6 can be easily confirmed with a text editor or with a command such as cat, which is commonly used to read text files, i.e.,

cat file6

grep command

grep is used to search text for patterns specified by the user. It is one of the most useful and powerful commands on Linux and other Unix-like operating systems.

grep's basic syntax is:

grep [option(s)] pattern [file(s)]

The items in square brackets are optional. When used with no options and no arguments (i.e., input files), grep searches standard input (which by default is text typed in at the keyboard) for the specified pattern and returns each line that contains a match to standard output (which by default is the display screen).

A line of text is defined in this context not as what appears as a line of text on the display screen but rather as all text between two newline characters. Newline characters are invisible characters that are represented in Unix-like operating systems by a backslash followed by the letter n and which are created when a user presses the ENTER key when using a text editor (such as gedit). Thus, a line of text returned by grep can be as short as a single character or occupy many lines on the display screen.

grep can search any number of files simultaneously. Thus, for example, the following would search the three files file1, file2 and file3 for any line that contains thestring (i.e., sequence of characters) Lin:

grep Lin file1 file2 file3

Each result is displayed beginning on a separate line, and it is preceded by the name of the file in which it was found in the case of multiple files. The inclusion of the file names in the output data can be suppressed by using the -h option.

grep is not limited to searching for just single strings. It can also search for sequences of strings, including phrases. This is accomplished by enclosing the sequence of strings that forms the pattern in quotation marks (either single or double). Thus, the above example could be modified to search for the phrase Linux is:

grep 'Linux is' file1 file2 file3

Text searches with grep can be considerably broadened by combining them with wildcards and/or performing recursive searches. A wildcard is a character that can represent some specific class of characters or sequence of characters. The following is a modification of the above example that uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to search all text files in the current directory (i.e., the directory in which the user is currently working):

grep 'Linux is' *

grep's search area can be broadened even further by using its -r option to search recursively through an entire directory tree (i.e., a directory and all levels of subdirectories within it) rather than just the files within a specified directory. For example, the following would search all files in the current

directory and in all of its subdirectories (including their subdirectories, etc.) for every line containing the full name of the creator of Linux:

```
grep -r 'Linus Torvalds' *
```

One of the most commonly employed of grep's many options is -i, which instructs it to ignore case, that is, to ignore whether letters in the pattern and text searched are lower case (i.e., small letters) or upper case (i.e., capital letters). Thus, for instance, the previous example could very easily be converted to a case-insensitive search as follows:

```
grep -ir 'Linus Torvalds' *
```

This would produce the same results as

```
grep -ir 'linUS torvAlds' *
```

Another frequently used option is -c, which causes grep to only report the number of times that the pattern has been matched for each file and to not display the actual lines. Thus, for instance, the following would show the total number of times that the string inu appears in a file named file4:

```
grep -c inu file4
```

Another useful option is -n, which causes grep to precede each line of output with the number of the line in the text file from which it was obtained. The -v option inverts the match; that is, it matches only those lines that do not contain the given pattern.

The -w option tells grep to select only those lines that contain an entire word or phrase that matches the specified pattern. The -x option tells grep to select only those lines that match exactly the specified pattern.

The -l option tells grep to not return the lines containing matches but to only return the names of the files that contain matches. The -L option is the opposite of the -l option (and analogous to the -v option) in that it will cause grep to return only the names of files that do not contain the specified pattern.

grep does not search the names of files for a specified pattern, only the text contained within files. However, sometimes it is useful to search the names of files, as well as of directories and links, rather than the contents of files. Fortunately, this can easily be accomplished by first using the ls command to list the contents of a directory and then using a pipe (which is represented by the vertical bar character) to transfer its output to grep for searching. For example, the following would provide a list of all files, directories and links in the current directory that contain the string linu in their names:

```
ls | grep linu
```

The following example uses ls with its -l (i.e., long) option (which is unrelated to grep's -l option) to find all filesystem objects in the current directory whose permissions have been set so that any user can read, write and execute them:

```
ls -l | grep rwxrwxrwx
```

grep is very useful for obtain information from log and configuration files. For example, it can be used to obtain information about the USB (universal serial bus) devices on a system by filtering the output from the dmesg command (which provides the messages from the kernel as a system is booting up) as follows:

```
dmesg | grep -i usb
```

Among grep's other options are --help, which provides a very compact summary of some of its many capabilities, and -V, or --version, which provides information about the currently installed version.

grep's search functionality can be even further refined through the use of regular expressions. These are a pattern matching system that uses strings constructed according to pre-defined syntax rules to find desired patterns in text. Additional information about grep, including its use with regular expressions, can be obtained from its built-in manual page by using the man command, i.e.,

man grep

The name grep comes from a command in ed, which was the original text editor on the UNIX operating system. The command takes the form g/re/p, which means to search globally for matches to the regular expression (i.e., re), and print (which is UNIX terminology for write on the display screen) lines that are found.

In command

In command is used to create links. Links are a kind of shortcuts to other files. The general form of command is:

```
$ ln TARGET LINK_NAME
```

There are two types of links, soft links and hard links. By default, hard links are created. If you want to create soft link, use -s option. In this example, both types of links are created for the file usrlisting.

```
$ ln usrlisting hard_link
```

```
$ ln -s usrlisting soft_link
```

```
$ ls -l
```

```
total 12
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 hard_link
```

```
lrwxrwxrwx 1 raghu raghu 10 2012-07-09 14:00 soft_link -> usrlisting
```

```
-rw-r--r-- 1 raghu raghu 491 2012-07-06 16:02 usrcopy
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 usrlisting
```

Some additional useful commands

alias command

'alias' is another name for a command. If no argument is given, it shows current aliases. Aliases can be used for short names of commands. For example, you might use clear command frequently. You can create an alias for it:

\$ alias c="clear"

Next time enter c on command line, your screen will be clear. Current aliases can be checked with 'alias' command:

\$ alias

```
alias alert='notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e \'s/^\\s*[0-9]+\\s*//;s/[;&]\\s*alert$//\'")'
```

alias c='clear'

alias egrep='egrep --color=auto'

alias fgrep='fgrep --color=auto'

alias grep='grep --color=auto'

alias l='ls -CF'

alias la='ls -A'

alias ll='ls -alF'

alias ls='ls --color=auto'

w command

The w command shows who is logged in to the system and what they are doing.

A login, logging in or logging on is the entering of identifier information into a system by a user in order to access that system (e.g., a computer or a website). It generally requires the user to enter two pieces of information, first a user name and then a password.

The basic syntax of w is:

w [options] [username1, username2, ...]

The square brackets indicated that the enclosed items are optional. When used without any options, w sends to standard output (which is by default the display screen) a header line followed by a table that contains a line of data for each user currently logged in.

The header shows six items: the current time, how long the system has been running (in minutes) since it was booted up (i.e., started up), how many users are currently logged on, and the system load averages, i.e., the average number of processes active, during the last one, five and 15 minutes. A process is an executing(i.e., running) instance of a program.

The main part of w's output consists of a table showing eight items of information for each user currently logged into the system. The eight columns are labeled USER, TTY, FROM, LOGIN@, IDLE, JCPU, PCPU and WHAT.

USER is the login name of the user. TTY (which now stands for terminal type but originally stood for teletype) is the name of the console or terminal (i.e., combination of monitor and keyboard) that the user logged into, which can also be found by using the tty command. Every time a user logs in across the network, a new tty is assigned to that user.

The consoles can be real or virtual. A feature of Linux systems is the use of virtual consoles, which act as

independent logical consoles that run in separate login sessions, but which are accessed from the same physical console (i.e., the same keyboard and screen). That is, each virtual console can have a different, or the same, user logged into it. On a Red Hat system, seven virtual consoles are configured and active by default.

FROM is the remote host (i.e., the name of some other computer), if any, that the user logged into. LOGIN@ is the time at which the user logged in. IDLE is the number of hours and minutes since the user last typed anything at the keyboard.

JCPU is the number of minutes accumulated by all processes attached to the tty. It does not include past background processes (i.e., low priority processes that operate only in gaps between higher priority foreground processes), but it does include currently running background processes.

PCPU is the time consumed by the current process, named in the WHAT column. WHAT lists the name of the current process along with any options and arguments(i.e., input files) used with the command that launched it.

Among the more useful of w's few options is -h, which tells it to omit the header header line from its output. The -s option tells it to use the short format, which omits the login time, JCPU and PCPU columns. The -l option creates a long listing, which is the same as the default. The -V option displays the version number of the currently installed w program.

By default, w reports on all users. However, it can be made to report on only a specified set of users by providing those usernames in a comma-separated list.

w provides information similar to that which would be provided by a combination of the uptime, who and ps -a commands. uptime produces a single line of output that is the same as w's header line. who shows who is currently logged into the system. ps -a lists all processes with a tty except session leaders (i.e., processes that created sessions).

w can be useful, but there are some faults with the information it provides, and thus its output should only be considered approximate. In particular, the notion of thecurrent process is unclear and there are some problems detecting background processes, even though they usually account for much of the load on the system. Also, the CPU time is only an estimate; for example, if a user leaves a background process running after logging out, the time is credited to the person currently on that terminal.

last command

Display information about the users who logged in and out of the system. The output of last can be very large, so the following output has been filtered (through head) to display top 10 lines only:

```
$ last | head
root tty1 Mon Jul 9 10:06 still logged in
root tty1 Mon Jul 9 10:06 - 10:06 (00:00)
raghu pts/1 :0.0 Mon Jul 9 10:05 - 10:06 (00:00)
raghu pts/0 :0.0 Mon Jul 9 09:34 still logged in
raghu tty7 :0 Mon Jul 9 09:19 still logged in
reboot system boot 2.6.38-13-generi Mon Jul 9 09:09 -
10:12 (01:02)
raghu tty7 :0 Sun Jul 8 23:36 - 00:30 (00:54)
reboot system boot 2.6.38-13-generi Sun Jul 8 23:36 -
00:30 (00:54)
raghu tty7 :0 Sun Jul 8 21:07 - down (01:06)
reboot system boot 2.6.38-13-generi Sun Jul 8 21:07 -
22:14 (01:07)
```

A similar command is lastb that shows last bad login attempts. But this command must be run as root otherwise would get an error of permission denied

```
$ lastb
raghu tty2 Mon Jul 9 10:16 - 10:16 (00:00)
UNKNOWN tty2 Mon Jul 9 10:15 - 10:15 (00:00)
ubuntu tty8 :1 Mon Jul 2 10:23 - 10:23 (00:00)
btmp begins Mon Jul 2 10:23:54 2012
```

du command

du command determines disk usage of a file. If the argument given to it is a directory, then it will list disk usage of all the files and directories recursively under that directory:

```
$ du /etc/passwd
4 /etc/passwd
$ du hello/
52 hello/HelloApp
4 hello/orb.db/logs
20 hello/orb.db
108 hello/
```

df command

df reports file system usage. For example:

```
$ df
Filesystem 1K-blocks Used Available Use% Mounted on
/dev/sda7 10079084 7372872 2194212 78% /
none 1522384 768 1521616 1% /dev
none 1529012 252 1528760 1% /dev/shm
none 1529012 108 1528904 1% /var/run
none 1529012 4 1529008 1% /var/lock
/dev/sda8 5039616 3758824 1024792 79% /home
```

```
/dev/sda2 209715196 196519248 13195948 94%
media/Data
```

fdisk command

The fdisk is the tool for getting partition information, adding and removing partitions. The fdisk tool requires super user privileges. To list all the partitions of all the hard drives available:

```
$ fdisk -l
Disk /dev/sda: 320.1 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x396f396f

Device Boot Start End Blocks Id System
/dev/sda1 1 2611 20971520 7 HPFS/NTFS
/dev/sda2 2611 28720 209715200 7 HPFS/NTFS
/dev/sda3 * 28720 38914 81882113 5 Extended
  /dev/sda5 28720 33942 41943040 7 HPFS/NTFS
  /dev/sda6 33942 34464 4194304 7 HPFS/NTFS
  /dev/sda7 34464 35739 10240000 83 Linux
  /dev/sda8 35739 36376 5120000 83 Linux
  /dev/sda9 36376 36886 4096000 82 Linux swap / Solaris
  /dev/sda10 36887 38276 11164672 83 Linux
  /dev/sda11 38277 38914 5117952 83 Linux
```

fdisk is an interactive tool to edit the partition table. It takes a device (hard disk) as an argument, whose partition table needs to be edited.

\$ fdisk /dev/sda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): m

Command	action
a	toggle a bootable flag
b	edit bsd disk label
c	toggle the dos compatibility flag
d	delete a partition
l	list known partition types
m	print this menu
n	add a new partition
o	create a new empty DOS partition table
p	print the partition table
q	quit without saving changes

s	create a new empty Sun disklabel
t	change a partition's system id
u	change display/entry units
v	verify the partition table
w	write table to disk and exit
x	extra functionality (experts only)

Pressing 'm' at the fdisk prompt prints out above help that lists all the commands available for fdisk. A new partition can be created with n and an existing partition can be deleted with d command. When you are done editing the partitions, press w to write the changes to the disk, and finally, q to quit from fdisk (q dies not save changes).

netstat command

'netstat' is the command used to check the network statistics of the system. It will list the current network connections, routing table information, interface statistics, masquerade connections and a lot more information.

\$ netstat | head

Active Internet connections (w/o servers)

Proto Recv-Q Send-Q Local Address Foreign Address State

Active UNIX domain sockets (w/o servers)

Proto RefCnt Flags Type State I-Node Path

unix 13 [] DGRAM 8498 /dev/log

unix 2 [] DGRAM 6824 @/org/kernel/udev/udevd

unix 3 [] STREAM CONNECTED 56738 /var/run/dbus/
system_bus_socket

unix 3 [] STREAM CONNECTED 56113

unix 3 [] STREAM CONNECTED 29138

unix 3 [] STREAM CONNECTED 29137

history command

This command shows the commands you have entered on your terminal so far.

passwd command

Change your password with 'passwd' command.

shutdown -h now

Finally shut down your system using this command.

Understanding and using file permissions

In Linux and Unix, everything is a file. Directories are files, files are files and devices are files. Devices are usually referred to as a node; however, they are still files.

All of the files on a system have permissions that allow or prevent others from viewing, modifying or executing. If the file is of type Directory then it restricts different actions than files and device nodes. The super user "root" has the ability to access any file on the system. Each file has access restrictions with permissions, user restrictions with owner/group association. Permissions are referred to as bits.

If the owner read & execute bit are on, then the permissions are:

There are three types of access restrictions:

Permission	Action	Chmod option
read	(view)	r or 4
write	(edit)	w or 2
execute	(execute)	x or 1

There are also three types of user restrictions:

User	ls output
owner	-rwx----
group	---rwx---
other	-----rwx

**The restriction type scope is not inheritable:
the file owner will be unaffected by restrictions
set for his group or everybody else.**

Folder/Directory Permissions

Directories have directory permissions. The directory permissions restrict different actions than with files or device nodes.

Permission	Action	chmod option
Read	(view contents, i.e. ls command)	r or 4
Write	(create or remove files from dir)	w or 2
execute	(cd into directory)	x or 1

1. read restricts or allows viewing the directories contents, i.e. ls command
2. write restricts or allows creating new files or deleting files in the directory. (Caution: write access for a directory allows deleting of files in the directory even if the user does not have write permissions for the file!)
3. execute restricts or allows changing into the directory, i.e. cd command

Folders (directories) must have 'execute' permissions set (x or 1), or folders (directories) will NOT FUNCTION as folders (directories) and WILL DISAPPEAR from view in the file browser (Nautilus).

Permissions in Action

```
$ ls -l /etc/hosts
```

```
-rw-r--r-- 1 root root 288 2005-11-13 19:24 /etc/hosts
```

Using the example above we have the file "/etc/hosts" which is owned by the user root and belongs to the root group.

The permissions from the above /etc/hosts ls output

```
-rw-r--r--
```

owner = Read & Write (rw-)

group = Read (r--)

other = Read (r--)

Changing permissions

The command to use when modifying permissions is chmod. There are two ways to modify permissions, with numbers or with letters. Using letters is easier to understand for most people. When modifying permissions be careful not to create security problems. Some files are configured to have very restrictive permissions to prevent unauthorized access. For example, the /etc/shadow file (file that stores all local user passwords) does not have permissions for regular users to read or otherwise access.

```
$ ls -l /etc/shadow
```

```
-rw-r----- 1 root shadow 869 2005-11-08 13:16 /etc/shadow
```

Permissions:

owner = Read & Write (rw-)

group = Read (r--)

other = None (---)

Ownership:

owner = root

group = shadow

chmod with Letters

Usage: chmod {options} filename

Options	Definition
U	owner
G	group
O	other
A	all (same as ugo)
X	execute
W	write
R	read
+	add permission
-	remove permission
=	set permission

Here are a few examples of chmod usage with letters (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
```

```
$ ls -l
```

```
total 0
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod u+x file1
```

```
$ ls -l file1
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod o+wx file2
```

```
$ ls -l file2
```

```
-rwxr--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod g-r file3
```

```
$ ls -l file3
```

```
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod ugo+rwx file4
```

```
$ ls -l file4
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
```

```
$
```

chmod with Numbers

Usage: chmod {options} filename

Options	Definition
#-	owner
#	group
-#	other
1	execute
2	write
4	read

Owner, Group and Other is represented by three numbers. To get the value for the options determine the type of access needed for the file then add.

For example if need a file that has -rw-rw-rwx permissions will use the following:

Owner	Group	Other
read & write 4+2=6	read & write 4+2=6	read, write & execute 4+2+1=7

\$ chmod 667 filename

Another example if you want a file that has --w-r-x-- permissions you will use the following:

Owner	Group	Other
write 2	read & execute 4+1 = 5	execute 1

\$ chmod 251 filename

Here are a few examples of chmod usage with numbers (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
$ ls -l
total 0
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod 744 file1
$ ls -l file1
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod 647 file2
$ ls -l file2
-rw-r--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod 604 file3
$ ls -l file3
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod 777 file4
$ ls -l file4
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
$
```

chmod with sudo

Changing permissions on files that do not have ownership of: (Note that changing permissions the wrong way on the wrong files can quickly mess up the system a great deal!

Please be careful when using sudo!)

```
$ ls -l /usr/local/bin/somefile
-rw-r--r-- 1 root root 550 2005-11-13 19:45 /usr/local/bin/
somefile
```

```
$
$ sudo chmod o+x /usr/local/bin/somefile
$ ls -l /usr/local/bin/somefile
-rw-r--r-x 1 root root 550 2005-11-13 19:45 /usr/local/
bin/somefile
```

\$

Recursive permission changes

To change the permissions of multiple files and directories with one command. Please note the warning in the chmod with sudo section and the Warning with Recursive chmod section.

Recursive chmod with -R and sudo

To change all the permissions of each file and folder under a specified directory at once, use sudo chmod with -R

```
$ sudo chmod 777 -R /path/to/someDirectory
$ ls -l
total 3
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file2
```

Recursive chmod using find, pipemill, and sudo

To assign reasonably secure permissions to files and folders/directories, it's common to give files a permission of 644, and directories a 755 permission, since chmod -R assigns to both. Use sudo, the find command, and a pipemill to chmod as in the following examples.

To change permission of only files under a specified directory.

```
$ sudo find /path/to/someDirectory -type f -print0 | xargs
-0 sudo chmod 644
```

```
user@host:/home/user$ ls -l
```

```
total 3
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

To change permission of only directories under a specified directory (including that directory):

```
$ sudo find /path/to/someDirectory -type d -print0 | xargs
-0 sudo chmod 755
```

```
$ ls -l
```

```
total 3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
drwxr-xr-x 2 user user 4096 Nov 19 20:13 folder
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

Warning with Recursive chmod

WARNING: Although it's been said, it's worth mentioning in context of a gotcha typo. Please note, Recursively deleting or chown-ing files are extremely dangerous. You will not be the first, nor the last, person to add one too many spaces into the command. This example will hose your system:

```
$ sudo chmod -R / home/john/Desktop/tempfiles
```

Note the space between the first / and home. You have been warned.

Changing the file owner and group

A file's owner can be changed using the chown command. For example, to change the foobar file's owner to tux:

```
$ sudo chown tux foobar
```

To change the foobar file's group to penguins, you could use either chgrp or chown with special syntax:

```
$ sudo chgrp penguins foobar
```

```
$ sudo chown :penguins foobar
```

Finally, to change the foobar file's owner to tux and the group to penguins with a single command, the syntax would be:

```
$ sudo chown tux:penguins foobar
```

Note that, by default, you must use sudo to change a file's owner or group.

Difference between chown and chgrp

- 1) Chown command is used to change ownership as well as group name associated to different one, whereas chgrp can change only group associated to it.
- 2) Many people say that regular user is only able to use chgrp to change the group if the user belongs to them. But it's not true; a user can use chown and chgrp irrespective of changing group to one of their groups because chown is located in /bin folder so everyone can use it with some limited access.

umask - Set default permissions

The umask command controls the default permissions given to a file when it is created.

It uses octal notation to express a mask of bits to be removed from a file's mode attributes.

```
[me@linuxbox ~]$ rm -f foo.txt
```

```
[me@linuxbox ~]$ umask
```

```
0002
```

```
[me@linuxbox ~]$ > foo.txt
```

```
[me@linuxbox ~]$ ls -l foo.txt
```

```
-rw-rw-r-- 1 me me 0 2008-03-06 14:53 foo.txt
```

We first removed any old copy of foo.txt to make sure we were starting fresh. Next,

we ran the umask command without an argument to see the current value. It responded with the value 0002 (the value 0022 is another common default value), which is the octal representation of our mask. We next create a new instance of the file foo.txt and observe its permissions.

We can see that both the owner and group both get read and write permission, while everyone else only gets read permission. The reason that world does not have write permission is because of the value of the mask.

```
$ rm foo.txt
```

```
$ umask 0000
```

```
$ > foo.txt
```

```
$ ls -l foo.txt
```

```
-rw-rw-rw- 1 me me 0 2008-03-06 14:58 foo.txt
```

When we set the mask to 0000 (effectively turning it off), we see that the file is now

world writable. To understand how this works, we have to look at octal numbers again.

If we take the mask and expand it into binary, then compare it to the attributes.

Original file mode	--- rw- rw- rw-
Mask	000 000 000 010
Result	--- rw- rw- r--

Ignore for the moment the leading zeros (we'll get to those in a minute) and observe that

where the 1 appears in our mask, an attribute was removed—in this case, the world

write permission. That's what the mask does. Everywhere a 1 appears in the binary value

of the mask, an attribute is unset. If we look at a mask value of 0022, we can see what it does:

Original file mode	--- rw- rw- rw-
Mask 000 000 010 010	000 000 000 010
Result	--- rw- r-- r--

Again, where a 1 appears in the binary value, the corresponding attribute is unset. Play with some values (try some sevens) to get used to how this works. When you're done, remember to clean up:

```
$ rm foo.txt; umask 0002
```

The Tar command

The tar (i.e., tape archive) command is used to convert a group of files into an archive.

An archive is a single file that contains any number of individual files plus information to allow them to be restored to their original form by one or more extraction programs. Archives are convenient for storing files as well as for transmitting data and distributing programs. Moreover, they are very easy to work with, often much more so than dealing with large numbers of individual files.

Although tar was originally designed for backups on magnetic tape, it can now be used to create archive files anywhere on a file system. Archives that have been created with tar are commonly referred to as tar balls.

Unlike some other archiving programs, and consistent with the Unix philosophy that each individual program should be designed to do only one thing but do it well, tar does not perform compression. However, it is very easy to compress archives created with tar by using specialized compression utilities.

tar's basic syntax is

tar option(s) archive_name file_name(s)

tar has numerous options, many of which are not frequently used. Unlike many commands, tar requires the use of at least one option, and usually two or more are necessary.

tar files are created by using both the -c and -f options. The former instructs tar to create an archive and the latter indicates that the next argument (i.e., piece of input data in a command) will be the name of the new archive file. Thus, for example, the following would create an archive file called file.tar from the three files named file1, file2 and file3 that are located in the current directory (i.e., the directory in which the user is currently working):

tar -cf file.tar file1 file2 file3

It is not absolutely necessary that the new file have the .tar extension; however, the use of this extension can be very convenient because it allows the type of file to be visually identified. It is necessary, however, that the -f option be the final option in a sequence of contiguous, single-letter options; otherwise, the system will become confused as to the desired name for the new file and will use the next option in the sequence as the name.

The -v (i.e., verbose) option is commonly used together with the -c and -f options in order to display a list of the files that are included in the archive. In such case, the above example would become

tar -cvf file.tar file1 file2 file3

tar can also be used to make archives from the contents of one or more directories. The result is recursive; that is, it includes all objects (e.g., directories and files) within each level of directories. For example, the contents of two directories named dir1 and dir2 could be archived into a file named dir.tar with the following:

tar -cvf dir.tar dir1 dir2

It is often convenient to use tar with a wildcard (i.e., a character which can represent some specific class of characters or sequence of characters). The following example uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to create an archive of every object in the current directory:

tar -cf *

By default, tar creates an archive of copies of the original files and/or directories, and the originals are retained.

However, they can be removed when using tar by adding the --remove-files option.

As it has no compression and decompression capabilities of its own, tar is commonly used in combination with an external compression utility. A very handy feature of the GNU version (which is standard on Linux) is the availability of options that will cause standard compression programs to compress a new archive file as soon as it has been created. They are -j (for bzip2), -z (for gzip) and -Z (for compress). Thus, for example, the following would create an archive named files.tar.bz2 of the files file4, file5 and file6 that is compressed using bzip2:

tar -cvjf files.tar.bz2 file4 file5 file6

tar can also be used for unpacking tar files. However, before doing this, there are several steps that should be taken. One is to confirm that sufficient space is available on the hard disk drive (HDD). Another is to move to an empty directory (which usually involves creating one with an appropriate name) to prevent the reconstituted files from cluttering up the current directory and overwriting any files or directories with same names that are in it. In addition, if the archive has been compressed, it must first be decompressed using the appropriate decompression program (which can usually be determined by the filename extension).

In order to unpack a tar file, the -x (for extract) and -f options are required. It is also common to add the -v option to provide a running listing of the files being unpacked. Thus, for example, to unpack the archive file.tar created in a previous example the following would be used:

tar -xvf file.tar

Just as options are available to allow three compression programs to automatically compress newly created tar files, the same options can be used to have the compression programs automatically decompress tar files prior to extraction. Thus, for instance, the following would decompress and extract the contents of the compressed archive files.tar.bz2 that was created in an above example:

tar -xjvf files.tar.bz2

Files can be added to an existing archive using the -r option. As is always the case with tar, it is also necessary to use the -f option to indicate that the following string (i.e., sequence of characters) is the name of the archive. For example, the following would append a file named file7 to file.tar:

tar -rf file.tar file7

The --delete option allows specified files to be completely removed from a tar file (except when the tar file is on magnetic tape). However, this is different from an extraction, as copies of the removed files are not made and placed in the current directory. Thus, for example, the files file1 and file2 can be removed from file.tar with the following:

tar -f file.tar --delete file1 file2

The -t option tells tar to list the contents of an uncompressed archive without performing an extraction. Thus, the following would list the contents of file.tar:

```
tar -tf file.tar
```

Input, output and error redirection in linux

Input/output redirection means the text that is showing on the screen while you are running any command(program)in the shell, that information can be redirect elsewhere and even it can store this output in a file or can be print directly.

This function called Redirection, and can also redirect the input of program.

In Linux systems everything consider as a file.

A file descriptor is number that is associated with every file

When run a program in shell (i.e when execute a command) on the back end Linux access 3 special files.

Standard input - 0 file descriptor(example = mouse,)

Standard output - 1 file descriptor(example = Screen)

Standard error output - 2 file descriptor(example=Screen)

So it can redirect these files to other files. If user redirect standard output (Descriptor = 1) to the printer, instead of showing these outputs on the screen and the computer start getting print on paper.

Output Redirection

Output Redirection is most commonly used, when execute a command it's normally appears on the terminal . If extract any tar file you will notice all the output scrolls down rapidly. And can redirect this output in a file for inspecting the output or can send anybody via email. This is called Output Redirection. Using this operator '>' in shell can redirect the output in a file.

Example :

```
$ ls > output.txt  
$ cat output.txt  
bin  
boot  
dev  
etc  
home  
lib  
lib64  
lost+found  
media  
mnt  
opt  
output.txt  
proc
```

```
root  
sbin  
selinux  
srv  
sys  
tmp  
usr  
var  
$
```

If output.txt file is already exist then '>' operator will overwrite the file for append more output into output.txt use '>>' instead of '>'.

Input Redirection

You can redirect your input by using '<' operator. Cannot run input redirection on all programs or commands. And can use only with that programs or commands that accept Input from keyboard.

Example : user going to send an email and already have Template of that email. and can put template in the email body using input redirect.

```
$ mail ali < mail_template.txt
```

above command launch email program with mail_template.txt contents.

Now due to advancement in GUI, and also lots of good email clients, method is rarely used.

Error Redirection

Error Redirection is very helpful when in trouble. In this case user trying to open a file that is not readable for my user will get permission denied errors. it will redirect these error into error.txt file.

Example :

```
$ cat ali.txt 2> /home/H.Ali/error.txt  
$ cat /home/H.Ali/error.txt  
cat: ali.txt: Permission denied
```

In the above command 2 is descriptor of error redirection file by typing '2>' you are saying redirect any kind of error to the file error.txt

Pipes ' | ' in Linux

Linux pipes allow us connect output stream of 'command a' to input stream of 'command b'. here in my case i will pipe cat commands output into less as input.

Example : cat /var/log/messages | less

we can also use pipe for searching strings specially from large text files.

```
cat /var/log/messages | grep kernal | less
```

grep is a line searcher it will search lines for specific piece of text.

above command will search a keyword 'kernel' with grep and then pipe it again to less.

Pipes in linux

A pipe is a form of redirection that is used in Linux and other Unix-like operating systems to send the output of one program to another program for further processing.

Redirection is the transferring of standard output to some other destination, such as another program, a file or a printer, instead of the display monitor (which is its default destination). Standard output, sometimes abbreviated stdout, is the destination of the output from command line (i.e., all-text mode) programs in Unix-like operating systems.

Pipes are used to create what can be visualized as a pipeline of commands, which is a temporary direct connection between two or more simple programs. This connection makes possible the performance of some highly specialized task that none of the constituent programs could perform by themselves. A command is merely an instruction provided by a user telling a computer to do something, such as launch a program. The command line programs that do the further processing are referred to as filters.

This direct connection between programs allows them to operate simultaneously and permits data to be transferred between them continuously rather than having to pass it through temporary text files or through the display screen and having to wait for one program to be completed before the next program begins.

Examples

A pipe is designated in commands by the vertical bar character, which is located on the same key as the backslash on U.S. keyboards. The general syntax for pipes is:

command_1 | command_2 [| command_3 . . .]

This chain can continue for any number of commands or programs.

A very simple example of the benefits of piping is provided by the dmesg command, which repeats the startup messages that scroll through the console (i.e., the all-text, full-screen display) while Linux is booting (i.e., starting up). dmesg by itself produces far too many lines of output to fit into a single screen; thus, its output scrolls down the screen at high speed and only the final screenful of messages is easily readable. However, by piping the output of dmesg to the filter less, the startup messages can conveniently be viewed one screenful at a time, i.e.,

dmesg | less

less allows the output of dmesg to be moved forward one screenful at a time by pressing the SPACE bar and back one screenful at a time by pressing the b key. The command can be terminated by pressing the q key. (The more command could have been used here instead of less; however, less is newer than more and has additional functions, including the ability to return to previous pages of the output.)

The same result could be achieved by first redirecting the output of dmesg to a temporary file and then displaying the contents of that file on the monitor. For example, the following set of two commands uses the output redirection operator (designated by a rightward facing angle bracket) to first send the output of dmesg to a text file called tempfile1 (which will be created by the output redirection operator if it does not already exist), and then it uses another output redirection operator to transfer the output of tempfile1 to the display screen:

dmesg > tempfile1

tempfile1 > less

However, redirection to a file as an intermediate step is clearly less efficient, both because two separate commands are required and because the second command must await the completion of the first command before it can begin.

The use of two pipes to chain three commands together could make the above example even more convenient for some situations. For example, the output of dmesg could first be piped to the sort filter to arrange it into alphabetic order before piping it to less:

dmesg | sort -f | less

The -f option tells sort to disregard case (i.e., whether letters are lower case or upper case) while sorting.

Likewise, the output of the ls command (which is used to list the contents of a directory) is commonly piped to the less (or more) command to make the output easier to read, i.e.,

ls -al | less

or

ls -al | more

ls reports the contents of the current directory (i.e., the directory in which the user is currently working) in the absence of any arguments (i.e., input data in the form of the names of files or directories). The -l option tells ls to provide detailed information about each item, and the -a option tells ls to include all files, including hidden files (i.e., files that are normally not visible to users). Because ls returns its output in alphabetic order by default, it is not necessary to pipe its output to the sort command (unless it is desired to perform a different type of sorting, such as reverse sorting, in which case sort's -r option would be used).

This could just as easily be done for any other directory. For example, the following would list the contents of the /bin directory (which contains user commands) in a convenient paged format:

ls -al /bin | less

The following example employs a pipe to combine the ls and the wc (i.e., word count) commands in order to show how many filesystem objects (i.e., files, directories and links) are in the current directory:

ls | wc -l

ls lists each object, one per line, and this list is then piped to wc, which, when used with its -l option, counts the number of lines and writes the result to standard output (which, as usual, is by default the display screen).

The output from a pipeline of commands can be just as easily redirected to a file (where it is written to that file) or a printer (where it is printed on paper). In the case of the above example, the output could be redirected to a file named, for instance, count.txt:

```
ls | wc -l > count.txt
```

The output redirection operator will create count.txt if it does not exist or overwrite it if it already exists. (The file does not, of course, require the .txt extension, and it could have just as easily been named count, lines or anything else.)

The following is a slightly more complex example of combining a pipe with redirection to a file:

```
echo -e "orange \npeach \ncherry" | sort > fruit
```

The echo command tells the computer to send the text that follows it to standard output, and its -e option tells the computer to interpret each \ as the newline symbol (which is used to start a new line in the output). The pipe redirects the output from echo -e to the sort command, which arranges it alphabetically, after which it is redirected by the output redirection operator to the file fruit.

As a final example, and to further illustrate the great power and flexibility that pipes can provide, the following uses three pipes to search the contents of all of the files in current directory and display the total number of lines in them that contain the string Linux but not the string UNIX:

```
cat * | grep "Linux" | grep -v "UNIX" | wc -l
```

In the first of the four segments of this pipeline, the cat command, which is used to read and concatenate (i.e., string together) the contents of files, concatenates the contents of all of the files in the current directory. The asterisk is a wildcard that represents all items in a specified directory, and in this case it serves as an argument to cat to represent all objects in the current directory.

The first pipe sends the output of cat to the grep command, which is used to search text. The Linux argument tells grep to return only those lines that contain the string Linux. The second pipe sends these lines to another instance of grep, which, in turn, with its -v option, eliminates those lines that contain the string UNIX. Finally, the third pipe sends this output to wc -l, which counts the number of lines and writes the result to the display screen.

Find hardware devices in Ubuntu Linux with lshw

There are a variety of ways to find out what kind of hardware running in linux, but one of the easiest ways that gives a large amounts of valuable data is to use lshw (Hardware Lister). And lshw is installed by default. Testing of lshw command as shown below...

```
$ sudo lshw
```

Installing

lshw is available on most package management systems.

If use APT (Debian-based distros: Ubuntu, Linux Mint, and others), run the following command in terminal:

```
$ sudo apt-get install lshw
```

If use Yum (Red Hat, Fedora, CentOS, Yellow Dog Linux, etc), run the following command in terminal:

```
$ sudo yum install lshw
```

If these instructions don't match your package manager, look for specific instructions on the lshw site to get it installed on your system.

Using lshw

If you just run lshw by itself on the command line, your screen will be flooded with large amounts of text. Fortunately, it is very easy to get lshw to give you output that meets your needs.

Shorter output

If you just quickly want to quickly find the chipset version of a piece of hardware is, you can run the following to provide a very short output that should give you what you need:

```
$ sudo lshw -short
```

For example, here is a sample when I run this on my Dell Studio 17 laptop (Note: I've removed a large portion of the output to make this fit):

```
$ sudo lshw -short
```

Device class	Description
system	Studio 1735
bus	0H275K
memory	64KiB BIOS
processor	Intel(R) Core(TM)2 Duo CPU T8100 @ 2.10GHz
memory	32KiB L1 cache
memory	3MiB L2 cache
memory	4GiB System Memory
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
display	Mobility Radeon HD 3650
multimedia	RV635 Audio device [Radeon HD 3600 Series]
multimedia	82801H (ICH8 Family) HD Audio Controller
eth1 network	BCM4322 802.11a/b/g/n Wireless LAN Controller
eth0 network	NetLink BCM5784M Gigabit Ethernet PCIe
/dev/sda disk	250GB WDC WD2500BEVS-7

This of course leaves out a lot of detail. Maybe we just need to store the data somewhere so it's easier to work with.

Storing output to a file

If you'd like to put all the lshw output into a file, you can do so easily from the terminal with output redirection.

```
$ sudo lshw > hardware.txt
```

This will run the lshw command and put all the output into a file in the current directory called hardware.txt. Note that this will replace any file in the current directory called hardware.txt. Make sure that you either backup the file, give the output file a unique name, or are prepared to lose that original file's information.

Now you can open the hardware.txt file with your favorite editor and look through the informations.

Creating HTML or XML Output

lshw has the ability to format its output in either HTML or XML. This can be very helpful if you want to post your hardware specs somewhere online to be viewed or to send the data to a storage system.

To create HTML output, simply give lshw the -html option:

```
$ sudo lshw -html > hardware.html
```

This will format the output into a HTML document and save the output in a file called hardware.html.

Creating XML is done with the -xml option:

```
$ sudo lshw -xml > hardware.xml
```

Like before, this will output the document in XML format and save it to hardware.xml.

Date command examples to display and set system date time

Date command is helpful to display date in several formats. It also allows you to set systems date and time.

Here few examples on how to use date command with practical examples.

When execute date command without any option, it will display the current date and time as shown below.

```
$ date
```

```
Mon May 20 22:02:24 PDT 2013
```

1. Display Date from a String Value using -date Option

If you have a static date or time value in a string, you can use -d or -date option to convert the input string into date format as shown below.

Please note that this doesn't use the current date and time value. Instead is uses the date and time value that you pass as string.

The following examples takes an input date only string, and displays the output in date format. If you don't specify time, it uses 00:00:00 for time.

```
$ date --date="12/2/2014"
```

```
Tue Dec 2 00:00:00 PST 2014
```

```
$ date --date="2 Feb 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

```
$ date --date="Feb 2 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

The following example takes an input date and time string, and displays the output in date format.

```
$ date --date="Feb 2 2014 13:12:10"
```

```
Sun Feb 2 13:12:10 PST 2014
```

2. Read Date Patterns from a file using -file option

This is similar to the -d or -date option that we discussed above. But, you can do it for multiple date strings. If you have a file that contains various static date strings, you can use -f or -file option as shown below.

In this example, we can see that datefile contained 2 date strings. Each line of datefile is parsed by date command and date is outputted for each line.

```
$ cat datefile
```

```
Sept 9 1986
```

```
Aug 23 1987
```

```
$ date --file=datefile
```

```
Tue Sep 9 00:00:00 PDT 1986
```

```
Sun Aug 23 00:00:00 PDT 1987
```

3. Get Relative Date Using -date option

You can also use date command to get a future date using relative values.

For example, the following examples gets date of next Monday.

```
$ date --date="next mon"
```

```
Mon May 27 00:00:00 PDT 2013
```

If string=@is given to date command, then date command convert seconds since the epoch (1970-01-01 UTC) to a date.

It displays date in which 5 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@5
```

```
Wed Dec 31 16:00:05 PST 1969
```

It displays date in which 10 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@10
```

```
Wed Dec 31 16:00:10 PST 1969
```

It displays date in which 1 minute (i.e. 60 seconds) is elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@60
```

```
Wed Dec 31 16:01:00 PST 1969
```

4. Display past date

You can display a past date using the -date command. Few possibilities are shown below.

```
$ date --date='3 seconds ago'
```

```
Mon May 20 21:59:20 PDT 2013
```

```
$ date --date="1 day ago"
```

```
Sun May 19 21:59:36 PDT 2013
```

```
$ date --date="yesterday"
```

```
Sun May 19 22:00:26 PDT 2013
```

```
$ date --date="1 month ago"
```

```
Sat Apr 20 21:59:58 PDT 2013
```

```
$ date --date="1 year ago"
```

```
Sun May 20 22:00:09 PDT 2012
```

5. Set Date and Time using -set option

You can set date and time of your system using -s or -set option as shown below..

In this example, initially it displayed the time as 20:09:31. We then used date command to change it to 21:00:00.

```
$ date
```

```
Sun May 20 20:09:31 PDT 2013
```

```
$ date -s "Sun May 20 21:00:00 PDT 2013"
```

```
Sun May 20 21:00:00 PDT 2013
```

```
$ date
```

```
Sun May 20 21:00:05 PDT 2013
```

6. Display Universal Time using -u option

You can display date in UTC format using -u, or -utc, or -universal option as shown below.

```
$ date
```

```
Mon May 20 22:07:53 PDT 2013
```

```
$ date -u
```

```
Tue May 21 05:07:55 UTC 2013
```

7. Display Last Modification Time using -r option

In this example, the current time is 20:25:48

```
$ date
```

```
Sun May 20 20:25:48 PDT 2013
```

The timestamp of datefile is changed using touch command. This was done few seconds after the above date command's output.

```
$ touch datefile
```

The current time after the above touch command is 20:26:12

```
$ date
```

```
Sun May 20 20:26:12 PDT 2013
```

Finally, use the date command -r option to display the last modified timestamp of a file as shown below. In this example, it displays last modified time of datefile as 20:25:57. It is somewhere between 20:25:48 and 20:26:12 (which is when we execute the above touch command to modify the timestamp).

```
$ date -r datefile
```

```
Sun May 20 20:25:57 PDT 2013
```

8. Various Date command formats

You can use formatting option to display date command in various formats using the following syntax:

```
$ date +%<format-option>
```

Command	Description
• apropos whatis	Show commands pertinent to string. See also threadsafe
• man -t ascii ps2pdf - > ascii.pdf	make a pdf of a manual page
which command	Show full path name of command
time command	See how long a command takes
• time cat	Start stopwatch. Ctrl-d to stop. See also sw
dir navigation	
• cd -	Go to previous directory
• cd	Go to \$HOME directory
(cd dir && command)	Go to dir, execute command and return to current dir
• pushd .	Put current dir on stack so you can popd back to it
file searching	
• alias l='ls -l --color=auto'	quick dir listing. See also l
• ls -lrt	List files by date. See also newest and find_mm_yyyy
• ls /usr/bin pr -T9 -W\$COLUMNS	Print in 9 columns to width of terminal
find -name '*.[ch]' xargs grep -E 'expr'	Search 'expr' in this dir and below. See also findrepo
find -type f -print0 xargs -r0 grep -F 'example'	Search all regular files for 'example' in this dir and below
find -maxdepth 1 -type f xargs grep -F 'example'	Search all regular files for 'example' in this dir
find -maxdepth 1 -type d while read dir; do echo \$dir; echo cmd2; done	Process each item with multiple commands (in while loop)
• find -type f ! -perm -444	Find files not readable by all (useful for web site)
• find -type d ! -perm -111	Find dirs not accessible by all (useful for web site)
• locate -r 'file[^/]*\.txt'	Search cached index for names. This re is like glob *file*.txt
• look reference	Quickly search (sorted) dictionary for prefix
• grep --color reference /usr/share/dict/words	Highlight occurrences of regular expression in dictionary
archives and compression	
gpg -c file	Encrypt file
gpg file.gpg	Decrypt file
tar -c dir/ bzip2 > dir.tar.bz2	Make compressed archive of dir/
bzip2 -dc dir.tar.bz2 tar -x	Extract archive (use gzip instead of bzip2 for tar.gz files)
tar -c dir/ gzip gpg -c ssh user@remote 'dd of=dir.tar.gz.gpg'	Make encrypted archive of dir/ on remote machine

	<code>find dir/ -name '*.txt' xargs cp -a --target-directory=dir_txt/ --parents</code>	Make copy of subset of dir/ and below
	<code>(tar -c /dir/to/copy) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) copy/ dir to /where/to/ dir
	<code>(cd /dir/to/copy && tar -c .) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) contents of copy/ dir to /where/to/
	<code>(tar -c /dir/to/copy) ssh -C user@remote 'cd /where/to/ && tar -x -p'</code>	Copy (with permissions) copy/ dir to remote:/where/to/ dir
	<code>dd bs=1M if=/dev/sda gzip ssh user@remote 'dd of=sda.gz'</code>	Backup harddisk to remote machine

rsync (Network efficient file copier: Use the --dry-run option for testing)

	<code>rsync -P rsync://rsync.server.com/path/to/file file</code>	Only get diffs. Do multiple times for troublesome downloads
	<code>rsync --bwlimit=1000 fromfile tofile</code>	Locally copy with rate limit. It's like nice for I/O
	<code>rsync -az -e ssh --delete ~/public_html/ remote.com:'~/public_html'</code>	Mirror web site (using compression and encryption)
	<code>rsync -auz -e ssh remote:/dir/ . && rsync -auz -e ssh . remote:/dir/</code>	Synchronize current directory with remote one

ssh (Secure SHell)

	<code>ssh \$USER@\$HOST command</code>	Run command on \$HOST as \$USER (default command=shell)
•	<code>ssh -f -Y \$USER@\$HOSTNAME xeyes</code>	Run GUI command on \$HOSTNAME as \$USER
	<code>scp -p -r \$USER@\$HOST: file dir/</code>	Copy with permissions to \$USER's home directory on \$HOST
	<code>scp -c arcfour \$USER@\$LANHOST: bigfile</code>	Use faster crypto for local LAN. This might saturate GigE
	<code>ssh -g -L 8080:localhost:80 root@\$HOST</code>	Forward connections to \$HOSTNAME:8080 out to \$HOST:80
	<code>ssh -R 1434:imap:143 root@\$HOST</code>	Forward connections from \$HOST:1434 in to imap:143
	<code>ssh-copy-id \$USER@\$HOST</code>	Install public key for \$USER@\$HOST for password-less log in

networking (Note ifconfig, route, mii-tool, nslookup commands are obsolete)

	<code>ethtool eth0</code>	Show status of ethernet interface eth0
	<code>ethtool --change eth0 autoneg off speed 100 duplex full</code>	Manually set ethernet interface speed
	<code>iw dev wlan0 link</code>	Show link status of wireless interface wlan0
	<code>iw dev wlan0 set bitrates legacy-2.4 1</code>	Manually set wireless interface speed
•	<code>iw dev wlan0 scan</code>	List wireless networks in range
•	<code>ip link show</code>	List network interfaces
	<code>ip link set dev eth0 name wan</code>	Rename interface eth0 to wan
	<code>ip link set dev eth0 up</code>	Bring interface eth0 up (or down)
•	<code>ip addr show</code>	List addresses for interfaces

	ip addr add 1.2.3.4/24 brd + dev eth0	Add (or del) ip and mask (255.255.255.0)
•	ip route show	List routing table
	ip route add default via 1.2.3.254	Set default gateway to 1.2.3.254
•	ss -tupl	List internet services on a system
•	ss -tup	List active connections to/from system
	host pixelbeat.org	Lookup DNS ip address for name or vice versa
•	hostname -i	Lookup local ip address (equivalent to host `hostname`)
•	whois pixelbeat.org	Lookup whois info for hostname or ip address

windows networking (Note samba is the package that provides all this windows specific networking support)

•	smbtree	Find windows machines. See also findsmb
	nmblookup -A 1.2.3.4	Find the windows (netbios) name associated with ip address
	smbclient -L windows_box	List shares on windows machine or samba server
	mount -t smbfs -o fmask=666,guest //windows_box/share /mnt/share	Mount a windows share
	echo 'message' smbclient -M windows_box	Send popup to windows machine (off by default in XP sp2)

text manipulation (Note sed uses stdin and stdout. Newer versions support inplace editing with the -i option)

	sed 's/string1/string2/g'	Replace string1 with string2
	sed 's/(.*\1)\1/\2/g'	Modify anystring1 to anystring2
	sed '/^ *#/d; /^ *\$/d'	Remove comments and blank lines
	sed ':a; /\\$\N; s/\n//; ta'	Concatenate lines with trailing \
	sed 's/[\t]*\$//'	Remove trailing spaces from lines
	sed 's/\\([`"\$\`])\\1/g'	Escape shell metacharacters active within double quotes
•	seq 10 sed "s/^/ /; s/ *\(\.\{7,\}\)/\1/"	Right align numbers
•	seq 10 sed p paste - -	Duplicate a column
	sed -n '1000{p;q}'	Print 1000th line
	sed -n '10,20p;20q'	Print lines 10 to 20
	sed -n 's/.*<title>\(.*)</title>.*/\1/ip;T;q'	Extract title from HTML web page
	sed -i 42d ~/.ssh/known_hosts	Delete a particular line
	sort -t. -k1,1n -k2,2n -k3,3n -k4,4n	Sort IPV4 ip addresses
•	echo 'Test' tr '[:lower:]' '[:upper:]'	Case conversion
•	tr -dc '[:print:]' < /dev/urandom	Filter non printable characters
•	tr -s '[:blank:]' '\t' </proc/diskstats cut -f4	cut fields separated by blanks
•	history wc -l	Count lines
•	seq 10 paste -s -d ''	Concatenate and separate line items to a

set operations (Note you can export LANG=C for speed. Also these assume no duplicate lines within a file)

sort file1 file2 uniq	Union of unsorted files
sort file1 file2 uniq -d	Intersection of unsorted files
sort file1 file1 file2 uniq -u	Difference of unsorted files
sort file1 file2 uniq -u	Symmetric Difference of unsorted files
join -t'\0' -a1 -a2 file1 file2	Union of sorted files
join -t'\0' file1 file2	Intersection of sorted files
join -t'\0' -v2 file1 file2	Difference of sorted files
join -t'\0' -v1 -v2 file1 file2	Symmetric Difference of sorted files

math

• echo '(1 + sqrt(5))/2' bc -l	Quick math (Calculate φ). See also bc
• seq -f '4/%g' 1 2 99999 paste -sd-+ bc -l	Calculate n the unix way
• echo 'pad=20; min=64; (100*10^6)/((pad+min)*8)' bc	More complex (int) e.g. This shows max FastE packet rate
• echo 'pad=20; min=64; print (100E6)/((pad+min)*8)' python	Python handles scientific notation
• echo 'pad=20; plot [64:1518] (100*10**6)/((pad+x)*8)' gnuplot -persist	Plot FastE packet rate vs packet size
• echo 'obase=16; ibase=10; 64206' bc	Base conversion (decimal to hexadecimal)
• echo \$((0x2dec))	Base conversion (hex to dec) ((shell arithmetic expansion))
• units -t '100m/9.58s' 'miles/hour'	Unit conversion (metric to imperial)
• units -t '500GB' 'GiB'	Unit conversion (SI to IEC prefixes)
• units -t '1 googol'	Definition lookup
• seq 100 paste -s -d+ bc	Add a column of numbers. See also add and funcpy

calendar

• cal -3	Display a calendar
• cal 9 1752	Display a calendar for a particular month year
• date -d fri	What date is it this friday. See also day
• [\$(date -d '12:00 today +1 day' +%d) = '01'] exit	exit a script unless it's the last day of the month
• date --date='25 Dec' +%A	What day does xmas fall on, this year
• date --date='@2147483647'	Convert seconds since the epoch (1970-01-01 UTC) to date
• TZ='America/Los_Angeles' date	What time is it on west coast of US (use tzselect to find TZ)
• date --date='TZ="America/Los_Angeles" 09:00 next Fri'	What's the local time for 9AM next Friday on west coast US

locales

• printf "%'d\n" 1234	Print number with thousands grouping appropriate to locale
-----------------------	--

• BLOCK_SIZE='\1 ls -l	Use locale thousands grouping in ls. See also l
• echo "I live in `locale territory`"	Extract info from locale database
• LANG=en_IE.utf8 locale int_prefix	Lookup locale info for specific country. See also ccodes
• locale -kc \$(locale sed -n 's/\(LC_\)\{4,\}\)=.*/\1/p') less	List fields available in locale database

recode (Obsoletes iconv, dos2unix, unix2dos)

• recode -l less	Show available conversions (aliases on each line)
recode windows-1252.. file_to_change.txt	Windows "ansi" to local charset (auto does CRLF conversion)
recode utf-8/CRLF.. file_to_change.txt	Windows utf8 to local charset
recode iso-8859-15..utf8 file_to_change.txt	Latin9 (western europe) to utf8
recode ../b64 < file.txt > file.b64	Base64 encode
recode /qp.. < file.qp > file.txt	Quoted printable decode
recode ..HTML < file.txt > file.html	Text to HTML
• recode -lf windows-1252 grep euro	Lookup table of characters
• echo -n 0x80 recode latin-9/x1..dump	Show what a code represents in latin-9 charmap
• echo -n 0x20AC recode ucs-2/x2..latin-9/x	Show latin-9 encoding
• echo -n 0x20AC recode ucs-2/x2..utf-8/x	Show utf-8 encoding

CDs

gzip < /dev/cdrom > cdrom.iso.gz	Save copy of data cdrom
mkisofs -V LABEL -r dir gzip > cdrom.iso.gz	Create cdrom image from contents of dir
mount -o loop cdrom.iso /mnt/dir	Mount the cdrom image at /mnt/dir (read only)
wodim dev=/dev/cdrom blank=fast	Clear a CDRW
gzip -dc cdrom.iso.gz wodim -tao dev=/dev/cdrom -v -data -	Burn cdrom image (use --prcap to confirm dev)
cdparanoia -B	Rip audio tracks from CD to wav files in current dir
wodim -v dev=/dev/cdrom -audio -pad *.wav	Make audio CD from all wavs in current dir (see also cdrdao)
oggenc --tracknum=\$track track.cdda.wav -o track.ogg	Make ogg file from wav file

disk space

• ls -lSr	Show files by size, biggest last
• du -s * sort -k1,1rn head	Show top disk users in current dir. See also dutop
• du -hs /home/* sort -k1,1h	Sort paths by easy to interpret disk usage
• df -h	Show free space on mounted filesystems
• df -i	Show free inodes on mounted filesystems
• fdisk -l	Show disks partitions sizes and types (run as root)

• rpm -q -a --qf '%10{SIZE}\t%{NAME}\n' sort -k1,1n	List all packages by installed size (Bytes) on rpm distros
• dpkg-query -W -f='\${Installed-Size;10}\t\${Package}\n' sort -k1,1n	List all packages by installed size (KBytes) on deb distros
• dd bs=1 seek=2TB if=/dev/null of=ext3.test	Create a large test file (taking no space). See also truncate
• > file	truncate data of file or create an empty file

monitoring/debugging

• tail -f /var/log/messages	Monitor messages in a log file
• strace -c ls >/dev/null	Summarise/profile system calls made by command
• strace -f -e open ls >/dev/null	List system calls made by command
• strace -f -e trace=write -e write=1,2 ls >/dev/null	Monitor what's written to stdout and stderr
• ltrace -f -e getenv ls >/dev/null	List library calls made by command
• lsof -p \$\$	List paths that process id has open
• lsof ~	List processes that have specified path open
• tcpdump not port 22	Show network traffic except ssh. See also tcpdump_not_me
• ps -e -o pid,args --forest	List processes in a hierarchy
• ps -e -o pcpu,cpu,nice,state,cputime,args --sort pcpu sed '/^ 0.0 /d'	List processes by % cpu usage
• ps -e -orss=,args= sort -b -k1,1n pr -TW\$COLUMNS	List processes by mem (KB) usage. See also ps_mem.py
• ps -C firefox-bin -L -o pid,tid,pcpu,state	List all threads for a particular process
• ps -p 1,\$\$ -o etime=	List elapsed wall time for particular process IDs
• watch -n.1 pstree -Uacp \$\$	Display a changing process subtree
• last reboot	Show system reboot history
• free -m	Show amount of (remaining) RAM (-m displays in MB)
• watch -n.1 'cat /proc/interrupts'	Watch changeable data continuously
• udevadm monitor	Monitor udev events to help configure rules

system information

• uname -a	Show kernel version and system architecture
• head -n1 /etc/issue	Show name and version of distribution
• cat /proc/partitions	Show all partitions registered on the system
• grep MemTotal /proc/meminfo	Show RAM total seen by the system
• grep "model name" /proc/cpuinfo	Show CPU(s) info
• lspci -tv	Show PCI info

• lsusb -tv	Show USB info
• mount column -t	List mounted filesystems on the system (and align output)
• grep -F capacity: /proc/acpi/battery/BAT0/info	Show state of cells in laptop battery
# dmidecode -q less	Display SMBIOS/DMI information
# smartctl -A /dev/sda grep Power_On_Hours	How long has this disk (system) been powered on in total
# hdparm -i /dev/sda	Show info about disk sda
# hdparm -T /dev/sda	Do a read speed test on disk sda
# badblocks -s /dev/sda	Test for unreadable blocks on disk sda
interactive	
• readline	Line editor used by bash, python, bc, gnuplot, ...
• screen	Virtual terminals with detach capability, ...
• mc	Powerful file manager that can browse rpm, tar, ftp, ssh, ...
• gnuplot	Interactive/scriptable graphing
• links	Web browser
• xdg-open .	open a file or url with the registered desktop application

MS WORD 2010 THEORY

Objectives : At the end of this lesson you shall be able to

- state what is MS Office
- brief what is MS Word and starting steps
- explain various screen blocks of MS Word
- explain procedures to create, save, print a document!

Microsoft office is a application software package introduced by Microsoft Corporation. MS Office consists of the following popular packages :

- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint
- Microsoft Access
- Microsoft Outlook

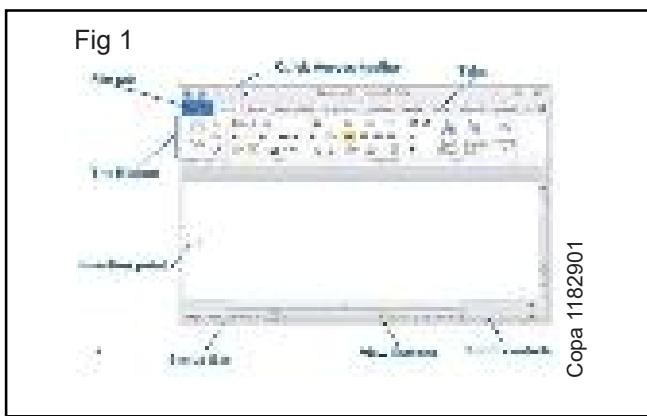
Word 2010

It is a word processor package that helps to create and edit a document. It is the most known word processor of nowadays. It makes professional looking documents by providing a comprehensive set of tools for creating and formatting a document, memos, letters, reports, brochures, business documents and even internet web pages.

Starting Word

Click on the Start > (windows Logo) All programmes > Microsoft office > Microsoft Word. MS Word opens along with a default blank document with default settings page layout.

Fig 1 - Default page layout



Unlike previous version, MS Office 2010 has a common set of features for all the components. It makes it easy to understand and common utilities to remain available on all the packages of MS Office including Word, Excel, PowerPoint, Access, etc. Many features are redesigned so as enabling the diverted users of other packaged can afford with. These enhancements and utilities in Word 2010 are described as below.

The Ribbon tab of Word has eight major parts viz. File, Home, Insert, Page Layout, References, Mailings, Review and View.

File tab of the ribbon is useful to create a new file, a blank or a template page as required. Ctrl + N always create a new blank document in Office Package. The documents so created can be saved as default word document or given compatible format. Furthermore, permission for accessing a documents can be fixed, share a document on a network, even manage a document to be compatible with previous and external versions. Print option makes the document to get a hard copy or a pdf format according to the installed printer features. Recently opened files can also be viewed to find it easy to work again. Help on word is there in the same tab.

Fig. 2 Home Tab



Home tab has clipboard options including cut, copy, paste and paste special. The Font block has all the options of setting fonts, size, superscript, subscript, bold, italic, underline, strikethrough, font colors, etc.

Fig 3 - Paragraph Group



Paragraph group creates the formatting paragraphs with alignments left, right, center, justify and indentations, para and line spacing. Line and page breaks allows to create pagination options and exceptions of formatting.

Fig 4 - Styles and Editing Group

Fig 4



The Styles group allows preformatted text styles like Heading styles, Paragraph styles, Subtitles, etc. Custom styles can also be stored with altered specifications. The Editing group used to select specific area, find and / or replace option in a specified area in text.

The Insert tab has 7 groups. Fig 5 - Pages, Tables and Illustrations blocks (Fig 5)

Fig 5



Page group makes cover pages, blank pages insertion and page breaks. Tables group helps to insert a table in a text document with ready specified row-column set or a customized table format. Illustration group inserts pictures from external sources, cliparts, shapes, smart art, charts of data, even screenshot into the text document.

Fig 6 - Links and Header/Footer Groups

Fig 6



Links group creates hyperlink on texts, bookmarks and cross references in a document.

The header and footer group inserts header, footer to be appearing on every page and page numbers to display as to placement area.

Fig 7 - Text and Symbols block

Fig 7



Text group allows creating text box, quick parts likely to create brochures, designed text as WordArt, paragraph styles, a signature line, date and time and an object insert option.

Symbols group inserts symbols of equations like math equations or symbols like currency, math symbols, etc.

Fig 8 - Themes and Page Setup Group

Fig 8



Page Layout tab has five major groups. Themes block creates predefined template setup using themes on documents. Even new themes customized can be created and saved for future use.

Page setup group has features on margin around, page orientation i.e. vertical or horizontal, paper size, columns to display, breaks, line numbers and hyphenation.

Fig 9 - Page Background and Paragraph Group

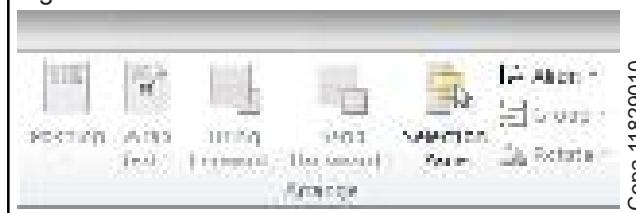
Fig 9



Page Background group creates a watermark, page Background color and page borders. Paragraph block has specified options already discussed in Home -> Paragraph group.

Fig 10 - Arrange Group

Fig 10



The arrange group creates position of objects, text elements, text wrapping, arranging objects, aligning of objects, grouping and transformations.

References tab has six blocks.

Fig 11 - TOC and Footnotes Group

Fig 11



Table of contents creates the TOC of a particular publication document automatically and upon modifications updatable. Footnotes tab creates footnotes of a page, block area which includes explanatory phrases or references. Endnote makes the note at the end of the document.

Fig 12 - Citations, Bibliography and Captions Group



Citation and Bibliography makes an external source as citation, reference tables and credits of authors related to the publication. Captions tab inserts a caption, table of figures, cross references inside a text.

Fig 13 - Index and Table of Authorities Group



Index enters a value on a main topic or sub topic and create the index accordingly. Table of authorities has the citation mark includes the list of the cases, statutes and other authorities cited in the document.

Fig 14 - Create and Mailmerge Groups



Mailings tab used to create mailing of a letter or order using common mailing features. Create block makes envelopes print using predefined formats as well as custom formats. Labels can also be printed to which the delivery address is mentioned.

Mail merge block is used to create mail merge of a letter, email. If a common letter is created and to be sent to many recipients, this option allows to create an Address block where the recipient's info should appear. Even selective recipients can be listed as well as a new recipient list can be created.

Fig 15 - Write and Insert fields Group



While writing a letter, it has many parts, which this mail merge creates fields of Address Block, Greetings Line, Merged field of content, labels, etc.

Fig 16 - Preview Results and Finish Groups



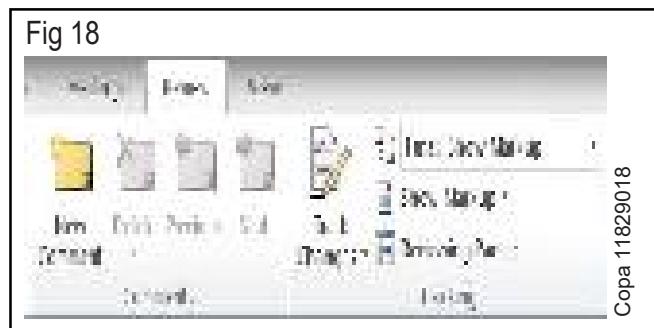
On successful completion of mail merge, it can be previewed and checked for errors for each recipients and edit accordingly. Upon validation the mail merge gets finished.

Fig 17 - Proofing and Language Groups



Review tab here is used for the various document areas to be reviewed. Proofing makes easier to check Spelling and Grammar of a document. Accidental errors can be corrected here. Research refines the search not only inside the document, but also the referenced documents. Thesaurus identifies the completeness of the document using the standard language compatibility of the region like English UK or English USA etc. Word count shows the analysis of the document as total words, total characters, with and without spaces, no. of paragraphs, lines, etc. Here Text blocks can also be included for such analysis.

Language Block helps to translate a page into the installed other languages and to change the proofing language. It requires the direct translator service from Microsoft Online.

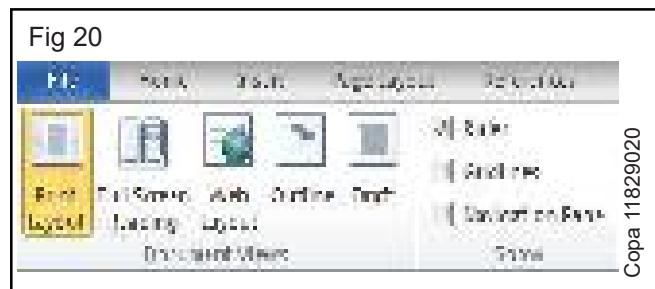
Fig 18 - Comments & Tracking Group

Comments group inserts a comment for a specific paragraph or text block.

Tracking group finds the changes made on a document by other authors in a protected mode. For example, if a document is created by user X and edited by user Y, is tracked separately with Track marks.

Fig 19 - Changes, Compare and Protect Groups

Changes hence made on the documents can either then accepted or rejected. More than a document can be compared for similarity using Compare. Also the document can be protected from editing by other authors.

Fig 20 - Document views and show Groups

View tab shows the way of displaying the word document. Document views have a Print Layout, a common view of Word, Full Screen Reading, minimises the tabs and ribbons to disappear and easy to read, Web Layout, which previews a html compatible view, Outline, views the basic version of document in mere text mode and Draft mode for a text editing mode.

The Rulers, Gridlines and Navigation Pane can be shown or hidden according to user preferences.

Fig 21 - Zoom / Window / Macro Groups

Also the view of the page can be Zoomed to full page, two pages view, 100% of the document and custom view. To make easy editing a document the window can be split into two, a new window for a document to cut paste, etc. can be created and all open word documents can be arranged for view. While formatting the documents, for repetition of commands the Macro option can be used. It uses the Record option to store the set of commands and repeat it again on other part of document or on another document on a single click.

Creating a file, save and other options

Objectives: At the end of this lesson you shall be able to

- explain how to create a new document, save and print
- state how to edit, format text and document styles
- brief using tables inside word document with data
- explain how to create styles in a document and save for future use
- explain Few unique features of Word 2010
- brief the mail merge processing

Fig 1 - File Info view



Word 2010 new document can be created as usual with Ctrl + N or through File menu New option. Basically the file created is saved as a word document extended format as docx in word file.

Fig 2 - Save options in Word



It can be saved using save as option in any compatible format or old versions of office, like 2003 or earlier versions. Main utility of the word software is the creation of word processing documents. It may be any of a format like publication, letter, brochure, etc. Word supports all type of formatting to design a text based presentation. Also it supports output files in major accepted formats according to industry standards.

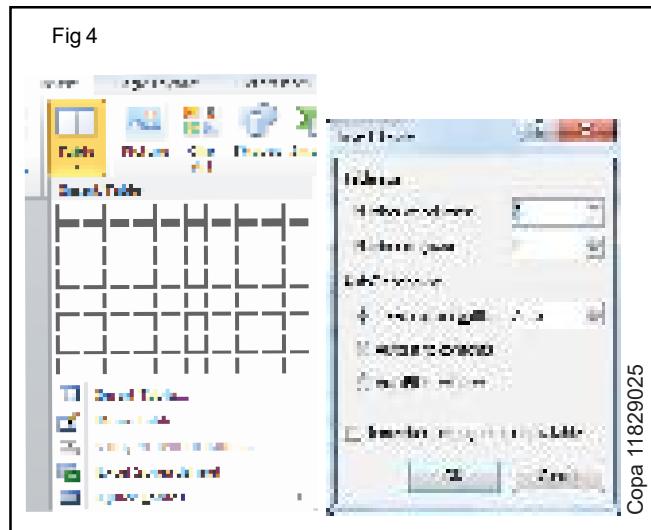
Fig 3 - Print options in word



The saved documents can be printed using the File Menu → Print option and the installed printer support makes it easy to get the document printed. If Adobe Acrobat Professional is installed, the same document can be stored as a PDF file for sharing purposes. Apart from printing and storage, the file created can be published in web as a web page or template that can be used for future publications in same format.

Basic concepts to be noted while using Word are Text properties. It includes Font type, Font size, Text Color, and usual decorations of text. Also creating of paragraphs styles are to be kept in mind. Paragraph alignment has left, right, center and justified settings. Text elements may contain items like ordered list, unordered list, subsection lists. They are found there paragraph formatting block of Home Tab. Indenting of text for creating Quotes is also there inside the same tab. According to the page size, line spacing and paragraph spacing can be adjusted, like before and after paragraph spaces, line heights, etc. The Styles can be predefined to use as ready to put on places where it required. Standard templates are available but it allows to create custom styles too.

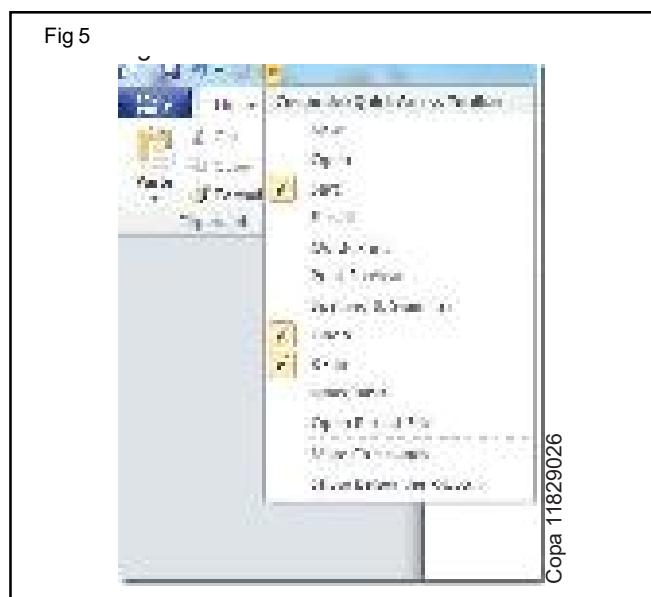
Tables can be inserted for various utilities. Normal table has adjustable width and columns so it can simply inserted with Insert > Table option directly.

Fig 4 - Table insert wizard options

In case of custom sized table is required, it can be created using insert table / draw table options. Insert table allows custom values for columns, width and other properties. Draw table creates custom table using a pen drawing tool through which new table can be drawn according to the available text contents.

Customizable Quick Access Tool Bar

Word 2010's Quick Access Toolbar displays all the commonly used options. It is located in the top left side corner of the application window, near the office button. By default it displays the following three options, Save, Undo and Redo, but is customizable and you may easily add more options to it. (Fig 5)



Paste Preview

It happens with most users that after copying and pasting something into their document, they need to undo the some changes. Word 2010 has made it easy for users, now you may eliminate this unnecessary step by using the paste preview option. It allows users to paste only the values or the formatting. (Fig 6)

Fig 6

Navigation Pane

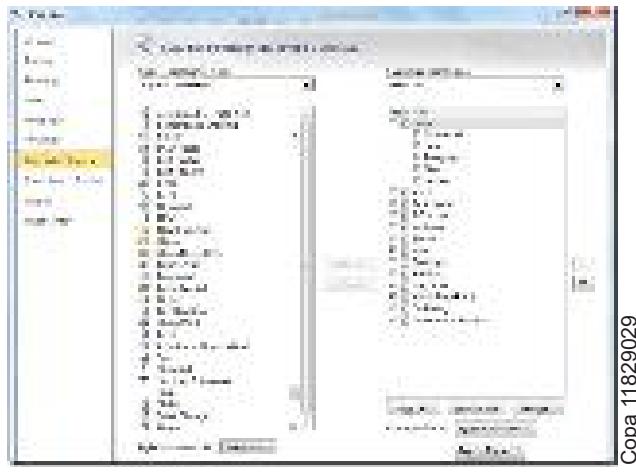
In the previous versions of Microsoft Office, one has to use the Ctrl+F hotkey to find any word or phrase from within a document. Word 2010 has added a new magic to this option, Ctrl+F now summons a Navigation Pane that appears on the left side of the document. You will see the three views available by clicking on their respective tabs, the Heading View, Thumbnail Page View, and the Search Result View. (Fig 7)



Customizable Ribbon Button

Apparently the Ribbon button in Word 2010 looks like the one in Word 2007. But there is one big addition, you may customize the word 2010's Ribbon button. In order to customize the Ribbon button navigate to the following option Office Button > Word Option > Customize Ribbon. (Fig 8)

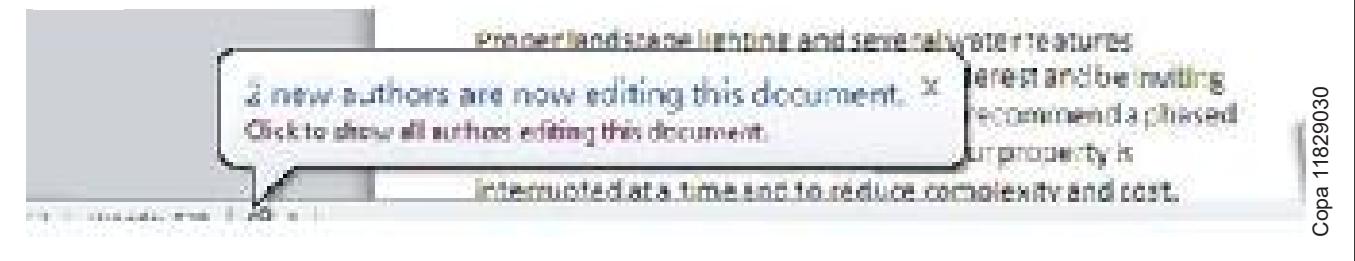
Fig 8



Improved Collaborations

Microsoft Word 2010 has a new feature called co-authoring. It allows more than one authors to edit a document at the same time. Word 2010 tells you how many authors are editing the document and their changes can be viewed too. (Fig 9)

Fig 9



Screen Capture Tool

Word 2010 includes a feature called Screen Capturing, now there is no need to use a third party or additional tool to capture a screenshot in order to use it in Word, just simply use Word 2010's built in tool to capture any area of the screen. A Screenshot may be taken by navigating to the following option Insert > Screenshot. (Fig 10)

Fig 10



Artistic Effects

In Word 2010 users can now apply a number of snazzy artistic effects to the pictures. In order to add the artistic effects to your document, Navigate to the following option Insert > Illustrations > Picture. Then browse and select the picture you want, Once the picture is added to your document, then the Picture Tools contextual tab is displayed and you will be able to see the new Artistic Effects drop down button over here. (Fig 11)

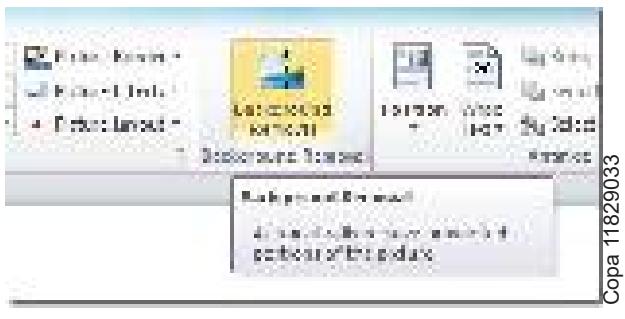
Fig 11



The Background Removal Option

Office 2010 has an awesome option by the name of Background Removal, which simply removes the background of any image. Yes, you don't need Photoshop anymore to remove the background. First insert the picture in your Word document from the Insert > Picture option. Then locate the Background Removal tool and get rid of the background. (Fig 12)

Fig 12



Office Backstage

The Office Backstage is a new concept, it is the enhanced form of the plain old office button and provides a much user-friendly menu. It helps users to manage documents, presentations, or spreadsheets at a greater level. (Fig 13)

Fig 13



Interesting feature, right? Read more about it here.

New Art Effects in WordArt

Just like other features, WordArt has been updated with new colorful art effects. Select the text, then click Word Art and a list of all the available options will be displayed. (Fig 14)

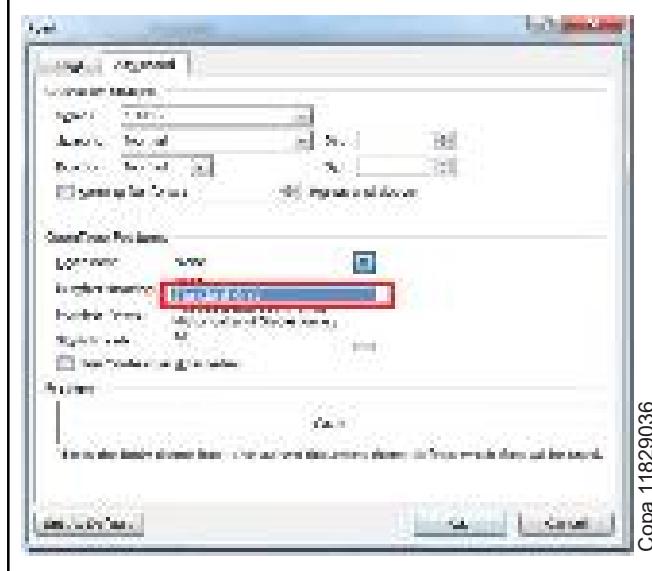
Fig 14



Ligatures

You might have heard about Ligatures. They make the fonts look fancy and they are also used to keep letters separate allowing you to search the text as if the font were regular. Its true that not all fonts support ligatures, but a large variety of the fonts supports them. You may enable them from Font Preferences > advanced, then select the standard only option in the ligatures drop down box. (Fig 15)

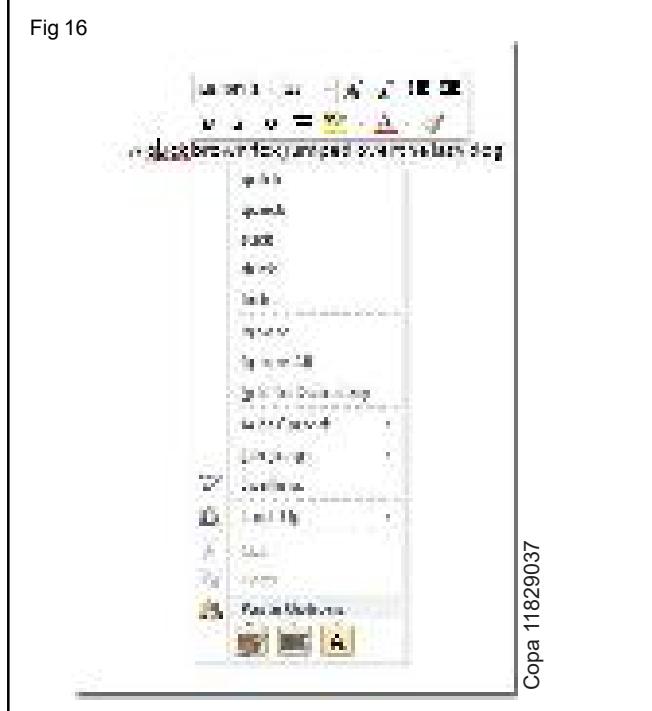
Fig 15



Improved Spell Checks

Word 2010 has added some new features to its spell checker, now it will detect the mistake and suggest changing the sentence.

Fig 16



Shortcut keys in Word 2010

Objective : at the end of the lesson you shall be able to

- **Learn the shortcut keys in MS Word.**

CTRL+SHIFT+A	converts the selected text to capital letters or vice versa
CTRL+SHIFT+F	Displays the Font dialog box.
CTRL+SHIFT+G	Displays the Word Count dialog box.
CTRL+SHIFT+S	Displays the Apply Styles task pane.
ALT+R	Displays the Review tab
ALT+CTRL+1	Apply Heading 1, Similarly ALT + CTRL + 2 will apply heading 2
CTRL+SHIFT+L	Applies Bullets
CTRL+SHIFT+F5	Bookmark
CTRL + B	Bold Text
CTRL + I	Italic Text
CTRL + U	Underline Text
CTRL+PAGE DOWN	Next
CTRL+E	Navigate to the center Paragraph
CTRL+SHIFT+ENTER	Column Break
CTRL+SHIFT+C	Copy Format
ALT+SHIFT+F7	Dictionary
ALT+CTRL+S	Splits the Document
CTRL+SHIFT+D	Double Underline
CTRL+END	End of Document
END	End of line
CTRL+SHIFT+P	Font size select
SHIFT+F5 or ALT+CTRL+Z	Go Back to previous state

CTRL+SHIFT+.	Grow Font
CTRL+]	Grow Font one point
ALT+SHIFT+R	Header Footer Link
CTRL+K	Hyperlink
CTRL+M	Indentation
CTRL+J	Justifies Paragraph
ALT+F8	Inserts Macros
ALT+SHIFT+K	Mail Merge Check
F10	Menu Mode
ALT+F7	Moves to the Next Misspelling
CTRL+H	Replace
CTRL+P	Print
CTRL+SHIFT+F12	Also launches Print
ALT+SHIFT+BACKSPACE	Redo
F12	Save As
CTRL+SHIFT+K	Small Caps
CTRL+SHIFT+S	Style
SHIFT+F7	Thesaurus
ALT+SHIFT+T	Time Field
CTRL+SHIFT+M	Unindent
	-

Typing practice using open source typing tutor tools

Objectives : At the end of this lesson you shall be able to

- understand about typing software
 - typing Tutor tools.
-

You will be able to learn touch typing quickly and efficiently with the program's intelligent practice lessons, useful support functions and an extensive progress tracker. You can also play a typing game and expand the program with open lessons or make your own to meet your specific needs.

Full courses for Beginner, Advanced and Expert typists

- Introduction course. First time using keyboard. The course covers all characters typed on your keyboard.
- Beginner course. This course helps to learn the position of keys on the keyboard. After completing this course, you will know which finger to use to hit each key without looking at the keyboard. The course also covers upper-case letters, special symbols, and the numeric pad.
- Advanced course, helps to improve your typing speed by memorizing frequently used syllables and words.

Expert course helps you to perfect the skills acquired by typing an actual text.

Progress Tracking

- The statistics reflect your typing speed, accuracy and time-out, complete with a summary at the end of each lesson.
- and it suggests your next step: Go to the next lesson or Try again comparing the results with Course goals.
- You can evaluate your own performance or students at any time by simply looking at charts.
- overall lesson rate, typing speed(WPM, CPM, KPM, WPS, CPS, KPS), accuracy and time-out are enabled in the both: table and chart presentation
- also, for each lesson, statistics by each character and keystroke in the column charts

The Typing Tutor Advantage

- Easy to Get Started
Create classes to group your students, and Import your entire student roster using our simple Student Import tool.
- Reporting
Access and export detailed reporting data. Reports and graphs exist for all levels of data.
- Statistical Graphs & Charts
Both students and teachers have access to detailed graphs and statistics to track progress.
- Complete Course - Novice to Professional
Beginner, Intermediate, Advanced, and Specialty Lessons to help typists of all levels.
- Fun Interactive Typing Games
Students can take a break from the exercises to practice with several educational typing games.
- Typing Test
Students can repeat the typing test to track their progress over time.
- Helpful Typing Hints & Tips
Tips and helpful technique information is constantly provided to reinforce proper typing techniques.
- On-Screen Keyboard & Hand Diagram
Key position and proper finger placement is always displayed to keep beginners from looking at their hands.

Introduction to MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
 - formulas and Functions
 - move Around in Excel 2010
 - conditional Formatting
 - link Excel Spreadsheet Data
-

Features & Functions of Microsoft Excel

Whether for work or home use, an Excel spreadsheet is the best tool in Microsoft Office for organizing data and making lists. Although Word documents can include tables and columns, Excel makes laying out information easier. Excel also has a range of functions for designing formulas that automate calculations. Although Excel looks intimidating at first, the program's layout is similar to other Office applications.

Cells and Worksheets

The main portion of Excel's window consists of a spreadsheet -- or worksheet of cells. Just as with a paper spreadsheet, each cell can contain any numbers or any text -- unlike working with an Access database, Excel allows to simply click on any cell and fill it however best fits the project.

In some cases, such as to track spending, if want to use an organized series of rows and columns. Other times, such as building a list of team members, cell order and positioning won't play a major role. One advantage to Excel is how simple it makes reorganizing data: select a cell and drag its border to move it to a new spot on the sheet.

Excel Workbooks

Every Excel file, called a workbook, contains one or more worksheets. To switch between sheets in a workbook, use the tabs in the lower left corner of the window. Since Excel 2010, most workbooks use the file extension XLSX,

whereas older versions used XLS files. New copies of Excel can read these old files, but to open a new workbook in an old edition, the old PC needs the Office compatibility pack.

Formulas and Functions

In addition to containing plain text and numbers, cells can contain formulas, which always start with an equals sign. With a formula, Excel displays the result of an equation in a cell, but automatically keeps that result up-to-date as you change its components. A basic formula can take the place of a calculator: write "=2+4" and Excel displays "6." Formulas also work with data in other cells: "=A1+B1" adds the values of cells A1 and B1.

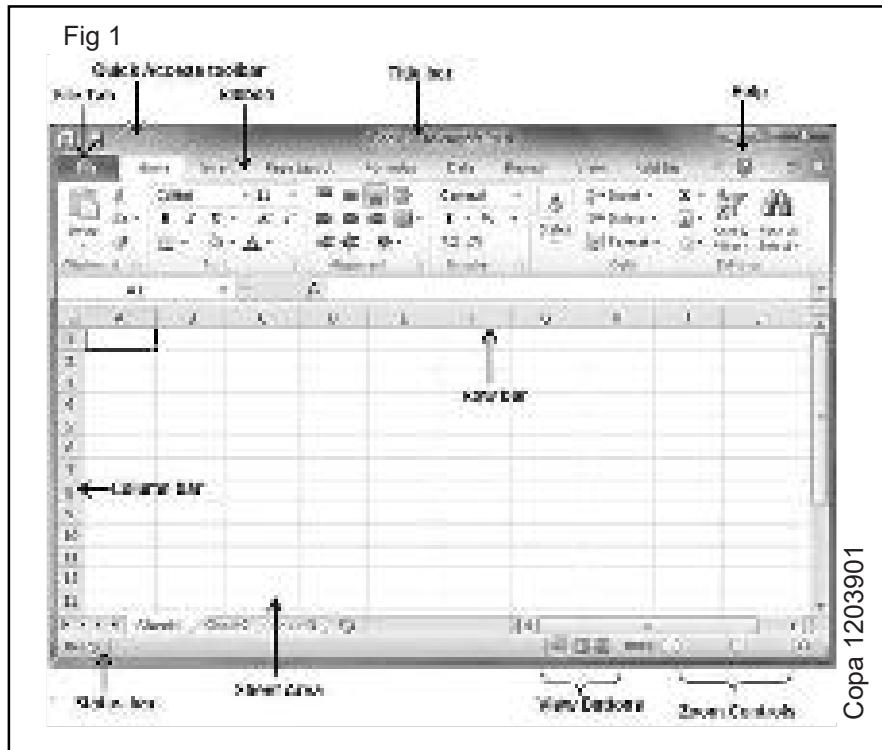
For procedures other than direct arithmetic, use functions to perform various operations on data. Functions' abilities range from simple math, such as "AVERAGE" to average a range of cells, to modifying text, such as "LOWER" to convert a line to lower case.

The two terms are often confused, but remember that each cell can contain only one formula, but each formula can use multiple functions, such as "=AVERAGE(A1, B1)+SUM(A2, B2)" to add the sum of two cells to the average of two other cells.

The following basic window appears when you start the excel application. Let us

now understand the various important parts of this window as shown in fig-1.

Ribbon Tabs



As with the rest of Office since 2007, Microsoft has replaced Excel's menus with ribbon tabs as shown in fig-2. The tab as visual menus that remain open each tab contains a set of related features with explanatory icons. For example, the Home tab contains the most common options, such as font and text color, while the Insert tab offers ways to insert tables, text boxes and charts. One tab, File, behaves differently. File still contains basic tasks including "New," "Open" and "Save," but displays these tasks in a full-screen area with extra options, called the backstage view. For example, the "New" button in the backstage view offers a searchable selection of templates for new workbooks.

Ribbon contains commands organized in three



components:

Tabs: They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout is the examples of ribbon tabs.

Groups: They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment etc.

?Home: Use this tab when creating, formatting, and editing a spreadsheet.

This tab is arranged into the Clipboard, Font, Alignment, Number, Styles, Cells, and Editing groups.

Insert: Use this when adding particular elements (including graphics, PivotTables, charts, hyperlinks, and headers and footers) to a spreadsheet. This tab is arranged into the Tables, Illustrations, Sparkline, Filter, Charts, Links, and Text groups.

Page Layout: Use this tab when preparing a spreadsheet for printing or reordering graphics on the sheet. This tab is arranged into the Themes, Page Setup, Scale to Fit, Sheet Options, and Arrange groups.

Formulas: Use this tab when adding formulas and functions to a spreadsheet or checking a worksheet for formula errors. This tab is arranged into the Function Library, Defined Names, Formula Auditing, and Calculation groups. Note that this tab also contains a Solutions group when activate certain add-in programs,

Data: Use this tab when importing, querying, outlining, and subtotaling the data placed into a worksheet's data list. This tab is arranged into the Get External Data, Connections, Sort & Filter, Data Tools, and Outline groups.

Review: Use this tab when proofing, protecting, and marking up a spreadsheet for review by others. This tab is arranged into the Proofing, Language, Comments, and Changes groups. Note that this tab also contains an Ink group with a sole Start Inking button if you're running Office 2010 on a Tablet PC or on a computer equipped with some sort of electronic input tablet.

View: Use this tab when changing the display of the Worksheet area and the data it contains. This tab is arranged into the Workbook Views, Show, Zoom, Window, and Macros groups.

Title Bar

This lies in the middle and at the top of the window. Title bar shows the program and the sheet titles.

Help

The Help Icon can be used to get excel related help anytime you like. This provides nice tutorial on various subjects related to excel.

Zoom Control

Zoom control lets to zoom in for a closer look at your text. The zoom control consists of a slider that user can slide left or right to zoom in or out. The + buttons can be clicked to increase or decrease the zoom factor.

View Buttons

The group of three buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch among excel's various sheet views.

Normal Layout view: This displays the page in normal view.

Page Layout view: This displays pages exactly as they will appear when printed. This gives a full screen look of the document.

Page Break view: This shows a preview of where pages will break when printed.

Sheet Area

The area where to enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type.

Row Bar

Rows are numbered from 1 onwards and keeps on increasing as to keep entering data. Maximum limit is 1,048,576 rows.

Column Bar

Columns are numbered from A onwards and keeps on increasing as to keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.

Status Bar

This displays the sheet information as well as the insertion point location. From left to right, this bar can contain the total number of pages and words in the document, language etc.

User can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list

File Tab

The File tab replaces the Office button from Excel 2010. User can click it to check the Backstage view, where user come to open or save files, create new sheets, print a sheet, and do other file-related operations.

Quick Access Toolbar

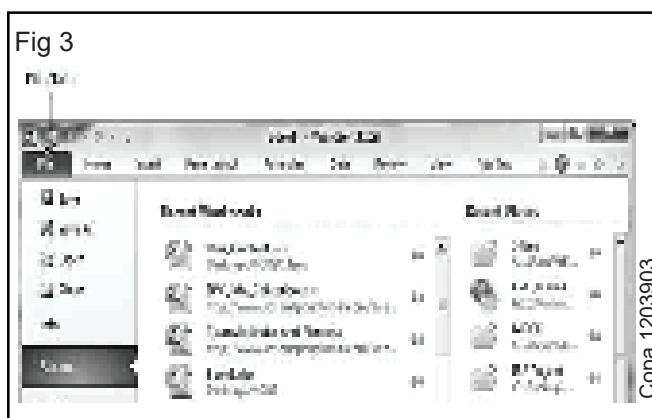
The File tab and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. And customize this toolbar based on the comfort.

Dialog Box Launcher(Fig-3)

This appears as a very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

If already have an opened sheet then it will display a window showing the

details about the opened sheet as shown fig-4. Backstage view shows three columns when select most of the available options in the first column.



First column of the backstage view will have the following options as shown in

Table-1:

Option	Description
Save	If an existing sheet is opened, it would be saved as is, otherwise it will display a dialogue box asking for the sheet name.
Save As	A dialogue box will be displayed asking for sheet name and sheet type. By default, it will save in sheet 2010 format with extension .xlsx.
Open	This option is used to open an existing excel sheet.
Close	This option is used to close an opened sheet.
Info	This option displays the information about the opened sheet.

Option	Description
Recent	This option lists down all the recently opened sheets.
New	This option is used to open a new sheet.
Print	This option is used to print an opened sheet.
Save & Send	This option saves an opened sheet and displays options to send the sheet using email etc.
Help	You can use this option to get the required help about excel 2010.
Options	Use this option to set various option related to excel 2010.
Exit	Use this option to close the sheet and exit.

Sheet Information

When click Info option available in the first column, it displays the following information in the second column of the backstage view:

Compatibility Mode: If the sheet is not a native excel 2007/2010 sheet, a Convert button appears here, enabling to easily update its format. Otherwise, this category does not appear.

Permissions: This option used to protect the excel sheet. And can set a password so that nobody can open the sheet, or lock the sheet so that nobody can edit the sheet.

Prepare for Sharing: This section highlights important information should know about the sheet before send it to others, such as a record of the edits the made as developed the sheet.

Versions: If the sheet has been saved several times, and may be able to access previous versions of it from this section.

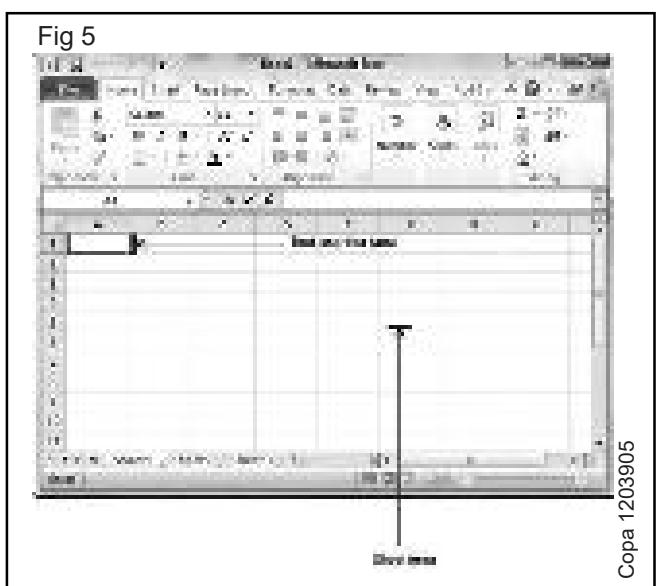
Sheet Properties

When click Info option available in the first column, it displays various properties in the third column of the backstage view. These properties include sheet size, title, tags, categories etc.

User can also edit various properties. Just try to click on the property value and if property is editable, then it will display a text box where can add the text like title, tags, comments, Author.

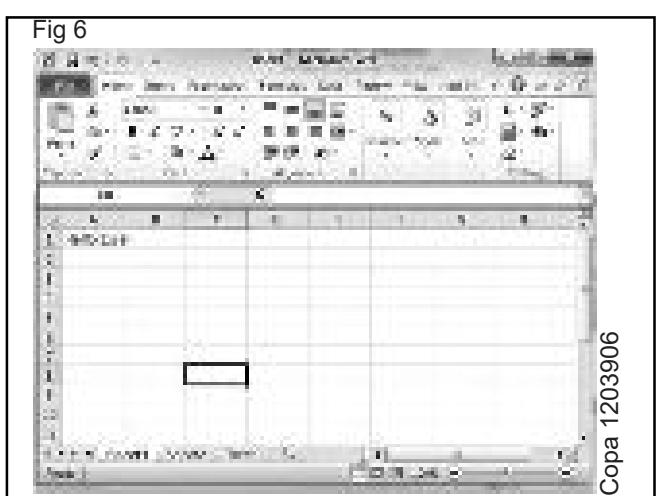
Entering values

A new sheet is displayed by default when open an excel sheet as shown in the fig-5 screen shot.



Sheet area is the place of type the text. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type. When click on a box then the box is highlighted. When double click the box, the flashing vertical bar appears and can start entering the data.

So, just keep the mouse cursor at the text insertion point and start typing whatever text would like to type. We have typed only two words "HelloExcel" as shown fig-6. The text appears to the left of the insertion point.



There are following three important points, which would help while typing:

- Press Tab to go to next column.
- Press Enter to go to next row.
- Press Alt + Enter to enter a new line in the same column.

Move Around in Excel 2010

Excel provides a number of ways to move around a sheet using the mouse and the keyboard.

First of all, let us create some sample text before we proceed. Open a new excel sheet and type any data. A sample data table as shown table-2 and fig-7.

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

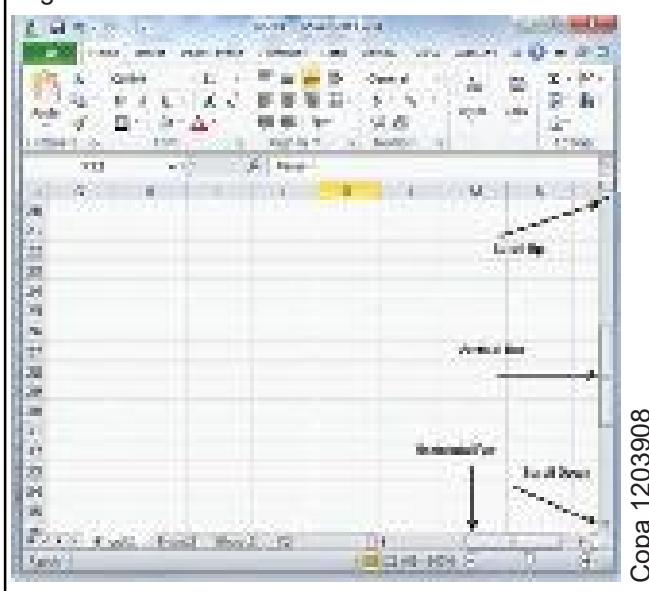
Fig 7 Table-2

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

Moving with Mouse

Mouse can easily move the insertion point by clicking in the text anywhere on the screen. Sometime if the sheet is big then user cannot see a place need to move. In such situations, to use the scroll bars, as shown fig-8 screen shot.

Fig 8



user can scroll the sheet by rolling mouse wheel, which is equivalent to clicking the up-arrow or down-arrow buttons in the scroll bar.

Moving with Scroll Bars

As shown in the above screen capture, there are two scroll bars: one for moving vertically within the sheet, and one for moving horizontally. Using the vertical scroll bar, user may ?

- Move upward by one line by clicking the upward-pointing scroll arrow.
- Move downward by one line by clicking the downward-pointing scroll arrow.
- Move one next page, using next page button (footnote).
- Move one previous page, using previous page button (footnote).
- Use Browse Object button to move through the sheet, going from one chosen object to the next.

Moving with Keyboard

The following keyboard commands, used for moving around your sheet, also move the insertion point -

Keystroke	Where the Insertion Point Moves
→	Forward one box
←	Back one box
↑	Up one box
↓	Down one box
PageUp	To the previous screen
PageDown	To the next screen
Home	To the beginning of the current screen
End	To the end of the current screen

User can move box by box or sheet by sheet. Now click in any box containing data in the sheet. It would have to hold down the Ctrl key while pressing an arrow key, which moves the insertion point as described here -

Key Combination	Where the Insertion Point Moves
Ctrl + →	To the last box containing data of the current row.
Ctrl + ←	To the first box containing data of the current row.
Ctrl + ↑	To the first box containing data of the current column.
Ctrl + ↓	To the last box containing data of the current column.
Ctrl + Page Up	To the sheet in the left of the current sheet.
Ctrl + Page Down	To the sheet in the right of the current sheet.
Ctrl + Home	To the beginning of the sheet.
Ctrl + End	To the end of the sheet.

Moving with Go To Command

Press F5 key to use Go To command as shown in fig-9, which will display a dialogue box contains various options to reach to a particular box.

Normally, we use row and column number, for example K5 and finally press Go To button.

Fig 9



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Conditional Formatting

MS Excel 2010 Conditional Formatting feature enables to format a range of values so that the values outside certain limits, are automatically formatted.

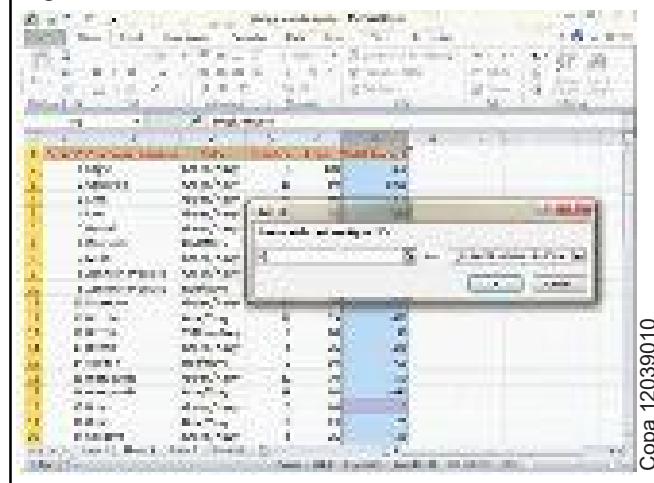
Choose Home Tab " Style group " Conditional Formatting dropdown.

Various Conditional Formatting Options

- **Highlight Cells Rules ?** It opens a continuation menu with various options for defining the formatting rules that highlight the cells in the cell selection that contain certain values, text, or dates, or that have values greater or less than a particular value, or that fall within a certain ranges of values.

Suppose to find cell with Amount 0 and Mark them as red. Choose Range of cell " Home Tab " Conditional Formatting DropDown " Highlight Cell Rules " Equal To as on fig-10.

Fig 10



After Clicking ok, the cells with value zero are marked as red as shown in fig-11.

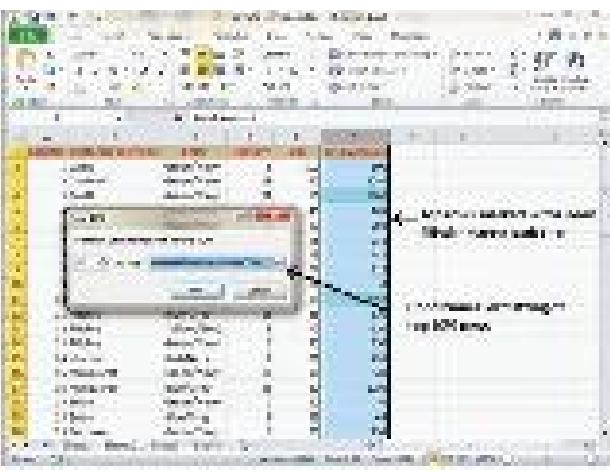
Fig 11

1	Chait	Green,White	10	30	300
2	Carmell	Green,White	10	30	300
3	Caroli	Green,White	10	30	300
4	Jad	Green,White	10	30	300
5	Kirpal	Green,White	10	30	300
6	Kiranpal	Amber	10	30	300
7	Kiran	Green,White	10	30	300
8	Kushalpreet	Green,White	10	30	300
9	Kushalpreet	Amber	10	30	300
10	Lokesh	Green,White	10	30	300
11	Mitul	Green,White	10	30	300
12	Nishan	Yellow,White	10	30	300
13	Nishan	Green,White	10	30	300
14	Rakesh	Amber	10	30	300
15	Rajpal	Green,White	10	30	300
16	Sharma	Amber	10	30	300
17	Shivam	Green,White	10	30	300
18	Soham	Amber	10	30	300
19	Surjeet	Green,White	10	30	300
20	Tarun	Green,White	10	30	300
21	Varinder	Amber	10	30	300
22	Yashveer	Green,White	10	30	300

- **Top/Bottom Rules:** It opens a continuation menu with various options for defining the formatting rules that highlight the top and bottom values, percentages, and above and below average values in the cell selection.

Suppose want to highlight the top 10% rows user can do this with these Top/Bottom rules as shown in fig-12.

Fig 12

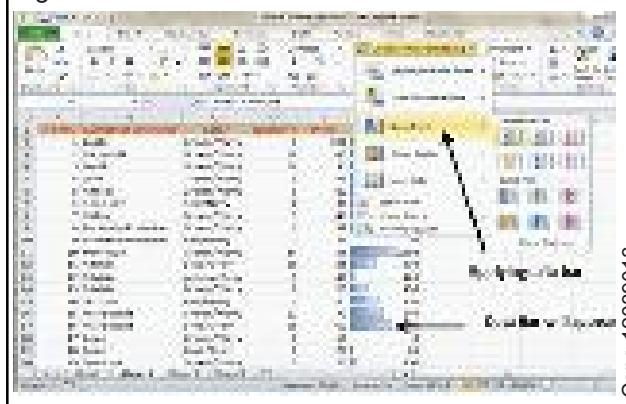


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- **Data Bars(fig-13):** It opens a palette with different color data bars that can apply to the cell selection to indicate their values relative to each other by clicking the data bar thumbnail.

With this conditional Formatting data Bars will appear in each cell.

Fig 13

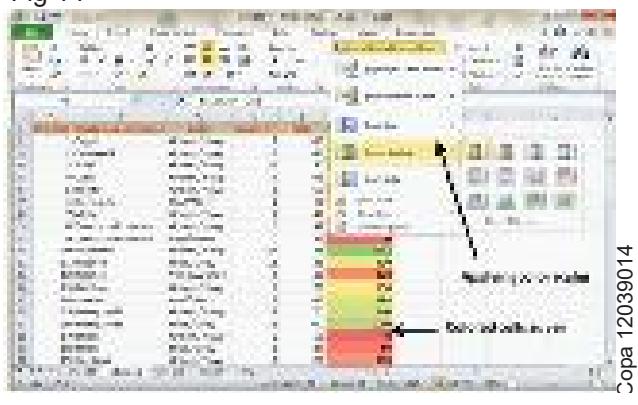


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- **Color Scales (Fig-14):** It opens a palette with different three- and two-colored scales that can apply to the cell selection to indicate their values relative to each other by clicking the color scale thumbnail.

See the below screenshot with Color Scales, conditional formatting applied.

Fig 14



- **Icon Sets** (Fig-15)? It opens a palette with different sets of icons that can apply to the cell selection to indicate their values relative to each other by clicking the icon set.

See the below screenshot with Icon Sets conditional formatting applied.

Fig 15



- **New Rule:** It opens the New Formatting Rule dialog box, where define a custom conditional formatting rule to apply to the cell selection.
- **Clear Rules:** It opens a continuation menu, where can remove the conditional formatting rules for the cell selection by clicking the Selected Cells option, for the entire worksheet by clicking the Entire Sheet option, or for just the current data table by clicking the This Table option.
- **Manage Rules:** It opens the Conditional Formatting Rules Manager dialog box, edit and delete particular rules as well as adjust their rule precedence by moving them up or down in the Rules list box.

Link Excel Spreadsheet Data

Microsoft Excel provides the ability for cells in one worksheet to be linked to cells in one or more other worksheets. This is a great productivity tool and can reduce the need for additional worksheets!

Linking Excel Worksheet Data Overview

In Excel, a link is a formula that dynamically pulls in data from a cell in another worksheet. The worksheet can be in the same workbook or a different workbook.

The destination worksheet is the worksheet that contains the link formula. The worksheet containing the data that will be brought in is called the source worksheet.

Any time the cell value in the source worksheet changes, the cell containing the link formula will be updated as well the next time the spreadsheet containing the link formula is opened. This is just one of many reasons the Excel software program is so powerful.

Need for Linking Spreadsheet Data

The ability to create links often eliminates the need to have identical data entered and updated in multiple sheets. This saves time, reduces errors, and improves data integrity. For example, a company's prices can be stored in a 'Master Price List' worksheet, and others needing pricing data can link to that worksheet.

Consider a Sales Manager who has a detailed spreadsheet for each salesperson, but would like a summary sheet to compare salespersons' performance and create grand totals. The summary sheet (destination) would bring in data from all the salespersons' sheets (source).

Create the Worksheet Link

Before creating the link, format the cell containing the link formula in the destination worksheet to equal the format of the source data.

For example, if the data from the source spreadsheet is currency with 2 decimal points, then first format the target cell for currency with 2 decimal places.

METHOD ONE

1. In the source worksheet, select the cell need to link to and click the Copy button on the Home tab. Or press **Ctrl+C**, or right-click and select **Copy**.
2. Switch to the destination spreadsheet and click the cell want to link. Then, depending on the version of Excel:
 - Excel 2007, 2010, and 2013: On the Home tab, click the down arrow below Paste and click **Paste Link**. In newer versions also right-click and select the **Paste Link** from the Paste menu.
 - Excel 2003 and older versions: On the Edit menu, click **Paste Special**, and then click **Paste Link**.
3. Return to the source worksheet and press **ESC** to remove the animated border around the cell.

METHOD TWO

This is a fast method that works in a different order than Method One.

1. In the destination worksheet cell that will contain the link formula, enter an equal sign (=).

2. In the source worksheet, click in the cell that contains the data and press the Enter key.

Link Formula Example(Fig-16)

In the example below, using Method One, we click in cell B6 in the source worksheet and click Copy. Then, on the destination worksheet, we click in cell B3, and paste the link. The value (\$3,500) automatically displays.

Follow the same steps to link the data from the Denver and Seattle worksheets to the Store Totals worksheet. And first formatted the cells to display the data as Currency. (Fig 16)

Fig 16

Source Worksheet

A	B	C
Atlanta Store	Date: 08/20/09	
	\$ Collected	
1	Register #1	\$1,800
2	Register #2	\$1,000
3	Register #3	\$1,200
4	Total:	\$3,500

Destination Worksheet

A	B	C
1	Store Totals for:	08/20/09
2	\$ Collected	
3	Atlanta	\$3,500
4	Denver	\$2,900
5	Seattle	\$3,200
6	Total:	\$9,600

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IT & ITES : COPA - (NSQF Level - 4): Related Theory for Exercise 1.7.39-1.7.41

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Functions and formulas in MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
- formulas and Functions
- move Around in Excel 2010
- conditional Formatting
- link Excel Spreadsheet Data

Formulas in MS Excel

formula, worksheet will be just simple tabular representation of data. A formula consists of special code, which is entered into a cell. It performs some calculations and returns a result, which is displayed in the cell.

Formulas use a variety of operators and worksheet functions to work with values and text. The values and text used in formulas can be located in other cells, which makes changing data easy and gives worksheets their dynamic nature. For example, it can quickly change the data in a worksheet and formulas works.

Elements of Formulas

A formula can consist of any of these elements ?

- Mathematical operators, such as +(for addition) and *(for multiplication)

Example -

=A1+A2 Adds the values in cells A1 and A2.

- Values or text

Example -

=200*0.5 Multiplies 200 times 0.5. This formula uses only values, and it always returns the same result as 100.

- Cell references (including named cells and ranges)

Example -

=A1=C12 Compares cell A1 with cell C12. If the cells are identical, the formula returns TRUE; otherwise, it returns FALSE.

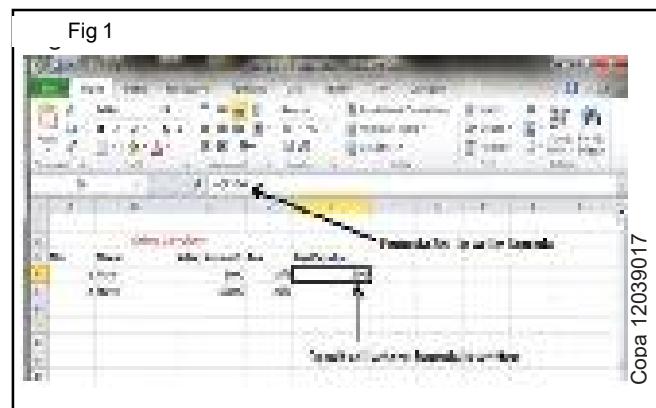
- Worksheet functions (such as SUM or AVERAGE)

Example -

=SUM(A1:A12) Adds the values in the range A1:A12.

Creating Formula

For creating a formula need to type in the Formula Bar. Formula begins with '=' sign. When building formulas manually, and can either type in the cell addresses or can point to them in the worksheet. Using the Pointing method to supply the cell addresses for formulas is often easier and more powerful method of formula building. When using built-in functions, to click the cell or drag through the cell range that want to use when defining the function's arguments in the Function Arguments dialog box as shown in Fig 1.



As soon as complete a formula entry, Excel calculates the result, which is then displayed inside the cell within the worksheet (the contents of the formula, however, continue to be visible on the Formula bar anytime the cell is active). If you make an error in the formula that prevents Excel from being able to calculate the formula at all, Excel displays an Alert dialog box suggesting how to fix the problem.

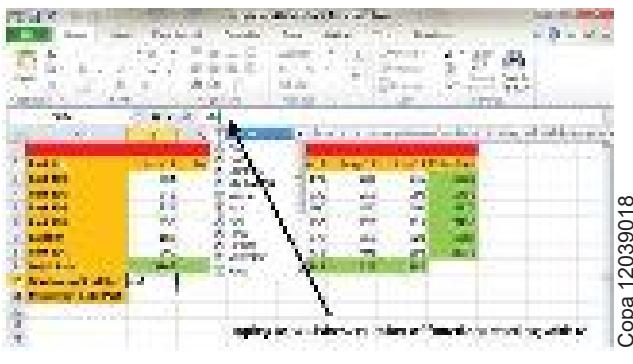
Functions in Formula

Many formulas are created using available worksheet functions. These functions enable to greatly enhance the power of the formulas and perform calculations that are difficult if use only the operators. For example, one can use the LOG or SIN function to calculate the Logarithm or Sin ratio. And cannot do this complicated calculation by using the mathematical operators alone.

Using Functions

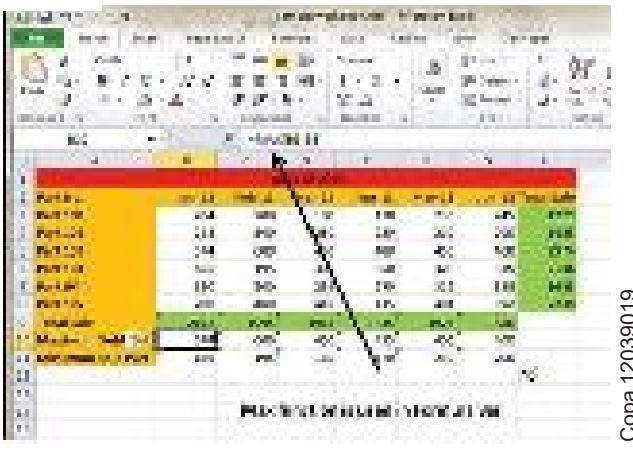
When type = sign and then type any alphabet the searched functions will show fig 2.

Fig 2



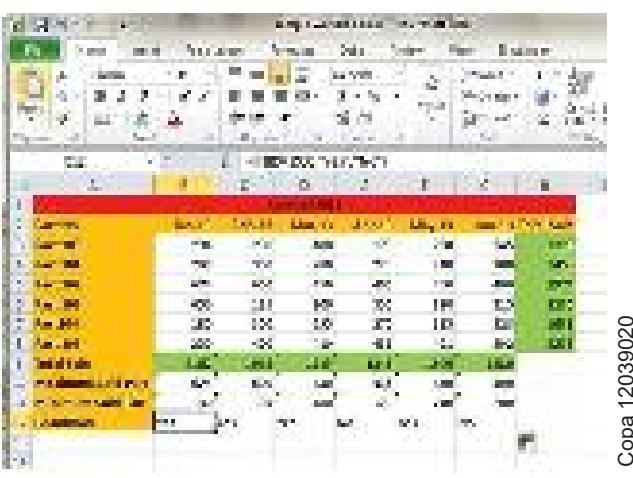
Suppose need to determine the largest value in a range. A formula can't tell the answer without using a function. We will use formula that uses the MAX function to return the largest value in the range B3:B8 as **=MAX(A1:D100)** as shown in fig 3.

Fig 3



Another example of functions. Suppose to find if the cell of month is greater than 1900 then we can give Bonus to Sales representative. The we can achieve it with writing formula with IF functions as **=IF(B9>1900,"Yes","No")** as shown in fig 4.

Fig 4



Function Arguments

In the above examples, notice that all the functions used parentheses. The information inside the parentheses is the list of arguments.

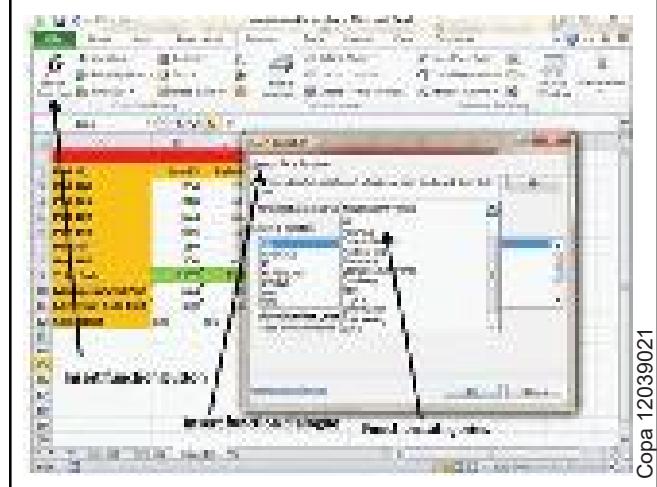
Functions vary in how they use arguments. Depending on what it has to do, a function may use.

- **No arguments** - Examples ? Now(), Date(), etc.
- **One argument** - UPPER(), LOWER(), etc.
- **A fixed number of arguments** - IF(), MAX(), MIN(), AVERAGE(), etc.
- **Infinite number of arguments**
- **Optional arguments**

Built In Functions

MS Excel has many built in functions, which we can use in our formula. To see all the functions by category, choose Formulas Tab "Insert Function" as shown in fig-5. Then Insert function Dialog appears from which we can choose the function.

Fig 5



Functions by Categories

Let us see some of the built in functions in MS Excel.

Text Functions

LOWER: Converts all characters in a supplied text string to lower case

UPPER : Converts all characters in a supplied text string to upper case

TRIM : Removes duplicate spaces, and spaces at the start and end of a text string

CONCATENATE : Joins together two or more text strings.
Fig 4

LEFT : Returns a specified number of characters from the start of a supplied text string.

MID : Returns a specified number of characters from the middle of a supplied text string

RIGHT : Returns a specified number of characters from the end of a supplied text string.

LEN: Returns the length of a supplied text string

FIND: Returns the position of a supplied character or text string from within a supplied text string (case-sensitive).

Date & Time

DATE: Returns a date, from a user-supplied year, month and day.

TIME: Returns a time, from a user-supplied hour, minute and second.

DATEVALUE: Converts a text string showing a date, to an integer that represents the date in Excel's date-time code.

TIMEVALUE: Converts a text string showing a time, to a decimal that represents the time in Excel.

NOW: Returns the current date & time.

TODAY: Returns today's date.

Statistical

MAX: Returns the largest value from a list of supplied numbers.

MIN: Returns the smallest value from a list of supplied numbers.

AVERAGE: Returns the Average of a list of supplied numbers.

COUNT: Returns the number of numerical values in a supplied set of cells or values.

COUNTIF: Returns the number of cells (of a supplied range), that satisfies a given criteria.

SUM: Returns the sum of a supplied list of numbers

Logical

AND: Tests a number of user-defined conditions and returns TRUE if ALL of the conditions evaluate to TRUE, or FALSE otherwise

OR: Tests a number of user-defined conditions and returns TRUE if ANY of the conditions evaluate to TRUE, or FALSE otherwise.

NOT: Returns a logical value that is the opposite of a user supplied logical value or expression i.e. returns FALSE if the supplied argument is TRUE and returns TRUE if the supplied argument is FALSE.

Math & Trig

ABS: Returns the absolute value (i.e. the modulus) of a supplied number.

SIGN: Returns the sign (+1, -1 or 0) of a supplied number.

SQRT: Returns the positive square root of a given number.

MOD: Returns the remainder from a division between

two supplied numbers.

Filters in MS Excel

Filtering data in MS Excel refers to displaying only the rows that meet certain conditions. (The other rows gets hidden.)

Using the store data, if user interested in seeing data where Shoe Size is 36, then set filter to do this. Follow the below mentioned steps to do this.

- Place a cursor on the Header Row.
- Choose **Data Tab > Filter** to set filter as shown in fig 6.

Fig 6

The screenshot shows a Microsoft Excel spreadsheet with a data table. The columns are labeled 'Shoe ID', 'Shoe Model', 'Shoe Size', and 'Shoe Price'. The 'Shoe Size' column has a dropdown arrow icon next to its header. The data includes various shoe models like 'Adidas', 'Puma', 'Nike', etc., with their respective sizes and prices. Some rows are highlighted in yellow, indicating they are visible due to the filter.

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- Click the drop-down arrow in the Area Row Header and remove the check mark from SelectAll, which unselects everything.
- Then select the check mark for Size 36 which will filter the data and displays data of Shoe Size 36 as shown in fig-23.
- Some of the row numbers are missing; these rows contain the filtered (hidden) data.
- There is drop-down arrow in the Area column now shows a different graphic - an icon that indicates the column is filtered. (Fig 7)

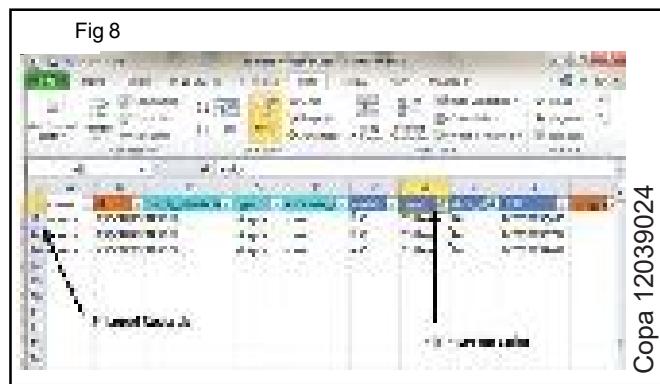
Fig 7

This screenshot shows the same Excel spreadsheet as Fig 6, but with a filter applied to the 'Shoe Size' column. The dropdown arrow icon next to the 'Shoe Size' header now has a different appearance, indicating it is filtered. Only rows where the 'Shoe Size' is 36 are visible, while other rows are hidden.

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Using Multiple Filters(fig-24)

Filtering of records by multiple conditions i.e. by multiple column values. Suppose after size 36 is filtered, need to have the filter where color is equal to Coffee. After setting filter for Shoe Size, choose Color column and then set filter for color. (Fig 8)

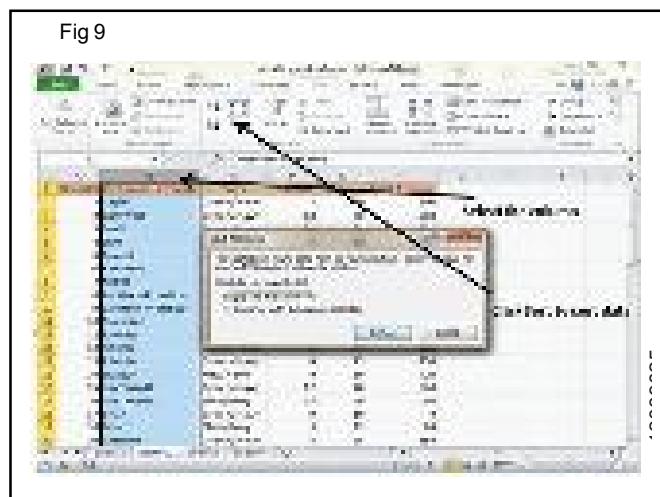


Sorting in MS Excel

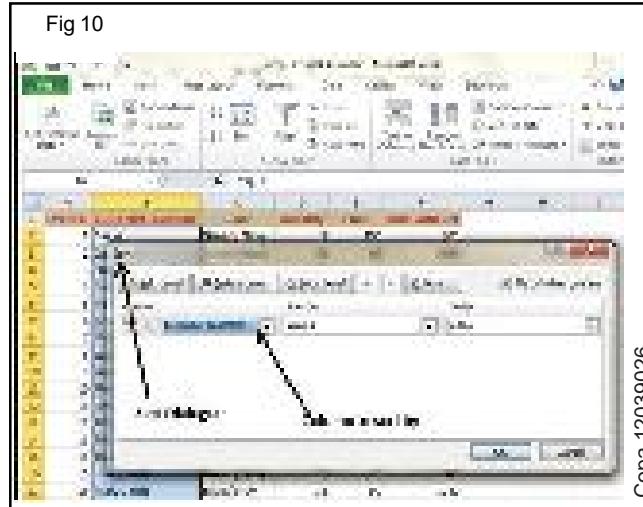
Sorting data in MS Excel rearranges the rows based on the contents of a particular column. sort a table to put names in alphabetical order Or sort data by Amount from smallest to largest or largest to smallest.

To Sort the data follow the steps mentioned below.

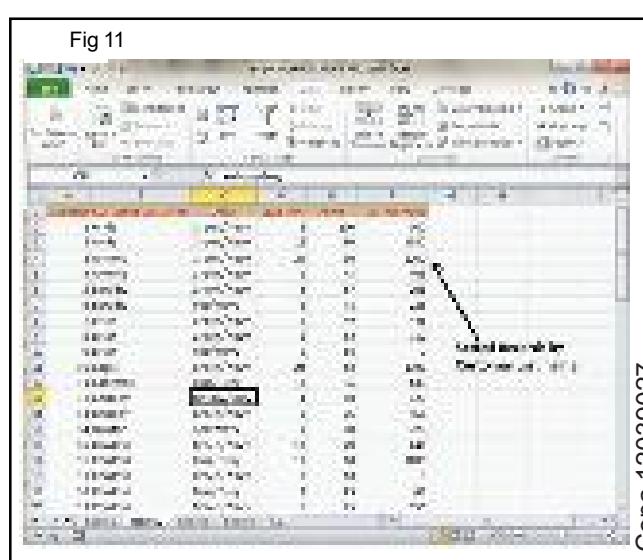
- Select the Column to sort data as on fig 9.



- Choose Data Tab " Sort Below dialog appears.
- If the user sort data based on a selected column, Choose Continue with the selection or if the data sorting based on other columns, choose Expand Selection.
- Sort the data based on the below Conditions as on fig 10.

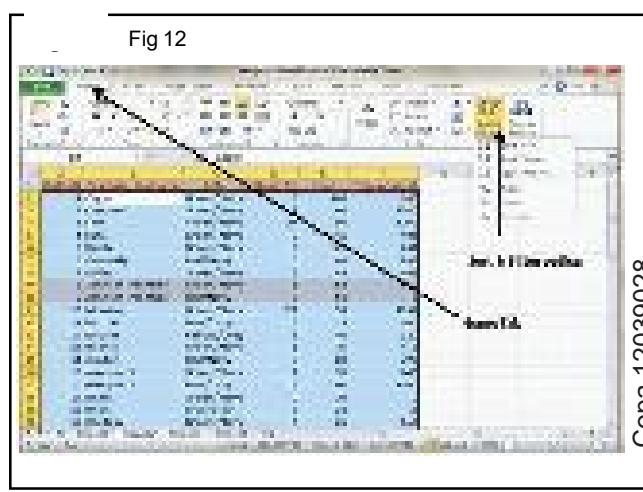


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Sorting option is also available from the Home Tab. Choose Home Tab " Sort & Filter. You can see the same dialog to sort records as on fig 12.



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Ranges in MS Excel:

A cell is a single element in a worksheet that can hold a value, some text, or a formula. A cell is identified by its address, which consists of its column letter and row number. For example, cell B1 is the cell in the second column and the first row.

A group of cells is called a range. You designate a range address by specifying its upper-left cell address and its lower-right cell address, separated by a colon.

Example of Ranges:

- C24** - A range that consists of a single cell.
- A1:B1** - Two cells that occupy one row and two columns.
- A1:A100** - 100 cells in column A.
- A1:D4** - 16 cells (four rows by four columns).

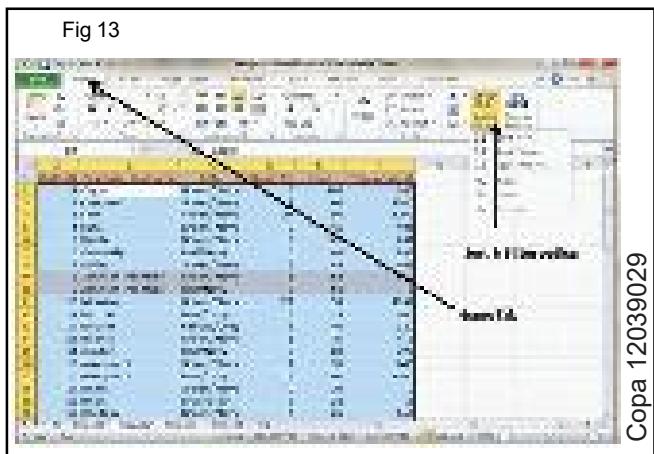
Selecting Ranges (Fig-29)

Selecting a range in several ways ?

- Press the left mouse button and drag, highlighting the range. Then release the mouse button. If drag to the end of the screen, the worksheet will scroll.
- Press the Shift key while uses the navigation keys to select a range.
- Press F8 and then move the cell pointer with the navigation keys to highlight the range. Press F8 again

to return the navigation keys to normal movement.

- Type the cell or range address into the Name box and press Enter. Excel selects the cell or range that specified. (Fig 13)



Selecting Complete Rows and Columns (Fig-30)

When user need to select an entire row or column.and can select entire rows and columns in much the same manner as select ranges:

- Click the row or column border to select a single row or column.
- To select multiple adjacent rows or columns, click a row or column border and drag to highlight additional rows or columns.
- To select multiple (nonadjacent) rows or columns, press Ctrl while click the row or column borders. (Fig 14)

Fig 14

SL	NAME	GRADE	MARKS	PERCENTAGE
1	Cagle	General Navy	100	100
2	Connie B	General Navy	100	100
3	Dorell	General Navy	90	90
4	Lori C	General Navy	85	85
5	Reita	General Navy	85	85
6	Suzanne	Family Navy	85	85
7	T. Miller	General Navy	85	85
8	Janice Thompson	General Navy	85	85
9	Zane Smith	Family Navy	85	85

Multiple columns selected

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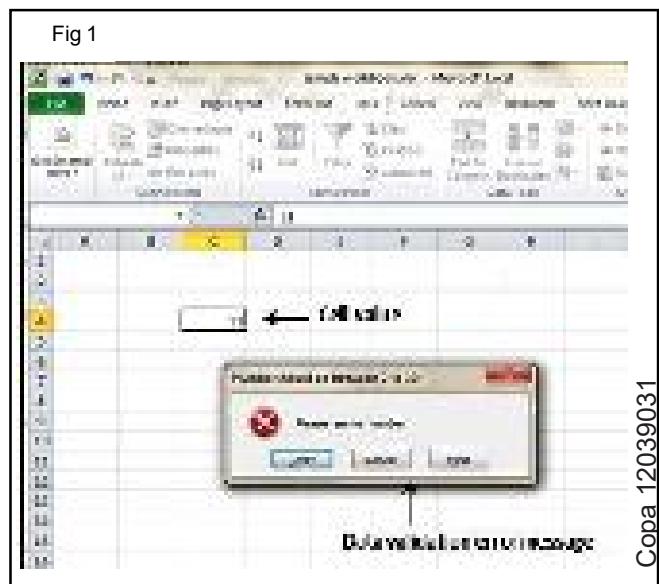
Data validations and Table management in MsExcel 2010

Objectives : At the end of this lesson you shall be able to

- data Validation
- data Table with Example
- charts and its types
- pivot table and pivot chart
- page setup and printing worksheet
- excel shortcut keys

Data Validation

MS Excel data validation feature allows to set up certain rules that dictate what can be entered into a cell. For example, user want to limit data entry in a particular cell to whole numbers between 0 and 10. If the user makes an invalid entry, and display a custom message as shown fig 1.



Validation Criteria

To specify the type of data allowable in a cell or range, follow the steps below, which shows all the three tabs of the Data Validation dialog box.

- Select the cell or range.
- Choose Data " Data Tools " Data Validation. Excel displays its Data Validation dialog box having 3 tabs settings, Input Message and Error alert.

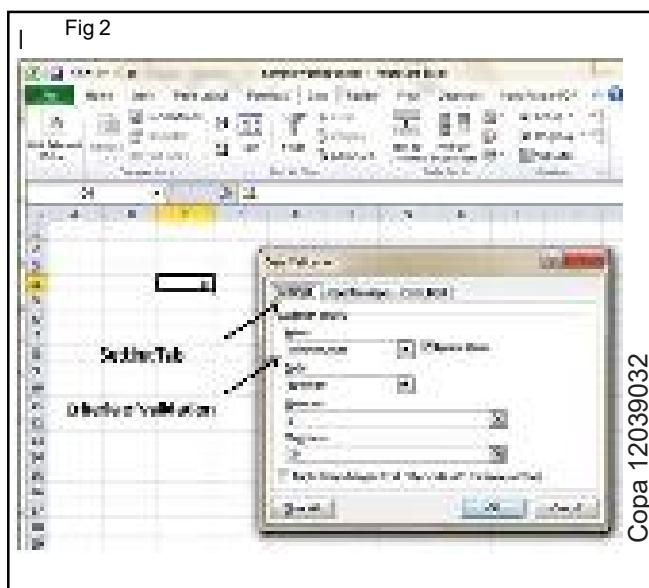
Settings Tab

Here user can set the type of validation. Choose an option from the Allow drop-down list. The contents of the Data Validation dialog box will change, displaying controls based on your choice.

- Any Value - Selecting this option removes any existing data validation.
- Whole Number - The user must enter a whole number. For example, you can specify that the entry must be a whole number greater than or equal to 50.

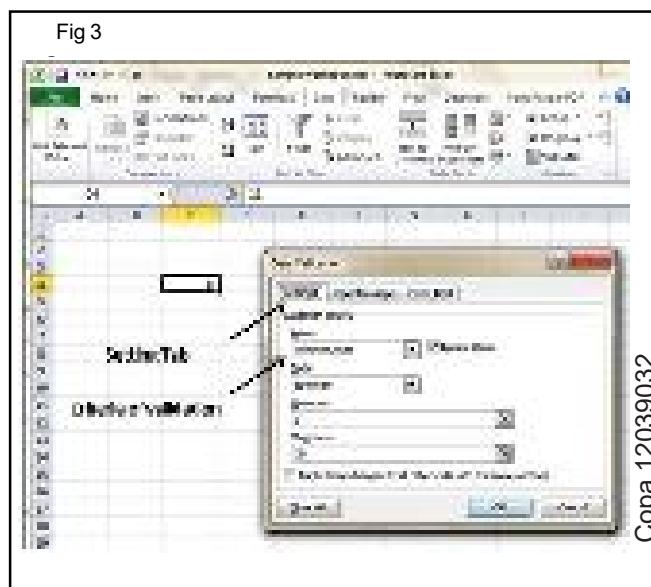
- Decimal - The user must enter a number. For example, you can specify that the entry must be greater than or equal to 10 and less than or equal to 20.
- List - The user must choose from a list of entries you provide. You will create drop-down list with this validation. You have to give input ranges then those values will appear in the drop-down.
- Date - The user must enter a date. You specify a valid date range from choices in the Data drop-down list. For example, you can specify that the entered data must be greater than or equal to January 1, 2013, and less than or equal to December 31, 2013.
- Time - The user must enter a time. Specify a valid time range from choices in the Data drop-down list. For example, user can specify that the entered data must be later than 12:00 p.m.
- Text Length - The length of the data (number of characters) is limited. specify a valid length by using the Data drop-down list. For example, that the length of the entered data be 1 (a single alphanumeric character).
- Custom - To use this option, must supply a logical formula that determines the validity of the user's entry (a logical formula returns either TRUE or FALSE).

Input Message Tab (fig 2)



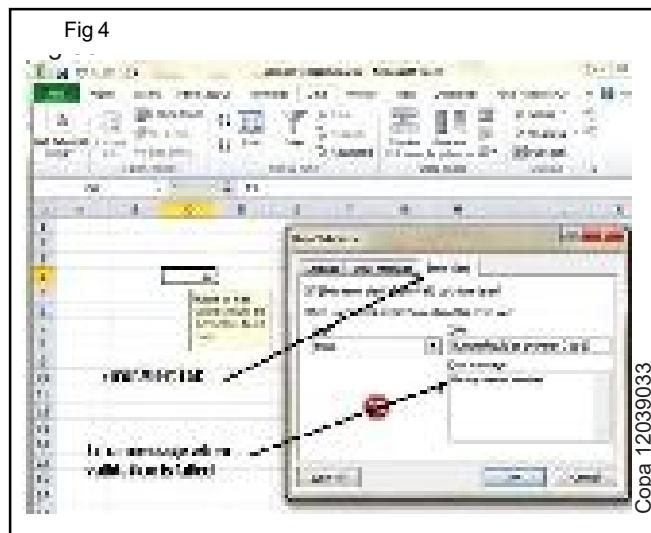
User can set the input help message with this tab. Fill the title and Input message of the Input message tab and the input message will appear when the cell is selected.

Error Alert Tab(fig 3)

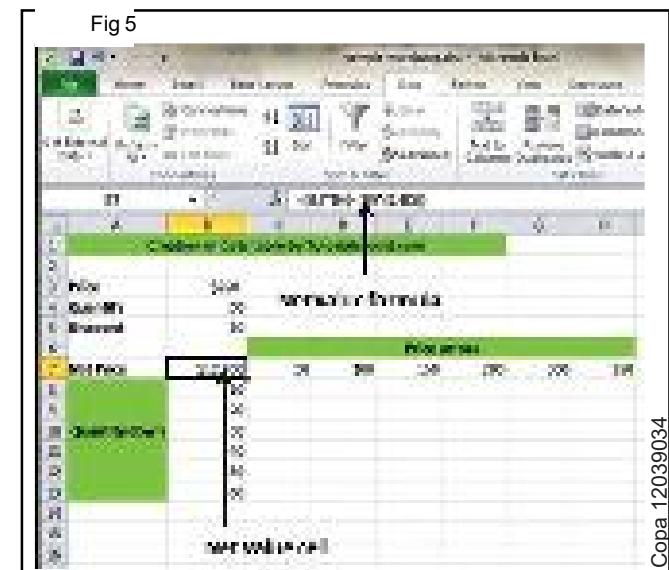


User specify an error message with this tab. Fill the title and error message. Select the style of the error as stop, warning or Information as per user need.

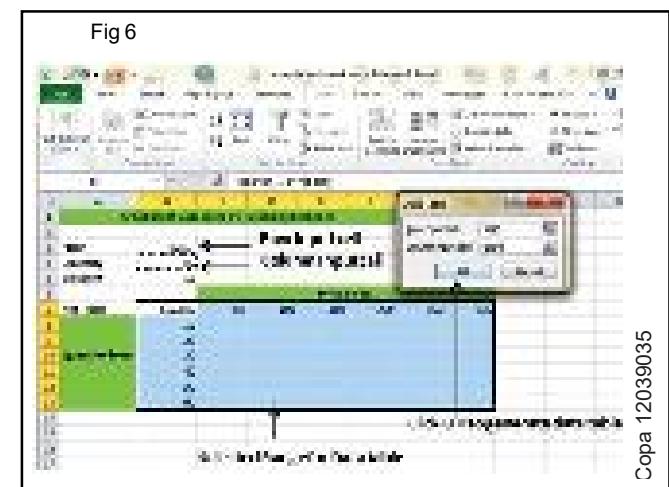
Data Table with Example (Fig 4)



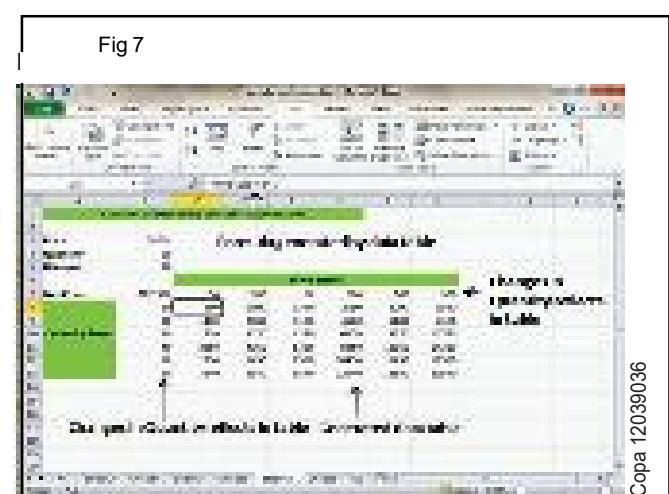
Here user have the Price and quantity of many values. Also, have the discount for that as third variable for calculating the Net Price. And can keep the Net Price value in the organized table format with the help of the data table. The Price runs horizontally to the right while quantity runs vertically down. We are using a formula to calculate the Net Price as Price multiplied by Quantity minus total discount (Quantity * Discount for each quantity) as shown in fig 5.



Now, for creation of data table select the range of data table. Choose Data Tab " What-If analysis dropdown " Data table. It will display dialogue asking for Input row and Input Column. Give the Input row as Price cell (In this case cell B3) and Input column as quantity cell (In this case cell B4) as shown in fig 6.



Clicking OK will generate data table as shown in fig 7. It will generate the table formula. And change the price horizontally or quantity vertically to see the change in the Net Price.

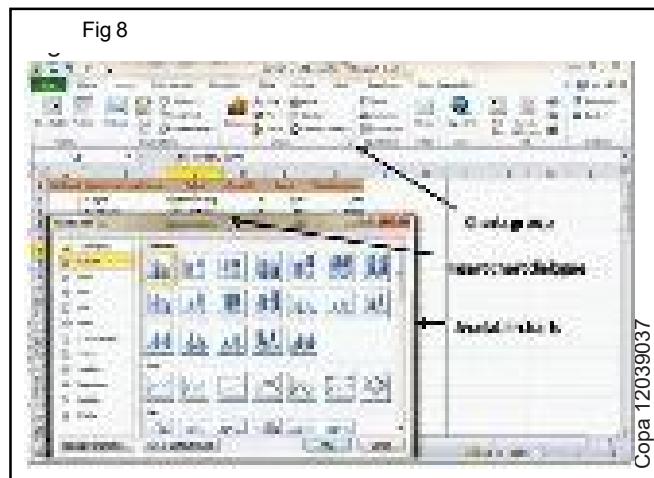


Charts

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets. Charts generated by early spreadsheet products were quite crude, but they have improved significantly over the years. Excel provides you with the tools to create a wide variety of highly customizable charts. Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships.

Types of Charts

There are various chart types available in MS Excel as shown in fig 8.



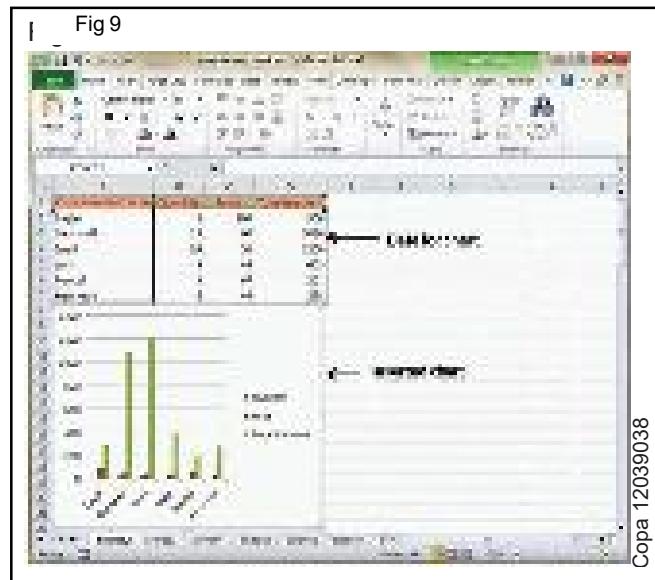
- **Column:** Column chart shows data changes over a period of time or illustrates comparisons among items.
- **Bar:** A bar chart illustrates comparisons among individual items.
- **Pie:** A pie chart shows the size of items that make up a data series, proportional to the sum of the items. It always shows only one data series and is useful to emphasize a significant element in the data.
- **Line:** A line chart shows trends in data at equal intervals.
- **Area:** An area chart emphasizes the magnitude of change over time.
- **X Y Scatter:** An xy (scatter) chart shows the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.

- **Stock:** This chart type is most often used for stock price data, but can also be used for scientific data (for example, to indicate temperature changes).
- **Surface:** A surface chart is useful to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.
- **Doughnut:** Like a pie chart, a doughnut chart shows the relationship of parts to a whole; however, it can contain more than one data series.
- **Bubble:** Data that is arranged in columns on a worksheet, so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.
- **Radar:** A radar chart compares the aggregate values of a number of data series.

Creating Chart

To create charts for the data by below mentioned steps.

- Select the data for which you want to create the chart.
- Choose Insert Tab " Select the chart or click on the Chart group to see various chart types.
- Select the chart of the choice and click OK to generate the chart as shown in fig 9.

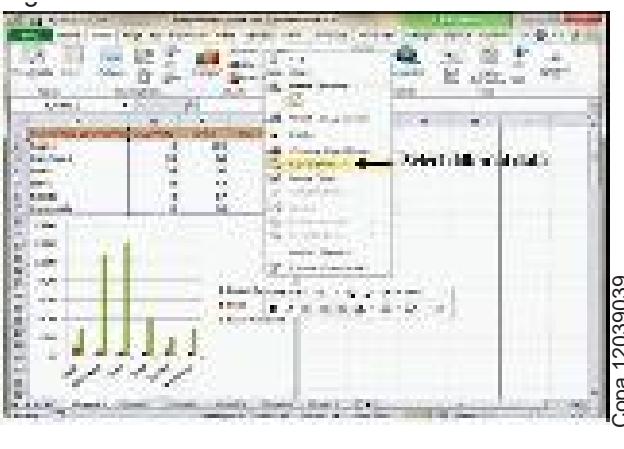


Editing Chart

You can edit the chart at any time after you have created it.

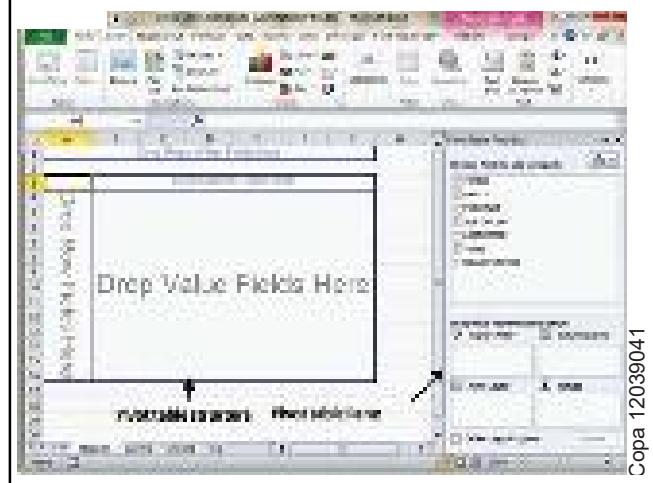
- select the different data for chart input with Right click on chart " Select data. Selecting new data will generate the chart as per the new data, as shown in fig 10.

Fig 10



This will generate the Pivot table pane as shown in fig-41. various options available in the Pivot table pane. And can select fields for the generated pivot table. (Fig 13)

Fig 12



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- change the X axis of the chart by giving different inputs to X-axis of chart.
- change the Y axis of chart by giving different inputs to Y-axis of chart.

Pivot Tables

A pivot table is essentially a dynamic summary report generated from a database. The database can reside in a worksheet (in the form of a table) or in an external data file. A pivot table can help transform endless rows and columns of numbers into a meaningful presentation of the data. Pivot tables are very powerful tool for summarized analysis of the data.

Pivot tables are available under Insert tab " PivotTable dropdown " PivotTable.

Pivot Table Example (Fig-40)

Now, let us see Pivot table with the help of example. Suppose huge data of voters and need to see the summarized data of voter Information per party, use the Pivot table for it. Choose Insert tab " Pivot Table to insert pivot table. MS Excel selects the data of the table. and select the pivot table location as existing sheet or new sheet. (Fig 11)

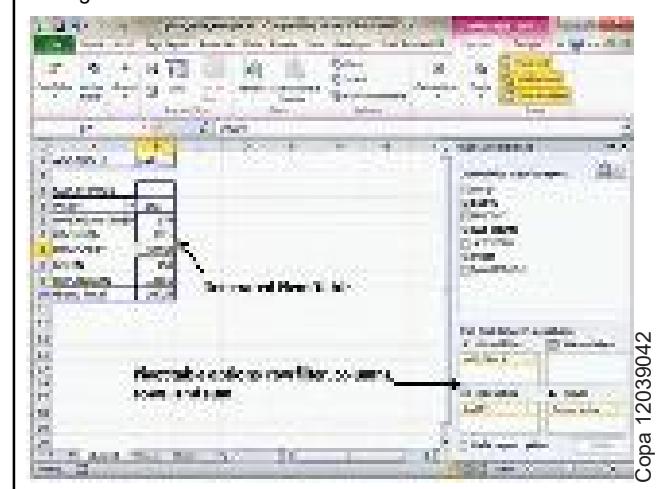
Fig 11



- **Column labels:** A field that has a column orientation in the pivot table. Each item in the field occupies a column.
- **Report Filter:** User can set the filter for the report as year, and then data gets filtered as per the year.
- **Row labels:** A field that has a row orientation in the pivot table. Each item in the field occupies a row.
- **Values area:** The cells in a pivot table that contain the summary data. Excel offers several ways to summarize the data (sum, average, count, and so on).

After giving input fields to the pivot table, it generates the pivot table with the data as shown in fig 13.

Fig 13



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Pivot Charts

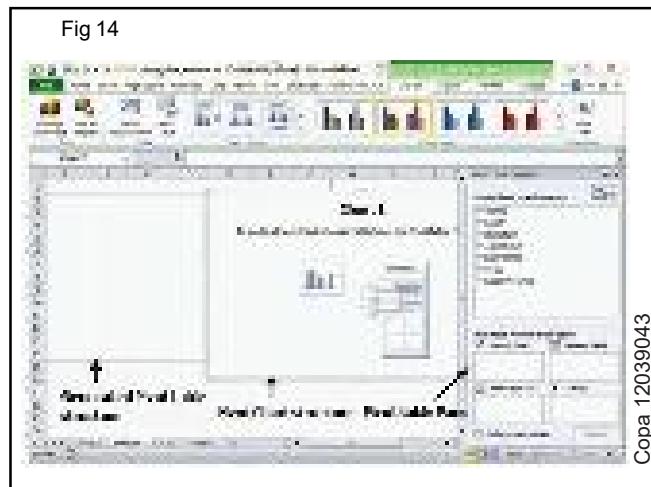
A pivot chart is a graphical representation of a data summary, displayed in a pivot table. A pivot chart is always based on a pivot table. Although Excel lets to create a pivot table and a pivot chart at the same time, user can't create a pivot chart without a pivot table. All Excel charting features are available in a pivot chart.

Pivot charts are available under **Insert tab > PivotTable dropdown > PivotChart**.

Pivot Chart Example

Suppose huge data of voters and need to see the summarized view of the data of voter

Information per party in the form of charts, then use the Pivot chart for it. Choose **Insert tab > Pivot Chart** to insert the pivot table. (Fig 14)



MS Excel selects the data of the table. And select the pivot chart location as an existing sheet or a new sheet. Pivot chart depends on automatically created pivot table by the MS Excel. generate the pivot chart in the below fig 15.



Quick Print

If user want to print a copy of a worksheet with no layout adjustment, use the Quick Print option. There are two ways in which we can use this option.

- Choose File " Print (which displays the Print pane), and then click the Print button as shown in fig 16.

- Press Ctrl+P and then click the Print button (or press Enter).

Fig 16



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Adjusting Common Page Setup Settings

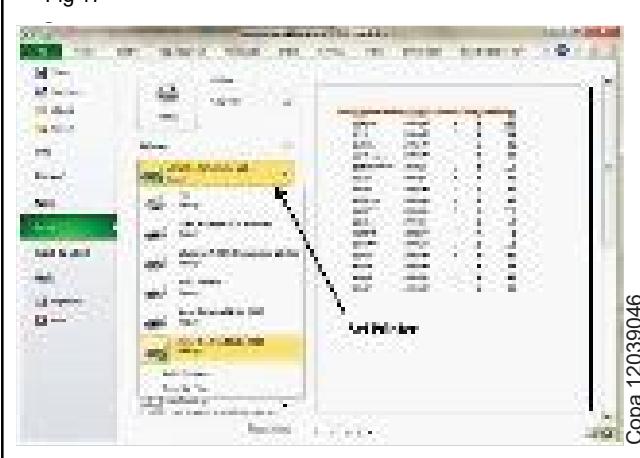
User can adjust the print settings available in the Page setup dialogue in different ways as discussed below. Page setup options include Page orientation, Page Size, Page Margins, etc.

- The Print screen in Backstage View, displayed when choose File " Print.
- The Page Layout tab of the Ribbon.

Choosing Your Printer(fig-46)

To switch to a different printer, choose **File > Print** and use the drop-down control in the Printer section to select any other installed printer. (Fig 17)

Fig 17



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Specifying What You Want to Print(Fig 18)

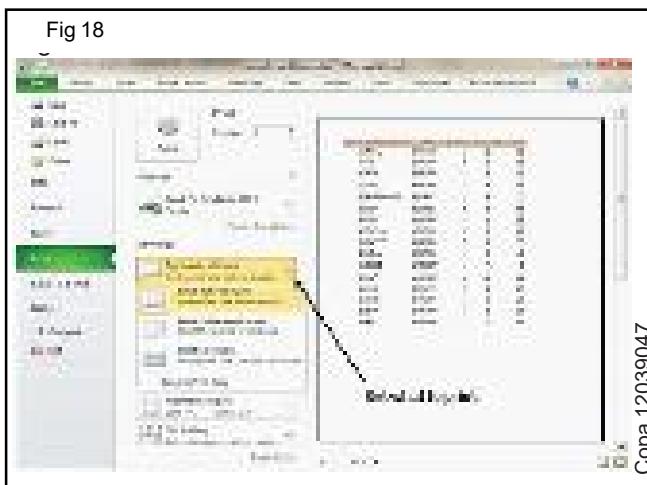
Sometimes print only a part of the worksheet rather than the entire active area. Choose **File > Print** and use the controls in the Settings section to specify what to print.

- Active Sheets:** Prints the active sheet or sheets that you selected.

- **Entire Workbook:** Prints the entire workbook, including chart sheets.
- **Selection:** Prints only the range that selected before choosing **File > Print**.

MS Excel Keyboard Short-cuts

MS Excel offers many keyboard short-cuts. Below is the list of all the major shortcut keys in Microsoft Excel. (Fig 18)



- | | |
|----------------------------|---|
| • Ctrl + A | - Selects all contents of the worksheet. |
| • Ctrl + B | - Bold highlighted selection. |
| • Ctrl + I | - Italicizes the highlighted selection. |
| • Ctrl + K | - Inserts link. |
| • Ctrl + U | - Underlines the highlighted selection. |
| • Ctrl + 1 | - Changes the format of selected cells. |
| • Ctrl + 5 | - Strikethrough the highlighted selection. |
| • Ctrl + P | - Brings up the print dialog box to begin printing. |
| • Ctrl + Z | - Undo last action. |
| • Ctrl + F3 | - Opens Excel Name Manager. |
| • Ctrl + F9 | - Minimizes the current window. |
| • Ctrl + F10 | - Maximize currently selected window. |
| • Ctrl + F6 | - Switches between open workbooks or windows. |
| • Ctrl + Page up | - Moves between Excel work sheets in the same Excel document. |
| • Ctrl + Page down | - Moves between Excel work sheets in the same Excel document. |
| • Ctrl + Tab | - Moves between Two or more open Excel files. |
| • Alt + = | - Creates a formula to sum all of the above cells |
| • Ctrl + ' | - Inserts the value of the above cell into cell currently selected. |
| • Ctrl + Shift + ! | - Formats the number in comma format. |
| • Ctrl + Shift + \$ | - Formats the number in currency format. |
| • Ctrl + Shift + # | - Formats the number in date format. |
| • Ctrl + Shift + % | - Formats the number in percentage format. |
| • Ctrl + Shift + ^ | - Formats the number in scientific format. |
| • Ctrl + Shift + @ | - Formats the number in time format. |
| • Ctrl + Arrow key | - Moves to the next section of text. |

- **Ctrl + Space** - Selects the entire column.
- **Shift + Space** - Selects the entire row.
- **Ctrl + -** - Deletes the selected column or row.
- **Ctrl + Shift + =** - Inserts a new column or row.
- **Ctrl + Home** - Moves to cell A1.
- **Ctrl + ~** - Switches between showing Excel formulas or their values in cells.
- **F2** - Edits the selected cell.
- **F3** - After a name has been created F3 will paste names.
- **F4** - Repeat last action. For example, if you changed the color of text in another cell pressing F4 will change the text in cell to the same color.
- **F5** - Goes to a specific cell. For example, C6.
- **F7** - Spell checks the selected text or document.
- **F11** - Creates chart from the selected data.
- **Ctrl + Shift + ;** - Enters the current time.
- **Ctrl + ;** - Enters the current date.
- **Alt + Shift + F1** - Inserts New Worksheet.
- **Alt + Enter** - While typing text in a cell pressing Alt + Enter will move to the next line allowing for multiple lines of text in one cell.
- **Shift + F3** - Opens the Excel formula window.
- **Shift + F5** - Brings up the search box.

Image editing, presentations

Objectives : At the end of this lesson you shall be able to

- Introduction to Power Point and its advantages
- Creation of slide shows
- Fine tuning of presentations

Introduction

PowerPoint is a presentation graphics software program that is part of the Microsoft Office package. It uses a graphical approach for the presentations in the form of slide shows that accompany the oral delivery of the topic. This program is widely used in business and classrooms and is an effective tool when used for training purposes.

PowerPoint is one of the simplest computer programs to learn. It is the easiest program used worldwide for presentations that creates professional looking presentations. It is easy to customize presentations with company logo and has design templates that come with the programs. In addition to an on screen slide show, PowerPoint has printing options that allow the presenter to provide handouts and outlines for the audience as well as notes pages for the speaker to refer to during the presentation.

PowerPoint 2010 allows to create presentations for printing or online viewing using a variety of tools. These include wizards to help with the content and look and feel of the presentations to animation tools to create moving images.

Presentation

A presentation is a collection of data and information that is to be delivered to a specific audience. A PowerPoint presentation is a collection of electronic slides that can have text, pictures, graphics, tables, sound and video. This collection can run automatically or can be controlled by a presenter.

Advantage and application of PowerPoint 2010

- Professional looking presentations
- Animated presentations shown on a monitor or overhead screen
- Notes for the speaker
- Handouts for the audience
- Paper printouts of your slide
- Overhead projector transparencies
- Movies

Working with PowerPoint 2010

Step 1: Click the Start button.



Step 2: Click All Programs option from the menu.



Step 3: Search for Microsoft Office from the sub menu and click it.



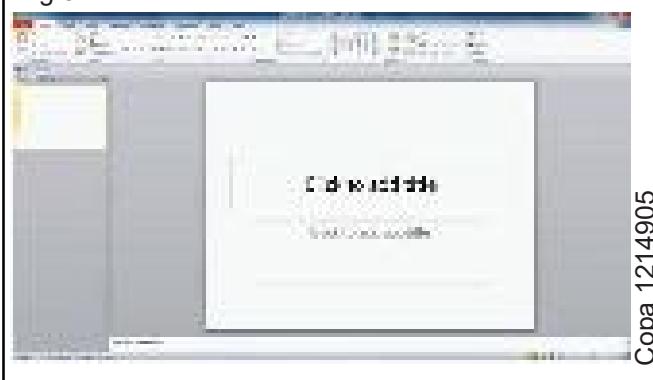
Step 4: Search for Microsoft PowerPoint 2010 from the submenu and click it.

Fig 4

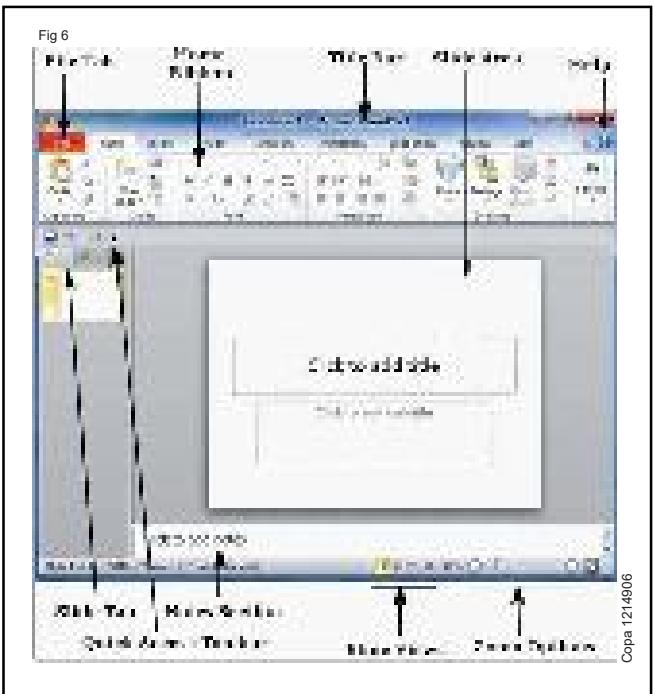


This will launch the Microsoft PowerPoint 2010 application and the following is the presentation window.

Fig 5



PowerPoint Screen



File Tab

This tab opens the Backstage view which basically allows to manage the file and settings in PowerPoint. This can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.

Ribbon

Fig 7



The ribbon contains three components:

- **Tabs:** They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.
- **Groups:** They organize related commands; each group name appears below the group on the Ribbon. For example, a group of commands related to fonts or a group of commands related to alignment, etc.
- **Commands:** Commands appear within each group as mentioned above.

Title Bar

This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

Slide Area

This is the area where the actual slide is created and edited. Add, edit and delete text, images, shapes and multimedia is supported in this section.

Help

The Help Icon can be used to get PowerPoint related help anytime. Clicking on the "?" opens the PowerPoint Help window where there is a list of common topics to browse from. Specific topics from the search bar at the top can also be used for searching.

Zoom Options

The zoom control zooms in for a closer look at the text. The zoom control consists of a slider that can slide left or right to zoom in or out, - and + buttons to can be used to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.

Slide Views

The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch between PowerPoint views.

- Normal Layout view: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows user to edit individual slides and also rearrange them.

- Slide Sorter view: This displays all the slides as a matrix. This view only allows the user to rearrange the slides but not edit the contents of each slide.
- Reading View: This view is like a slideshow with access to the Windows task bar in case the user need to switch windows. However, like the slideshow user cannot edit anything in this view.

Notes Section

This sections allows user to add notes for the presentation. These notes will not be displayed on the screen during the presentation; these are just quick reference for the presenter.

Quick Access Toolbar

The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint. User can customize this toolbar to suit their needs.

Slide Tab

This section is available only in the Normal view. It displays all the slides in sequence. User can add, delete and reorder slides from this section.

Backstage View in Powerpoint 2010

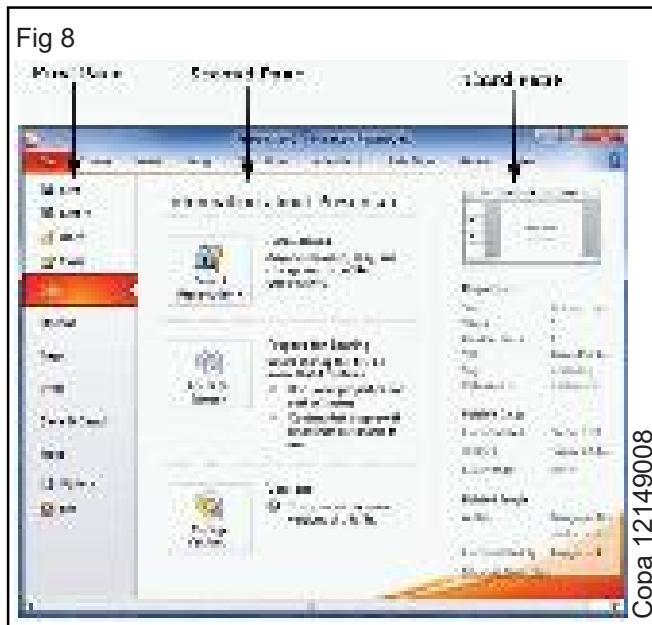
In Office 2010, Microsoft replaced the traditional file menu with the new Backstage view. This view not only offers all the menu items under the file menu, but additional details which makes management of files a lot easier.

Accessing Backstage View

User can access the Backstage view simply by clicking on the File tab. They can exit this view by clicking on any tab (including the File tab again). 'Esc' button on the keyboard can also be pressed for the same.

Organization of Backstage View

The backstage view has three sections or panes.



- First Pane ? This is the commands pane which consists of all the commands that would typically found in the file menu of older versions. it also has the Options menu which edits the options on the program like customizing the ribbon.

Various commands under the first pane are described in the table below ?

S.No	Command & Description
1	Save This allows user to save a new file or an existing file in standard format. If user is working on a previously saved file this will save the new changes in the same file format. If user is working on a new file, this command would be similar to the Save As command.
2	Save As Allows user to specify the file name and the file type before saving the file.
3	Open Allows user to open new PowerPoint files.
4	Close Allows user to close an existing file.
5	Info Displays the information about the current file.
6	Recent Lists series of recently viewed or edited PowerPoint files.
7	New Allows user to create a new file using blank or pre-defined templates.
8	Print Allows user to select the printer settings and print the presentation.
9	Save & Send Allows user to share your presentation with larger audience via emails, web, cloud services, etc.
10	Help Provides access to PowerPoint Help.
11	Options Allows user to set various options related to PowerPoint program.
12	Exit Closes the presentation and exits the program.
	• Second Pane ? This is the subcommands pane. This will list all the commands related to the main command chosen in the first pane. For example, if user selects Print in the first pane, user get to choose the printer and adjust the print settings in the second pane.

- Third Pane ? This is the preview or file information page. Depending on the command and the subcommand user select, this pane will either display the properties of the file or give a preview of the file.

Creating Presentation using Powerpoint 2010

PowerPoint offers a host of tools that will aid the user in creating a presentation. These tools are organized logically into various ribbons in PowerPoint. The table below describes the various commands that can be accessed from the different menus.

Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions.
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols.
Design	Slide setup, slide orientation, presentation themes and background.
Transitions	Commands related to slide transitions.
Animations	Commands related to animation within the individual slides.
Slide Show	Commands related to slideshow set up and previews.
Review	Proofing content, language selection, comments and comparing presentations.
View	Commands related to presentation views, Master slides, color settings and window arrangements.

Besides these depending on the objects selected in the slide, there are other menu tabs that get enabled.

Add New Slides in Powerpoint 2010

The following are the steps that allows the user to insert a new slide .

Step 1: Right-click in the Navigation Pane under any existing slide and click on the New Slide option.

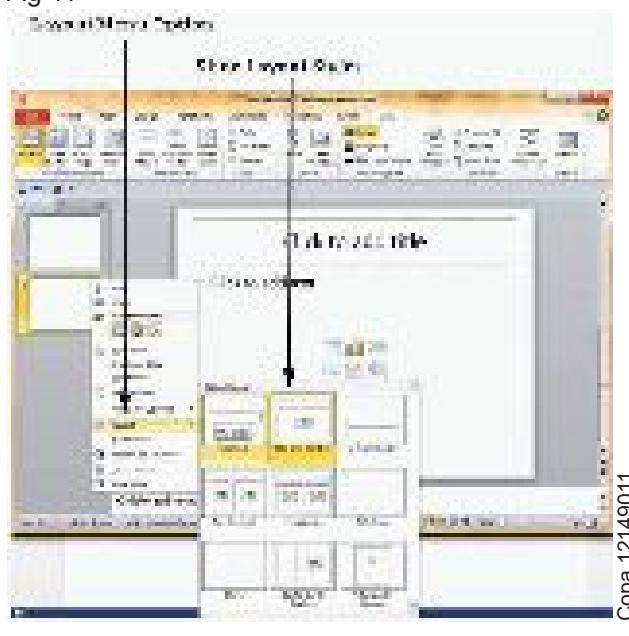


Step 2: The new slide is inserted. The layout of this slide can be changed to suit the design requirements.



Step 3: To change the slide layout, right-click on the newly inserted slide and go to the Layout option where user can choose from the existing layout styles available .

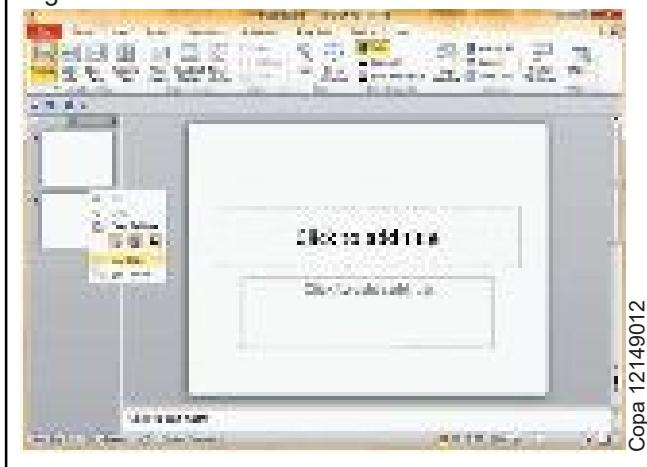
Fig 11



Same steps can be followed to insert a new slide in between existing slides or at the end on the slide list.

When we insert a new slide, it inherits the layout of its previous slide with one exception. If inserting a new slide after the first slide (Title slide), the subsequent slide will have the Title and Content layout.

Fig 12



Adding Text in Boxes in PowerPoint 2010

PowerPoint allows users to add text to the slide in a well-defined manner to ensure the content is well distributed and easy to read. The procedure to add the text in a PowerPoint slide is always the same - just click in the text box and start typing. The text will follow the default formatting set for the text box, although this formatting can be changed later as required.

The most common content blocks in PowerPoint are:

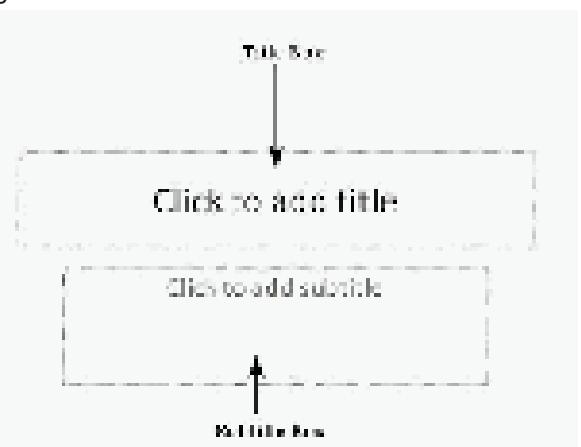
Title Box

This is typically found on slides with the title layout and in all the slides that have a title box in them. This box is indicated by "Click to add title".

Subtitle Box

This is found only in slides with the Title layout. This is indicated by "Click to add subtitle"

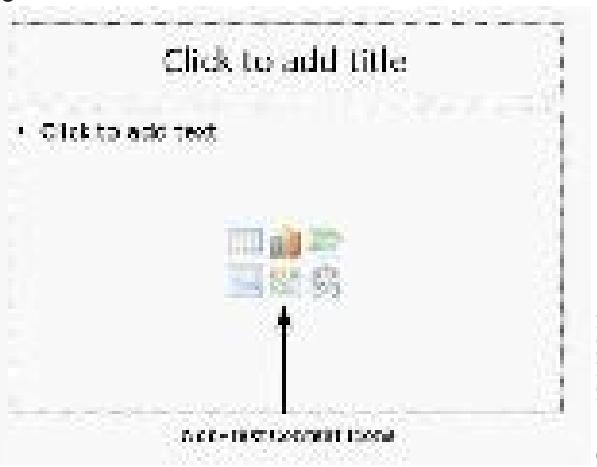
Fig 13



Content Box

This is found in most of the slides that have a placeholder for adding content. This is indicated by "Click to add text". This box allows user to add text as well as non-text content. To add text to such a box, click anywhere on the box, except on one of the content icons in the center and start typing.

Fig 14



Text Only Box

This is not a default content box available in PowerPoint, but user can create it using Slide Master, if required. This is also indicated by "Click to add text". The only difference between the Text Only Box and the Content Box is that the former only supports text in the content area.

Fig 16



Adding New Text Boxes in Powerpoint 2010

Most of the standard layouts come with the text box option. As mentioned, text boxes will have "Click to add text" as the default text. Here are the steps to add new text boxes in slide.

Step 1: Click on the Text Box icon in the Home ribbon under the Drawing section.

Fig 16



Step 2 : User will get the insert text box cursor that looks like an inverted cross.

Fig 17



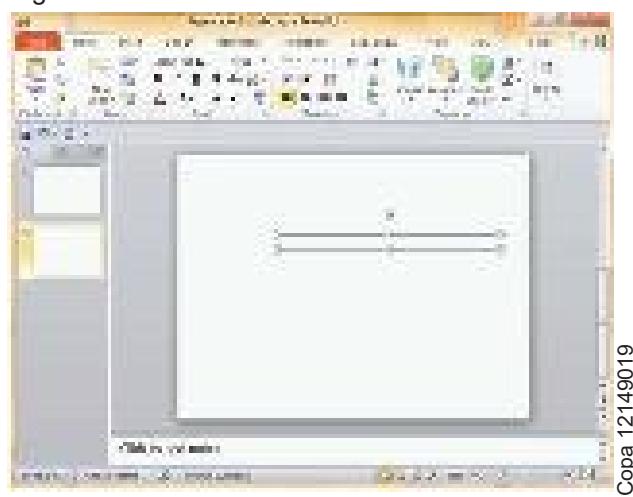
Step 3: Click to insert a text box. User can now start typing directly into the text box.

Fig 18



Step 4: Alternately, user can click and drag the cursor without releasing the click to create a text box.

Fig 19



The size of the text box can be adjusted by selecting one of the edges marked by squares or corners marked by circles.

Slide Show in Powerpoint 2010

Most PowerPoint presentations are created to be run as a slideshow. Most of these features of PowerPoint 2010 are really to help user create a good slideshow without having to go through the entire presentation over and over again after every minor change. Features related to running the slideshow are grouped under the Slideshow ribbon.

Fig 20



Section	Menu Item	Description
Start Slideshow	From Beginning From Current Slide Broadcast Slideshow Custom Slideshow	Starts slideshow from beginning Starts slideshow from the current slide Allows users to broadcast the slideshows using Microsoft's PowerPoint Broadcast Service Builds a custom slideshow by picking the slides you want to run
Set Up	Set Up Slideshow Hide Slide Rehearse Timing Record Slideshow Slideshow Checkboxes	Helps set up the slideshow including browser/ full screen display, show options with or without narration/ animation, pen and laser color during the slideshow and the slides to be presented during the show Helps mark/ unmark the slide as hidden, so it is skipped or shown during the slideshow respectively Allows users to rehearse the timing on each slide and the entire slideshow Records the slideshow including narration and animation Helps set or avoid the use of narrative audio and rehearsed timings during the show. Display media controls in the slideshow view
Monitors	Resolution Show Presentation on Use Presenter View	Defines resolution in slideshow view Picks the monitor to display the presentation one - in case of multiple monitors Run presentation in Presenter view rather than just slideshow view

Concepts of data and Databases

Objectives : At the end of this lesson you shall be able to

- explain database structure and control
- describe Ms access database utilities.

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

- Microsoft Access is just one part of Microsoft's overall data management product strategy.
- It stores data in its own format based on the Access Jet Database Engine.
- Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. However, Access 2013 also complements other database products because it has several powerful connectivity features.
- It can also import or link directly to data stored in other applications and databases.
- As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.
- Access can also understand and use a wide variety of other data formats, including many other database file structures.
- You can export data to and import data from word processing files, spreadsheets, or database files directly.
- Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.
- Software developers can use Microsoft Access to develop application software.

Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

- **Database Creation:** Create your Microsoft Access database and specify what kindof data you will be storing.
- **Data Input:** After your database is created, the data of every business day canbe entered into the Access database.
- **Query:** This is a fancy term to basically describe the process of retrievinginformation from the database.

- **Report (optional):** Information from the database is organized in a nicepresentation that can be printed in an Access Report.

Architecture

- Access calls anything that can have a name an object. Within an Access desktop database, the main objects are tables, queries, forms, reports, macros, data macros, and modules.
- If you have worked with other database systems on desktop computers, you might have seen the term database used to refer to only those files in which you store data.
- But, in Access, a desktop database (.accdb) also includes all the major objects related to the stored data, including objects you define to automate the use of your data.

RDBMS

In the computing system (web and business applications), there are enormous data that comes out every day from the web. A large section of these data is handled by Relational database management systems (RDBMS). The idea of relational model came with E.F.Codd's 1970 paper "A relational model of data for large shared data banks" which made data modeling and application programming much easier. Beyond the intended benefits, the relational model is well-suited to client-server programming and today it is predominant technology for storing structured data in web and business applications.

MS Access - RDBMS

Microsoft Access has the look and feel of other Microsoft Office products as far as its layout and navigational aspects are concerned, but MS Access is a database and, more specifically, a relational database.

- Before MS Access 2007, the file extension was ***.mdb**, but in MS Access 2007 the extension has been changed to ***.accdb** extension.
- Early versions of Access cannot read accdb extensions but MS Access 2007 and later versions can read and change earlier versions of Access.
- An Access desktop database (.accdb or .mdb) is a fully functional RDBMS.
- It provides all the data definition, data manipulation, and data control features that you need to manage large volumes of data.

- You can use an Access desktop database (.accdb or .mdb) either as a standalone RDBMS on a single workstation or in a shared client/server mode across a network.
- A desktop database can also act as the data source for data displayed on webpages on your company intranet.
- When you build an application with an Access desktop database, Access is the

RDBMS.

Data Definition

Let us now understand what Data Definition is:

- In document or a spreadsheet, you generally have complete freedom to define the contents of the document or each cell in the spreadsheet.
- In a document, you can include paragraphs of text, a table, a chart, or multiple columns of data displayed with multiple fonts.
- In spreadsheet, you can have text data at the top to define a column header for printing or display, and you might have various numeric formats within the same column, depending on the function of the row.
- An RDBMS allows you to define the kind of data you have and how the data should be stored.
- You can also usually define rules that the RDBMS can use to ensure the integrity of your data.
- For example, a validation rule might ensure that the user can't accidentally store alphabetic characters in a field that should contain a number.

Data Manipulation

Working with data in RDBMS is very different from working with data in a word processing or spreadsheet program.

- In a word processing document, you can include tabular data and perform a limited set of functions on the data in the document.
- You can also search for text strings in the original document and, with ActiveX controls, include tables, charts, or pictures from other applications.
- In a spreadsheet, some cells contain functions that determine the result you want, and in other cells, you enter the data that provides the source information for the functions.
- An RDBMS provides you many ways to work with your data. For example,
- You can search a single table for information or request a complex search across several related tables.
- You can update a single field or many records with a single command.

- You can write programs that use RDBMS commands to fetch data that you want to display and allow the user to update the data.

Access uses the powerful SQL database language to process data in your tables. Using SQL, you can define the set of information that you need to solve a particular problem, including data from perhaps many tables.

Data Control

Spreadsheets and word processing documents are great for solving single-user problems, but they are difficult to use when more than one person needs to share the data.

- When you need to share your information with others, RDBMS gives you the flexibility to allow multiple users to read or update your data.
- An RDBMS that is designed to allow data sharing also provides features to ensure that no two people can change the same data at the same time.
- The best systems also allow you to group changes (which is also known as transaction) so that either all the changes or none of the changes appear in your data.
- You might also want to be sure that no one else can view any part of the order until you have entered all of it.
- Because you can share your Access data with other users, you might need to set some restrictions on what various users are allowed to see or update.

Designing a Database

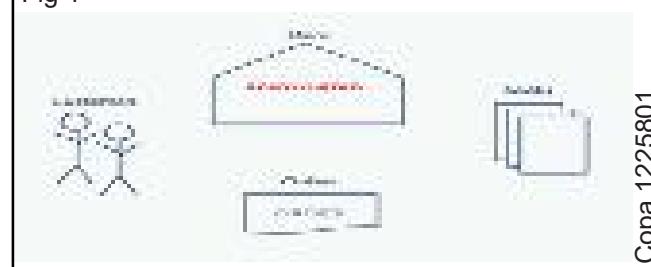
The first step in creating a database is to think about why you need it-what is its purpose? Once you know the answer, you can begin designing your own database. Ask yourself questions like What kinds of information will it store? How will I have to break down this information so it can be stored in my database? How will I use the data once it's in there?

The bookstore scenario

The best way to learn about designing a database is to jump right in to the process. Let's pretend we work for the bookstore, and we need to build a database for the store to use. Let's think about what we might need the database to do for us.

The following diagram shows that we have **customers** and sell **books** via **orders**, both in the store and online.

Fig 1



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The store needs a way to keep track of these things.

Determine the purpose of the database

The first step of designing a database is to determine the purpose of the database. What do we need it to do?

At Ready-2-Read, our customers will place orders for books. At the very least, we will want our database to track the books we sell, the customers we sell them to, and the date of each of the orders.

The database will also be able to tell us where our customers live when we need to send them books or coupons. Additionally, we can use it to track our sales or to make a bestseller list to post in the store.

Plan database tables

Once we've established its purpose, we can begin about how to break up the information into the tables the database will need to store data. Recall that a table is a collection of records, and each record is broken up into the smallest pieces of needed information, called fields.

Because we're planning a database to track our customers, the books we have, and the orders our customers place, we will need a table for each one of these.

- Customers
- Orders
- Books

Plan table fields

Once you know what tables you need, the next step is deciding what fields belong in each table. Remember that fields are the smallest chunk of information in any record.

Let's look at our Ready-2-Read bookstore example again. There will be several fields in our Customers table. We'll obviously want each customer's first name and last name. We'll also need an address if we need to send a customer his order. Email will be necessary if we need to contact the customer if there is an issue with the order.

Customers	Books	Orders
First Name	Title	Customer
Last Name	Author First	Book
Street	Author Last	Date
City	Price	
State	Category	
Pin/Zip Code		
Email		

We will also need several fields in the Books table. Title and Author make sense for books. We'll need a Price for each book. Category will help us know what type of books sell the best so we can order more books that fit into this category.

The Orders table will have fewer fields. We'll need this table to track the Customer who is placing the order, the

Book the customer is ordering, and the Date the order is placed.

Creating a new database with Access

When you launch Access 2007/2010, you will see the Getting Started window.

In the left pane, the template categories-including the featured local templates-are listed, as well as the categories on Office Online. Templates are prebuilt databases focused on a specific task that you can download and use immediately.

You will also see the New Blank Database option, which allows you to build your own database from scratch.

Fig 2



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When you choose the New Blank Database option at the top of the window, you will be prompted to rename the database from the default name, which is Database1.accdb. Rename the database whatever you want. In the example below, we named the database Ready2Read because it's the name of the store in our scenario.

Fig 3



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Click Create to finish naming the database.

Setting up tables

The new database opens with one table showing as a default. It also defaults to naming this table Table1 in both the navigation pane and the Table tab itself. You will want to name your tables based on your database design plan.

Fig 4

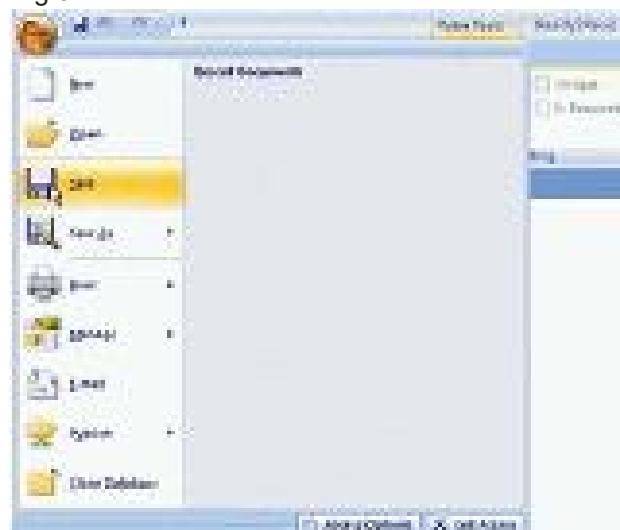


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Naming a table

To give the table a unique name, you must first click on the Microsoft Office button in the upper-left corner of the application.

Fig 5



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Next, select Save from the menu. The Save As dialog box will appear to let you save the table whatever name you want.

Fig 6



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The new table names appear in both the navigation pane and the Table tab itself, as you can see in the picture below.

Fig 7



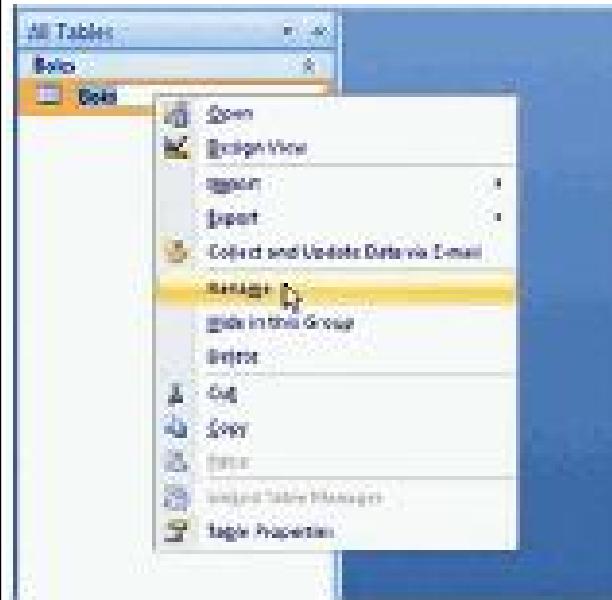
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TIP: Give your tables logical, easy-to-understand names.

To rename a table:

With the table closed, right-click the Table you want to rename in the navigation pane. Select the Rename option that appears in the menu.

Fig 8



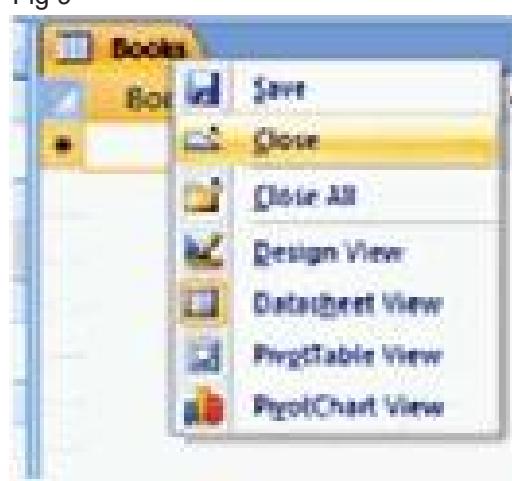
Copa 1225808

The table name will be highlighted and a cursor will appear, which means you can now type the new name right there. Left-click anywhere outside of the table name to make the change.

To close a table:

There are several ways to close an active table. You can right-click the Table tab and choose Close from the menu.

Fig 9



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A more common method is to click the X that appears in the top-right corner of the active database object window.

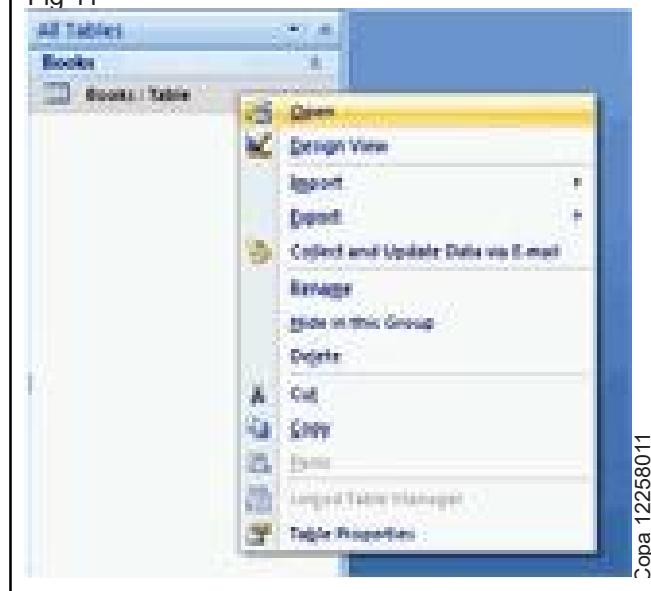
Fig 10



To open a table:

To open a table, right-click the Table name of the table you want to open in the navigation pane, then choose Open from the menu.

Fig 11



A more common method is to double-click the table name in the navigation pane. The selected table will open in the active database object window.

Adding more tables to the database

By default, Access 2007 starts out with one table. To add more tables to the database, click the Create tab on the Ribbon.

Fig 12



Next, select Table from the Tables command group. A new table will open in the active database object window. You must name your table using the Save command from Microsoft Office menu.

Adding fields to a table

Access 2007 allows you to add fields to tables when you are:

- Working in Datasheet view, which looks like a spreadsheet
- Working in Design view, where you are able to set more controls for your fields

Either way, you need to know how to switch between the two views.

To switch views:

Select the Views command group from either the Home tab (seen below) or the Datasheet tab on the Ribbon. Select the view option you want from the menu.

Fig 13



Adding fields in Datasheet view

By default, Access 2007 creates one field in each new table: the ID field. This field auto-numbers to give each record in the table a unique number identifier. Recall that records are the rows in a table. You may want to rename the ID field with a unique name because the ID field appears automatically in every table you create. While this is not necessary, it may help avoid confusion when setting up table relationships.

Fig 14



To add more fields to a table in Datasheet view, double-click the Add New Field header.

Fig 15

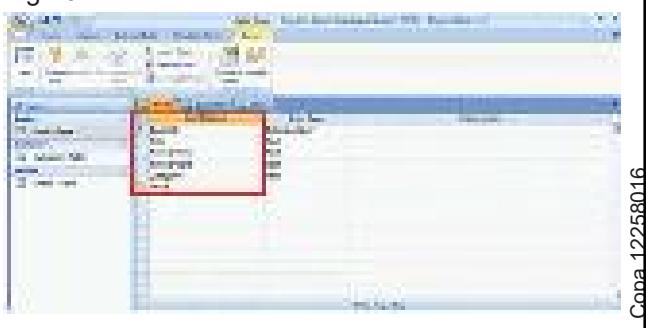


The Add New Field text will disappear from the header. Name the field by typing the name directly into the header. Press the Tab key on your keyboard to move to the next field.

Adding fields in Design view

In Design view, the field names are along the lefthand column instead of across the top like in Datasheet view, as seen below.

Fig 16



To add a new field to a table in Design view, click in the cell where you want the new field and type the field name. When you switch back to Datasheet view, your new field appears as its own column, as seen below.

Fig 17



Datatypes

Every field in a table has properties and these properties define the field's characteristics and behavior. The most important property for a field is its data type. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require characters. calculating (e.g. phone numbers).	Up to 255
Long Text	Lengthy text or combinations of text and numbers. characters.	Up to 63, 999
Number	Numeric data used in mathematical (16 bytes if set to calculations. Replication ID).	1, 2, 4, or 8 bytes
Date/Time	Date and time values for the years 100 through 9999.	8 bytes.
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes.
AutoNumber	A unique sequential (incremented by 1) number or random number assigned by set to Replication Microsoft Access whenever a new record is ID). added to a table.	4 bytes (16 bytes if
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or	1 bit.

Here are some of the other more specialized data types, you can choose from in Access.

Data Types	Description	Size
Attachment	Files, such as digital photos. Multiple files can be attached per record. This data type is not available in earlier versions of Access.	Up to about 2 GB.
OLE objects	OLE objects can store pictures, audio, video, or other BLOBS (Binary Large Objects)	Up to about 2 GB.
Hyperlink	Text or combinations of text and numbers stored as	Up to 8,192 (each part of a Hyperlink data type can contain up to 2048 characters).
Lookup	The Lookup Wizard entry in the Data Type column in the Design view is not actually a data type. When you choose this entry, a wizard starts to help you define either a simple or complex lookup field.	Dependent on the data type of the lookup field.
Wizard	A simple lookup field uses the contents of another table or a value list to validate the contents of a single value per row. A complex lookup field allows you to store multiple values of the same data type in each row.	
Calculated	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.

MS Access - Adding Data

Adding records to tables

When you enter records into your table, you are populating the database. In Access 2007, you can do this a few different ways.

To add records in the new record row:

- Click the record row with the asterisk that appears at the bottom of the table.

Fig 18



- Type the data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record navigation button:

- Click the New Record button in the navigation bar. The navigation bar is located in the bottom-left corner of the open object pane.

Fig 19



- Type data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record command:

- Click the New Record command in the Records group in the Ribbon.

Fig 20



- Type the data into the appropriate fields.
- Hit the Enter or the Tab key to move to the next field.

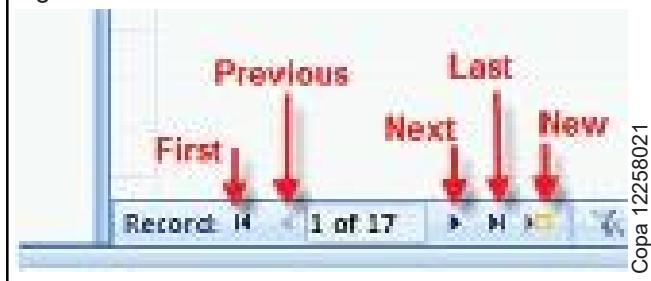
Editing records in tables

Sometimes it is necessary to edit records in the database. Like with every other task in Access 2007, this can be done several different ways.

To edit a record directly:

- Scroll through the records, or use the navigation buttons on the navigation bar to find the record to edit.

Fig 21



- Click the cell containing the information that must be edited. A pencil icon appears to indicate edit mode.

Fig 22



- Type the new information into the field.
- Click outside of the record row to apply the change.

To edit a record using Find and Replace:

- Click the Find command in the Find group on the Ribbon.

Fig 23



- The Find and Replace dialog box opens.

Fig 24



- Tell Access what to find by typing it into the Find What: area.
- Type the replace term in the Replace With: area.
- Tell Access where to look with the Look In: drop-down list. The first choice in the drop-down list is the field you were last in within the table.
- Tell Access what to Match: Any part of the field, the whole field, or just the start of the field.
- Tell Access how to Search: Up finds records above the cursor, Down finds records below the cursor, and All searches all records.
- Click one of the action options:
 - Find Next will find the next instance of the word in the table.

- Replace will put the new word into the table, overwriting what is currently there.
 - Cancel stops the editing process.

CAUTION: DO NOT use Replace All because it will overwrite every instance of the Find term in the table, which can have a serious impact on your data.

To copy and paste a Record:

- Select the record you want to copy. Right-click, then select Copy.
 - Select the new record row. Right-click and select Paste. The record information appears with a new record ID number.

To delete a record:

- Select the record you want to delete, then right-click and select Delete Record.
 - A dialog box appears, telling you the action cannot be undone and asking if you are sure you want to delete the record.

Fig 25



There may be other records that rely on the record you are trying to delete. DO NOT delete a record without knowing how it will impact the rest of your database.

Fig 26

When you delete a record, the record number is permanently deleted from the database table. If you delete the last record from a table and then add a new record, your new record numbers will appear to be out of sequence.

Data validation

Data validation is an important database concept. It is the process by which Access tests the data that is being entered into the database to make sure it is in an acceptable-or valid-format.

Let's say one of your database users has entered an order date of January 4, 2008, in the month/date/year format as 01/04/2008. Another user has entered an order placed on that same date in the day/month/year format as 04/01/2008. If the database is tracking all sales for the month of January 2008, it may not show both orders as placed in January, even though both were placed on the same date.

Access 2007 allows you to set **field properties** and **data validation** rules to force the person entering data to follow a specific format.

Data types and validation rules

Data validation begins when data types are set during the process of building tables and fields. For example, if a field data type had been set to Currency and a text value is entered in that table field during data entry, Access will not accept an invalid format and will display a validation error, like the one below.

Fig 27



Data validation is accomplished by setting data validation rules and other field properties for various fields.

To set data validation rules:

- In Design view, highlight the field that requires a validation rule.
 - In the Field Properties section at the bottom half of the window, set your validation rule using the Expression Builder. The Expression Builder offers common syntax to set up a data validation rule.

Fig 28

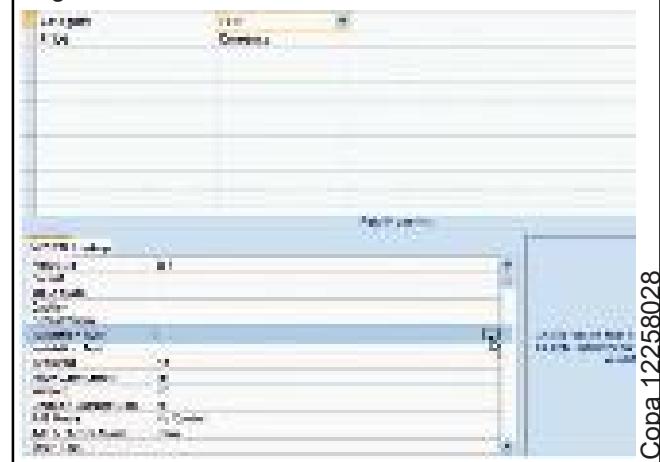
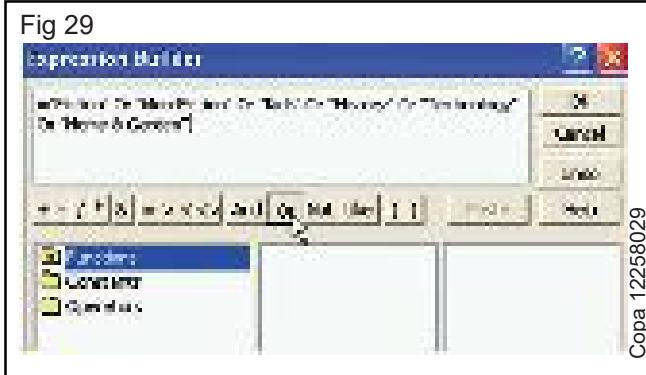


Fig 29



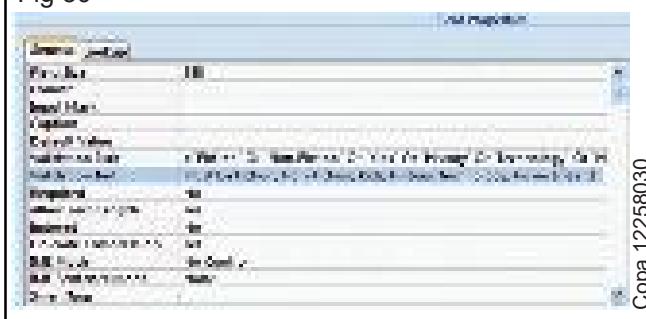
Validation rules work most easily with numerical fields. Rules for text fields require you to enclose each acceptable value inside its own quotation marks, separating them with Or, as seen above.

Validation text

Validation text is a specialized error message you can set to have Access tell the user entering data the specific way you want that person to enter it.

To set the validation text, enter the error message exactly as you want it to appear to users in the row directly beneath the Validation Rule row in the Field Properties section of Design view. For the validation rule we set for Category, you'd set the validation text like this:

Fig 30



The image below shows the resulting error message users would see when the Category validation rule has been broken.

Fig 31



Using field properties to ensure data integrity

Another way to ensure data integrity is by setting field properties such as Field Size, Format, and Required.

- Field Size can be set to hold a specific number of characters, up to as many as 255 for text fields. If you were using a text field to hold the two-letter state postal abbreviation, the field size could be set to 2 to ensure no one enters a full state name into this field.
- The Format field property can be set to display text or numbers in a standardized way. For example, text can be set to show as all uppercase, and numbers can be set to show scientific numbers, percentages, or decimals.
- Set the Required property to Yes if you want users entering data to be required to enter something in the field. Choose No if users are allowed to leave the field blank.

These are just some ways Access helps you ensure data being entered into your database is valid.

Forms, quires, and reports in access

Objectives : At the end of this lesson you shall be able to

- explain database relationship and forms
- explain quires and reports in as access

In a relational database (Access), the data in one table is related to the data in other tables. In general, tables can be related in one of three different ways: one-to-one, one-to-many or many-to-many. The relationship is used to cross reference information between tables.

One to One

In a one-to-one relationship each record in one table has at most one related record in another table.

In a one-to-one relationship, each record in Table A can have only one matching record in Table B, and each record in Table B can have only one matching record in Table A. This type of relationship is not common, because most information related in this way would be in one table. You might use a one-to-one relationship to divide a table with many fields, to isolate part of a table for security reasons, or to store information that applies only to a subset of the main table.

One to Many

A one-to-many relationship, often referred to as a "master-detail" or "parent-child" relationship.

A one-to-many relationship is the most common type of relationship. In a one-to-many relationship, a record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A.

Many to Many

In a many-to-many relationship, a record in Table A can have many matching records in Table B, and a record in Table B can have many matching records in Table A. This type of relationship is only possible by defining a third table (called a junction table) whose primary key consists of two fields the foreign keys from both Tables A and B. A many-to-many relationship is really two one-to-many relationships with a third table.

A many-to-many relationship means that for each record in one table there can be many records in another table and for each record in the second table there can be many in the first.

Many-to-many relationships can not be directly represented in relational database programs and have to be built by using two or more one-to-many relationships.

Defining relationships

You define a relationship by adding the tables that you want to relate to the Relationships window, and then dragging the key field from one table and dropping it on the key field in the other table.

- The kind of relationship that Microsoft Access creates depends on how the related fields are defined:
- A one-to-many relationship is created if only one of the related fields is a primary key or has a unique index.
- A one-to-one relationship is created if both of the related fields are primary keys or have unique indexes.
- A many-to-many relationship is really two one-to-many relationships with a third table whose primary key consists of two fields the foreign keys from the two other tables.

move a table that appears in the relationship map:

- Place your mouse over the table you want to move.
- Hold down the left mouse button, then drag the table to a new location.
- Release the mouse button to drop the table in its new place.

Understanding the relationship map

The relationship map lists all of the tables that were selected to relate, as well as all of the fields that were previously set up for that table. Notice that the first field has a key icon next to it. This is the primary key for the table.



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Primary and foreign keys

A primary key is the first field in each table of the database. You may recall that this field auto-numbers by default, so every record in the table has its own unique number to identify it. Access uses this number to quickly pull information together when you run queries or reports, which are covered later.

In the example above, the primary key for the Customers table is Customer ID, the primary key for the Orders table is Order ID, and the primary key for the Books table is Book ID.

A foreign key is a field that is the primary field in its own table but that shows up in another table. If you look closely at the Orders table, the fields Customer ID and Book ID appear there, as well as in their own respective tables. These fields are the primary key in their own tables, but in the Orders table, they are considered foreign keys.



Forms

A form is a database object that you can use to enter, edit, or display data from a table or a query. You can use forms to control access to data, such as which fields of data are displayed. For example, certain users may not need to see all of the fields in a table. Providing those users with a form that contains just the necessary fields makes it easier for them to use the database.

create a form with a single click,

1. Open the table or query upon which you want to base the form.
2. To create a form on which all fields from the underlying table or query are placed, displaying one record at a time, on the Create tab, click Form.



Forms in Access are like display cases in stores that make it easier to view or get the items that you want. Since forms are objects through which you or other users can add, edit, or display the data stored in your Access desktop database, the design of your form is an important aspect. There's a lot you can do design-wise with forms in Microsoft Access. You can create two basic types of forms -

- Bound forms
- Unbound forms

Bound Forms

- Let us now understand what Bound Forms are ?
- Bound forms are connected to some underlying data source such as a table, query, or SQL statement.
- Bound forms are what people typically think of when they think of the purpose of a form.
- Forms are to be filled out or used to enter or edit data in a database.
- Examples of bound forms will typically be what users use to enter, view or edit data in a database.

Unbound Forms

Let us look into Unbound Forms:

- These forms are not connected to an underlying record or data source.
- Unbound forms could be dialog boxes, switch boards, or navigation forms.
- In other words, unbound forms are typically used to navigate or interact with the database at large, as opposed to the data itself.

Types of Bound Forms

There are many types of bound forms you can create in Access. Let us understand the types ?

Single Item Form

This is the most popular one and this is where the records are displayed - one record at a time.

Multiple Item Form

This displays multiple records at a time from that bound data source.

Split Form

The form is divided into halves, either vertically or horizontally. One half displays a single item or record, and the other half displays a list or provides a datasheet view of multiple records from the underlying data source.

Form Controls

Every object on a form or report is a control and has its own set of properties (displayed in the Property list) that determine the characteristics of the data it contains. Some controls are linked to fields in the underlying table or query and some are merely text or graphical objects not related to any data source. Two of the most commonly used controls in a form or report are text boxes and labels.

- 1) Label: displays unchanging or informational text often times as headings or titles. Labels do not come from a source in the database such as a field or expression. This is called an unbound control because it is not bound to any data source.
- 2) Text Box: displays data as text and is a bound control. A bound control displays information that is stored in a field from the data. Text boxes are used to display, enter, and update values from fields in your database.

Form Sections

Forms consist of header, footer, and detail sections. In forms, there are two types of headers/footers. Form headers and footers are visible on every page of the form. Page headers/footers only appear on a printed copy of a form. There are never visible in Form View. Information about individual records appears in the detail sections.

Sizing Sections

Adjust the size of the area for any of the sections (headers, footers, detail), by dragging the horizontal border for that section with your mouse. To adjust line spacing in the detail section, drag the Detail border. There is no other line spacing control.

Working with Queries

Queries are questions you ask of your database. They allow you to select certain fields out of a table, or pull together data from various related tables and display it together. Queries can be used to perform calculations, and to edit the data in your tables. Queries can also form the basis of forms and reports.

Query Results

- If a query contains fields from two or more related tables, the results will only include records that have related records in all the tables. (In other words, in the query shown above, customers without records in the Orders table will not appear in the query results.) To display such records, use an outer join (see page 6) in your query.
- WARNING!** Any change you make in a query (adding, deleting or editing data) WILL BE CHANGED IN THE TABLES TOO!!!

Sort query results

In Design View, click the Sort row in the column you wish to sort by. A dropdown arrow appears; choose Ascending or Descending. If you sort by more than one column, the sorts will be done left-to-right.

Create a concatenated field in a query

Concatenated fields combine information from two or more fields into one. Ex: Combine first and last names into one field, called "FullName". In Design View, click in a blank column and type the following:

FullName:[FirstName]&" "&[LastName]

(Type a space between the two sets of quotation marks, and use square brackets around the field names.)

Create a calculated field in a query

In Design View, click in a blank column and type a mathematical expression, typing field names in square brackets. Any of the normal mathematical operators (+ - * / ^) can be used. If desired, give the expression a name as in the sample below. The following expression calculates a total cost by multiplying quantity times price:

Item Total:[Quantity]*[Price]

Use the Expression Builder to create calculated or concatenated fields

Fig 35



You can simplify the process of creating concatenated fields and other expressions with the Expression Builder. Create a blank column in your query grid and then click the Builder button in the Query Setup group on the Query Design Ribbon. The Expression Builder opens.

Type the expression in the large box at the top. One advantage is that you have way more room to type and see your expression than you have at the top of a query grid column!

A second advantage is that you can add fields to the expression by double clicking them in the Expression Categories column rather than by typing them. This removes the possibility of typos.

Fig 36



Specify criteria in a query (Filtering)

In Query Design View, click in the criteria row for the field you want to filter, and type the criteria (ex: type "OH" in the criteria row of the State field). When you run the query, only records matching the criteria.

Fig 37



Using Multiple Criteria

You can type criteria in more than one field.

- Criteria typed on the same line must all be met for a record to be displayed ("AND" logic). Ex: "OH" in the state field and "Smith" in the LastName field pulls up only Ohio-dwelling Smiths.
- If criteria are typed on different lines, records matching any of them will be retrieved ("OR" logic). Ex: "WA" and "OH" on different lines in the State field retrieves records for both states.

Criteria Ranges

Criteria ranges broaden and customize a search. Type a criteria range instead of a single value in the Criteria row of the query grid.

Criteria	Example	Description and Result
<	<14	Finds records where the field is less than a certain value. Records will have values under 14.
<=	<= #2/2/2006#	Finds records where the field is less than or equal to a certain value. Records will have dates on or before February 2, 2006 Note: dates are enclosed between # signs.
>	>100	Similar to above: Finds records where the value is
>=	>=100	greater than 100. The second expression displays records where the value is greater than or equal to 100.
=	="Diana"	Finds records where the value in the field is Diana. Note: text is enclosed in double quotes.

Expressions like these may be combined - for example, a criteria of <49 Or>=100 would return records with values below 49, or 100 or above, but not ones with values between 49 and 99.99.

Between __ And __	Between 1 and 4	Finds records where the field is between the endpoints.
Is Null	Is Null	Finds records where the field is empty.
Is Not Null	Is Not Null	Finds records where the field is not empty.
Like	Like U* Like "[U-X]*" Like "Korea" Like "ina" Like "Chi???" Like "*4.99"	Finds records where the criteria match parts of the field. The * wildcard stands for any number of characters, and the ? wildcard stands for a single character. The sample criteria will return records where the field 1) starts with U; 2) starts with U, V, W or X, 3) contains the letters 'Korea'; 4) ends in the letters 'ina' as in ballerina; 5) has five letters and begins with the letters 'Chi' as in Chile or China; 6) is a number and ends in the digits '4.99' as in 24.99.

Create a parameter query

Parameters make queries flexible by letting users choose their own criteria each time they run the query. In the criteria box, type a phrase in square brackets; Access will use this phrase to prompt the user for a value. Ex: In a State field, type [Enter a state]. If the user types CA, only California records will be retrieved.

Specify a range in a parameter query

In the criteria box, type the following:

Between [] And []

Inside the brackets, type text telling the user what kind of information to enter.

Inner Joins vs. Outer Joins

Excel normally uses inner joins in its queries. These queries return only those rows from both tables in the join that match on the joining field (e.g., customers in the Customers table with corresponding orders in the Orders table.)

If you need to display all customers, with or without orders, as well as any available order information, you need to use an outer join.

In the query tray, double click the join line between two related tables. The Join Properties dialog box will appear:

Fig 38



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Select button 2 or 3 depending on which field's records you want to display completely.

Action Queries

Action queries modify groups of records in one fell swoop. Types of action queries include:

- Update Queries (modify all records in a table that meet specific criteria - ex: change the tax rate for all Ohio customers from 5.75% to 6%)
- Delete Queries (remove records from a table - ex: delete all customers whose last order date is more than 2 years ago)
- Append Queries (add records to an existing table - ex: at the end of the year, add the year's orders to the end of an archive table)

- Make-table Queries (create a new table - ex: extract a subset of records into a new table, for a subordinate who needs Ohio customers only)

Other Specialized Queries

Instructions for creating and running these special query types can be found in the Access help manual by clicking the Help button in the upper right corner of the screen (Internet connection required).

Find Duplicates query: Lets you locate duplicate records in a table by displaying a field containing duplicate values alongside other fields for comparison, to help you tell if the record is really a duplicate.

Find Unmatched query: Lets you compare two tables and identify records in one of the tables that have no corresponding records in the other table.

Crosstab query: This is a special type of Totals query that presents summary information in a compact format that is similar to a spreadsheet.

Union query: Lets you review all of the data that is returned by several similar select queries together, as a combined set.

Concepts of network and internet

Objectives : At the end of this lesson you shall be able to

- define computer network and its advantages and disadvantages
- name and explain the types of network and their characteristics
- explain the types of topologies
- state about the cables used for network system
- name and state about the various connectors used in network system
- explain about the hub, modem and internet
- describe about the internet protocols connection sharing (ICS) using windows.

Define computer network

A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes.

Advantages of Computer Networks

The following are some of the advantages of computer networks.

- **File Sharing:** Networks offer a quick and easy way to share files directly. Instead of using a disk or USB key to carry files from one computer or office to another, you can share files directly using a network.
- **Security:** Specific directories can be password protected to limit access to authorized users. Also, files and programs on a network can be designated as "copy inhibit" so you don't have to worry about the illegal copying of programs.
- **Resource Sharing:** All computers in the network can share resources such as printers, fax machines, modems, and scanners.
- **Communication:** Even outside of the internet, those on the network can communicate with each other via electronic mail over the network system. When connected to the internet, network users can communicate with people around the world via the network.
- **Flexible Access:** Networks allow their users to access files from computers throughout the network. This means that a user can begin work on a project on one computer and finish up on another. Multiple users can also collaborate on the same project through the network.

- **Workgroup Computing:** Workgroup software like Microsoft BackOffice enables many users to contribute to a document concurrently. This allows for interactive teamwork.
- **Error reduction and improve consistency:** One can reduce errors and improve consistency by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.

Network Application Areas

There is a long list of application areas, which can be benefited by establishing Computer Networks. Few of the potential applications of Computer Networks are:

- 1 Information retrieval systems which search for books, technical reports, papers and articles on particular topics
- 2 News access machines, which can search past news, stories or abstracts with given search criteria.
- 3 Airline reservation, hotel booking, railway-reservation, car-rental, etc.
- 4 A writer's aid: a dictionary, thesaurus, phrase generator, indexed dictionary of quotations, and encyclopaedias.
- 5 Stock market information systems which allow searches for stocks that meet certain criteria, performance comparisons, moving averages, and various forecasting techniques.
- 6 Electronic Fund Transfer (EFT) between banks and via cheque clearing house.
- 7 Games of the types that grow or change with various enthusiasts adding to the complexity or diversity.
- 8 Electronic Mail Messages Systems (EMMS).

- 9 Corporate information systems such as marketing information system, customer information system, product information system, personnel information system, etc.
- 10 Corporate systems of different systems such as Order-Entry System, Centralized Purchasing, Distributed Inventory Control, etc.
- 11 On-line systems for Investment Advice and Management, Tax Minimization, etc.
- 12 Resources of interest to a home user.
- 13 Sports results.
- 14 Theatre, movies, and community events information.
- 15 Shopping information, prices, and advertisements.
- 16 Restaurants; good food guide.
- 17 Household magazine, recipes, book reviews, film reviews.
- 18 Holidays, hotels, travel booking.
- 19 Radio and TV programmes.
- 20 Medical assistance service.
- 21 Insurance information.
- 22 Computer Assisted Instruction (CAI).
- 23 School homework, quizzes, tests.
- 24 Message sending service.
- 25 Directories.
- 26 Consumer reports.
- 27 Employment directories and Job opportunities.
- 28 Tax information and Tax assistance.
- 29 Journey planning assistance viz. Train, bus, plane etc.
- 30 Catalogue of Open University and Virtual University courses.

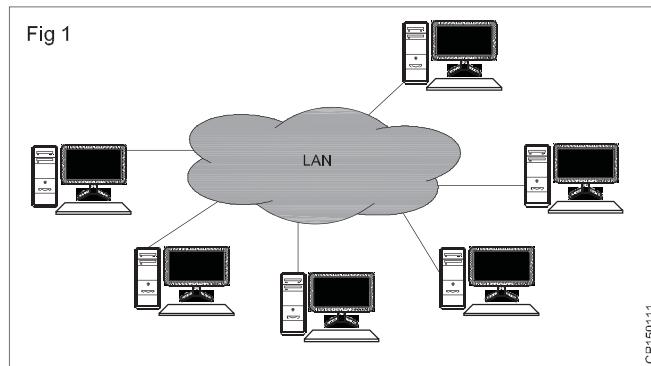
A classification of computer networks can be done to distance as in the table.

Interprocess (or) Distance	Network Type
0 to 1 Km	Local Area Network (LAN)
1 Km to 10 Km	Metropolitan Area Network (MAN)
10 Km to 1000 Km	Wide Area Network (WAN)
Above 1000 Km	Internet

Local Area Network (LAN)

Networks used to interconnect computers in a single room, rooms within a building or buildings on one site are called Local Area Network (LAN). LAN transmits data with a speed of several megabits per second (106 bits per second). The transmission medium is normally coaxial cables.

LAN (Fig 1) links computers, i.e., software and hardware, in the same area for the purpose of sharing information. Usually LAN links computers within a limited geographical area because they must be connected by a cable, which is quite expensive. People working in LAN get more capabilities in data processing, work processing and other information exchange compared to stand-alone computers. Because of this information exchange most of the business and government organisations are using LAN.



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Major Characteristics of LAN

- every computer has the potential to communicate with any other computers of the network
- high degree of interconnection between computers
- easy physical connection of computers in a network
- inexpensive medium of data transmission
- high data transmission rate

Types of Connection

Peer to Peer: Peer to peer is an approach to computer networking where all computers share equivalent responsibility for processing data. Peer-to-peer

networking (also known simply as peer networking) differs from client-server networking, where certain devices have responsibility for providing or "serving" data and other devices consume or otherwise act as "clients" of those servers.

Client server: The term client-server refers to a popular model for computer networking that utilizes client and server devices each designed for specific purposes. The client-server model can be used on the Internet as well as LAN.

Advantages of LAN

- The reliability of network is high because the failure of one computer in the network does not affect the functioning for other computers.
- Addition of new computer to network is easy.
- High rate of data transmission is possible.
- Peripheral devices like magnetic disk and printer can be shared by other computers.

Disadvantages of LAN

If the communication line fails, the entire network system breaks down.

Use of LAN

Followings are the major areas where LAN is normally used

- File transfers and Access
- Word and text processing
- Electronic message handling
- Remote database access
- Personal computing
- Digital voice transmission and storage

Metropolitan Area Network (MAN)

A Data network designed for a town or city. In terms of geographic breadth, MANs are larger than, but smaller than. MANs (Fig 2) are usually characterized by very high-speed connections using optical fiber or other digital media.

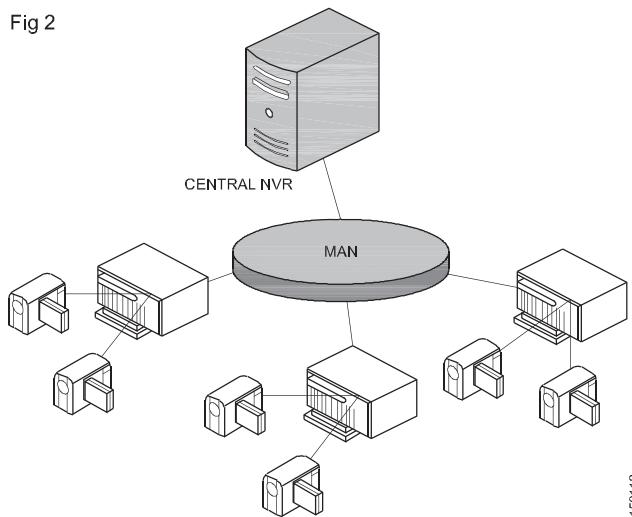
Characteristic of MAN

- 1 The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km range. Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings.
- 2 A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communications links and equipment are generally owned by either a consortium of users or by a network service provider

who sells the service to the users.

- 3 A MAN often acts as a high speed network to allow sharing of regional resources. It is also frequently used

Fig 2



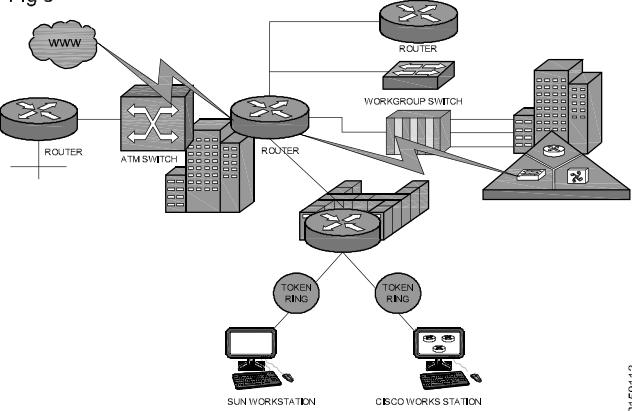
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to provide a shared connection to other networks using a link to a WAN.

Campus Area Network (CAN)

A Campus Area Network or Corporate Area Network (CAN) is a network made up of an interconnection of local area network within a limited geographical area. A

Fig 3



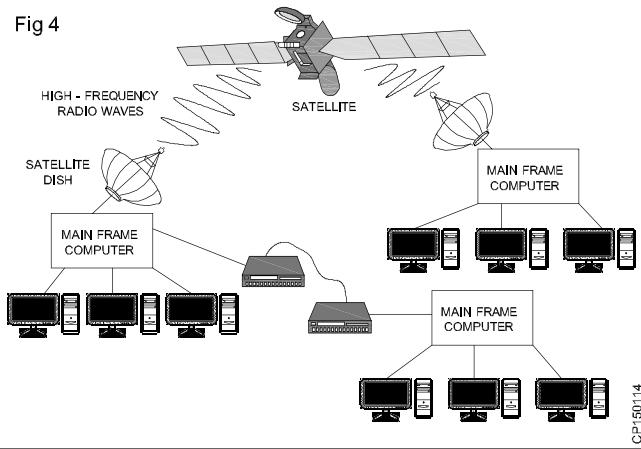
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CAN (Fig 3) is larger than a local area network but smaller than a Wide area Network

Wide Area Network (WAN)

The term Wide Area Network (Fig 4) is used to describe a computer network spanning a regional, national or global area. For example, for a large company the head quarters might be at Delhi and regional branches at Bombay, Madras, Bangalore and Calcutta. Here regional centres are connected to head quarters through WAN. The distance

Fig 4



between computers connected to WAN is larger. Therefore the transmission mediums used are normally telephone lines, microwaves and satellite links.

Characteristics of WAN

Followings are the major characteristics of WAN.

- Communication Facility:** For a big company spanning over different parts of the country the employees can save long distance phone calls and it overcomes the time lag in overseas communications. Computer conferencing is another use of WAN where users communicate with each other through their computer system.
- Remote Data Entry:** Remote data entry is possible in WAN. It means sitting at any location you can enter data, update data and query other information of any computer attached to the WAN but located in other cities.
- Centralised Information:** In modern computerised environment you will find that big organisations go for centralised data storage. This means if the organisation is spread over many cities, they keep their important business data in a single place. As the data are generated at different sites, WAN permits collection of this data from different sites and save at a single site.

Examples of WAN

- Ethernet:** Ethernet developed by Xerox Corporation is a famous example of WAN. This network uses coaxial cables for data transmission. Special integrated circuit chips called controllers are used to connect equipment to the cable.
- Arpanet:** The Arpanet is another example of WAN. It was developed at Advanced Research Projects Agency of U. S. Department. This Network connects more than 40 universities and institutions throughout USA and Europe.

Difference between LAN and WAN

- LAN is restricted to limited geographical area of few kilometers. But WAN covers great distance and op-

erate nationwide or even worldwide.

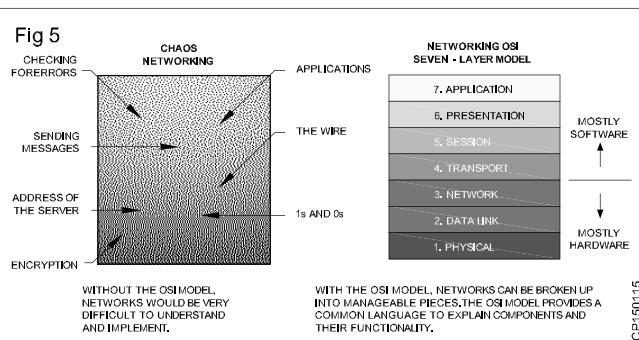
- In LAN, the computer terminals and peripheral devices are connected with wires and coaxial cables. In WAN there is no physical connection. Communication is done through telephone lines and satellite links.
- Cost of data transmission in LAN is less because the transmission medium is owned by a single organisation. In case of WAN the cost of data transmission is very high because the transmission medium used is hired either telephone lines or satellite links.
- The speed of data transmission is much higher in LAN than in WAN. The transmission speed in LAN varies from 0.1 to 100 megabits per second. In case of WAN the speed ranges from 1800 to 9600 bits per second (bps).
- Few data transmission errors occur in LAN compared to WAN. It is because in LAN the distance covered is negligible.

Open Systems Interconnection (OSI)

The Open Systems Interconnection (OSI) model is a reference tool for understanding data communications between any two networked systems. It divides the communications processes into seven layers. Each layer both performs specific functions to support the layers above it and offers services to the layers below it. The three lowest layers focus on passing traffic through the network to an end system. The top four layers come into play in the end system to complete the process.

An Overview of the OSI Model (Fig 5)

Application Layer (Layer 7): This layer interfaces directly to and performs common application services for the application processes. The common application services provide semantic conversion between associated application processes. Examples of common applica-



tion services include the virtual file, virtual terminal (for example, Telnet), and "Job transfer and Manipulation protocol" (JTM, standard ISO/IEC 8832)

Presentation Layer (Layer 6): The Presentation layer relieves the Application layer of concern regarding syntactical differences in data representation within the end-user systems. MIME encoding, encryption and similar manipulation of the presentation of data are done at this layer. An example of a presentation service would be

the conversion of an EBCDIC-coded text file to an ASCII-coded file.

Session Layer (Layer 5): The Session layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes check pointing, adjournment, termination, and restart procedures. This layer is responsible for setting up and tearing down TCP/IP sessions.

Transport Layer (Layer 4): The purpose of the Transport layer is to provide transparent transfer of data between end users, thus relieving the upper layers from any concern with providing reliable and cost-effective data transfer. The transport layer controls the reliability of a given link. Some protocols are stateful and connection oriented. This means that the transport layer can keep track of the packets and retransmit those that fail. The best known example of a layer 4 protocol is TCP.

Network Layer (Layer 3): The Network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service requested by the Transport layer. The Network layer performs network routing, flow control, segmentation/desegmentation, and error control functions. The router operates at this layer - sending data throughout the extended network and making the Internet possible, although there are layer 3 (or IP) switches. This is a logical addressing scheme - values are chosen by the network engineer. The addressing scheme is hierarchical.

Data Link Layer (Layer 2): The Data link layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical layer. The addressing scheme is physical which means that the addresses (MAC) are hard-coded into the network cards at the time of manufacture. The addressing scheme is flat.

Physical Layer (Layer 1): The physical layer defines all electrical and physical specifications for devices. This includes the layout of pins, voltages, and cable specifications. Hubs and repeaters are physical-layer devices. The major functions and services performed by the physical layer are:

- Establishment and termination of a connection to a communications medium.
- Participation in the process whereby the communication resources are effectively shared among multiple users. For example, contention resolution and flow control.
- Modulation or conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications

channel. These are signals operating over the physical cabling - copper and fiber optic, for example. SCSI operates at this level.

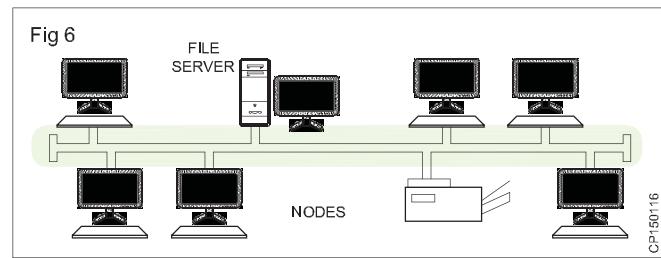
Network Topology

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations.

Main Types of Physical Topologies

- LINEAR BUS
- STAR
- RING
- TREE
- MESH

Linear Bus Topology



A linear bus topology (Fig 6) consists of a main run of cable with a terminator at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable.

Advantages of a Linear Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

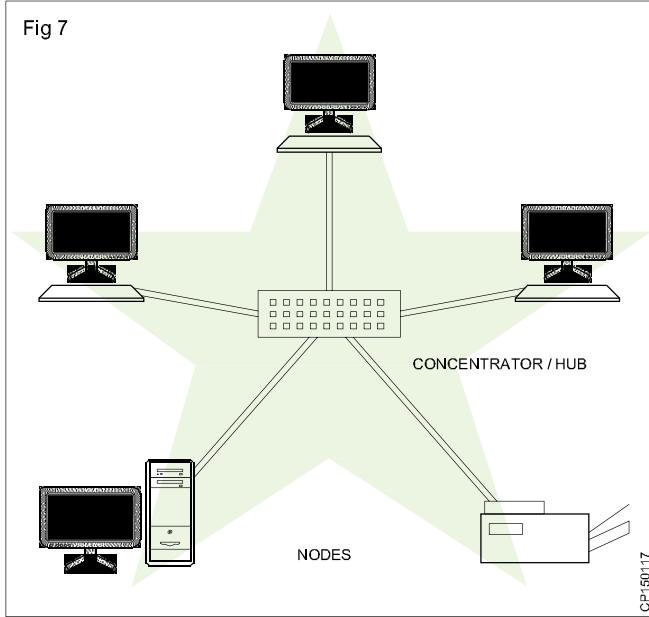
Disadvantages of a Linear Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star Topology

A star topology (Fig 7) is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub, switch, or concentrator

Fig 7



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Data on a star network passes through the hub, switch, or concentrator before continuing to its destination. The hub, switch, or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.

This configuration is common with twisted pair cable; however, it can also be used with coaxial cable or fiber optic cable.

Advantages of a Star Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

Disadvantages of a Star Topology

- Requires more cable length than a linear topology.
- If the hub, switch, or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the hubs, etc.

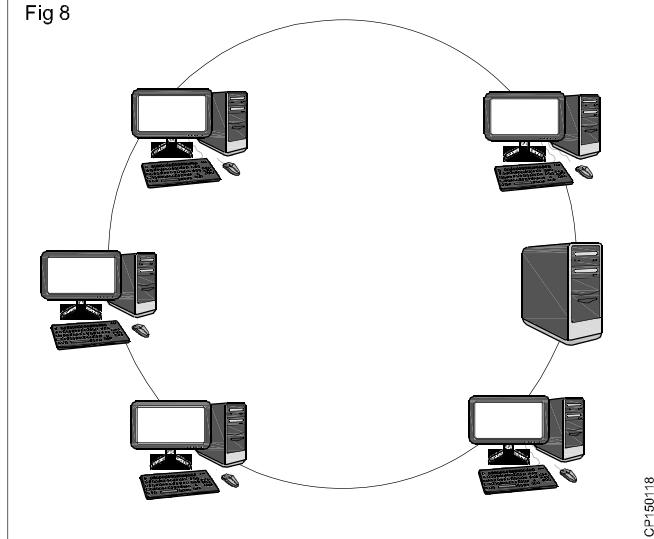
Ring Topology

The ring topology (Fig 8) is one which the network is a loop where data is passed from one workstation to another.

Advantages of Ring Topology

- This is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

Fig 8



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- There is no need for network server to control the connectivity between workstations.
- Additional components do not affect the performance of network.
- Each computer has equal access to resources.

Disadvantages of Ring Topology

- Each packet of data must pass through all the computers between source and destination.
- If one workstation or port goes down, the entire network gets affected.
- Network is highly dependent on the wire which connects different components.
- MAU's and network cards are expensive as compared to Ethernet cards and hubs.

Tree or Expanded Star

A tree topology (Fig 9) combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable. Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.

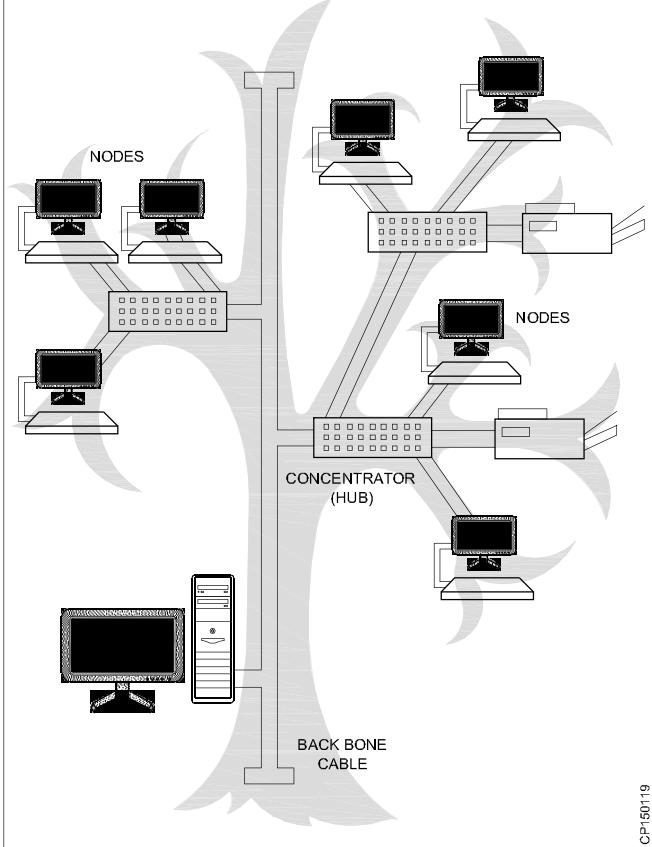
Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.

Disadvantages of a Tree Topology

- Overall length of each segment is limited by the type

Fig 9



of cabling used.

- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

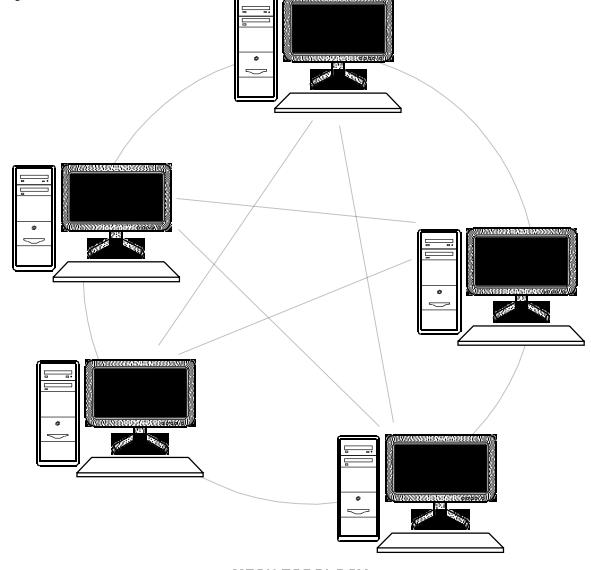
Mesh Topology

A network setup where each of the computers and network devices are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this topology is commonly used for wireless networks (Fig 10).

Advantages of Mesh topology

- Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected.
- Expansion and modification in topology can be done without disrupting other nodes.

Fig 10



Disadvantages of Mesh topology

- There are high chances of redundancy in many of the network connections.
- Overall cost of this network is way too high as compared to other network topologies.
- Set-up and maintenance of this topology is very difficult. Even administration of the network is tough.

PROTOCOLS

Network Protocol

A **network protocol** defines rules and conventions for communication between network devices. Protocols for computer networking all generally use packet switch techniques to send and receive messages in the form of packets. Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received. Some protocols also support message acknowledgement and data compression designed for reliable and/or high-performance network communication. Hundreds of different computer network protocols have been developed each designed for specific purposes and environments.

Parameters of Protocol

- 1 Physical cable or transmission media.
- 2 Number of bits transmitted on the media.
- 3 When to transmit the data on the network.
- 4 Volume of data to be transmitted.
- 5 Interact with a network with different cable type or topology.
- 6 Ensure that the message has been delivered intact

Network Topology Comparison

Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
Star Bus	Each computer connects to a central connection device.	All information passes through the central network connection. Each computer must be close to the central device. 100 meters maximum cable length. Up to 24 computers per network.	Each computer must be close to the central device. 100 meters maximum cable length. Up to 24 computers per network.	Add a new computer by plugging in a new cable from the computer to the connection device. When one computer goes down, the rest of the network is unaffected. If the connection device goes down, then the network is down.	More expensive of the simple topologies, it requires costly connection device. Usually cheaper than a hybrid network.	Uses twisted pair cable. Requires large amounts of cable. No more than 100 meters from the computer to the connection device.
Bus	Single cable connects everything.	One computer at a time sends information. Information goes along the cable and the computer accesses the information off the cable.	Connect the cable from one computer to the next and so on to the end. A terminator is placed at each end of the network.	To add a computer, you must shut down the network and disconnect the cable from the existing computers. If one computer malfunctions, the entire network goes down.	A cheaper network since there is usually one continuous copper cable.	Single continuous cable connects the devices. Terminator is required at each end of the cable. Uses coaxial or twisted pair cabling.
Ring	Single cable configured in a ring.	Information goes in one direction around the ring and passes along the ring until it reaches the correct computer.	Computers are located close to each other. Setup is easy. There is no connector. The ring has no beginning and no end.	Cable between the computers must be broken to add a new computer, so the network is down until the new device is back online. If there's a break in the cable or an error in the network, information continues to transfer through the rest of the ring until reaching the point of the break. This makes troubleshooting easy.	One of the more expensive topologies due to high cable costs.	Requires more cabling than other topologies. Uses twisted pair.

Network Topology Comparison						
Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
H y b r i d Mesh Combines two or more different structures.	Often used across long distances. Information transfer can happen in different ways, depending on the other topologies.	Often created when expanding an existing network. Can use a variety of connection devices.	Connection devices make combining different networks and different topologies easy.	Troubleshooting is most difficult in this topology because of the variety of technologies.	Expensive, large, and usually complicated.	Cabling depends on the types of networks. Can use twisted pair and coaxial cable. Also incorporates fiber optic cabling over long distances.

and in a proper manner.

List of Network Protocols

1 TCP/IP: Transmission Control Protocol / Internet Protocol is an industry standard protocol widely used. It is used for inter operating among different types of computers. Almost all types of networks support TCP/IP. It is the protocol used by the Internet. It uses a 32 - bit addressing scheme.

IP Address

IP defines an addressing scheme that is independent of the underlying physical address (e.g. 48-bit MAC address). IP specifies a unique 32-bit number for each host on a network.

This number is known as the **Internet Protocol Address**, the **IP Address** or the **Internet Address**. These terms are interchangeable. Each packet sent across the internet contains the IP address of the source of the packet and the IP address of its destination.

2 UDP - User Datagram Protocol - is a simple OSI transport layer protocol for client/server network applications based on Internet Protocol (IP). UDP is the main alternative to TCP and one of the oldest network protocols in existence, introduced in 1980. UDP is often used in videoconferencing applications or computer games specially tuned for real-time performance.

3 FTP: File Transfer Protocol (**FTP**) is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet.

FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves using a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that hides (encrypts) the username and password, and encrypts the content, FTP is often secured with SSL/TLS ("FTPS"). **SSH File Transfer Protocol (SFTP)** is sometimes also used instead.

4 SMTP

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (**IP**) networks.

While electronic mail servers and other mail transfer agents use SMTP to send and receive mail messages, user-level client mail applications typically only use SMTP for sending messages to a mail server for relaying.

For receiving messages, client applications usually use either the **Post Office Protocol (POP)** or the **Internet Message Access Protocol (IMAP)** or a proprietary system (such as Microsoft Exchange or Lotus Notes/ Domino) to access their mail box accounts on a mail server.

5 Telnet

Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal

connection. User data is interspersed in-band with Telnet control information in an 8-bitbyte oriented data connection over the **Transmission Control Protocol (TCP)**.

Telnet provided access to a command-line interface (usually, of an operating system) on a remote host. Most network equipment and operating systems with a TCP/IP stack support a Telnet service for remote configuration (including systems based on Windows NT). Because of security issues with Telnet, its use for this purpose has waned in favour of SSH.

6 HTTP

The **Hypertext Transfer Protocol (HTTP)** is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

Hypertext is a multi-linear set of objects, building a network by using logical links (the so-called hyperlinks) between the nodes (e.g. text or words). HTTP is the protocol to exchange or transfer hypertext.

7 SSH File Transfer Protocol

In computing, the **SSH File Transfer Protocol** (also **Secure File Transfer Protocol**, **Secure FTP**, or **SFTP**) is a network protocol that provides file access, file transfer, and file management functionalities over any reliable data stream.

It was designed by the **Internet Engineering Task Force (IETF)** as an extension of the **Secure Shell Protocol (SSH)** version 2.0 to provide secure file transfer capability, but is also intended to be usable with other protocols.

The IETF of the Internet Draft states that even though this protocol is described in the context of the SSH-2 protocol, it could be used in a number of different applications, such as secure file transfer over **Transport Layer Security (TLS)** and transfer of management information in VPN applications.

This protocol assumes that it is run over a secure channel, such as SSH, that the server has already authenticated the client, and that the identity of the client user is available to the protocol.

8 Post Office Protocol

In computing, the **Post Office Protocol (POP)** is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection. POP and IMAP (Internet Message Access Protocol) are the two most prevalent Internet standard protocols for e-mail retrieval.

Virtually all modern e-mail clients and servers support both. The POP protocol has been developed through several versions, with version 3 (POP3) being the current standard. Most webmail service providers such as Hotmail, Gmail and Yahoo! Mail also provide IMAP and POP3 service.

Networking Components

- **Gateway:** A device sitting at a network node for interfacing with another network that uses different protocols. Works on OSI layers 4 to 7.
- **Router:** A specialized network device that determines the next network point to which it can forward a data packet towards the destination of the packet. Unlike a gateway, it cannot interface different protocols. Works on OSI layer 3.
- **Switch:** A device that allocates traffic from one network segment to certain lines (intended destination(s)) which connect the segment to another network segment. So unlike a hub a switch splits the network traffic and sends it to different destinations rather than to all systems on the network. Works on OSI layer 2.
- **Bridge:** A device that connects multiple network segments along the data link layer. Works on OSI layer 2.
- **Hub:** It connects multiple Ethernet segments together making them act as a single segment. When using a hub, every attached device shares the same broadcast domain and the same collision domain. Therefore, only one computer connected to the hub is able to transmit at a time.

Depending on the network topology, the hub provides a basic level 1 OSI model connection among the network objects (workstations, servers, etc.). It provides bandwidth which is shared among all the objects, compared to switches, which provide a connection between individual nodes.

- **Repeater:** A device to amplify or regenerate digital signals received while sending them from one part of a network into another. Works on OSI layer 1.
- **Modem (MoDem):** A device that modulates an analog "carrier" signal (such as sound), to encode digital information, and that also demodulates such a carrier signal to decode the transmitted information, as a computer communicating with another computer over the telephone network

Types of MODEM

External Modem: This is a modem separated from the system unit in the computer case. It is connected to the serial port of the computer by means of a cable. It is connected to the telephone wall jack by another cable.

Internal Modem: An internal modem is a circuit board (a modem card) that can be added to the system unit of the computer. It takes one of the expansion slots.

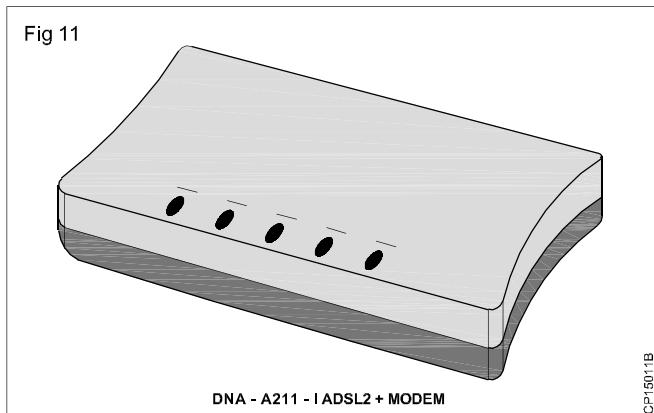
Wired Modem / Standard Modem

Most modem's used today are called standard modems. These modems are usually operated by commands entered from a microcomputer keyboard. Users control the functions (dialling, etc.) of a modem through the keyboard. Modems may use different command languages to control their functions,

Wireless Modems: Wireless modems transmit the data signals through the air instead of by using a cable. They sometimes are called a radiofrequency modem. This type of modem is designed to work with cellular technology, and wireless local area networks. Wireless modems are not yet perfected, but the technology is rapidly improving.

ADSL Modem

Asymmetric Digital Subscriber Line, ADSL (Fig 11) is a type of DSL broadband communications technology used for connecting to the Internet. ADSL allows more data to be sent over existing copper telephone lines POTS, when compared to traditional modem lines. A special filter, called a micro filter, is installed on a subscriber's telephone line to allow both ADSL and regular voice (telephone) services to be used at the same time. ADSL requires a special ADSL modem and subscribers must be in close geographical locations to the provider's central office to receive ADSL service. Typically this distance is within a radius of 2 to 2.5 miles. ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the up-stream rate).



Network Interface Card (NIC)

NIC (Fig. 12) provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card. Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or Wi-Fi wireless standards.



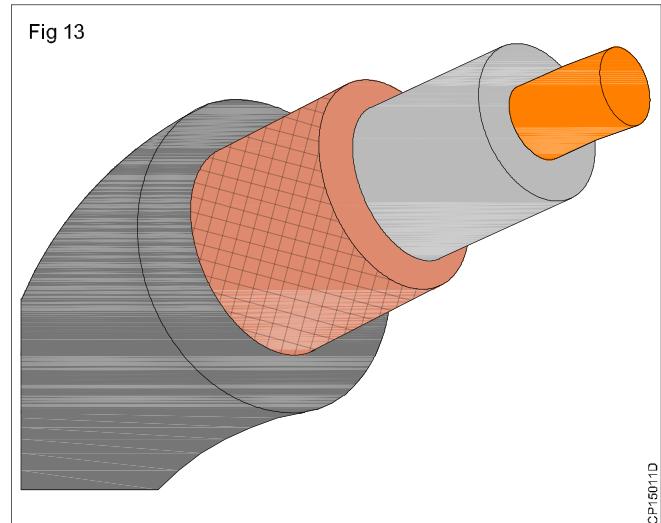
Ethernet NICs plug into the system bus of the PC and include jacks for network cables, while Wi-Fi NICs contain built-in transmitters / receivers (transceivers). In new computers, many NICs are now pre-installed by the manufacturer. All NICs feature a speed rating such as 11 Mbps, 54 Mbps or 100 Mbps that suggest the general performance of the unit.

Network Cables Standards

Cable is the medium through which information usually moves from one network device to another. There are several types of cable which are commonly used with LANs. In some cases, a network will utilize only one type of cable, other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol, and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

Cable standards

A wide range of cabling types are been used to run Ethernet systems. Therefore, different types of cabling standards are being used for the networks involved in connecting devices together using different types of cabling system.



Coaxial cable (Fig 13) is the kind of copper cable used by companies between the community antenna and user homes and businesses. Coaxial cable is sometimes used by telephone companies from their central office to the telephone poles near users. It is also widely installed for use in business and corporation and other types of.

Coaxial cable is called "coaxial" because it includes one physical that carries the signal surrounded (after a layer of insulation) by another concentric physical channel, both running along the same axis. The outer channel serves as a ground. Many of these cables or pairs of coaxial tubes can be placed in a single outer sheathing and, with repeaters, can carry information for a great distance.

10BASE-T Cable Standard: 10Base-T is one of the Ethernet standards for cabling in a network environment. 10BaseT uses a twisted pair cable with a maximum length

of 100 meters. Standard 10BaseT operates at 10 Mbps. It is commonly used in a star topology.

10BASE-FL Cable Standard: 10BaseFL is a fiber optic cable standard designed to run at 10 Mbps. It is similar to 10Base-T, though the media type is fiber. For use up to 2000 meters.

100BASE-TX Cable Standard: 100 Mbps Fast Ethernet over category 5 twisted pair cable. Maximum cable length of 100 meters.

100BASE-FX Cable Standard: 100 Mbps Fast Ethernet standard over fiber cable. Can transmit data up to 2000 meters.

1000BASE-T Cable Standard: Gigabit Ethernet over twisted pair copper wires. Transmit up to 1000 Mbps. 100 meter maximum cable length. Cat5 or better required (Cat6 cabling recommended).

1000BASE-CX Cable Standard: Gigabit Ethernet over a special copper twinax cable. Up to 25 meters in length. Typically used in a wiring closet or data center as a short jumper cable.

1000BASE-SX Cable Standard: Gigabit Ethernet using a short-wavelength laser device over multimode fiber optic cable. 50 μm core (max 300 meters) or 62.5 μm core (max 500 meters). 1000Mbps maximum transfer speed.

1000BASE-LX Cable Standard: Gigabit Ethernet using long-wavelength laser transmitters over fiber optic cable. Up to 3,000 meters. Uses single mode fiber and requires SC connectors for terminating the cable.

10 GBASE-SR Cable Standard: 802.3ae standard. 33 meters for 62.5 μm fiber optic cable, 300 meters for 50 μm cables. 10 Gbps (Gigabit per second) transfer rate.

10 GBASE-LR Standard: 10 Gbps transfer rate. 10 kilometres maximum distance. Fiber optic cable.

10 GBASE-ER Standard: 10 Gbps transfer rate. 40 kilometres maximum cable length. Fiber optic cable.

Media types

A cable is a device which contains a number of signal conductors usually in the form of separate wires. It is the medium through which information usually moves from one system to another through the network. There are several types of cable which are commonly used with the local area network. In some cases, a network utilizes only one type of cable, whereas other network uses a variety of cable types. The type of cable chosen for a network is related to network topology, protocol and size.

Twisted Pair

Twisted pair cable is the most common type of network medium used in LAN today. A transmission media consists of colour coded pairs of two shielded insulated copper wires which are arranged in a spiral pattern. The spiral pattern is an important aspect of twisted - pair cables in order to minimize cross talk of interference between

adjoining wires.

The advantage of using twisted pair cables are

- It is lighter, thinner and more flexible
- Easy to install
- It is inexpensive

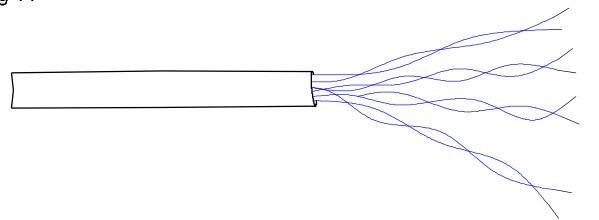
There are two varieties of twisted pair cabling, they are

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**

Unshielded twisted pair (UTP)

Unshielded twisted pair (Fig 14) cabling consists of two unshielded wires twisted around each other that contain no shielding. It is commonly used in the telephone wires and is common for computer networking because of high flexibility of the cables. It is a plastic connector that looks like a large telephone-style connector. The standard connector for unshielded twisted pair cabling is RJ-45 connector.

Fig 14



CP15011E

UTP has five categories of cable standards defined by the Electronic Industries Association and Telecommunications Industry Association (commonly known as EIA/TIA). The five categories of unshielded twisted pair are:

Categories of Unshielded Twisted Pair

In order to manage the network cabling, you need to be familiar with the standards that may be used on modern networks. The categories of the unshielded twisted pair cable are described below.

Category 1

- It is a form of UTP that contains two pairs of wire.
- CAT 1 is suitable for voice communications but not for data.
- It can carry up to 128 kilobits per second (Kbps) of data.
- It is usually used for telephone wire Data rate - 1 Mbps. This type of wire is not capable of supporting computer network traffic and is not twisted.

Category 2

- It contains four wire pairs and can carry up to 4 Mbps of data.
- CAT 2 is rarely found on modern networks.
- Category 2 or CAT 2 is capable of transmitting data up to 4 Mbps. This type of cable is seldom used.

Category 3

- CAT 3 made up of four twisted - pair wires, each twist is three times per foot. It is certified to transmit data up to 10 Mbps.
- CAT 3 has typically been used for 10 Mbps Ethernet or 4 Mbps Token Ring networks.
- The CAT 3 cabling is gradually replaced with CAT5 to accommodate higher throughput.

Category 4

- CAT 4 is made up of four twisted-pair wires, specialized to transmit data up to 16 Mbps and is rarely used in new installations.
- CAT 4 may be used for 16Mbps Token Ring or 10 Mbps Ethernet networks. It is guaranteed for signals as high as 20 MHz and Provides More protection against crosstalk and attenuation than CAT1, CAT2, orCAT 3.

Category 5

- CAT 5 is the most popular twisted pair Ethernet cabling designed for high signal integrity which is in common use today.
- CAT 5 contains four wire pairs and supports up to 100 Mbps throughout.
- It is the most popular form of UTP for new network installations and upgrades to Fast Ethernet.
- In addition to 100 Mbps Ethernet, CAT 5 wiring can support other fast networking technologies.
- It is popular because it is both affordable and high speed for today's local area networks Cat 5 cables are often used in structured cabling for computer networks such as fast Ethernet.

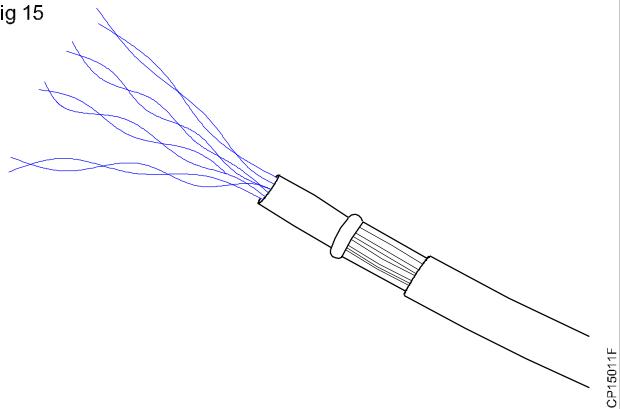
Category 6

- CAT 6 cable was originally designed to support gigabit Ethernet. It is similar to CAT 5 wire, but contains a physical separator between the four Twisted copper wires pairs to further reduce the electromagnetic interference.
- It is a twisted-pair cable that contains four wire pairs, each wrapped in foil insulation. Additional foil insulation covers the bundle of wire pairs, and a fire-resistant plastic sheet covers the second foil layer.
- The foil insulation provides excellent resistance to crosstalk and enables CAT 6 to support at least six times the throughput supported by regular CAT 5.
- When the CAT 6 is used as a patch cable, it is usually terminated in RJ-45 Electrical connectors.

Shield Twisted Pair (Fig 15)

A type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires.

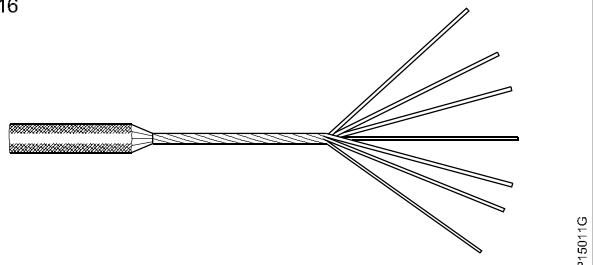
Fig 15



The extra covering in shielded twisted pair wiring protects the transmission line from leaking into or out of the cable. STP cabling often is used in networks, especially fast data rate Ethernets.

Fiber Optic Cable (Fig 16)

Fig 16



A technology that uses glass (or plastic) threads (fibers) to transmit. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages on to light waves.

Fibre optics has several advantages over traditional metal lines:

- Fibre optic cables have a much greater than metal cables. This means that they can carry more data.
- Fibre optic cables are less susceptible than metal cables to interference.
- Fibre optic cables are much thinner and lighter than metal wires.
- Data can be transmitted (the natural form for data) rather than analogically.

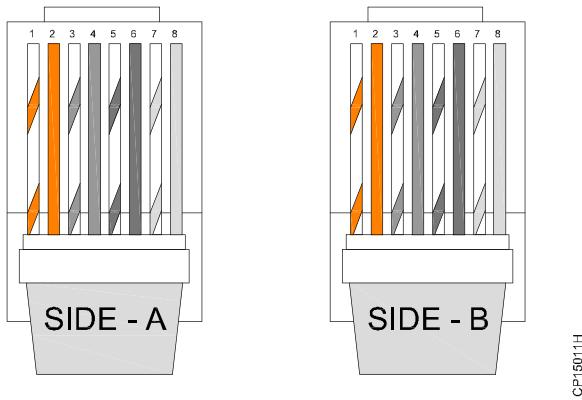
The main disadvantage of fibre optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

In addition, telephone companies are steadily replacing traditional telephone lines with fibre optic cables. In the future, almost all communications will employ fibre optics.

Straight Cable

A straight cable (Fig 17) is to connect different type of devices. This type of cable will be used most of the time and can be used to:

Fig 17



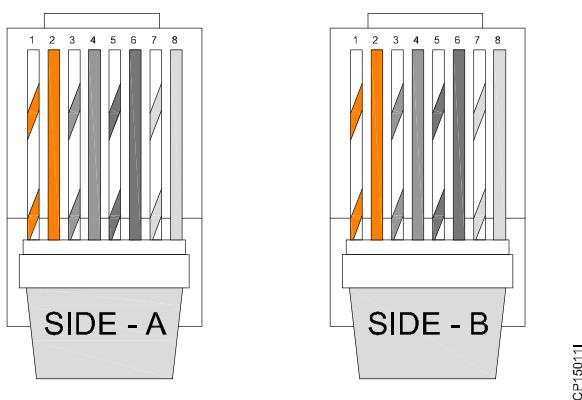
- 1 Connect a computer to a switch/hub's normal port.
- 2 Connect a computer to a cable/DSL modem's LAN port.
- 3 Connect a router's WAN port to a cable/DSL modem's LAN port.
- 4 Connect a router's LAN port to a switch/hub's uplink port. (Normally used for expanding network)
- 5 Connect 2 switches/hubs with one of the switch/hub using an uplink port and the other one using normal port.

If you need to check how straight cable looks like, it's easy. Both sides (side A and side B) of cable have wire arrangement with same colour.

Crossover Cable

A crossover cable (Fig 18), it's usually used to connect same type of devices. A crossover cable can be used to:

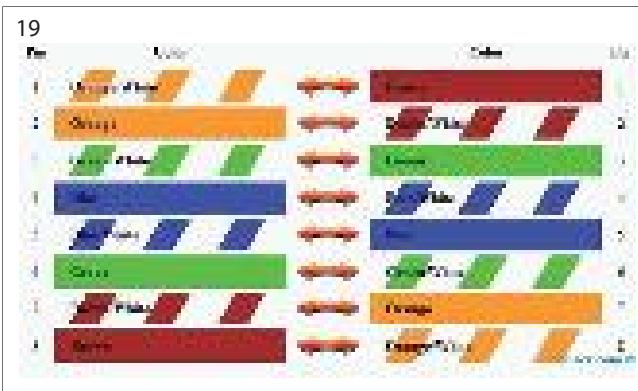
Fig 18



- 1 Connect 2 computers directly.
- 2 Connect a router's LAN port to a switch/hub's normal port. (Normally used for expanding network).
- 3 Connect 2 switches/hubs by using normal port in both switches/hubs.

In you need to check how crossover cable looks like, both side (side A and side B) of cable have wire arrangement with following different colour.

Rollover Cable (Fig 19)



Rollover cable (also known as **Cisco Console Cable** or a **Yost Cable**) is a type of cable that is often used to connect a computer terminal to a router's port. This cable is typically flat (and has a light blue colour) to help distinguish it from other types of network cabling. It gets the name rollover because the pin outs on one end are reversed from the other, as if the wire had been rolled over and you were viewing it from the other side.

Connectors

The media connectors are the physical devices that help to transfer the data between the systems.

RJ11: Registered Jack-11 (Fig 20) a four- or six-wire used primarily to connect telephone equipment. RJ-11 connectors are also used to connect some types of some types of Local area network.



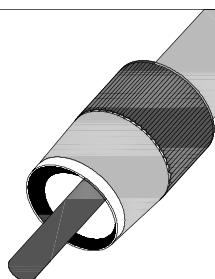
RJ45: RJ45 (Fig 21) connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable.

ST: ST stands for **Straight Tip** (Fig 22) - a quick release bayonet style developed by AT&T. STs were predominant in the late 80s and early 90s.

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Fig 22



CP-15011M

ST Connectors are among the most commonly used fiber optic connectors in networking applications. They are cylindrical with twist lock coupling, 2.5mm keyed ferrule. ST connectors are used both short distance applications and long line systems.

SC: SC stands for **S**ubscriber **C**onnecto**r** (Fig 23) - a general purpose push/pull style Connector developed by NTT. SC has an advantage in keyed duplexility to support send/receive channels.

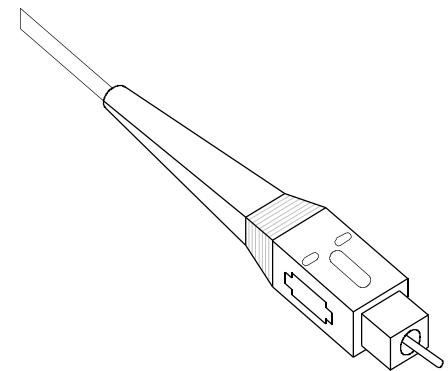
SC Connectors are frequently used for newer Network applications. The SC is a snap-in connector that is widely used in single mode systems for its performance. The SC connector is also available in a Duplex configuration. They offer low cost, simplicity, and durability. SC connectors provide for accurate alignment via their ceramic ferrules.

The square, snap-in connector latches with a simple push-pull motion and is keyed. They feature a 2.5mm Ferrule and molded housing for protection. Typical matched SC connectors are rated for 1000 mating cycles and have an Insertion Loss of 0.25 dB.

LC: LC stands for **L**ucent **C**onnecto**r** (Fig 24). The LC is a small form factor fiber optic connector.

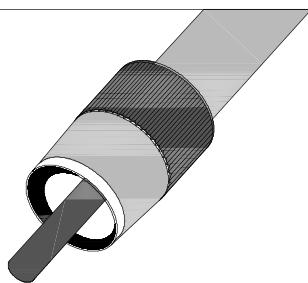
The LC Connector uses a 1.25 mm ferrule, half the size of the ST. Otherwise, it is a standard ceramic Ferrule connector. The LC has good performance and is highly favoured for single mode.

Fig 23



CP-15011N

Fig 22



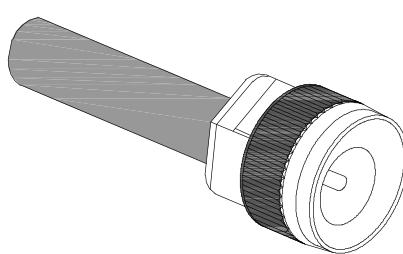
CP-15011M

USB: The USB 2.0 Standard-A type of USB plug is a flattened rectangle which inserts into a "downstream-port" receptacle on the USB host, or a hub, and carries both power and data. This plug is frequently seen on cables that are permanently attached to a device, such as one connecting a keyboard or mouse to the computer via USB connection.

A Standard-B plug-which has a square shape with bevelled exterior corners-typically plugs into an "upstream receptacle" on a device that uses a removable cable, e.g. a printer. A Type B plug delivers power in addition to carrying data. On some devices, the Type B receptacle has no data connections, being used solely for accepting power from the upstream device. This two-connector-type scheme (A/B) prevents a user from accidentally creating an Electrical loop.

BNC: Bayonet Neill Concelman (Fig 25) connector, (sometimes erroneously called a British Naval Connector or Bayonet Nut Connector, a type of connector used with coaxial cable such as the RG-58 A/U cable used with the 10Base2. The basic BNC connector is a male type mounted at each end of a cable.

Fig 25



CP-15011P

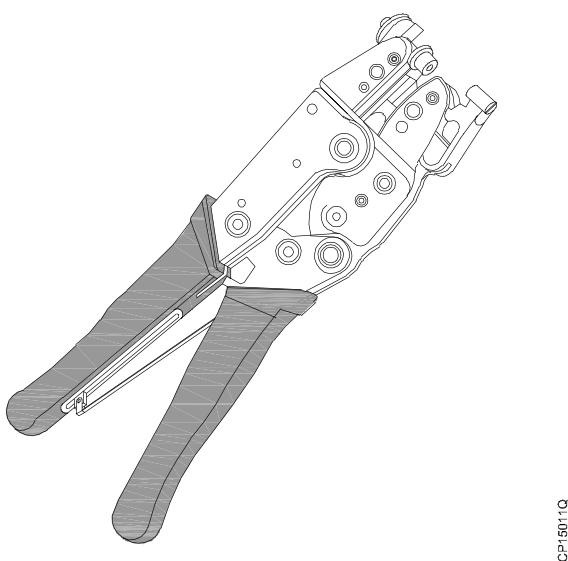
This connector has a center pin connected to the center cable conductor and a metal tube connected to the outer cable shield. A rotating ring outside the tube locks the cable to any female connector.

BNC T-connectors (used with the 10Base-2 system) are female devices for connecting two cables to a NIC. A BNC barrel connector allows connecting two cables together.

BNC connectors can also be used to connect some monitor, which increases the accuracy of the signals sent from the adapter.

Crimping Tool: A crimping tool (Fig 26) is a tool designed to crimp or connect a connector to the end of a cable. For example, network cables and phone cables are created using a crimping tool to connect the RJ45 and RJ11 connectors to the end of the cable. In the picture to the right, is an example of what a crimping tool looks like. This shows a tool capable of crimping both RJ-11 and RJ-45 connectors.

Fig 26



How to Crimp RJ45

1 Strip 1 to 2 inches (2.5 to 5.1 cm) of the outer skin at the end of the cable wire by making a shallow cut in the skin with a utility knife. Run the knife around the cable, and the jacket should slide off easily. There will be 4 pairs of twisted wires exposed, each of them a different color or colour combination.

Orange-white striped and solid orange

Green-white striped and solid green

Blue-white striped and solid blue

Brown-white striped and solid brown

2 Fold each pair of wires backwards to expose the core of the cable.

3 Cut off the core and discard.

4 Straighten the twisted wires using 2 pair of tweezers. Grasp a wire beneath a bend with 1 pair of tweezers, and use the other pair to gently straighten the bend. The straighter your wires, the easier your job will be

5 Arrange the untwisted wires in a row, placing them into the position, running from right to left, in which they will go into the RJ-45 connector:

- Orange with a white stripe
- Orange
- Green with a white stripe
- Blue
- Blue with a white strip
- Green
- Brown with a white stripe
- Brown

6 Trim the untwisted wires to a suitable length by holding the RJ-45 connector next to the wires. The insulation on the cable should be just inside the bottom of the RJ-45 connector. The wires should be trimmed so that they line up evenly with the top of the RJ-45 connector.

- Trim the wires in small increments, checking frequently to ensure a correct fit. It's better to cut the untwisted wires a few times than have to go back and start all over again because you trimmed off too much.

7 Insert the wires into the RJ-45 connector, making sure that they stay aligned and each color goes into its appropriate channel. Make sure that each wire goes all the way to the top of the RJ-45 connector. If you don't make these checks, you will find that your newly crimped RJ-45 connector is useless.

8 Use the crimping tool to crimp the RJ-45 connector to the cable by pressing the jacket and cable into the connector so that the wedge at the bottom of the connector is pressed into the jacket.

Re crimp the cable once more to ensure proper connection.

9 Follow the instructions above to crimp an RJ-45 connector to the opposite end of the cable

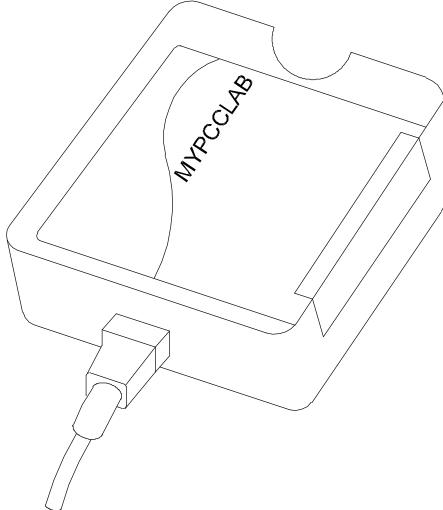
10 Use a cable tester to assure that your cable is working properly when both ends are crimped.

Cable Tester (Fig 27)

When connected to an Ethernet cable, a network cable tester tells if the cable is capable of carrying an Ethernet signal. If the cable carries the signal, this indicates that all the circuits are closed, meaning that electric current can move unimpeded through the wires, and that there are no short circuits, or unwanted connections, in the wire.

Network cable testers vary in complexity and price, but a basic tester consists of a source of electrical current, a measuring device that shows if the cable is good, and a connection between the two, usually the cable itself.

Fig 27



CP15011R

Computer networks use Ethernet cables to allow computers in the network to "talk" to each other. An Ethernet cable has eight wires that are arranged in four pairs. For current to flow correctly, the wire pairs must be connected in the proper order.

A network cable tester can identify if the wires are paired correctly. It can also show if there is a break in the insulation, a situation which allows crosstalk between two wires that should not be connected. The tester can also tell whether the cable has the proper level of resistance.

A network cable tester can be a simple apparatus that merely identifies whether current flows through the cable, or it may be a professional-level, complex device that gives additional information that helps identify the problem.

Professional-level network cable testers may not only tell if an open circuit exists, but may identify where the break is located. Some also identify the gauge of wire used and can generate their own signal to test for interference.

How to Check with the Tester

- 1 Turn on your network cable tester.
- 2 Plug one end of the Ethernet cable you are trying to test into the "IN" Ethernet input on the network cable tester.
- 3 Plug the other end of your Ethernet cable you are trying to test into the "OUT" input on the network cable tester.
- 4 Press the "Test" button. The network cable tester will send a signal across the Ethernet cable. If the signal gets from one end of the cable to the other, a green light will appear on the device, letting you know that the test was successful. If the signal does not get from one end of the cable to the other, a red light will appear on the device, letting you know that the test was not successful and that the cable is bad.

Switch

A **Network Switch** (Fig 28) is a small hardware device that joins multiple computers together within one Local Area Network. Technically, network switches operate at layer two (Data Link Layer) of the OSI.

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Network switches appear nearly identical to hub, but a switch generally contains more intelligence (and a slightly higher price tag) than a hub. Unlike hubs, network switches are capable of inspecting data packet as they are received, determining the source and destination device of each packet, and forwarding them appropriately.

By delivering messages only to the connected device intended, a network switch conserves bandwidth and offers generally better performance than a hub.

Availability of Switches

- 1 8 Port Switches
- 2 16 port switches
- 3 24 port switches
- 4 32 port switches

Hub: A Hub (Fig 29) is a small, simple, inexpensive device that joins multiple computers together. Many network hubs available today support the Ethernet standard. Other types including USB hubs also exist, but Ethernet is the type traditionally used in home networking.

To network a group of computers using an Ethernet hub,

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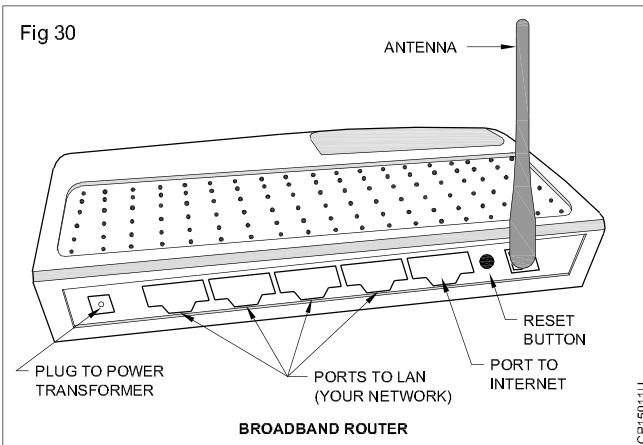


first connect an Ethernet cable into the unit, and then connect the other end of the cable to each computer's NIC. All Ethernet hubs accept the RJ45 connectors of standard Ethernet cables.

Ethernet hubs vary in the speed (network data rate or bandwidth they support. Some years ago, Ethernet hubs offered only 10 Kbps rated speeds. Newer types of hubs offer 100 Mbps Ethernet. Some support both 10 Mbps and 100 Mbps (so-called dual-speed or 10/100 hubs).

Routers

Routers (Fig 30) are physical devices that join multiple wired or wireless networks together. Technically, a wired or wireless router is a Layer 3 gateway, meaning that the wired/wireless router connects networks (as gateways do), and that the router operates at the network layer of the OSI model.



Home networkers often use an Internet Protocol (IP) wired or wireless router, IP being the most common OSI network layer protocol. An IP router such as a DSL or cable modem router joins the home's LAN to the WAN of the Internet.

Bridges

A bridge (Fig 31) device filters data traffic at a network boundary. Bridges reduce the amount of traffic on a LAN by dividing it into two segments.



Bridges operate at the data link layer (Layer 2) of the OSI model. Bridges inspect incoming traffic and decide whether to forward or discard it. An Ethernet bridge, for example, inspects each incoming Ethernet frame - including the source and destination MAC addresses, and sometimes the frame size - in making individual forwarding decisions.

ISP: Internet Service Provider, it refers to a company that provides Internet services, including personal and business access to the internet. For a monthly fee, the service provider usually provides a software package, Username, password and access phone number.

Equipped with a modem you can then log on to the Internet and browse the world wide web and USENET and send and receive email. For broadband access you typically receive the broadband modem hardware or pay a

monthly fee for this equipment that is added to your ISP account billing.

In addition to serving individuals, ISPs also serve large companies, providing a direct connection from the company's networks to the Internet. ISPs themselves are connected to one another through Network Access Point (NAPs). ISPs may also be called IAPs (Internet Access Provider).

State Owned ISP's

- **BSNL** - Servicing all of India except Mumbai and Delhi. Triple-play Broadband Services provided by ADSL and VDSL. Also providing internet services over GPRS, 3G, as well as WiMax
- **MTNL** - Servicing Mumbai and Delhi. Triple-play Broadband Services provided by ADSL under the "Tri-Band" brand. Also providing GPRS and 3G internet services.

Private Owned nationwide ISP's

- Airtel - ADSL, GPRS, 3G & 4G LTE
- Skynet Broadband - Internet Service Provider
- Aircel - GPRS & 3G
- Hathway - Broadband over Cable
- Idea - GPRS & 3G
- MTS India - CDMA/EV-DO
- O-Zone Networks Private Limited - Pan - India Public Wi-Fi hotspot provider
- Reliance Communications - ADSL, GPRS & 3G, Metro-Ethernet, CDMA/EV-DO, Wimax
- Reliance Industries - LTE (to be launched)
- Sify - Broadband over cable
- Tata DoCoMo - GPRS & 3G
- Tata Indicom - ADSL, CDMA/EV-DO, Metro-Ethernet, WiMax
- Vodafone - GPRS & 3G

NSP: Network Service Providers (**NSP**) is a business or organization that sells bandwidth or network access by providing direct Internet backbone access to the Internet and usually access to its **Network Access Point (NAPs)**.

Network service providers may consist of Telecommunications companies, data carriers, wireless communications providers, Internet service provider, and Cable television operators offering high-speed Internet access.

Dial up: Dial-up access is really just like a phone connection, except that the parties at the two ends are computer devices rather than people. Because dial-up access uses normal telephone lines, the quality of the connection is not always good and data rate are limited.

In the past, the maximum data rate with dial-up access was 56 Kbps (56,000 bits per second), but new technologies such as ISDN are providing faster rates.

Broadband: The term broadband refers to a telecommunications signal or device of greater Bandwidth (signal processing), in some sense, than another standard or usual signal or device (and the broader the band, the greater the capacity for traffic).

Wireless (Wi-Fi): Wireless broadband is high-speed Internet service via wireless technology. Wireless broadband is available in Internet cafés, local "hot spots" within many cities, private businesses and many homes.

The advantage of wireless broadband is that the computer receiving the Internet signal need not be tethered by an Ethernet or network cable to the broadband modem or router.

A wireless broadband modem receives the service and transmits it via radio waves to the immediate surrounding area. Any computer equipped with wireless capacity within receiving distance can pick up the signal, making the Internet 'portable.' The most common way to take advantage of wireless broadband is by using a laptop computer.

Mobile Broadband: The term mobile broadband refers to high-speed wireless Internet connections and services designed to be used from arbitrary locations.

Cellular networks normally provide broadband connections suitable for mobile access. The technologies in use today fall into two categories -3G (third generation cell networks) and 4G (fourth generation).

Introduction to TCP/IP

Objectives : At the end of this lesson you shall be able to

- explain TCP/IP, addresses and subnets.

Introduction to TCP/IP : TCP and IP were developed by Department of Defense (DOD) research project to connect a number different networks designed by different vendors into a network of networks (the “Internet”). It was initially unsuccessful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems. Several computers in a small department can use TCP/IP (along with other protocols) on a single LAN. The IP component provides routing from the department to the enterprise network, then to regional networks, and finally to the global internet. On the battlefield a communications network will sustain damage, so the DOD designed TCP/IP to be robust and automatically recover from any node or phone failure. This design allows the construction of very large networks with less central management. However, because of the automatic recovery, network problems can go undiagnosed and uncorrected for long periods of time.

As with all other communications protocol, TCP/IP is composed of layers:

IP is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organisations. The organisations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organisation to region and then around the world.

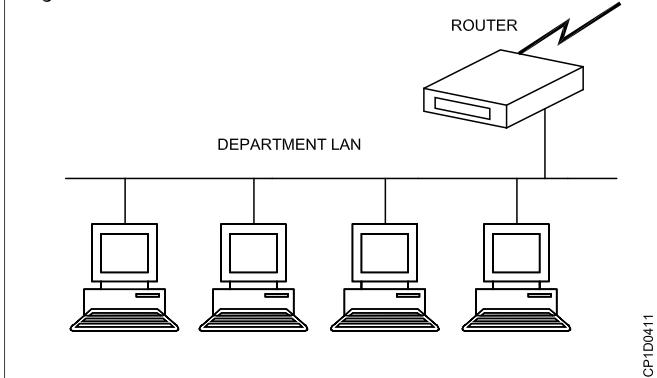
TCP is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

Sockets is a name given to the package of subroutines that provide access to TCP/IP on most systems.

The Internet Protocol was developed to create a Network of Networks (the “Internet”). Individual machines are first connected to a LAN (Ethernet or Token Ring). TCP/IP shares the LAN with other users (a Novell file server, Windows for Workgroups peer systems). One device provides the TCP/IP connection between the LAN and the rest of the world. (Refer Fig 1)

To insure that all types of systems from all vendors can communicate, TCP/IP is absolutely standardised on the LAN. However, larger networks based on long distances and phone lines are more volatile. In US, many large corporations would wish to reuse large internal networks based on IBM's SNA. In Europe, the national phone

Fig 1



companies traditionally standardize on X.25. However, the sudden explosion of high speed microprocessors, fiber optics and digital phone systems has created a burst of new options: ISDN, frame relay, FDDI, Asynchronous Transfer Mode (ATM). New technologies arise and become obsolete within a few years. With cable TV and phone companies competing to built the National Information Superhighway, no single standard can govern citywide, nationwide, or worldwide communications.

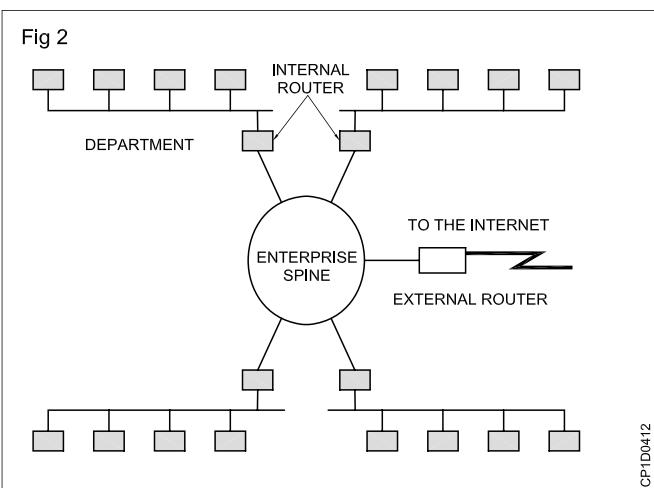
The original design of TCP/IP as a Network of Networks fits nicely within the current technological uncertainty. TCP/IP data can be sent across a LAN or it can be carried within an internal corporate SNA network or it can piggyback on the cable TV service. Furthermore, machines connected to any of these networks can communicate to any other network through gateways supplied by the network vendor.

Addresses : Each technology has its own convention for transmission messages between two machines within the same network. On a LAN, messages are sent between machines by supplying the six byte unique identifier (the “MAC” address). In an SNA network, every machine has Logical Units with their own network address. DECNET, Appletalk and Novell IPX all have a scheme for assigning numbers to each local network and to each workstation attached to the network.

On top of these local or vendor specific network addresses, TCP/IP assigns a unique number to every workstation in the world. This “IP number” is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. For example, a server IP is like 130.132.59.234

Subnets: Although the individual subscribers do not need to tabulate network numbers or provide explicit routing, it is convenient for most Class B networks to be internally manage as much smaller and simpler version

of the larger network organisations. It is common to subdivide the two bytes available for internal assignment into a one byte department number and a one byte workstation ID. (Refer Fig 2)



The enterprise network is built using commercially available TCP/IP router boxes. Each router has small tables with 255 entries to translate the one byte department number into selection of a destination Ethernet connected to one of the routers.

TCP treats the data as a stream of bytes. It logically assigns a sequence number to each byte. The TCP packet has a header that says, in effect, "This packet starts with byte 379642 and contains 200 bytes of data." The receiver can detect missing or incorrectly sequenced packets. TCP acknowledges data that has been received and retransmits data that has been lost. The TCP design means that error recovery is done end-to-end between the Client and Server machine. There is no formal standard for tracking problems in the middle of the network, though each network has adopted some adhoc tools.

There are three levels of TCP/IP knowledge. Those who administer a regional or national network must design a system of long distance phone lines, dedicated routing devices and very large configuration files. They must know the IP numbers and physical locations of thousands of subscriber networks. They must also have a formal network monitor strategy to detect problems and respond quickly.

Each large company or university that subscribes to the Internet must have an intermediate level of network organisation and expertise. A half dozen routers might be configured to connect several dozen departmental LANs in several buildings. All traffic outside the organisation would typically be routed to a single connection to a regional network provider.

However, the end user can install TCP/IP on a personal computer without any knowledge of either the corporate or regional network. Three pieces of information are required:

- 1 The IP address assigned to this personal computer.
- 2 The part of the IP address (the subnet mask) that distinguishes other machines on the same LAN (messages can be sent to them directly) from machines in other departments or elsewhere in the world (which are sent to a router machine)
- 3 The IP address of the router machine that connects this LAN to the rest of the world.

Transmission media and network components

Objectives : At the end of this lesson you shall be able to

- explain cable media, wireless media and network adapter.

Network media : Media are what the message is transmitted over. Different media have different properties and are most effectively used in different environments for different purposes.

In computer networking, the medium affects nearly every aspect of communication. Most important, it determines how quickly and to whom a computer can talk and how expensive the process is.

Cable media : Cables have a central conductor that consists of a wire or fiber surrounded by a plastic jacket. Three types of cable media are twisted-pair, coaxial and fiber-optic cable. Two types of twisted-pair cable are used in networks: unshielded (UTP) and shielded (STP).

Table summarizes the characteristics of these types of cable media, which are discussed in the following sections.

Factor	UTP	STP	Coaxial	Fiber-optic
Cost	Lowest	Moderate	Moderate	Highest
Installation	Easy	Fairly easy	Fairly easy	Difficult
Bandwidth capacity	1- to 155 Mbps (typically 10 Mbps)	1- to 155Mbps (typically 16 Mbps)	Typically 10 Mbps	2 Gbps (typically 100 Mbps)
Node capacity per segment	2	2	30 (10base 2) 100 (10 base 5)	2
Attenuation	High (range of hundreds of meters)	High (range of hundreds of meters)	Lower (range of a few kilometers)	Lowest (range of tens of kilometers)
EMI	Most vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Not affected by EMI or eavesdropping

Twisted-pair cable : Twisted-pair cable uses one or more pairs of two twisted copper wires to transmit signals. It is commonly used as telecommunications cable.

When copper wires that are close together conduct electric signals, there is a tendency for each wire to produce interference in the other. One wire interfering with another in this way is called crosstalk. To decrease the amount of crosstalk and outside interference, the wires are twisted. Twisting the wires allows the emitted signals from one wire to cancel out the emitted signals from the other and protects them from outside noise.

Twisted pairs are two color-coded, insulated copper wires that are twisted around each other. A twisted-pair cable consists of one or more twisted pairs in a common jacket. Fig 1 shows a twisted-pair cable.

The two types of twisted-pair cable are unshielded and shielded.

Fig 1

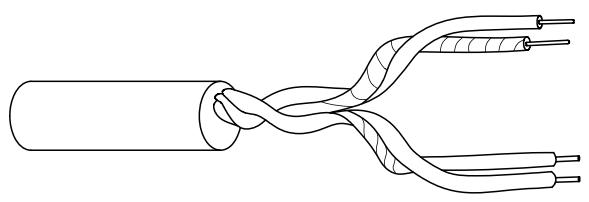


CP1D0211

Unshielded twisted-pair cable : Unshielded twisted-pair (UTP) cable consists of a number of twisted pairs with a simple plastic casing. UTP is commonly used in telephone systems. Fig 2 shows a UTP cable.

The Electrical Industries Association (EIA) divides UTP into different categories by quality grade. The rating for each category refers to conductor size, electrical characteristics and twists per foot. The following categories are defined.

Fig 2



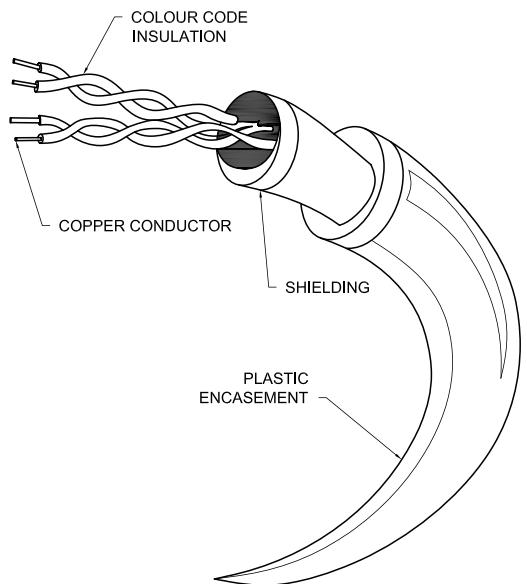
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The other side of the punch-down block is wired to a patch panel. The patch panel provides connectivity through patch cables to other user devices and connectivity devices.

UTP's popularity is partly due to the, first usage of the same in telephone systems. In many cases a network can be run over the already existing wires installed for the phone system, at a great savings in installation cost.

Shielded twisted-pair cable : The only difference between shielded twisted pair (STP) and UTP is that STP cable has a shielded usually aluminium/polyester between the outer jacket or casing and the wires. Fig 4 shows STP cable.

Fig 4



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The shield makes STP less vulnerable to EMI because the shield is electrically grounded. If a shield is grounded correctly, it tends to prevent signals from getting into or out of the cable. It is a more reliable cable for LAN environments. STP was the first twisted-pair cable to be used in LANs. Although many LANs now use UTP, STP is still used.

Transmission media specifications from IBM and Apple Computer use STP cable. IBM's Token Ring network uses STP and IBM has its own specifications for different qualities and configurations of STP. A completely different type of STP is the standard for Apple's Apple Talk networks. Networks that conform to each vendor's specifications have their own special requirements, including connector types and limits on cable length.

STP has the following characteristics

Cost : Bulk STP is fairly expensive. STP costs more than UTP and thin coaxial cable but less than thick coaxial or fiber-optic cabling.

Installation : The requirement for special connectors can make STP more difficult to install than UTP. An electrical ground must be created with the connectors. To simplify installation, use standardised and prewired cables.

Because STP is rigid and thick (up to 1.5 inches in diameter), it can be difficult to handle.

Bandwidth capacity : With the outside interference reduced by the shielding, STP can theoretically run at 500 Mbps for a 100 meter cable length. Few installations run at data rates higher than 155 Mbps. Currently, most STP installations have data rates of 16 Mbps.

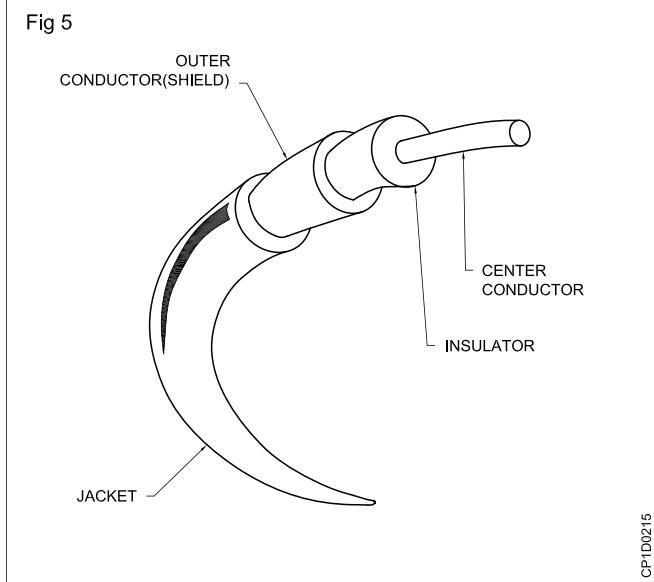
Node capacity : Since only two computers can be connected together by an STP cable, the number of computers in an STP network is not limited by the cable. Rather, it is limited by the hub or hubs that connect the cables together. In a Token Ring network, which is the most common type of STP network, the useful upper limit is around 200 nodes in a single ring, but it depends on the type of data traffic in your network. There is a specified maximum limit of 270, but you will probably never reach this limit.

Attenuation : STP does not outperform UTP by much in terms of attenuation. The most common limit is 100 meters.

EMI : The biggest difference between STP and UTP is the reduction of EMI. The shielding blocks a considerable amount of the interference. However, since it is copper wire, STP still suffers from EMI and is vulnerable to eavesdropping.

Coaxial cable : Coaxial cable commonly called coax has two conductors that share the same axis. A solid copper wire or stranded wire runs down the center of the cable and this wire is surrounded by plastic foam insulation. The form is surrounded by a second conductor, a wire mesh tube, metallic foil or both. The wire mesh protects the wire from EMI. It is often called the shield. A tough plastic jacket forms the cover of the cable, providing protection and insulation. Fig 5 shows a coaxial cable.

Fig 5



Coaxial cable comes in different sizes. It is classified by size (RG) and by the cable's resistance to direct or alternating electric currents (measured in ohms also called impedance)

The following are some coaxial cables commonly used in networking:

50 ohm, RG-8 and RG-11 used for thick ethernet.

50 ohm, RG-58 used for thin ethernet.

75 ohm, RG-59 used for cable TV.

93 ohm, RG-62 used for ARCnet.

PVC and plenum cable : Polyvinyl chloride (PVC) is commonly used in coaxial cabling because it is a flexible, inexpensive plastic well suited for use as insulation and cable jacketing. PVC is often used in the exposed areas of an office.

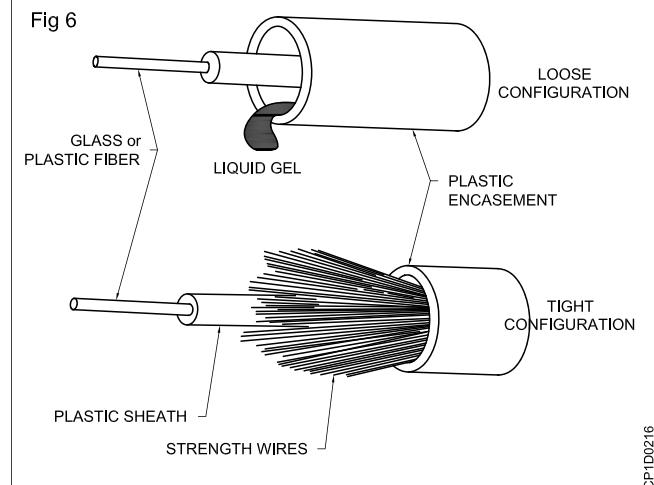
A plenum is the space between the false ceiling of an office and the floor above. The air in the plenum circulates with the air in the rest of the building, and there are strict fire codes about what can be placed in a plenum environment.

Because PVC gives off poisonous gases when burned, you cannot use it in a plenum environment. You must use plenum grade cable instead. Plenum grade cable is certified to be fire resistant to produce a minimum amount of smoke. Plenum cable is also used in vertical runs (walls) without conduit (a tube to hold the cable). Plenum cable is more expensive and less flexible than PVC.

Fiber-optic cable : Fiber-optic cable transmits light signals rather than electrical signals. It is enormously more efficient than the other network transmission media. As soon as it comes down in price (both in terms of the cable and installation costs) fibre optic will be the choice for network cabling.

Each fiber has an inner core of glass or plastic that conducts light. The inner core is surrounded by cladding, a layer of glass that reflects the light back into the core. Each fiber is surrounded by a plastic sheath. The sheath can be either tight or loose. Fig 6 shows examples of these two types of fiber optic cables.

Fig 6

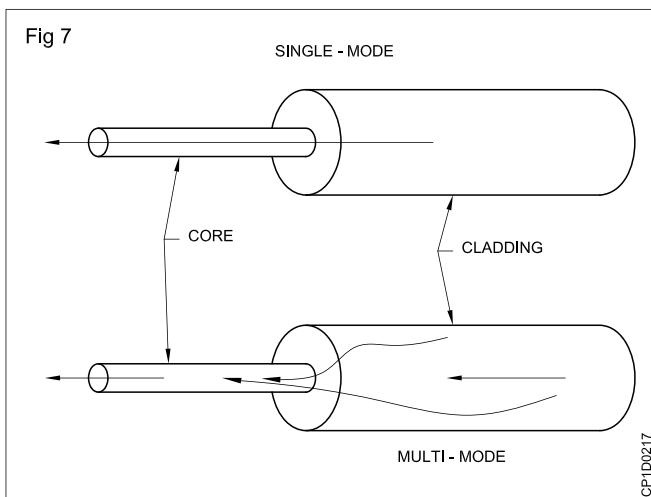


Tight configurations completely surround the fibers with a plastic sheath and sometimes include wires to strengthen the cable (although these wires are not required). Loose configurations leave a space between the sheath and the

outer jacket, which is filled with a gel or other material. The sheath provides the strength necessary to protect against breaking or extreme heat or cold. The gel, strength wires and outer jacket provide extra protection.

A cable may contain a single fiber, but often fibers are bundled together in the center of the cable. Optical fibers are smaller and lighter than copper wire. One optical fiber is approximately the same diameter as a human hair.

Optical fibers may be multimode or single mode. Single mode fibers allow a single light path and are typically used with laser signaling. Single mode fiber can allow greater bandwidth and cable runs than multimode but is more expensive. Multimode fibers use multiple light paths. The physical characteristics of the multimode fiber make all parts of the signal (those from the various paths) arrive at the same time, appearing to the receiver as though they were one pulse. If you want to save money, look into multimode, since it can be used with LEDs (light emitting diodes) which are a more affordable light source than lasers. Fig 7 shows single mode and multi mode fibers.



Optical fibers are differentiated by core/cladding size and mode. The size and purity of the core determine the amount of light that can be transmitted. The following are the common types of fiber-optic cable.

8.3 micron core/125 micron cladding, single mode

62.5 micron core/125 micron cladding, multimode

50 micron core/125 micron cladding, multimode

100 micron core/140 micron cladding, multimode

A typical LAN installation starts at a computer or network device that has a fiber-optic network interface and (NIC). This NIC has an incoming interface and an outgoing interface. The interfaces are directly connected to fiber-optic cables with special fibre-optic connectors. The opposite ends of the cables are attached to a connectivity device or splice center.

Wireless media : Wireless media do not use an electrical or optical conductor. In most cases, the earth's atmosphere is the physical path for the data. Wireless media is therefore useful when distance or obstructions make

bounded media difficult. There are three main types of wireless media: radio wave, micro wave and infrared.

Radio wave transmission systems : Radio waves have frequencies between 10 kilohertz (KHz) and 1 gigahertz (GHz). The range of the electromagnetic spectrum between 10 KHz and 1 GHz is called radio frequency (RF).

Radio wave include the following types.

Short wave

Very high frequency (VHF) television and FM radio

Ultra-high frequency (UHF) radio and television

Radio waves can be broadcast omnidirectionally or directionally. Various kinds of antennas can be used to broadcast radio signals.

Microwave transmission systems : Microwave communication makes use of the lower gigahertz frequencies of the electromagnetic spectrum. These frequencies, which are higher than radio frequencies, produce better throughout and performance. There are two types of microwave data communication systems: terrestrial and satellite.

Terrestrial microwave : Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz range. The signals are highly focused and the physical path must be line-of-sight. Relay towers are used to extend signals. Terrestrial microwave systems are typically used when using cabling is cost prohibitive.

Because terrestrial microwave equipment often uses licensed frequencies, additional costs and time constraints may be imposed by licensing commissions or government agencies (the FCC, in the United States).

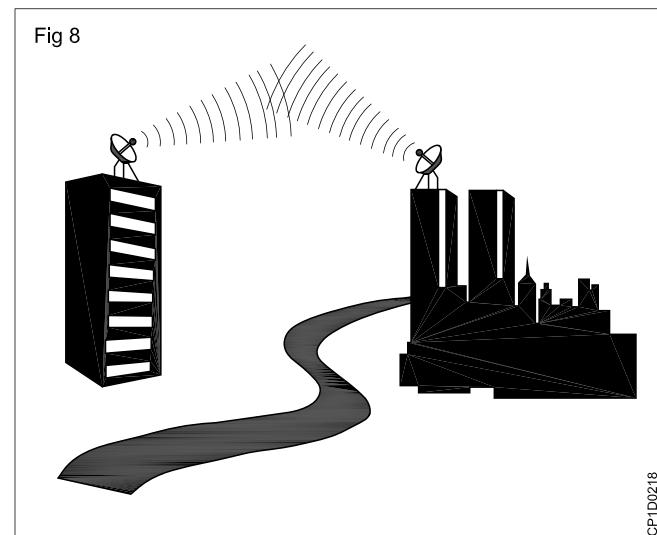


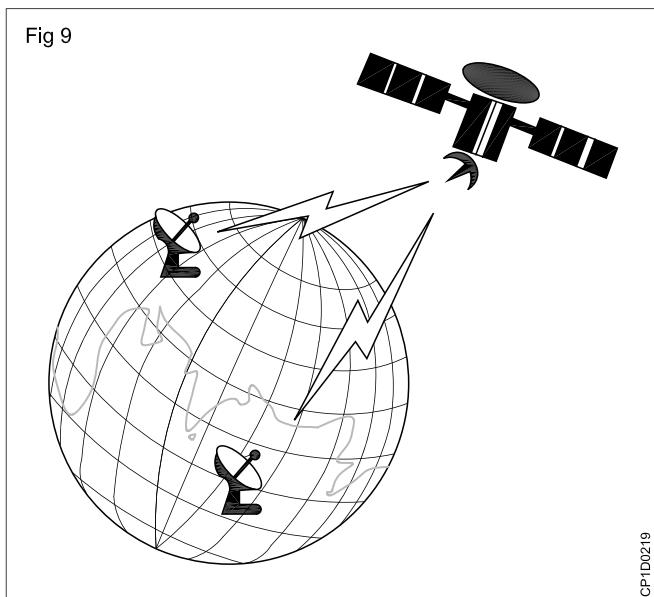
Fig 8 shows a microwave system connecting separate buildings. Smaller terrestrial microwave systems can be used within a building, as well. Microwave LANs operate at low power, using small transmitters that communicate with omnidirectional hubs. Hubs can then be connected to form an entire network.

Satellite : Satellite microwave systems transmit signals between directional parabolic antennas. Like terrestrial microwave systems, they use low gigahertz frequencies and must be in line-of-sight. The main difference with satellite system is that one antenna is on a satellite in geosynchronous orbit about 50,000 kilometers (22,300 miles) above the earth. Because of this, satellite microwave systems can reach the most remote places on earth and communicate with mobile devices.

Here's how it usually works: a LAN sends a signal through cable media to an antenna (commonly known as a satellite dish), which beams the signal to the satellite in orbit above the earth. The orbiting antenna then transmits the signal to the another location on the earth or, if the destination is on the opposite side of the earth, to another satellite, which then transmits to a location on earth.

Fig 9 shows a transmission being learned from a satellite dish on earth to an orbiting satellite and then back to earth.

Fig 9



Because the signal must be transmitted 50,000 kilometers to the satellite and 50,000 kilometers back to earth, satellite microwave transmissions take about as long to cover a few kilometers as they do to span continents. Because the transmission must travel long distances, satellite microwave systems experience delays between the transmission of a signal and its reception. These delays are called propagation delays. Propagation delays range from .5 to 5 seconds.

Infrared transmission systems : Infrared media use infrared light to transmit signals. LEDs or ILDs transmit the signals and photodiodes receive the signals. Infrared media use the tera-hertz range of the electromagnetic spectrum. The remote controls we use for television, VCR and CD players use infrared technology to send and receive signals.

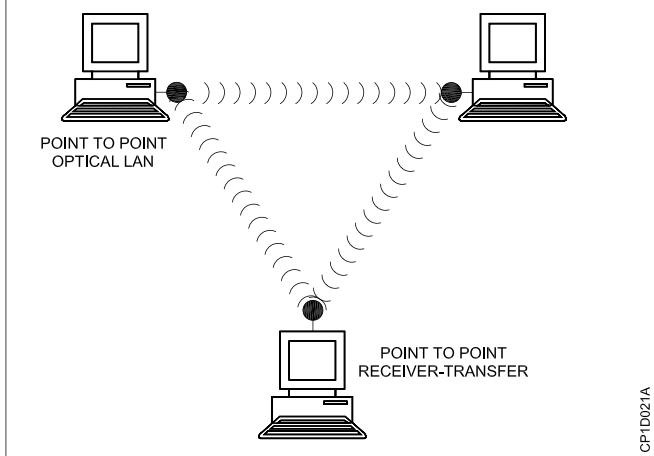
Because infrared signals are in the terahertz (higher-frequency) range, they have good throughout. Infrared signals do have a downside: the signals cannot penetrate walls or other objects and they are diluted by strong light sources.

Infrared media use pure light, normally containing only electromagnetic waves or photons from a small range of the electromagnetic spectrum. Infrared light is transmitted either line-of-sight (point-to-point) or broadcast omnidirectionally, allowing it to reflect off walls and ceilings. Point-to-point transmission allows for better data rates, but devices must remain in their locations. Broadcast, on the other hand, allows for more flexibility but with lower data rates. (Part of the signal strength is lost with each reflection.)

Point-to-point : Infrared beams can be tightly focused and directed at a specific target. Laser transmitters can transmit line-of-sight across several thousand meters.

One advantage of infrared is that an FCC license is not required to use it. Also, using point-to-point infrared media reduces attenuation and makes eavesdropping difficult. Typical point-to-point infrared computer equipment is similar to that used for consumer product with remote controls. Careful alignment of transmitter and receiver is required. Fig 10 shows how a network might use point-to-point infrared transmission.

Fig 10



Broadcast : Broadcast infrared systems spread the signal to cover a wider area and allow reception of the signal by several receivers. One of the major advantage is mobility; the workstations or other devices can be moved more easily than with point-to-point infrared media. Fig 11 shows how a broadcast infrared system might be used.

Because broadcast infrared signals are not as focussed as point-to-point, this type of system cannot offer the same throughout. Broadcast infrared is typically limited to less than 1 Mbps, making it too slow for most network needs.

Network adapters, sometimes called Network Interface Cards (NICs) are peripheral cards that plug into the motherboard of your computer and into a network cable. It is through the network adapter that your computer communicates on the network. Many newer IBM-compatible computers have built-in networking adapters for Ethernet.

Network adapters perform all the functions required to communicate on a network. They convert data from the

form stored in the computer to the form transmitted or received (or transceived) on the cable and provide a physical connection to the network.

Fig 11

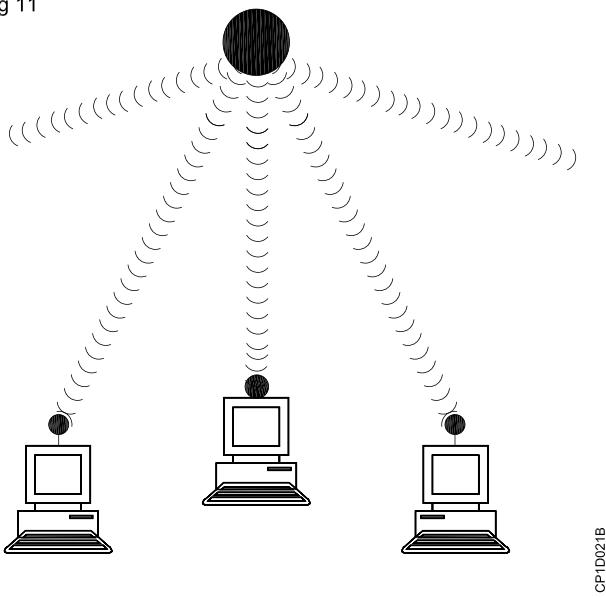
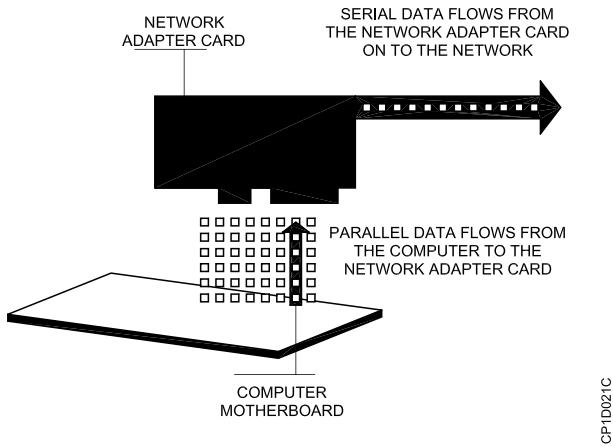


Fig 12 shows how an adapter plugs into a computer and attaches to a network cable.

Fig 12



Adapters in Abstract: Your computer software does not have to be aware of how the network adapter performs its function because the network driver software handles all the specifics for your computer. The applications running on your computer need only address data and hand it to the adapter card.

This is much the way the post office or a parcel delivery service works. You don't care about the details of postal delivery; you simply address your parcel and hand it to the delivery driver. The postal service manages the process of delivering it for you.

This abstraction allows your computer to use a microwave radio transmitter just as easily as a fiber-optic network adapter or an adapter that works over coaxial cable.

Everything in your computer remains the same except for the actual network adapter and the driver software for that adapter.

How network adapters work : Network adapters receive the data to be transmitted from the motherboard of your computer into a small amount of RAM called a buffer. The data in the buffer is moved into a chip that calculates a checksum value for the chunk and adds address information, which includes the address of the destination card and its own address, which indicates where the data is from. Ethernet adapter addresses are permanently assigned when the adapter is made at the factory. This chunk is now referred to as a frame.

For example, in Ethernet, the adapter listens for silence on the network when no other adapters are transmitting. It then begins transmitting the frame one bit at a time, starting with the address information, then the chunk of data and then the checksum.

The network adapter must still convert the serial bits of data to the appropriate media in use on the network. For instance, if the data is being transmitted over optical fiber, the bits are used to light up an infrared LED (light emitting diode) or laser diode, which transmits light pulses down the fiber to the receiving device's APD (avalanche photo diode) or photo-transistor. If the data is being sent over twisted-pair cable, the adapter must convert the bits of data from the 5-volt logic used in computers to the differential logic used for digital twisted-pair transmission.

The circuitry used to perform this media conversion is called a transceiver. Ethernet is the same no matter what type of media you use only the transceiver changes. Transceivers can be external devices attached through the AUI port on an Ethernet adapter, or they can be internal on the card. Some cards (usually called combo cards) have more than one type of transceiver built in so you can use them with your choice of media. AUI interfaces on Ethernet adapters are not transceivers—they are where you attach a transceiver for the different media types.

Because a network signal travels through copper and optical fiber at about 66 percent as fast as the speed of light, there's a chance that one of two adapters far away from each other could still be hearing silence when the other has in fact started transmitting. In this case, they could transmit simultaneously and garble their data. This is referred to as a collision.

While adapters transmit, they listen to the wire to make sure the data on the line matches the data being transmitted. As long as it does, everything is fine. If another adapter has interrupted, the data being, "heard" by the transmitting network adapter will not match the data being transmitted. If this happens, the adapter ceases transmitting and transmits a solid on state instead, which indicates to all computers that it has detected a collision and that they should discard the current frame because it has been corrupted. The network adapter waits a random amount of time and then again attempts to transmit the frame.

Configuring network adapters : Because network adapters have not been around since computers were invented, there is no assigned place for cards to be set to. Most adapter cards require their own interrupt, port address and upper memory range. PCI motherboards automatically assign IRQ and port settings to your PCI card, so you don't need to worry about it.

Unfortunately, network adapters in computers with ISA buses can conflict with other devices, since no two devices

should share the same interrupt or port. No software that comes with your computer will tell you every interrupt and port in use unless your computer is already running Windows NT, so you must be somewhat familiar with the hardware in your computer or use a program that can probe for free resources to find one. Many adapters have test programs that can tell you whether the adapter is working correctly with the settings you've assigned.

Computer name and workgroup - Client server

Objectives : At the end of this lesson you shall be able to

- define computer name
- define workgroup
- explain client-server model, centralised computing and client computing with central file storage
- explain web server.

Computer Name: In network computers are identified by its IP Address, but a name can also be given to identify it easily as remembering IP address is difficult comparing remembering a alphanumeric name.

Client-Server : The term Client-Server can describe hardware, in which case it is referring to network servers and client computers, or it can refer to a way of organising software applications and services on a network. Client-server computing is a powerful way of constructing programs on a network. In order to describe its advantage and how it works, we will first describe two alternatives to client-server computing:

- Centralised computing
- Client computing with central file storage

Centralized computing : Centralized computing originated with mainframe computers and time-sharing. The principle behind centralized computing is that a central computer executes a program, such as a database or a transaction-processing program (for instance, an airline reservations system or a bank records program) and remote terminals merely display data on a screen and convey keyboard data back to the central computer.

In modern networks, personal computers can perform the role of dumb terminals. With Windows software, the PC can appear to the central computer as many terminals, each virtual terminal accessing different data or performing a separate transaction on the mainframe.

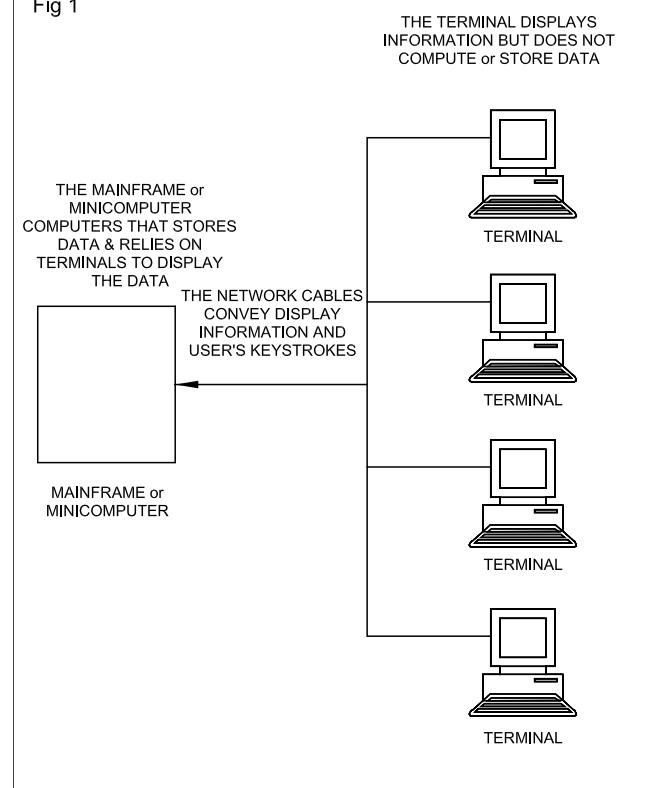
In centralized computing it is the central computer that does all the work. The data resides on the central computer and the program executes on the central computer. The personal computer or dumb terminal only display screen data and accepts keystrokes for the central computer to process. Centralized computing does not fully use the capabilities of today's powerful network clients. Fig 1 illustrates centralized computing.

Client computing with Central file storage : At the opposite end of the spectrum from centralized computing is client computing with central file storage (see Fig 2). In this way of organizing an application, the client computer does all the work. A central file server stores, but that is all.

Workgroup: In a network computers can be grouped together by using workgroup feature. Computers in a particular workgroup will show together when you open a workgroup. Though a computer of one workgroup can access other workgroup computers also.

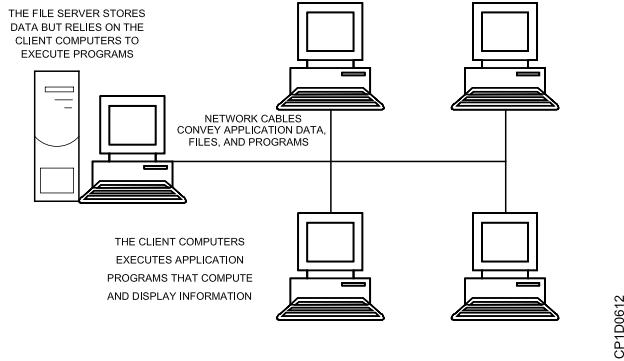
Client computers cooperate to ensure that central files are not corrupted by attempts by several computers to access them at the same time. When a client computer needs to perform an operation, the file is transferred to the client computer to perform the operation. Two examples of this type of application are networked database programs that do not use a SQL. (Structured Query Language) server and any network-aware application that does not communicate with a special program executing on the server, such as network scheduling programs and groupware.

Fig 1



CP1D0611

Fig 2

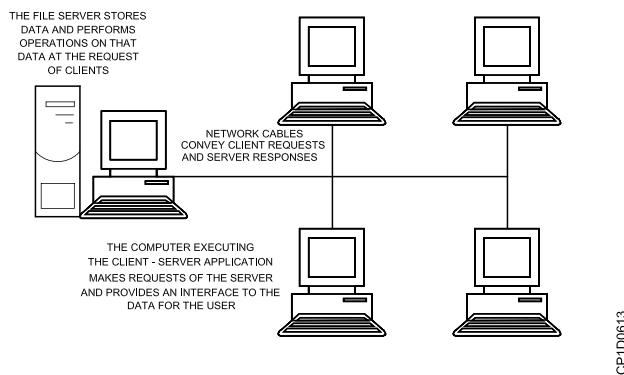


While it is fully exploits the capabilities of client computers and provides a richer and more customizable environment for the user, this type of program can place heavy demands on the network if the data files in which program works with are large. It also takes time to transmit data from the server to the client, process the data, and transfer it back to the server so other network programs can access the data.

The Client-Server Model : The client-server model combines the advantages of both the centralized computing model and the client model of computing. It does this by performing the operations that are best executed by a central computer on the file server and performing those operations that are best done close to the user on the client computer (see Fig 3). The client-server model works best when many people need access to large amounts of data. Simply stated, a client-server system is any system in which the client computer makes a request over a network to a server computer that then satisfies the request.

The Client : When you use a client-server system, what you see is the client, or front end. It presents the interface to manipulate or search for data. The request you make by manipulating windows, menu, check boxes and so on, is translated into a compact form that the client transmits over the network for the server to perform.

Fig 3



One example of a front end is Microsoft Access when it is used with a SQL back end. (You can also use Access without a SQL back end.) Access displays tables in windows or in forms you can browse. It allows you to modify and search the tables in an easy-to-use graphical environment. All the actual data manipulation, however, occurs on the SQL server. Access translates all the database operations into SQL for the server to perform. The results of the operations are transmitted back to Access to display in an intuitive, graphical form.

SQL is not limited to database programs such as Microsoft Access. User programs such as Microsoft Excel can use SQL to query the back-end data-base server for values to use in spreadsheet calculations. Program tools allow custom programs to store and retrieve data in server-based databases. Query tools provide direct access to the SQL data.

The Server : The server is where data operations in a client-server system occur. The central computer can service many client requests quickly and efficiently, which is the traditional advantage of centralized computing. The central computer can also provide enhanced security by performing only authorized operations on the data.

Back-end database software is optimized to perform searches and sorts and the back-end computer is often more powerful than the front-end computer.

Web server : A web server is a program using the client/server model and the World Wide Web's Hyper Text Transfer Protocol (HTTP) serves the files that form web pages to web users.

Every computer on the internet that contains a web site must have a web server program. The most popular web servers are: The Microsoft's Internet Information Server (IIS) which comes with the Microsoft's Windows NT Server; Netscape Fast Track and Enterprises Servers and Apache, a web server for Unix-based operating systems. Other web servers include Novell's Web Server for users of its Netware Operating System and IBM's family of Lotus Domino Servers. Primarily for IBM's OS/390 and AS/400 customers.

Web servers often come as a part of a larger package of Internet related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files and building and publishing web pages. Consideration in choosing a web server include how well it works with the operating system and other servers, its ability to handle server side programming and publishing, search engine and site building tools that may come with it.

DHCP

Objectives : At the end of this lesson you shall be able to

- define DHCP
 - explain DHCP.
-

DHCP: Dynamic Host Control Protocol allows server computers to distribute dynamic IP address when the client establish connection to server. The server maintains a IP address pool and it offer some IP which is not already allotted to some other client. When client disconnects from server its IP then becomes free again and can be given to other client.

It is dynamic as same client can get different IP in different times. It is beneficial as requirement of IP address is less as all the clients are not always connected to server and its saves the time to allocate IP to each client manually.

Dynamic Host Configuration Protocol (DHCP) is a standard protocol defined by RFC 1541 (which is

superseded by RFC 2131) that allows a server to dynamically distribute IP addressing and configuration information to clients. Normally the DHCP server provides the client with at least this basic information:

- IP Address
- Subnet Mask
- Default Gateway

Other information can be provided as well, such as Domain Name Service (DNS) server addresses and Windows Internet Name Service (WINS) server addresses. The system administrator configures the DHCP server with the options that are parsed out to the client.

Concept of proxy server

Objectives : At the end of this lesson you shall be able to

- explain the meaning of proxy server
- explain common connection point
- explain packet filtering, domain filtering and control user access by service
- explain logging and web publishing.

What is a proxy server? To be a “proxy” means to act on behalf of another. This is exactly what a proxy server does; it acts on behalf of its proxy clients to interact with other servers. You could say that a proxy server is a “mediator” for computer communications.

Placing a proxy server on your network gives you several advantages, including security enhancements, caching enhancements and greater control over your network users. The advantages of using Microsoft Proxy Server (MPS) is listed below:

- Common connection point
- Caching
- Packet filtering
- Domain filtering
- Control user access by service
- Logging
- Web publishing

Common connection point : MPS was designed to connect two networks, rather like a gateway. Typically, MPS connects an internal network and the Internet. This configuration gives the internal computers a common connection point to the Internet-through MPS.

When used to provide a common connection, MPS lets clients share a single connection to the Internet. Instead of giving each user on a Local Area Network (LAN) a separate modem, phone line and dial-up account to the Internet, MPS can function as a gateway to the Internet using a single connection. Instead of using separate standard phone line connections, users can share a single higher-speed connection through the proxy server. The net effect is usually an overall cost savings and reduction in administrative overhead. One connection is usually cheaper and easier to maintain than several separate connections.

Caching : Since you can use MPS as a common connection point to the Internet, you can also use it to cache frequently accessed resources. MPS allocates a portion of the server's hard disk space to store frequently accessed objects.

Caching can either be passive or active. Passive caching just stores objects as they are requested so the cache is updated only when users request information. Active caching directs the server to refresh objects in the cache automatically.

You can selectively control MPS caching so that you can limit the size of cached objects, change the expiration limits (control the freshness of objects) and determine whether MPS always caches or always excludes from cache certain content.

Caching only works with the Web Proxy Service in MPS. You will learn more about the Web Proxy Service later in this chapter.

Packet Filtering : To protect internal users from the outside world (in other words to protect the network from outsiders), MPS provides packet-filtering services. A packet filter prevents unauthorized access from the outside by limiting the available connection points coming into the network. To that end, packet filters stop various types of protocols from entering the network.

MPS supports both static and dynamic packet filters. A static filter keeps all traffic of a certain description or type from passing through MPS. A dynamic packet filter automatically determines which type of traffic is allowed in or out. With a static filter the administrator defines the port, the protocol and maybe the IP address. With a dynamic filter the administrator just defines the service to be allowed or filtered.

Domain Filtering : MPS also lets you limit the access of your internal clients to the Internet. You can configure filters for a single computer, a group of computers or a domain name. Many companies prefer to have this type of control over their users because they can block access to Internet sites that they believe reduce employee productivity or contain offensive material. Some popular examples of domain filtering are blocking access to Internet game servers or Web sites that contain pornographic material.

You can configure domain filters for a specific IP address, IP address and subnet mask or domain name. IP address filters prevent users from contacting a single computer. Using the IP address and subnet mask as a filter limits access to an entire group (a subnet) of computers. Domain name filters can apply to an entire Web site or to subsections of that site.

Control user access by Protocol or Service : You can also selectively enable and disable ports, services and protocols through MPS. MPS lets you control access to Internet services at the user level. You can also enable or restrict access to protocols on a user or group basis. Many protocols are predefined in the default MPS configuration.

If the protocol or service you would like to enable or disable is not defined in the MPS property sheets, you can create a new sheet. You can define a protocol by TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) port number or range. This gives you the ability to control access by port.

Logging : Because all traffic between networks passes through MPS, MPS has the unique opportunity to log and track communication. You can track the information your internal clients get from other networks or the Internet and monitor inbound communication. You can use this information to help you secure your internal network from attack and unauthorized access. Plus, you can monitor where your users spend their time on the Internet and what information they are downloading.

Web publishing : MPS can also act as a Web server. MPS can service requests from cache on behalf of a Web server, pass requests to the Web server on the local system or pass requests to another Web server on the internal network. The terms "reverse proxying" and "reverse hosting" describe the Web Publishing services that MPS provides.

As a reverse proxy, MPS listens to incoming Web requests for a single Web server on the local network. The incoming requests are simply forwarded to another Web server. Web hosting requires more work on the part of MPS. As a reverse host, MPS can send requests to one of many Web servers. In this case, MPS responds as if the entire site were contained locally, even though the actual data may be coming from several different Web servers.

The main difference between reverse proxying and reverse hosting is that in performing reverse proxying, MPS forwards all requests to the Web server. In performing reverse hosting, MPS selectively forwards requests to multiple Web servers on the internal network. In reverse hosting, the Microsoft Proxy Server routes an external request for a resource (that specifies an Internet domain name) to one or more internal Web servers. For instance, requests for <http://www.hudlogic.com/bios> might be routed to an internal server named "business" (<http://business>), while requests for <http://www.hudlogic.com/pictures> could be sent to a different Web server named "server1" (<http://server1>).

Services : Microsoft Proxy Server 2.0 supports Hypertext Transfer Protocol (HTTP) version 1.1, Windows Sockets version 1.1, SOCKS version 4.3a and Secure Sockets Layer (SSL) 3.0. The MPS services that provide this support are the Web Proxy service, WinSock Proxy service and the SOCKS Proxy service, respectively.

Web Proxy Service : The Web Proxy service provides support for HTTP (a.k.a. Web publishing), FTP, Gopher and secure (SSL) communications. The Web Proxy service works with any CERN-compliant Web browser, such as Internet Explorer or Netscape Navigator. Because the Web Proxy supports only these widely adopted Internet standard communication methods, it isn't operating system dependent. Clients running Unix, Macintosh or Windows operating systems can communicate with the Web Proxy service as long as they're configured with a CERN-compliant Web browser.

Any operating system using a CERN-compliant Web browser can communicate through the Web Proxy server, regardless of its underlying operating system.

WinSock Proxy Service : The WinSock Proxy service supports Microsoft Windows operating systems using Windows Sockets. This support is available for both Transmission Control Protocol/internet Protocol (TCP/IP) and Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocols. The WinSock Proxy service applies mainly to Windows clients including Windows 3.x, Windows 95 and Windows NT.

Windows Sockets is an interprocess communication mechanism derived from the Berkeley Sockets interface (originally designed for Unix systems). The Sockets interface was extended to support Windows-based clients running Microsoft implementations of TCP/IP. The name given to this Sockets interface for Windows was WinSock (for Windows Sockets).

The WinSock Proxy Service doesn't support 16-bit IPX/SPX clients such as the Windows 3.x 16-bit Netware clients.

SOCKS Proxy Service : The SOCKS Proxy service supports SOCKS version 4.3a client applications such as FTP, Gopher and Telnet. Operating systems like Macintosh and Unix can run SOCKS 4.3a and access the SOCKS Proxy service when communicating through the Microsoft Proxy Server. One limitation of the SOCKS proxy service on MPS is that it does not support UDP-based protocols.

UDP-based protocols aren't supported through the SOCKS Proxy service, but the WinSock Proxy service does support UDP for Windows clients.

Video conferencing

Objectives: At the end of this lesson you shall be able to

- define video conferencing
- list the advantages of video conferencing
- list the disadvantages of video conferencing.

Video Conferencing

Definition: Videoconferencing is the conduct of a conference by a set of telecommunication technologies which allow two or more remotely located teams to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Video conferencing is a very useful technique to cut down various costs as well as travel time when meetings and conferences are concerned. Video conferencing connects individuals in real time through audio and video communication over broadband networks. It enables visual meetings and collaboration on digital documents and shared presentations. New technologies allow participants to connect remotely over a network through multiple devices like laptops, desktops, smartphones and tablets.

Advantages

- 1 Significant Travel Savings
- 2 Not only is video conferencing a direct replacement for many in-person business trips, but because there is virtually no cost to add additional key employees to a virtual meeting, it is a cost effective solution.
- 3 Improved Communication
- 4 Audio conferencing and e-mail may be used for communication but there is a lack of visual connection

and eye contact in these. Video conferencing allows users to successfully convey, creating essential social bonds and shared understandings.

- 5 Increased Productivity
- 6 Important meetings are shorter and more effective. But it is a well-known fact that many meetings take longer than the necessary time of the participants. Video conferencing users can save a minimum of two hours a week with the technology. The interactivity of group collaboration and document sharing greatly increases productivity.
- 7 Conferencing Quality
- 8 The present day state-of-the-art technology delivers excellent, reliable audio and video quality, making conferencing very effective and interesting too.

Disadvantages

- 1 Absence of Physical Presence
- 2 Initial installation costs
- 3 Not yet popular with a large size of users.

Network security

Objectives: At the end of this lesson you shall be able to

- **define network security**
- **explain network security concepts.**

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator.

Network security concepts

Network security refers to any activities designed to protect your network. Specifically, these activities protect the usability, reliability, integrity, and safety of your network and data. Effective network security targets a variety of threats and stops them from entering or spreading on your network.

Network security starts with authenticating, commonly with a username and a password. Since this requires just one detail authenticating the user name -i.e. the password- this is sometimes termed one-factor authentication. With two-factor authentication, something the user needs a 'dongle', an ATM card, or a mobile phone, and with three-factor authentication, something the user needs a fingerprint or retinal scan.

Once authenticated, a firewall decides what services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component may fail to check potentially harmful content such as computer worms or Trojans being transmitted over the network.

Anti-virus software or an intrusion prevention system (IPS) helps detect and inhibit the action of such malware.

Encrypting the communication between two hosts using a network helps maintain privacy.

Surveillance and early-warning tools sometimes referred to as Honeypots can be employed.

Honeypot is a trap set to detect, deflect, or, in some manner, counteract attempts at unauthorized use of information systems. Generally, a honeypot consists of a computer, data, or a network site that appears to be part of a network, but is actually isolated and monitored, and which seems to contain information or a resource of value to attackers. This is similar to the police baiting a criminal and then conducting undercover surveillance.

The Foundations of Security

Security relies on the following elements:

- **Authentication**

Authentication addresses the question: who are you? It is the process of uniquely identifying the clients of your applications and services. These might be end users, other services, processes, or computers. In security parlance, authenticated clients are referred to as principals.

- **Authorization**

Authorization addresses the question: what can you do? It is the process that governs the resources and operations that the authenticated client is permitted to access. Resources include files, databases, tables, rows, and so on, together with system-level resources such as registry keys and configuration data. Operations include performing transactions such as purchasing a product, transferring money from one account to another, or increasing a customer's credit rating.

- **Auditing**

Effective auditing and logging is the key to non-repudiation. Non-repudiation guarantees that a user cannot deny performing an operation or initiating a transaction. For example, in an e-commerce system, non-repudiation mechanisms are required to make sure that a consumer cannot deny ordering 100 copies of a particular book.

- **Confidentiality**

Confidentiality, also referred to as privacy, is the process of making sure that data remains private and confidential, and that it cannot be viewed by unauthorized users or eavesdroppers who monitor the flow of traffic across a network. Encryption is frequently used to enforce confidentiality. Access control lists (ACLs) are another means of enforcing confidentiality.

- **Integrity**

Integrity is the guarantee that data is protected from accidental or deliberate (malicious) modification. Like privacy, integrity is a key concern, particularly for data passed across networks. Integrity for data in transit is typically provided by using hashing techniques and message authentication codes.

- **Availability**

From a security perspective, availability means that systems remain available for legitimate users. The goal for many attackers with denial of service attacks is to crash an application or to make sure that it is sufficiently overwhelmed so that other users cannot access the application. Threats, Vulnerabilities, and Attacks Defined

A threat is any potential occurrence, malicious or otherwise, that could harm an asset. In other words, a threat is any bad thing that can happen to your assets.

A vulnerability is a weakness that makes a threat possible. This may be because of poor design, configuration mistakes, or inappropriate and insecure coding techniques. Weak input validation is an example of an application layer vulnerability, which can result in input attacks.

An attack is an action that exploits a vulnerability or enacts a threat. Examples of attacks include sending malicious input to an application or flooding a network in an attempt to deny service.

How Do You Build a Secure Web Application?

It is not possible to design and build a secure Web application until you know your threats. An increasingly important knowledge needed is about threat modeling. The purpose of threat modeling is to analyze your application's architecture and design and identify potentially vulnerable areas that may allow a user, perhaps mistakenly, or an attacker with malicious intent, to compromise your system's security.

After you know your threats, design with security in mind by applying proven security principles. You must follow secure coding techniques to develop secure, robust, and hack-resilient solutions. The design and development of application layer software must be supported by a secure network, host, and application configuration on the servers where the application software is to be deployed.

E-mail

Objectives : At the end of this lesson you shall be able to

- state the hotmail services offered
- explain MSN outlook express and its tools
- explain popular search engines
- state the FAQs about hotmail.

Hotmail: MSN Hotmail is the world's largest provider of free Web-based e-mail. Hotmail is based on the premise that e-mail access should be easy and possible from any computer connected to the World Wide Web.

By adhering to the universal HyperText Transfer Protocol (HTTP) standard, Hotmail eliminates the disparities that exist between different e-mail programs. Sending and receiving e-mail from Hotmail is as easy as going to the Hotmail web site at <http://www.hotmail.com>, or by clicking on the Hotmail link at <http://www.msn.com>, signing in, and sending an e-mail message.

Hotmail is the web-based e-mail provider, which means you can send and receive messages from any computer connected to the Internet. You can use Hotmail from home, work, school, an Internet cafe, a friend's house or any other computer in the world with an Internet connection. Your messages are stored in a central location, so your Inbox will always be up to date. This is great for people who use more than one computer, travel frequently, or don't even own a computer.

Advantages of Hotmail

Get a permanent e-mail address: When you create a Hotmail account, you choose a permanent e-mail address that will never change as long as you continue to use Hotmail. This is great for people who: Want to switch Internet Service Providers. Your Hotmail address will be the same no matter how you access the Internet, so you don't have to worry about retrieving messages from your old address or notifying friends, family and associates of a new e-mail address. You are free to select any Internet Service Provider that suits your needs.

When you leave town for travel, you may no longer have access to your ISP's e-mail account. But with Hotmail, your friends will always know where to reach you.

Your e-mail is private and secure: When you sign up for Hotmail, you choose your personal ID and password. The only way you can access your account is by using the password you selected. This means that only you will have access to your Hotmail account, even if you use a computer at a public terminal or a friend's house. Because the messages in your Hotmail account are stored securely at a central location, you don't have to worry about losing important information if something happens to your computer. Hotmail is strongly committed to keeping your personal information confidential.

Hotmail is fast and easy to use: Hotmail is recognized world wide as the best Web-based e-mail service. It is also stated that 'while others provide similar services, none can match Hotmail's general ease of use'. If everything is fine, it takes less than a minute to get started on Hotmail and its pages are so worked out to load quickly knowing that the users time is valuable.

Get an additional e-mail account for FREE: Hotmail offers everyone the opportunity to get a free e-mail account. Hotmail can offer e-mail accounts for free because it places banner advertising on some of its pages. Some Internet Service Providers charge a monthly fee for additional e-mail accounts. Hotmail lets an unlimited number of people use a single Internet Service Provider account and have a free, personal e-mail account.

Keep your personal e-mail separate from your work e-mail: People who use e-mail for work will find it convenient to keep their personal messages separate from their work messages. You can use Hotmail for your personal correspondence and your company's e-mail system only for business messages. Additionally, you don't have to store personal e-mail on your company's servers. All messages in your Hotmail account are securely stored in a central location that you access via the Internet with the password you select.

Outlook Express

Microsoft Outlook Express puts the world of online communication on your desktop. Whether you want to exchange e-mail with colleagues and friends or join newsgroups to trade ideas and information. Some of the tools offered by outlook express are;

Manage multiple mail and news accounts: If you have several mail or news accounts, you can use them all from one window. You can also create multiple users, or identities, for the same computer. Each identity gets its own mail folders and Address Book. The ability to create multiple accounts and identities makes it easy for you to keep work separate from personal mail and also between individual users.

Browse through messages quickly & easily: Using the message list and preview pane, you can view a list of messages and read individual messages at the same time. The Folders list contains mail folders, news servers, and newsgroups, and you can easily switch between them. You can also create new folders to organize and sort messages, and then set up message rules so that

incoming mail that meets your criteria automatically goes to a specific folder. You can also create your own views to customize the way you look at your mail.

Keep your mail on a server so you can view it from more than one computer: If your ISP uses an IMAP mail server for incoming mail, you can read, store, and organize your messages in folders on the server without downloading the messages to your computer. That way, you can view messages from any computer that can connect to that server.

Use the Address Book to store and retrieve e-mail addresses: You can save names and addresses in your Address Book automatically by simply replying to a message or by importing them from other programs, by typing them in, by adding them from e-mail messages you receive, or by searching popular Internet directory services (white pages). The Address Book supports Lightweight Directory Access Protocol (LDAP) for accessing Internet directory services.

Add a personal signature or stationery to your messages: You can insert essential information into outgoing messages as part of your personal signature, and you can create multiple signatures to use for different purposes. For more detailed information, you can include a business card. To make your messages look more attractive, you can add stationery patterns and backgrounds, and you can change the color and style of the text.

Send and receive secure messages: You can digitally sign and encrypt messages by using digital IDs. Digitally signing your message assures recipients that the message is really from you. Encryption ensures that only intended recipients can read a message.

Find newsgroups that interest you: Looking for a newsgroup that matches your interests? You can search for newsgroups that contain keywords or browse through all of the newsgroups available from your Usenet provider. When you find a newsgroup you want to view regularly, add it to your Subscribed list so you can find it again easily.

View newsgroup conversations efficiently: You can view a newsgroup message and all of the responses without reading an entire message list. When you view the list of messages, you can expand and collapse conversations to make it easier to find what interests you. You can also use views to display only the messages you want to read.

Download newsgroup messages for offline reading: To use your online time efficiently, you can download messages or entire newsgroups, so you don't have to be connected to your ISP to read messages. You can also download message headers only for offline viewing and then mark the headers of the messages you want to read; then the next time you are connected, Outlook Express downloads the message text. You can also compose messages offline and send them the next time you reconnect.

Some important (Top 8) recommendations for staying safe and secure when you're online are listed below;

- Change your password often. The quick act of changing your password can ensure your e-mail remains private. In addition, passwords that use both letters and numbers are harder to break.
- Don't share your password. Most e-mail administrators will not ask for your password. Do not be duped by malicious e-mails asking you for your password. This is a well-known, although not-too-common trick designed to fool you into sharing your password. As a rule, never share it with anyone.
- Never open attachments from unknown sources. They may contain what are known as "letterbombs" or "viruses," which can damage your PC.
- Always remember to sign out when you are done. It's quick, easy and may save your account from unwanted trespassers. If you are using a public terminal, at an internet cafe for example, it is advised that you close the browser you were using when you are ready to end your Internet session.
- Don't reply to unsolicited messages ("spam") mail, or other harassing or offensive mail. By responding, you only confirm that you are a person with an active e-mail address who can be plagued with constant unwanted e-mail solicitations. Instead, forward the unsolicited message to the customer service department of the source's e-mail (usually of a form similar to abuse@[implicateddomain].com). To help control spam, Hotmail provides members with "filters" for incoming mail. These can easily be set up to send certain messages (such as those that include certain words) directly to your online trash can.
- Make sure that you are using the most up-to-date Internet software (e.g. browsers such as Microsoft Internet Explorer or Netscape Navigator). More recent versions often offer enhanced security protection.
- Always use a secure network. Most corporate networks and Internet service providers are protected by administrators who watch for potential security problems and act to protect users from "hackers" (malicious users) who may try to steal personal information that is transferred through the network. Although the risk is small, use caution when on any unfamiliar network.
- Use stations maintained by sources you trust, or ask if the Internet terminal you are using is protected against security break-ins.

A SMALL LIST OF Search Engines

Yahoo.com (<http://www.Yahoo.com>)

Search.com (<http://search.com>)

EasySearcher (<http://www.easysearcher.com>)

AltaVista (<http://www.altavista.com>)

Excite (<http://www.excite.com>)

Google (<http://www.google.com>)
Hotbot (<http://www.hotbot.com>)
Infoseek (<http://www.infoseek.com>)
Lycos (<http://www.lycos.com>)
WebCrawler (<http://www.webcrawler.com>)
www.all4one.com (This useful tool queries four search engines at once)
www.av.com (Very powerful search engine which gives plenty of results)
www.askjeeves.com (Instead of entering words to search for, just type in your question)
www.rediff.com (Search for anything)
www.bigfoot.com (Looking for someone's email address ? Try here)
www.sawaal.com (All your questions answered)
www.hotbot.com (Useful search engine which helps to find pictures, video or music)
www.indiainfo.com (Info lets you search the web easily)
www.yahoo.com (Search engine which is also the most popular)
mp3.lycos.com (The place to start if you're after music files in the mp3 format)
www.metacrawler.com (Metacrawler puts your search through a host different engines)
www.mirago.co.uk (A search engine with an excellent selection of shopping links)
www.webferret.com (One of the easiest way to search the web)
www.indiatimes.com (The portal's search engine)
www.webcrawler.com (Let the webcrawler spider to do the searching for you)
www.indonet.net (Excellent Indian search engine with loads of useful search categories)
www.satyamonline.com (On ISP's site and has good search options)

COMPILED LIST OF INTERESTING FAQ's about HOTMAIL

1 How much e-mail storage space do I get with Hotmail?

Hotmail offers 2MB of storage space. If you do not keep your account below this limit, Hotmail may remove some messages, which cannot be recovered.

If you need additional storage space, there are a few options. You can use the latest version of Microsoft Internet Explorer v5 or above, which includes Outlook Express, which offers you the ability to store e-mails locally. You can send a blank e-mail message to hmoex@hotmail.com for more information on how to use the beta (pre-release) process to store Hotmail messages on your local PC, using Outlook Express.

Also, MSN has introduced Preview 2 of MSN Explorer as an integrated client for MSN services, such as MSN Hotmail. This client allows you to also store Hotmail locally on your machine. This too reduces the amount of storage that you need on hotmail.

2 Can I get Hotmail in different languages?

MSN Hotmail can now be viewed in a variety of languages.

You can make the language of a Hotmail session match the language of the Sign In page used to begin that session. You have your choice of the following languages: English, French, German, Italian, Japanese, Portuguese (Brazilian), and Spanish, and more to come.

3 Can I use Hotmail as a business address?

No. You may not use your Hotmail address as your primary business address. If, however, you work for a company with which you have an e-mail address and you want to use your Hotmail account to send and receive e-mail while away from your computer at work, you are encouraged to do so.

Example of Prohibited Use:

You are an individual who runs a business. You and your employees want to use Hotmail accounts rather than registering and administering your account through a paid ISP.

Example of Allowed Use:

You are a businessperson who travels. You have an account with your company (**yourname@yourcompany.com**). You use your Hotmail account to read and send solicited messages while you are traveling.

Hotmail prohibits account sharing. Since Hotmail is accessible from everywhere in the world, each individual is able to sign up for his or her own personal account. You are encouraged to sign up for an account of your own, to which only you have access. Sharing an account compromises the privacy and security of your e-mail. Each Hotmail user must have his or her individual e-mail account.

4 Is my e-mail really private and secure? (SSL)?

Secure connections (often called SSL, or Secure Sockets Layer) is the industry standard in Web security. It is used primarily for transmitting sensitive information over the Internet. When you have a secure connection between your browser and a Web site, no one else can easily access the data that you send across the connection. Hotmail uses SSL to encrypt your sign-in name, and password, when you log in to give you a high level of security.

It is Hotmail's policy to respect the privacy of its users. Therefore, Hotmail will not monitor, edit, or disclose the contents of a user's private communications unless required to do so by law or in the good faith belief that such action is necessary to:

- conform to the edicts of the law or comply with legal process served on Hotmail;
- protect and defend the rights or property of Hotmail; or
- act under exigent circumstances to protect the personal safety of its users or the public.

5 Can Hotmail protect its users from e-mail viruses?

MSN Hotmail is pleased to offer users McAfee VirusScan for free. Whenever you receive attachments in your Hotmail account, it will automatically scan them with McAfee's popular VirusScan before downloading.

MSN Hotmail recently added the ability to have all attachments you want to send scanned before they can be attached to your outgoing e-mail. So before you upload file to send to another user, it will also be scanned for viruses before you send it, reducing the spread of viruses to Hotmail users and the other recipients of your e-mail.

Remember, to ensure safety, Hotmail recommends that you never open attachments from unknown sources.

6 How do I send images and use e-mail stationery to make e-mail I send more colorful and fun?

(Emoticons/Stationery/RTF)

MSN Hotmail offers users stationery to send fun, colorful messages to family and friends! Always capture the right mood for your messages by selecting one of the many different stationery templates. Use the Stationery Chooser button on the Compose page to view the available stationery choices.

You can also accent your messages by using Rich Text Formatting. The Rich Text Formatting option, also allows you to add emoticons to your e-mail. This new feature allows you to add selected symbols or emoticons to your message. These icons help you convey emotion or add flair within a message.

7 What does it mean when my account is marked "inactive"?

Currently, if you do not sign in to your Hotmail account for 60 days, or if you do not sign-in within the first 10 days, your account will be marked "inactive." Stored e-mail and addresses will be deleted, and inbound mail will be refused. Your Passport will still function, and your Hotmail e-mail name will be reserved. To re-activate your account, simply go to <http://www.hotmail.com> and enter your Sign-In name and password. You will then be able to once again send and receive e-mail using hotmail. If your account stays "inactive" for over a period of 90 days, it may be permanently deleted.

8 Can I send and receive attachments on Hotmail?

Yes, you can send and receive as many files as you want to a message - up to 1MB (1024K) of attachments.

Attachments sent to your Hotmail account can be downloaded to your personal computer by clicking them. GIF and JPEG images and HTML files are automatically displayed in the browser window.

Chatting, video chatting and using social network sites

Objectives : At the end of this lesson you shall be able to

- explain chating process
- explain video chating process
- explain social network services.

Chatting Process

A web chat is a system that allows users to communicate in real time using easily accessible web interfaces. It is a type of internet online chat distinguished by its simplicity and accessibility to users who do not wish to take the time to install and learn to use specialized chat software. This trait allows users instantaneous access and only a web browser is required to chat. Users will always get the latest version of a chat service because no software installation or updates are required.

Video Chat

In video chat video of both caller and receiver can be seen on screen of both user along with audio. So it gives an impression of face to face interaction though the caller and receiver can be thousands of mile apart.

Social Networking services

A social networking service is a platform to build social networks or social relations among people who, share interests, activities, backgrounds or real-life connections. A social network service consists of a representation of each user (often a profile), his social links, and a variety of additional services. Social networking is web-based services that allow individuals to create a public profile, to create a list of users with whom to share connection, and view and cross the connections within the system. Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Social network sites are varied and they incorporate new information and communication tools such as, mobile connectivity, photo/video/sharing and blogging. Online community services

are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, pictures, posts, activities, events, interests with people in their network.

The main types of social networking services are those that contain category places (such as former school year or classmates), means to connect with friends (usually with self-description pages), and a recommendation system linked to trust. Popular methods now combine many of these, with American-based services such as Facebook, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr and Twitter widely used worldwide; Nexopia in Canada; Badoo, Bebo, Vkontakte (Russia), Delphi (also called Delphi Forums), Draugiem.lv (mostly in Latvia), Hi5 (Europe), Hyves (mostly in The Netherlands), iWiW (mostly in Hungary), Nasza-Klasa, Soup (mostly in Poland), Glocals in Switzerland, Skyrock, The Sphere, StudiVZ (mostly in Germany), Tagged, Tuenti (mostly in Spain), and XING in parts of Europe; Hi5 and Orkut in South America and Central America; Mxit in Africa; and Cyworld, Mixi, Orkut, renren, weibo and Wretch in Asia and the Pacific Islands.

There have been attempts to standardize these services to avoid the need to duplicate entries of friends and interests (see the FOAF standard and the Open Source Initiative). According to experts, the largest social networking users are Asian-Pacific regions with 615,9 million people. A 2013 survey found that 73% U.S adults use social networking sites.

Explaining threats to computers connected to Internet & process of protecting computers from it.

Objectives : At the end of this lesson you shall be able to

- **explain threats to computers connected to Internet**
- **process of Protecting computers from Internet.**

A web threat is any threat that uses the World Wide Web to facilitate cybercrime. Web threats use multiple types of malware and fraud, all of which utilize HTTP or HTTPS protocols, but may also employ other protocols and components, such as links in email or IM, or malware attachments or on servers that access the Web. They benefit cybercriminals by stealing information for subsequent sale and help absorb infected PCs into botnets.

Web threats pose a broad range of risks, including financial damages, identity theft, loss of confidential information/data, theft of network resources, damaged brand/personal reputation, and erosion of consumer confidence in e-commerce and online banking.

It is a type of threat related to information technology (IT). The IT risk, i.e. risk affecting has gained and increasing impact on society due to the spread of IT processes.

Web threats can be divided into two primary categories, based on delivery method - push and pull. Push-based threats use spam, phishing, or other fraudulent means to lure a user to a malicious (often spoofed) website which then collects information and/or injects malware. Push attacks use phishing, DNS poisoning (or pharming), and other means to appear to originate from a trusted source.

Precisely-targeted push-based web threats are often referred to as spear phishing to reflect the focus of their data gathering attack. Spear phishing typically targets specific individuals and groups for financial gain. In other push-based web threats, malware authors use social engineering such as enticing subject lines that reference holidays, popular personalities, sports, pornography, world events and other hot topics to persuade recipients to open the email and follow links to malicious websites or open attachments with malware that accesses the Web.

Pull-based web threats are often referred to as "drive-by" threats by experts (and more commonly as "drive-by downloads" by journalists and the general public), since they can affect any website visitor. Cybercriminals infect legitimate websites, which unknowingly transmit malware to visitors or alter search results to take users to malicious websites. Upon loading the page, the user's browser passively runs a malware downloader in a hidden HTML frame (IFRAME) without any user interaction.

Internet security

Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet. The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing. Different methods have been used to protect the transfer of data, including encryption.

Types of security

Network layer security

TCP/IP which stands for Transmission Control Protocol (TCP) and Internet Protocol (IP) aka Internet protocol suite can be made secure with the help of cryptographic methods and protocols. These protocols include Secure Sockets Layer (SSL), succeeded by Transport Layer Security (TLS) for web traffic, Pretty Good Privacy (PGP) for email, and IPsec for the network layer security.

Internet Protocol Security (IPsec)

This protocol is designed to protect communication in a secure manner using TCP/IP aka Internet protocol suite. It is a set of security extensions developed by the Internet Task force IETF, and it provides security and authentication at the IP layer by transforming data using encryption. Two main types of transformation that form the basis of IPsec: the Authentication Header (AH) and ESP. These two protocols provide data integrity, data origin authentication, and anti-replay service. These protocols can be used alone or in combination to provide the desired set of security services for the Internet Protocol (IP) layer.

The basic components of the IPsec security architecture are described in terms of the following functionalities:

- Security protocols for AH and ESP
- Security association for policy management and traffic processing
- Manual and automatic key management for the internet key exchange (IKE)
- Algorithms for authentication and encryption

The set of security services provided at the IP layer includes access control, data origin integrity, protection against replays, and confidentiality. The algorithm allows these sets to work independently without affecting other parts of the implementation. The IPsec implementation is operated in a host or security gateway environment giving protection to IP traffic.

Security token

Some online sites offer customers the ability to use a six-digit code which randomly changes every 30-60 seconds on a security token. The keys on the security token have built in mathematical computations and manipulate numbers based on the current time built into the device. This means that every thirty seconds there is only a certain array of numbers possible which would be correct to validate access to the online account. The website that the user is logging into would be made aware of that devices' serial number and would know the computation and correct time built into the device to verify that the number given is indeed one of the handful of six-digit numbers that works in that given 30-60 second cycle. After 30-60 seconds the device will present a new random six-digit number which can log into the website.

Electronic mail security (E-mail)

Background

Email messages are composed, delivered, and stored in a multiple step process, which starts with the message's composition. When the user finishes composing the message and sends it, the message is transformed into a standard format: an RFC 2822 formatted message. Afterwards, the message can be transmitted. Using a network connection, the mail client, referred to as a mail user agent (MUA), connects to a mail transfer agent (MTA) operating on the mail server. The mail client then provides the sender's identity to the server. Next, using the mail server commands, the client sends the recipient list to the mail server. The client then supplies the message. Once the mail server receives and processes the message, several events occur: recipient server identification, connection establishment, and message transmission. Using Domain Name System (DNS) services, the sender's mail server determines the mail server(s) for the recipient(s). Then, the server opens up a connection(s) to the recipient mail server(s) and sends the message employing a process similar to that used by the originating client, delivering the message to the recipient(s).

Pretty Good Privacy (PGP)

Pretty Good Privacy provides confidentiality by encrypting messages to be transmitted or data files to be stored using an encryption algorithm such Triple DES or CAST-128. Email messages can be protected by using cryptography in various ways, such as the following:

- Signing an email message to ensure its integrity and confirm the identity of its sender.
- Encrypting the body of an email message to ensure its confidentiality.

- Encrypting the communications between mail servers to protect the confidentiality of both message body and message header.

The first two methods, message signing and message body encryption, are often used together; however, encrypting the transmissions between mail servers is typically used only when two organizations want to protect emails regularly sent between each other. For example, the organizations could establish a virtual private network (VPN) to encrypt the communications between their mail servers over the Internet. Unlike methods that can only encrypt a message body, a VPN can encrypt entire messages, including email header information such as senders, recipients, and subjects. In some cases, organizations may need to protect header information. However, a VPN solution alone cannot provide a message signing mechanism, nor can it provide protection for email messages along the entire route from sender to recipient.

Multipurpose Internet Mail Extensions (MIME)

MIME transforms non-ASCII data at the sender's site to Network Virtual Terminal (NVT) ASCII data and delivers it to client's Simple Mail Transfer Protocol (SMTP) to be sent through the Internet. The server SMTP at the receiver's side receives the NVTASCII data and delivers it to MIME to be transformed back to the original non-ASCII data.

Message Authentication Code

A Message authentication code (MAC) is a cryptography method that uses a secret key to encrypt a message. This method outputs a MAC value that can be decrypted by the receiver, using the same secret key used by the sender. The Message Authentication Code protects both a message's data integrity as well as its authenticity.

Firewalls

A firewall (computing) controls access between networks. It generally consists of gateways and filters which vary from one firewall to another. Firewalls also screen network traffic and are able to block traffic that is dangerous. Firewalls act as the intermediate server between SMTP and Hypertext Transfer Protocol (HTTP) connections.

Role of firewalls in web security

Firewalls impose restrictions on incoming and outgoing Network packets to and from private networks. Incoming or outgoing traffic must pass through the firewall; only authorized traffic is allowed to pass through it. Firewalls create checkpoints between an internal private network and the public Internet, also known as choke points(borrowed from the identical military term of a combat limiting geographical feature). Firewalls can create choke points based on IP source and TCP port number. They can also serve as the platform for IPsec. Using tunnel mode capability, firewall can be used to implement VPNs. Firewalls can also limit network

exposure by hiding the internal network system and information from the public Internet. Also, WE HAVE A LOT OF BIG WAYE to deal with it.

Types of firewalls

Packet filter

A packet filter is a first generation firewall that processes network traffic on a packet-by-packet basis. Its main job is to filter traffic from a remote IP host, so a router is needed to connect the internal network to the Internet. The router is known as a screening router, which screens packets leaving and entering the network.

Stateful packet inspection

In a stateful firewall the circuit-level gateway is a proxy server that operates at the network level of an Open Systems Interconnection (OSI) model and statically defines what traffic will be allowed. Circuit proxies will forward Network packets (formatted unit of data) containing a given port number, if the port is permitted by the algorithm. The main advantage of a proxy server is its ability to provide Network Address Translation (NAT), which can hide the user's IP address from the Internet, effectively protecting all internal information from the Internet.

Application-level gateway

An application-level firewall is a third generation firewall where a proxy server operates at the very top of the OSI model, the IP suite application level. A network packet is forwarded only if a connection is established using a known protocol. Application-level gateways are notable for analyzing entire messages rather than individual packets of data when the data are being sent or received.

Malicious software

Malware

A computer user can be tricked or forced into downloading software onto a computer that is of malicious intent. Such programs are known as malware and come in many forms, such as viruses, Trojan horses, spyware, and worms. Malicious software is sometimes used to form botnets.

Viruses

Computer Viruses are programs that can replicate their structures or effects by infecting other files or structures on a computer. The common use of a virus is to take over a computer to steal data.

Worms

Computer worms are programs that can replicate themselves throughout a computer network, performing malicious tasks throughout.

Trojan horse

A Trojan horse commonly known as a Trojan is a general term for malicious software that pretends to be harmless, so that a user willingly allows it to be downloaded onto the computer.

Ransomware and Scareware

Botnet

A botnet is a network of zombie computers that have been taken over by a robot or bot that performs large-scale malicious acts for the creator of the botnet.

Spyware

The term spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

Denial-of-service attack

A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of the concerted efforts to prevent an Internet site or service from functioning efficiently or at all, temporarily or indefinitely.

Browser choice

Web browser statistics tend to affect the amount a Web browser is exploited. For example, Internet Explorer 6, which used to own a majority of the Web browser market share, is considered extremely insecure because vulnerabilities were exploited due to its former popularity. Since browser choice is more evenly distributed (Internet Explorer at 28.5%, Firefox at 18.4%, Google Chrome at 40.8%, and so on) and vulnerabilities are exploited in many different browsers.

Application vulnerabilities

Applications used to access Internet resources may contain security vulnerabilities such as memory safety bugs or flawed authentication checks. The most severe of these bugs can give network attackers full control over the computer. Most security applications and suites are incapable of adequate defense against these kinds of attacks.

Internet security products

Antivirus

Antivirus programs and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Before 2000 a user would pay for antivirus software, 10 years later however, computer users can choose from a host of free security applications on the Internet.

Security Suites

So called "security suites" were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more. They may now offer theft protection, portable storage device safety check, private internet browsing, cloud anti-spam, a file shredder or make security-related decisions (answering popup windows) and several were free of charge as of at least 2012.

Outlook Express & Google+

Objectives : At the end of this lesson you shall be able to

- explain outlook express
 - explain Google+
-

Microsoft Outlook

Microsoft Outlook is a personal information manager from Microsoft, available as a part of the Microsoft Officesuite. Although often used mainly as an email application, it also includes a calendar, task manager, contact manager, note taking, journal, and web browsing. It can be used as a stand-alone application, or can work with Microsoft Exchange Server and Microsoft SharePoint Server for multiple users in an organization, such as shared mailboxes and calendars, Exchange public folders, SharePoint lists, and meeting schedules. There are third-party add-on applications that integrate Outlook with devices such as BlackBerry mobile phones and with other software such as Office and Skype internet communication. Developers can also create their own custom software that works with Outlook and Office components using Microsoft Visual Studio. In addition, Windows Mobile devices can synchronize almost all Outlook data to Outlook Mobile.

Google+

Google+ (pronounced and sometimes written as Google Plus) is a social networking and identity service that is owned and operated by Google Inc. Google has described Google+ as a "social layer" that enhances many of its online properties, and that it is not simply a social networking website, but also an authorship tool that associates web-content directly with its owner/author. It is the second-largest social networking site in the world after Facebook. 540 million monthly active users are part of the Identity service site, by interacting socially with Google+'s enhanced properties, like Gmail, +1 button, and YouTube comments. In October 2013, Google counted 540 million active users who used at least one Google+ service, of which 300 million users are active in "the stream".

Creation

Google launched the Google+ service as an invitation-only "field test" on June 28, 2011, but soon suspended early invites due to an "insane demand" for new accounts. On August 6, each Google+ member had 150 invitations to give out until September 20, 2011, when Google+ opened to everyone 18 years of age or older without the need for an invitation. It was opened for a younger age group (13 years or older in US and most countries, 14 or older in South Korea and Spain, 16 or older in the Netherlands) on January 26, 2012. Google+ is available as a website and on mobile devices.

Before the launch, Google referred to Google+ as Google Circles, a name alluding to its emphasis on organising friendship information. Google+ is considered the company's fourth foray into social networking, following Google Buzz (launched 2010, retired in 2011), Google Friend Connect (launched 2008, retired by March 1, 2012) and Orkut (launched in 2004, as of 2013 operated entirely by subsidiary Google Brazil). Sources such as The New York Times have declared it Google's biggest attempt to rival the social network Facebook, which has over 1 billion users.

Web designing

Objectives : At the end of this lesson you shall be able to

- explain web sites and web pages
 - explain static and dynamic web pages
 - explain HTML, DHTML and XML
 - explain the concept of web hosting, web server, application server and database server.
-

Introduction

The World Wide Web (WWW) was created in 1990 by CERN physicist Tim Berners-Lee. On 30 April 1993, CERN announced that the World Wide Web would be free to use for anyone. Before the introduction of HTML and HTTP, other protocols such as File Transfer Protocol and the Gopher Protocol were used to retrieve individual files from a server. These protocols offer a simple directory structure which the user navigates and chooses files to download. Documents were most often presented as plain text files without formatting, or were encoded in word processors formats.

Websites

A website, also written as Web site, web site, or simply site, is a set of related web page containing content (media) such as written language, Image, video, sound, etc. A website is hosted on at least one web server, accessible via a network such as the internet or a private local area network through an Internet address known as a uniform resource locator. All publicly accessible websites collectively constitute the world wide web.

A webpage is a document, typically written in plain text interspersed with formatting instructions of Hypertext Mark-up Language (HTML) XHTML. A webpage may incorporate elements from other websites with suitable HTML anchor.

Web pages are accessed and transported with the Hypertext Transfer Protocol (HTTP), which may optionally employ encryption secure, HTTPS to provide security and privacy for the user of the webpage content. The user's application, often a web browser, renders the page content according to its HTML Mark-up instructions onto a Computer monitor.

The pages of a website can usually be accessed from a simple Uniform Resource Locator (URL) called the web address. The URLs of the pages organize them into a hierarchy, although hyperlink between them conveys the reader's perceived sitemap and guides the reader's navigation of the site which generally includes a Home page with most of the links to the site's web content, and a supplementary about page, contact page and link page.

Some websites require a subscription to access some or all of their content. Examples of subscription websites include many business sites, parts of news websites, Academic journal websites, gaming websites, file-sharing websites, Internet forum, web-based Email, Social networking websites, websites providing real-time Stock market data, and websites providing various other services (e.g., websites offering storing and/or sharing of images, files and so forth).

A website may be

- Personal website
- Commercial website
- E-Government
- Non-profit organization website.

Static Website

A static website is one that has web pages stored on the server in the format that is sent to a client web browser. It is primarily coded in Hypertext Markup Language (HTML).

Simple forms or marketing examples of websites, such as classic website, a five-page website or a brochure website are often static websites, because they present pre-defined, static information to the user. This may include information about a company and its products and services through text, photos, animations, audio/video and interactive menus and navigation.

This type of website usually displays the same information to all visitors. Similar to handing out a printed brochure to customers or clients, a static website will generally provide consistent, standard information for an extended period of time. Although the website owner may make updates periodically, it is a manual process to edit the text, photos and other content and may require basic website design skills and software.

Advantages

- Static Websites are easier to develop
- Can be developed quickly
- They are indexed easily by search engines as all the web pages actually exist on the server, which is not the case with dynamic websites.

Disadvantages

- Static websites cannot do complex tasks required by many online services.
- Updating a whole site can be cumbersome and time consuming.
- An isolation of Data and Design is not provided in static websites.

Dynamic Website

A dynamic website is one that changes or customizes itself frequently and automatically, based on certain criteria.

Dynamic websites can have two types of dynamic activity: Code and Content. Dynamic code is invisible or behind the scenes and dynamic content is visible or fully displayed

Advantages

- Can do more complex task required by online services.
- They are easier to update.
- Isolation of data and design allows programmers and content writers to work independently.

Disadvantages

- Can take more time to build.
- Can be difficult to build.
- Dynamic websites are not indexed by search engines easily, since they do not have actual web pages present on the web server. With continuous improvements in search engine technology, this problem is now very much eliminated and you can find that many dynamic websites are very well indexed by search engines now a days.

A few such classifications are:

- Affiliate: enabled portal that renders not only its custom CMS but also syndicated content from other content providers for an agreed fee. There are usually three relationship tiers. Affiliate Agencies (e.g., Commission Junction), Advertisers (e.g., eBay) and consumer (e.g., Yahoo!).
- Archive site: used to preserve valuable electronic contents that are on verge of extinction. For examples: Internet Archive, which since 1996 has preserved billions of old and new web pages; and Google Groups, which in early 2005 had preserved over 845,000,000 messages posted to Usenet news/discussion groups.
- Blog Site: sites generally used to post online diaries, comments or views that may include discussion forums (e.g., blogger, Xanga).

- Content Site: these sites create and sell of original content to end-user. (e.g., Slate, About.com).
- Corporate website: used to provide information regarding business, organization, or service.
- Commerce site (or eCommerce site): these sites are designed for purchasing or selling goods, such as Amazon.com, CSN Stores, and Overstock.com.
- Community site: sites where persons with similar interests communicate to each other through chatting and messaging or through soci message boards, such as MySpace or Facebook.
- City Site: A site that shows information about a certain city or town and events that takes place in that town. Usually created by the city council. For example, Richmond.com is the geodomain for Richmond, Virginia.
- Information site: contains content that is intended to inform visitors, but not necessarily for commercial purposes, such as: RateMyProfessors.com, Free Internet Lexicon and Encyclopaedia. Most government, educational and non-profit institutions have an informational site.
- Mirror site: A complete reproduction of a website.
- News site: similar to an information site, but dedicated to dispensing news and commentary.
- Personal homepage: run by an individual or a small group such as a family that contains information or any content that the individual wishes to include. These are usually uploaded using a web hosting service such as Geocities.
- Phish Site: a website created to fraudulently acquire sensitive information, such as passwords and credit card details, by disguising as a trustworthy person or business (such as Social Security Administration, PayPal) in an electronic communication.
- Political site: A site on which people may voice political views.
- Rating site: A site on which people can praise or disparage what is featured.
- Review site: A site on which people can post reviews for products or services.
- School site: a site on which teachers, students, or administrators can post information about current events at or involving their school.
- Video sharing: A site that enables user to upload videos, such as YouTube and Google Video.
- Search engine site: a site that provides general information and is intended as a gateway for retrieving other sites. Google, Yahoo and MSN are the most widely known search engines.
- Shock site: includes images or other material that is intended to be offensive to most viewers (e.g. rotten.com).

- Warez: a site designed to host and let users download copyrighted materials illegally.
- Web portal: a site is vehicle that provides a gateway to other resources on the Internet or an intranet.

Web Pages

A web page or webpage is a Document or information resource that is suitable for the world wide Web and can be accessed through a web browser and displayed on a computer display or mobile device. This information is usually in HTML or XHTML format, and may provide navigation bar to other web pages via Hyper text Hyper link. Web pages frequently subsume other resources such as Cascading Style Sheet, Client-side-scripting and Images into their final presentation.

Web pages may be retrieved from a local computer or from a remote Web server. The web server may restrict access only to a private network, e.g. a corporate Intranet or it may publish pages on the World Wide Web. Web pages are requested and served from web. Web server using Hypertext Transfer Protocol (HTTP).

Web pages may consist of files of static text and other Web content stored within the Web server's file system(Static Web page), or may be constructed by Server-side scripting when they are requested (Dynamic web page). Client-side scripting can make web pages more responsive to user input once on the client browser.

Web Browser

A Web browser can have a Graphical User Interface, like Internet Explorer, Mozilla Firefox, Google Chrome and Opera (web browser), or can be Command Line Interface, like Lynx (web browser) (Fig 1) or Links (web browser). Web users with disabilities often use assistive technologies and adaptive strategies to Web accessibility web pages. Users may be colour blind, may or may not want to use a mouse perhaps due to repetitive stress injury or motor-neurone problems, may be deaf and require audio to be captioned, may be blind and using a Screen reader or display, may need screen magnification, etc. Disabled and able-bodied users may disable the download and viewing of images and other media, to save time, network bandwidth or merely to simplify their browsing experience.

Users of mobile devices often have restricted displays and bandwidth. Anyone may prefer not to use the fonts, font sizes, styles and colour schemes selected by the web page designer and may apply their own CSS styling to the page. The World Wide Web Consortium (W3C) and Web Accessibility Initiative (WAI) recommend that all web pages should be designed with all of these options in mind.

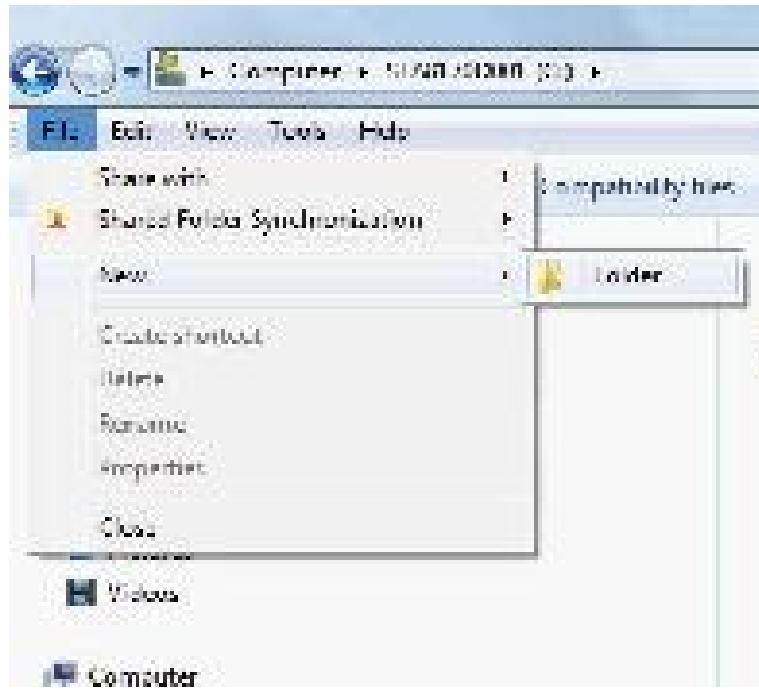
Fig 1



Downloading a Software from Internet

- 1 Create a Temporary Files folder by opening My Computer, double click on your hard drive (typically the C: drive), then select File/New/Folder as on Fig 2.

Fig 2



- 2 Type "Temporary File" and name it as on Fig 3.
- 3 Type "My SQL 5. 1 free download " from freeware software website on internet.

Note: As an example Choose "<http://dev.mysql.com/downloads/>" select "My SQL Community server" in download from the opened site as on Fig 4

Fig 3

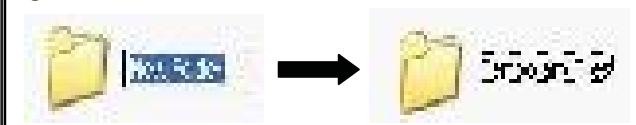


Fig 4



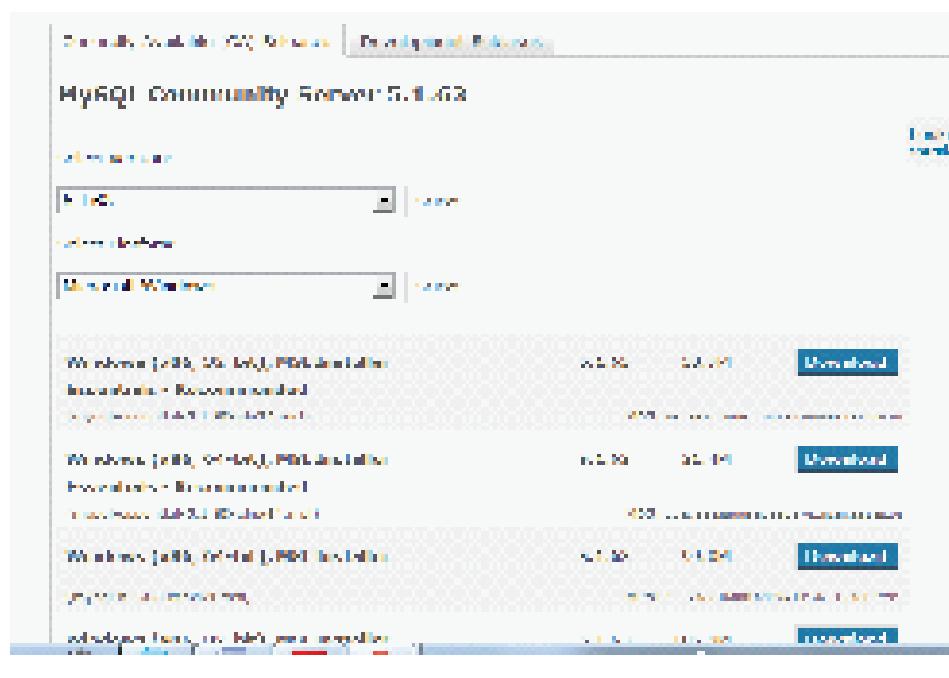
4 Click "MySQL Community Server 5.1 " from looking for previous version option as on Fig 5

Fig 5

A screenshot of the MySQL Community Server 5.1 download page. The title is 'Download MySQL Community Server'. It features two main download options: 'Recommended: MySQL Community Server 5.1' and 'Alternative: MySQL Community Server 5.0'. Below these are sections for 'Windows (x86, 32-bit), MSI Installer Essentials - Recommended' and 'Windows (x86, 32-bit), ZIP Archive - Alternative'. There is also a 'Windows (x86, 32-bit), ZIP Archive - Recommended' link. The page includes a brief description of MySQL and links to MySQL Cluster and MySQL InnoDB.

5 Choose "Windows (x86, 32-bit), MSI Installer Essentials - Recommended" and click download (Fig.6).

Fig 6



Note: Save the "My SQL 5.1.63" in the created Folder name " Temporary Folder"

- 6 Burn the Downloaded "My SQL 5.1.63" in a CD ROM for Installation.

WEB LANGUAGES

Web languages are called as Markup languages are designed for the processing, definition and presentation of text. The language specifies code for formatting, both the layout and style, within a text file. The code used to specify the formatting are called tags

Four Types of Markup languages

- 1 BML
- 2 HTML
- 3 DHTML
- 4 XML

BML (Better markup language)

BML is essentially a simple macro language. Macros are called blocks in BML. Blocks are defined in look files, and are invoked in BML files. Blocks accept parameters and are divided into several types, according to how parameters are transmitted and how the definition of the block is able to make use of them.

HTML (Hyper text markup Language)

HTML or HyperText Markup Language is the language of the web. All web pages are written in HTML. HTML defines the way that images, multimedia, and text are displayed in web browsers. It includes elements to connect the

documents (hypertext) and make web documents interactive (such as with forms).

HTML is a defined standard markup language. That standard was developed by the World Wide Web Consortium (W3C). It is based upon SGML (Standard Generalized Markup Language). It is a language that uses tags to define the structure of your text. Elements and tags are defined by the < and > characters.

DHTML

Dynamic HTML is not really a new specification of HTML, but rather a new way of looking at and controlling the standard HTML codes and commands.

When thinking of dynamic HTML, we need to remember the qualities of standard HTML, especially that once a page is loaded from the server, it will not change until another request comes to the server. Dynamic HTML give more control over the HTML elements and allows them to change at any time, without returning to the Web server.

There are four parts to DHTML:

- Document Object Model (DOM) (definition)
- Scripts
- Cascading Style Sheets (CSS)
- XHTML

DOM

The DOM is allows to access any part of Web page to change it with DHTML. Every part of a Web page is specified by the DOM and using its consistent naming conventions can access them and change their properties.

Scripts

Scripts written in either JavaScript or ActiveX are the two most common scripting languages used to activate DHTML. You use a scripting language to control the objects specified in the DOM.

Cascading Style Sheets

CSS is used in DHTML to control the look and feel of the Web page. Style sheets define the colors and fonts of text, the background colors and images, and the placement of objects on the page. Using scripting and the DOM, we can change the style of various elements.

XHTML

XHTML or HTML 4.x is used to create the page itself and build the elements for the CSS and the DOM to work on. There is nothing special about XHTML for DHTML - but having valid XHTML is even more important, as there are more things working from it than just the browser.

Features of DHTML

There are four primary features of DHTML:

- 1 Changing the tags and properties
- 2 Real-time positioning
- 3 Dynamic fonts (Netscape Communicator)
- 4 Data binding (Internet Explorer)

Changing the tags and properties

This is one of the most common uses of DHTML. It allows to change the qualities of an HTML tag depending on an event outside of the browser (such as a mouse click, time, or date, and so on). we can use this to preload information onto a page, and not display it unless the reader clicks on a specific link.

Real-time positioning

Objects, images, and text moving around the Web page. This can allow we to play interactive games with the readers or animate portions of the screen.

Dynamic Fonts

This is a Netscape only feature. Netscape developed this to get around the problem designers had with not knowing what fonts would be on a reader's system. With dynamic fonts, the fonts are encoded and downloaded with the page, so that the page always looks how the designer intended it to.

Data binding

This is an IE only feature. Microsoft developed this to allow easier access to databases from Web sites. It is very similar to using a CGI to access a database, but uses an ActiveX control to function.

XML

Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services

Creating an HTML document

Before start writing code to write a web page, it is a good practice to plan ahead the appearance of the web page. An HTML document has two elements:

- 1 Document Content
- 2 Tags

Document content is the information on a web page that the user will see. That information could be text or graphics.

Tags are the HTML codes that control how the document content will appear. The tags, in other words, will determine whether the text will be bold, black or blue, or of font type Time New Roman or Arial.

Start Notepad

To start Notepad go to:

Start

All Programs

Accessories

Notepad

Edit Your HTML with Notepad (Fig 7)

Type your HTML code into your Notepad:

Save Your HTML

Fig 7



```
Untitled - Notepad
File Edit Format View Help
<!DOCTYPE html>
<html>
<body>
<h1>My First Heading</h1>
<p>My first paragraph.</p>
</body>
</html>
```

Select Save as.. in Notepad's file menu.

When you save an HTML file, you can use either the .htm or the .html file extension.

Save the file in a folder that is easy to remember

Run the HTML in Your Browser

Start your web browser and open your html file from the File, Open menu, or just browse the folder and double-click your HTML file.

The result should look much like this: (Fig 8)

Fig 8



Structure of Markup Language

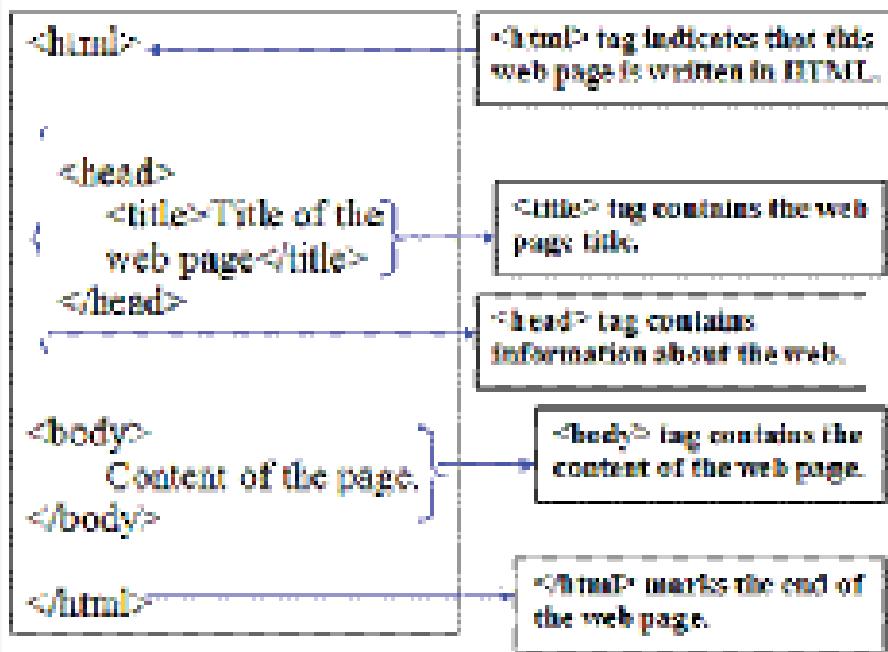
An HTML document has two* main parts:

- 1 head. The head element contains title and meta data of a web document.
- 2 body. The body element contains the information that you want to display on a web page.

To make your web pages compatible with HTML 4, you need to add a document type declaration (DTD) before the HTML element. Many web authoring software add DTD and basic tags automatically when you create a new web page.

In a web page, the first tag (specifically, <html>) indicates the markup language that is being used for the document. The <head> tag contains information about the web page. Lastly, the content appears in the <body> tag. (Fig 9)

Fig 9



The <!DOCTYPE> Declaration

There are many different documents on the web. A browser can only display a document correctly, if it knows what kind of document it is.

There are also many different versions of HTML, and a browser can only display an HTML page 100% correctly if it knows the exact HTML version used in the page. This is what <!DOCTYPE> is used for.

<!DOCTYPE> is not an HTML tag. It is an information (a declaration) to the browser about what version the HTML is written in.

The HTML <head> Element

The <head> element is a container for all the head elements. Elements inside <head> can include scripts, instruct the browser where to find style sheets, provide meta information, and more.

The following tags can be added to the head section: <title>, <base>, <link>, <meta>, <script>, and <style>.

The HTML <title> Element

The <title> tag defines the title of the document.

The title element is required in all HTML/XHTML documents.

The title element:

- Defines a title in the browser toolbar.

- Provides a title for the page when it is added to favorites.
- Displays a title for the page in search-engine results.

HTML Element Syntax

- An HTML element starts with a start tag / opening tag
- An HTML element ends with an end tag / closing tag
- The element content is everything between the start and the end tag
- Some HTML elements have empty content
- Empty elements are closed in the start tag
- Most HTML elements can have attributes

HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

Examples

```

<html>
<body>
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
<h4>This is heading 4</h4>
<h5>This is heading 5</h5>
<h6>This is heading 6</h6>
</body>
</html>

```

Result

This is heading 1

This is heading 2

This is heading 3

This is heading 4

This is heading 5

This is heading 6

HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag.

```
<html>
<body>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
</body>
</html>
```

Examples

This is a paragraph.

This is a paragraph.

This is a paragraph.

HTML Links

HTML links are defined with the `<a>` tag.

```
<html>
<body>
<a href="http://www.facebook.com">
This is a link</a>
</body>
</html>
```

Result

This is a link

By clicking the link it shows the facebook login page

HTML Images

HTML images are defined with the `` tag.

```
<html>
<body>

</body>
</html>
```

Result (Fig 10)

Fig 10



HTML Attributes

- HTML elements can have attributes
- Attributes provide additional information about an element
- Attributes are always specified in the start tag
- Attributes come in name/value pairs like: `name="value"`

Attribute Example

HTML links are defined with the `<a>` tag. The link address is specified in the `href` attribute:

```
<html>
<body>
<a href="http://www.yahoo.com">
This is a link</a>
</body>
</html>
```

Result

This is the link

By clicking the link yahoo home page appears (Fig 11).

Formatting

Create Line Breaks - The `
` Element:

Whenever the `
` element, anything following it starts on the next line. This tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Fig 11



Example:

```
Hello<br/>
You come most carefully upon your hour.<br/>
Thanks<br/>
Mahnaz
```

Result

```
Hello
You come most carefully upon your hour.
Thanks
Mahnaz
```

To Become

Centring Content - The <center> Element:

You can use <center> tag to put any content in the center of the page or any table cell.

Example:

```
<p>This is not in the center.</p>
<center>
<p>This is in the center.</p>
</center>
```

This will produce following result:

```
This is not in the center.
This is in the center.
```

Soft Hyphens:

Occasionally, you will want to allow a browser to hyphenate long words to better justify a paragraph. For example, consider the following code and its resulting output.

```
<p style="text-align: justify;"> The morbid fear of
the number 13, or triskaidekaphobia, has plagued
some important historic figures like Mahamiya and
Nanao.</p>
```

This will produce following result:

```
Example for soft hyphen - The morbid fear of the
number 13, or triskaidekaphobia, has plagued some
important historic figures like Mahamiya and Nanao.
```

Preserve Formatting - The <pre> Element:

Sometimes you want your text to follow the exact format of how it is written in the HTML document. In those cases, you can use the preformatted tag (<pre>).

Any text between the opening <pre> tag and the closing </pre> tag will preserve the formatting of the source document.

```
<pre>
function testFunction( strText ){
alert (strText)
}
</pre>
```

This will produce following result:

```
function testFunction( strText ){
alert (strText)
}
```

Horizontal Rules - The `<hr />` Element

Horizontal rules are used to visually break up sections of a document. The `<hr>` tag creates a line from the current position in the document to the right margin and breaks the line accordingly.

For example you may want to give a line between two paragraphs as follows:

```
<p>This is paragraph one and should be on top</p>
<hr />
```

```
<p>This is paragraph two and should be at bottom</p>
```

This will produce following result:

This is paragraph one and should be on top

This is paragraph two and should be at bottom

Again `<hr />` tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Note: The `<hr />` element has a space between the characters hr and the forward slash. If you omit this space, older browsers will have trouble rendering the line break, while if you miss the forward slash character and just use `<hr>` it is not valid XHTML

Presentational Tags:

If you use a word processor, you are familiar with the ability to make text bold, italicized, or underlined; these are just three of the ten options available to indicate how text can appear in HTML and XHTML.

Bold Text - The `` Element:

Anything that appears in a `...` element is displayed in bold, like the word bold here:

```
<p>The following word uses a <b>bold</b>
typeface.</p>
```

This will produce following result:

The following word uses a bold typeface.

Italic Text - The `<i>` Element:

Anything that appears in a `<i>...</i>` element is displayed in italicized, like the word italicized here:

```
<p>The following word uses a <i>italicized</i>
typeface.</p>
```

This will produce following result:

The following word uses a italicized typeface.

Underlined Text - The `<u>` Element:

Anything that appears in a `<u>...</u>` element is displayed with underline, like the word underlined here:

```
<p>The following word uses a <u>underlined</u>
typeface.</p>
```

This will produce following result:

The following word uses a underlined typeface.

Strike Text - The `<strike>` Element:

Anything that appears in a `<strike>...</strike>` element is displayed with strikethrough, which is a thin line through the text:

```
<p>The following word uses a
<strike>strikethrough</strike> typeface.</p>
```

This will produce following result:

The following word uses a strikethrough typeface.

Monospaced font - The `<tt>` Element:

The content of a `<tt>` element is written in monospaced font. Most fonts are known as variable-width fonts because different letters are of different widths (for example, the letter m is wider than the letter i). In a monospaced font, however, each letter is the same width.

```
<p>The following word uses a
<tt>monospaced</tt> typeface.</p>
```

This will produce following result:

The following word uses a monospaced typeface.

Superscript Text - The `<sup>` Element:

The content of a `<sup>` element is written in superscript; the font size used is the same size as the characters surrounding it but is displayed half a character's height above the other characters.

```
<p>The following word uses a
<sup>superscript</sup> typeface.</p>
```

This will produce following result:

The following word uses a superscript typeface.

Subscript Text - The `<sub>` Element:

The content of a `<sub>` element is written in subscript; the font size used is the same as the characters surrounding it, but is displayed half a character's height beneath the other characters.

```
<p>The following word uses a
<sub>subscript</sub> typeface.</p>
```

This will produce following result:

The following word uses a subscript typeface.

Larger Text - The **<big>** Element:

The content of the **<big>** element is displayed one font size larger than the rest of the text surrounding it.

```
<p>The following word uses a <big>big</big>  
typeface.</p>
```

This will produce following result:

The following word uses a big typeface.

Smaller Text - The **<small>** Element:

The content of the **<small>** element is displayed one font size smaller than the rest of the text surrounding it.

```
<p>The following word uses a <small>small</  
small> typeface.</p>
```

This will produce following result:

The following word uses a small typeface.

Styling HTML with CSS

CSS was introduced together with HTML 4, to provide a better way to style HTML elements.

CSS can be added to HTML in the following ways:

- Inline - using the **style** attribute in HTML elements
- Internal - using the **<style>** element in the **<head>** section
- External - using an external CSS file

```
<html>  
<body style="background-color:PowderBlue;">  
<h1>Look! Styles and colors</h1>  
<p style="font-family:verdana;color:red;">  
This text is in Verdana and red</p>  
<p style="font-family:times;color:green;">  
This text is in Times and green</p>  
<p style="font-size:30px;">This text is 30 pixels high</p>  
</body>  
</html>
```

Result:

Look! Styles and colors

This text is in Verdana and red

This text is in Times and green

This text is 30 pixels high

HTML Hyperlinks (Links)

A hyperlink (or link) is a word, group of words, or image that you can click on to jump to a new document or a new section within the current document.

When you move the cursor over a link in a Web page, the arrow will turn into a little hand.

Links are specified in HTML using the **<a>** tag.

The **<a>** tag can be used in two ways:

- 1 To create a link to another document, by using the **href** attribute
- 2 To create a bookmark inside a document, by using the **name** attribute

The HTML code for a link is simple. It looks like this:

```
<a href="url">Link text</a>
```

The **href** attribute specifies the destination of a link.

```
<a href="http://www.yahoo.com/">Visit yahoo</a>
```

which will display like this: Visit yahoo.com

Clicking on this hyperlink will send the user to Yahoo homepage.

The "Link text" doesn't have to be text. It can be an image or any other HTML element.

HTML Links - The target Attribute

The target attribute specifies where to open the linked document.

The example below will open the linked document in a new browser window or a new tab:

Example

```
<a href="http://www.yahoo.com/" target="_blank">Visit  
yahoo !</a>  
<html>  
<body>  
<a href="http://www.yahoo.com" target="_blank">Visit  
yahoo.com!</a>  
<p>If you set the target attribute to "_blank", the link will  
open in a new browser window/tab.</p>  
</body>  
</html>
```

Result

Visit yahoo.com!

If you set the target attribute to "_blank", the link will open in a new browser window/tab.

HTML Images - The Tag and the Src Attribute

In HTML, images are defined with the tag.

The tag is empty, which means that it contains attributes only, and has no closing tag.

To display an image on a page, you need to use the src attribute. Src stands for "source". The value of the src attribute is the URL of the image you want to display.

Syntax for defining an image:

```

```

The URL points to the location where the image is stored. An image named "bamboo.gif", located in the "images" directory on "www.w3schools.com" has the URL: <http://www.backgrounlabs.com/index.php?search=bamboo>.

The browser displays the image where the tag occurs in the document. If you put an image tag between two paragraphs, the browser shows the first paragraph, then the image, and then the second paragraph.

HTML Images - The Alt Attribute

The required alt attribute specifies an alternate text for an image, if the image cannot be displayed.

The value of the alt attribute is an author-defined text:

```

```

The alt attribute provides alternative information for an image if a user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader).

HTML Images - Set Height and Width of an Image

The height and width attributes are used to specify the height and width of an image.

The attribute values are specified in pixels by default:

```

```

Note: It is a good practice to specify both the height and width attributes for an image. If these attributes are set, the space required for the image is reserved when the page is loaded. However, without these attributes, the browser does not know the size of the image. The effect will be that the page layout will change during loading (while the images load).

If an HTML file contains ten images - eleven files are required to display the page right. Loading images takes time, so my best advice is: Use images carefully.

When a web page is loaded, it is the browser, at that moment, that actually gets the image from a web server and inserts it into the page. (Fig 12) Therefore, make sure that the images actually stay in the same spot in relation to the web page, otherwise your visitors will get a broken link icon. The broken link icon is shown if the browser cannot find the image.

Fig 12



```

<html>
<body>
<h2>Friendship Card</h2>

</body>
</html>

```

HTML Tables

Tables are defined with the `<table>` tag.

A table is divided into rows (with the `<tr>` tag), and each row is divided into data cells (with the `<td>` tag). `td` stands for "table data," and holds the content of a data cell. A `<td>` tag can contain text, links, images, lists, forms, other tables, etc.

Table Example

```

<table border="1">
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in a browser:

row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Tables and the Border Attribute

If you do not specify a border attribute, the table will be displayed without borders. Sometimes this can be useful, but most of the time, we want the borders to show.

To display a table with borders, specify the border attribute:

```

<table border="1">
<tr>
<td>Row 1, cell 1</td>
<td>Row 1, cell 2</td>
</tr>
</table>

```

HTML Table Headers

Header information in a table are defined with the `<th>` tag.

All major browsers display the text in the `<th>` element as bold and centered.

```

<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in your browser:

Header 1	Header 2
row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Unordered Lists

An unordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with bullets (typically small black circles).

```

<ul>
<li>Coffee</li>
<li>Milk</li>
</ul>

```

How the HTML code above looks in a browser:

- Coffee
- Milk

HTML Ordered Lists

An ordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with numbers.

```

<ol>
<li>Coffee</li>
<li>Milk</li>
</ol>

```

How the HTML code above looks in a browser:

- 1 Coffee
- 2 Milk

HTML Definition Lists

A definition list is a list of items, with a description of each item.

The `<dl>` tag defines a definition list.

The `<dl>` tag is used in conjunction with `<dt>` (defines the item in the list) and `<dd>` (describes the item in the list):

```
<dl>
<dt>Coffee</dt>
<dd>- black hot drink</dd>
<dt>Milk</dt>
<dd>- white cold drink</dd>
</dl>
```

How the HTML code above looks in a browser:

Coffee - black hot drink
Milk- white cold drink

Note : Inside a list item you can put text, line breaks, images, links, other lists, etc.

HTML List Tags

Tag	Description
<code></code>	Defines an ordered list
<code></code>	Defines an unordered list
<code></code>	Defines a list item
<code><dl></code>	Defines a definition list
<code><dt></code>	Defines an item in a definition list
<code><dd></code>	Defines a description of an item in a definition list

HTML elements can be grouped together with `<div>` and ``

HTML Block Elements

Most HTML elements are defined as block level elements or as inline elements.

Block level elements normally start (and end) with a new line when displayed in a browser.

Examples: `<h1>`, `<p>`, ``, `<table>`

HTML Inline Elements

Inline elements are normally displayed without starting a new line.

Examples: ``, `<td>`, `<a>`, ``

The HTML `<div>` Element

The HTML `<div>` element is a block level element that can be used as a container for grouping other HTML elements.

The `<div>` element has no special meaning. Except that, because it is a block level element, the browser will display a line break before and after it.

When used together with CSS, the `<div>` element can be used to set style attributes to large blocks of content.

Another common use of the `<div>` element, is for document layout. It replaces the "old way" of defining layout using tables. Using tables is not the correct use of the `<table>` element. The purpose of the `<table>` element is to display tabular data.

The HTML `` Element

The HTML `` element is an inline element that can be used as a container for text.

The `` element has no special meaning.

When used together with CSS, the `` element can be used to set style attributes to parts of the text.

HTML Grouping Tags

Tag	Description
<code><div></code>	Defines a div
<code></code>	Defines a span

HTML Layout

Website Layouts

Most websites have put their content in multiple columns (formatted like a magazine or newspaper).

Multiple columns are created by using `<div>` or `<table>` elements. CSS are used to position elements, or to create backgrounds or colorful look for the pages.

HTML Layouts - Using `<div>` Elements

The `div` element is a block level element used for grouping HTML elements.

The following example uses five `div` elements to create a multiple column layout, creating the same result as in the previous example:

Example

```
<div>
<!DOCTYPE html>
<html>
<body>
<div id="container" style="width:500px">
<div id="header" style="background-color:#FFA500;">
<h1 style="margin-bottom:0;">Main Title of Web Page</h1></div>
<div id="menu" style="float:left; width:100px; height:200px; background-color:#FFD700; margin-right:10px;">
<b>Menu</b><br />
</div>
<div id="content" style="float:left; width:300px; height:200px; background-color:#FFFFE0;">
<h2>Content Area</h2>
</div>
</div>
<script>
document.getElementById("header").style.backgroundColor = "#FFA500";
document.getElementById("menu").style.backgroundColor = "#FFD700";
document.getElementById("content").style.backgroundColor = "#FFFFE0";
</script>

```

```

<div id="content" style="background-color:#EEEEEE;height:200px;width:400px;float:left;">
Content goes here</div>
<div id="footer" style="background-color:#FFA500;clear:both;text-align:center;">

```

```

</div>
</div>
</body>
</html>

```

Result (Fig 13)

Fig 13



HTML Forms

HTML forms are used to pass data to a server.

A form can contain input elements like text fields, checkboxes, radio-buttons, submit buttons and more. A form can also contain select lists, textarea, fieldset, legend, and label elements.

The <form> tag is used to create an HTML form:

<form>

input elements.

</form>

HTML Forms - The Input Element

The most important form element is the input element.

The input element is used to select user information.

An input element can vary in many ways, depending on the type attribute. An input element can be of type text field, checkbox, password, radio button, submit button, and more.

The most used input types are described below.

Text Fields

<input type="text" /> defines a one-line input field that a user can enter text into:

<form>

First name: <input type="text" name="firstname" />

Last name: <input type="text" name="lastname" />
</form>

How the HTML code above looks in a browser:

First name:

Last name:

Note: The form itself is not visible. Also note that the default width of a text field is 20 characters.

Password Field

<input type="password" /> defines a password field:

<form>

Password: <input type="password" name="pwd" />

</form>

How the HTML code above looks in a browser:

Password:

Note: The characters in a password field are masked (shown as asterisks or circles)

Radio Buttons

<input type="radio" /> defines a radio button. Radio buttons let a user select ONLY ONE of a limited number of choices:

```
<form>
<input type="radio" name="sex" value="male" /> Male<br/>
<input type="radio" name="sex" value="female" /> Female
</form>
```

How the HTML code above looks in a browser:

- Male
- Female

Checkboxes

<input type="checkbox" /> defines a checkbox. Checkboxes let a user select ONE or MORE options of a limited number of choices.

```
<form>
<input type="checkbox" name="vehicle" value="Bike" />
I have a bike<br />
<input type="checkbox" name="vehicle" value="Car" />
I have a car
</form>
```

How the HTML code above looks in a browser:

- I have a bike
- I have a car

Submit Button

<input type="submit" /> defines a submit button.

A submit button is used to send form data to a server. The data is sent to the page specified in the form's action attribute. The file defined in the action attribute usually does something with the received input:

```
<form name="input" action="html_form_action.asp"
method="get">
```

Username: <input type="text" name="user" />

```
<input type="submit" value="Submit" />
</form>
```

How the HTML code above looks in a browser:

Username: Submit

If you type some characters in the text field above, and click the "Submit" button, the browser will send your input to a page called "html_form_action.asp". The page will show you the received input.

HTML Iframes

Syntax for adding an iframe:

```
<iframe src="URL"></iframe>
```

The URL points to the location of the separate page.

Iframe - Set Height and Width

The height and width attributes are used to specify the height and width of the iframe.

The attribute values are specified in pixels by default, but they can also be in percent (like "80%").

Example

```
<!DOCTYPE html>
<html>
<body>
<iframe src="demo_iframe.htm" width="200"
height="200"></iframe>
</body>
</html>
```

It will appear as shown in Fig 14.

Iframe - Remove the Border

The frameborder attribute specifies whether or not to display a border around the iframe.

Set the attribute value to "0" to remove the border:

Example

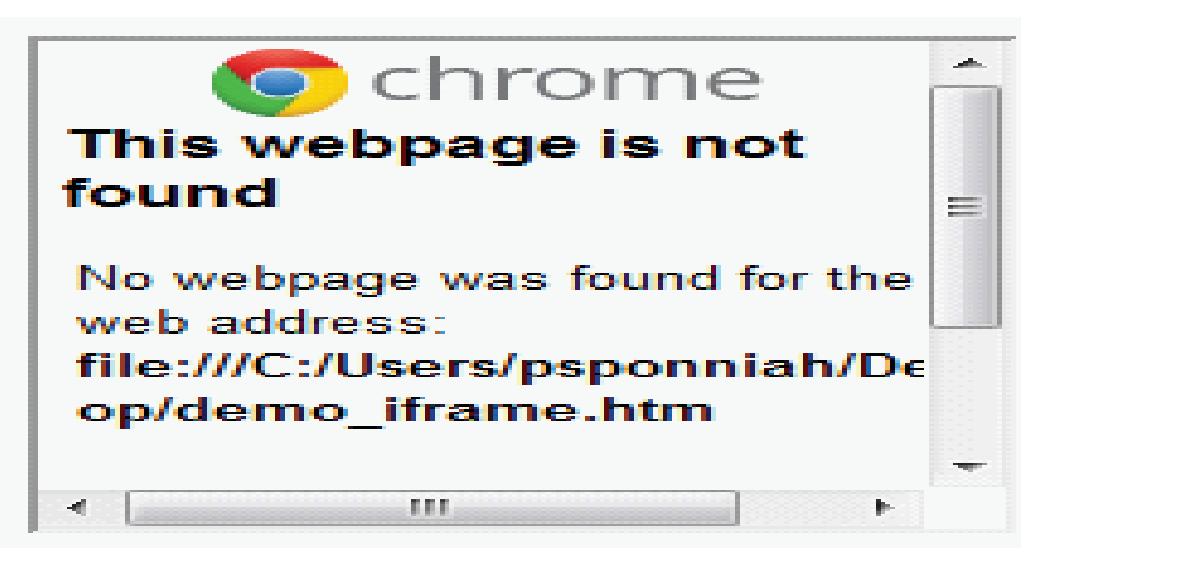
```
<iframe src="demo_iframe.htm" frameborder="0"></
iframe>
```

Use iframe as a Target for a Link

An iframe can be used as the target frame for a link.

The target attribute of a link must refer to the name attribute of the iframe:

Fig 14



Example

```
<iframe src="demo_iframe.htm" name="iframe_a"></iframe>  
<p><a href = "http://www.yahoo.com" target="iframe_a">yahoo.com</a></p>
```

HTML iframe Tag

Tag	Description
<iframe>	Defines an inline sub window (frame)

HTML Colour

Color Values

HTML colors are defined using a hexadecimal notation (HEX) for the combination of Red, Green, and Blue color values (RGB).

The lowest value that can be given to one of the light sources is 0 (in HEX: 00). The highest value is 255 (in HEX: FF).

HEX values are specified as 3 pairs of two-digit numbers, starting with a # sign.

Color Values (Fig 15)

Fig 15

Color	Color HEX	Color RGB
Black	#000000	rgb(0,0,0)
Red	#FF0000	rgb(255,0,0)
Green	#00FF00	rgb(0,255,0)
Blue	#0000FF	rgb(0,0,255)
Yellow	#FFFF00	rgb(255,255,0)
Cyan	#00FFFF	rgb(0,255,255)
Magenta	#FF00FF	rgb(255,0,255)
Grey	#C0C0C0	rgb(192,192,192)
White	#FFFFFF	rgb(255,255,255)

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<p style="background-color:#FFFF00">
```

Color set by using hex value

```
</p>
```

```
<p style="background-color:rgb(255,255,0)">
```

Color set by using rgb value

```
</p>
```

```

<p style="background-color:yellow">
Color set by using color name
</p>
</body>
</html>

```

Result

Color set by using hex value
 Color set by using rgb value
 Color set by using color name

DHTML

The HTML script Element

The <script> tag is used to define a client-side script, such as a JavaScript.

The script element either contains scripting statements or it points to an external script file through the src attribute.

The required type attribute specifies the MIME type of the script.

Common uses for JavaScript are image manipulation, form validation, and dynamic changes of content.

The script below writes Hello World! to the HTML output:

Example

```

<script type="text/javascript">
document.write("Hello World!")
</script>

```

The HTML noscript Element

The <noscript> tag is used to provide an alternate content for users that have disabled scripts in their browser or have a browser that doesn't support client-side scripting.

The noscript element can contain all the elements that you can find inside the body element of a normal HTML page.

The content inside the noscript element will only be displayed if scripts are not supported, or are disabled in the user's browser:

Example

```

<!DOCTYPE html>
<html>
<body>
<script type="text/javascript">
document.write("Hello World!")
</script>

```

<noscript>Sorry, your browser does not support JavaScript!</noscript>

<p>A browser without support for JavaScript will show the text in the noscript element.</p>

</body>

</html>

Result

Hello World!

A browser without support for JavaScript will show the text in the noscript element.

HTML Script Tags

Tag	Description
<script>	Defines a client-side script
<noscript>	Defines an alternate content for users that do not support client-side scripts

HTML Entities

Some characters are reserved in HTML.

It is not possible to use the less than (<) or greater than (>) signs in your text, because the browser will mix them with tags.

To actually display reserved characters, we must use character entities in the HTML source code.

A character entity looks like this:

&entity_name;

OR

&#entity_number;

Non-breaking Space

A common character entity used in HTML is the non-breaking space ().

Browsers will always truncate spaces in HTML pages. If you write 10 spaces in your text, the browser will remove 9 of them, before displaying the page. To add spaces to your text, you can use the character entity.

HTML Useful Character Entities

Note: Entity names are case sensitive!

HTML Uniform Resource Locators

A **URL** is another word for a web address.

Result	Description	Entity Name	Entity Number
	non-breaking space	 	
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
•	euro	€	€
§	section	§	§
©	copyright	©	©
®	registered trademark	®	®
™	trademark	™	™

A URL can be composed of words, such as "w3schools.com", or an Internet Protocol (IP) address: 192.68.20.50. Most people enter the name of the website when surfing, because names are easier to remember than numbers.

Scheme	Short for...	Which pages will the scheme be used for...
http	HyperText Transfer Protocol	Common web pages starts with http://. Not encrypted
https	Secure HyperText Transfer Protocol	Secure web pages. All information exchanged are encrypted
ftp	File Transfer Protocol	For downloading or uploading files to a website. Useful for domain maintenance
file		A file on your computer

URL Encoding

URLs can only be sent over the Internet using the ASCII character-set.

Since URLs often contain characters outside the ASCII set, the URL has to be converted into a valid ASCII format.

URL encoding replaces non ASCII characters with a "%" followed by two hexadecimal digits.

URLs cannot contain spaces. URL encoding normally replaces a space with a + sign.

URL - Uniform Resource Locator

When you click on a link in an HTML page, an underlying <a> tag points to an address on the world wide web.

A Uniform Resource Locator (URL) is used to address a document (or other data) on the world wide web.

Explanation:

- **Scheme** - defines the **type** of Internet service. The most common type is http
- **Host** - defines the **domain host** (the default host for http is www)
- **Domain** - defines the Internet **domain name**, like w3schools.com
- **Port** - defines the **port number** at the host (the default port number for http is 80)
- **Path** - defines a **path** at the server (If omitted, the document must be stored at the root directory of the web site)
- **Filename** - defines the name of a document/resource

Common URL Schemes

The table below lists some common schemes:

XML Structure

The XML structure including the document parts, the prologue, and provides a simple XML example document.

Document Parts

- Prolog
- Document Element (root element)

The Prologue

The prologue, equivalent to the header in HTML, may include the following:

- An XML declaration (optional) such as:

```
<?xml version="1.0"?>
```
- A DTD or reference to one (optional). An example reference to an external DTD file:

```
<!DOCTYPE LANGLIST SYSTEM "langlist.dtd">
```
- Processing instructions - An example processing instruction that causes style to be determined by a style sheet:

```
<?xml-stylesheet type="text/css" href="xmlstyle.css"?>
```

An XML Example

Therefore a complete well formed XML document may look like:

```
<?xml version="1.0"?>

<LAND>
  <FOREST>
    <TREE>Oak</TREE>
    <TREE>Pine</TREE>
    <TREE>Maple</TREE>
  </FOREST>
  <MEADOW>
    <GRASS>Bluegrass</GRASS>
    <GRASS>Fescue</GRASS>
    <GRASS>Rye</GRASS>
  </MEADOW>
</LAND>
```

The LAND element, above, is the root element.

Result

Oak Pine Maple Bluegrass Fescue Rye

Web Elements

A web page, as an information set, can contain numerous types of information, which is able to be seen, heard or interact by the End-user

Web Hosting

A web hosting service is a type of Internet hosting service that allows individuals and organizations to make their Website accessible via the World Wide Web. Web hosts are companies that provide space on a Server (computing) owned or leased for use by clients, as well as providing Internet connectivity, typically in a data centre. Web hosts can also provide data centre space and connectivity to the Internet for other servers located in their data centre, called Collocation.

TYPES OF Web Hosting

There are four types of Web hosting

- 1 Free hosting
- 2 Dedicated hosting
- 3 Shared (Virtual) hosting
- 4 Collocated Hosting

Free hosting

Free web hosting is best suited for small sites with low traffic, like personal sites. It is not recommended for high traffic or for real business. Technical support is often limited, and technical options are few.

Dedicated Hosting

With dedicated hosting, your web site is hosted on a dedicated server. Dedicated hosting is the most expensive option. This option is best suited for large web sites with high traffic, and web sites that use special software. Dedicated hosting to be very powerful and secure, with almost unlimited software solutions.

Shared (Virtual) Hosting

Shared hosting is very cost effective.

With shared hosting, your web site gets its own domain name, and is hosted on a powerful server along with maybe 100 other web sites. Shared solutions often offer multiple software solutions like e-mail, database, and different editing options. Technical support tends to be good.

Collocated Hosting

Collocation means "co-location". Collocated hosting lets place own web server on the premises (locations) of a service provider. This is pretty much the same as running own server in your own office, only that it is located at a place better designed for it. Most likely an ISP will have dedicated resources like high-security against fire and vandalism, regulated backup power, dedicated Internet connections and more.

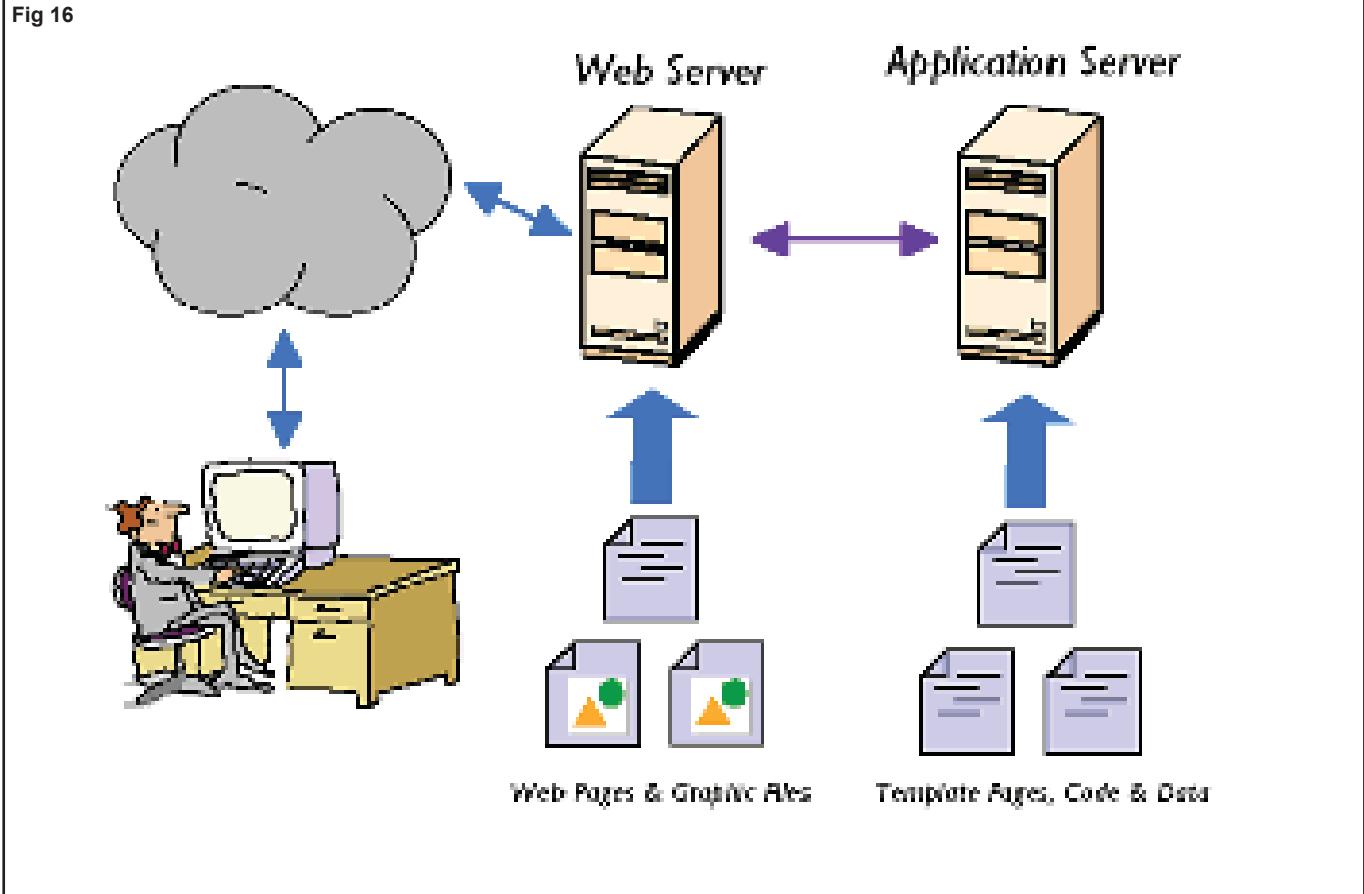
Web Server

A Web server is a program that, using the client server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web servers are Apache, the most widely-installed Web server, and Microsoft's Internet Information Server (IIS). Other Web servers include Novell's Web Server for users of its Netware operating system and IBM's family of Lotus Domino servers, primarily for IBM's OS390 and AS-400 customers.

Web servers often come as part of a larger package of Internet- and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, security characteristics, and publishing, search engine, and site building tools that may come with it.

Application Server

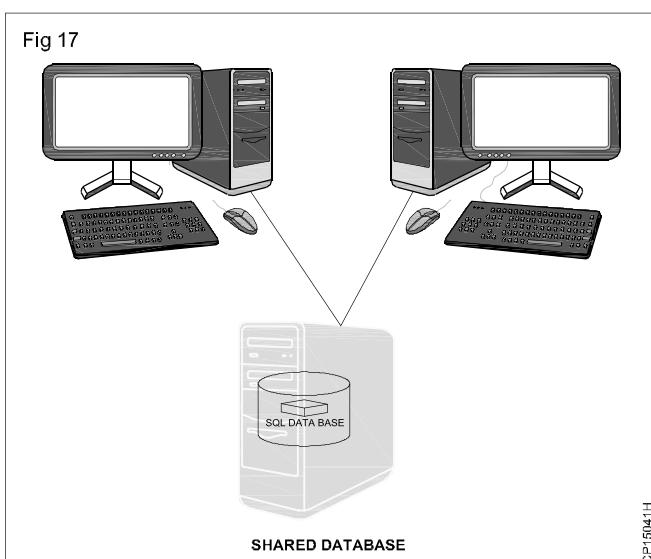
Also called an appserver, and application server (Fig 16) is a program that handles all application operations between users and an organization's backend business applications or database. An application server is typically used for complex transaction-based applications. To support high-end needs, an application server has to have built-in redundant, monitor for high-availability, high-performance distributed application services and support for complex database access.



Database Server

Database server (Fig 17) is the term used to refer to the back-end system of a database application using client-

server architecture. The back-end, sometimes called a database server, performs tasks such as data analysis, storage, data manipulation, archiving, and other non-user specific tasks.



Introduction to CMS and web authoring tools

Objectives: At the end of this lesson you shall be able to

- explain the meaning of content management System.
 - list some of the popular CMSes.
 - explain the use and main features of kompozer web authoring tool.
-

Definition of CMS:

CMS Stands for "Content Management System." A CMS is a software tool that allows you to create, edit, and publish content.

Description of CMS:

The goal of a CMS is to provide an intuitive user interface for building and modifying webpage content. Each CMS also provides a web publishing tool that allows one or more users to publish updates live on the Web. The editing component is called the content management application (CMA), while the publishing tool is called the content delivery application (CDA). These two components are integrated together in a CMS to streamline the web development process.

In terms of web publishing, content can be simple text, photos, music, video, documents, or just about anything you can think of. While early CMS software was used to manage documents and local computer files, most CMS systems are now designed exclusively to manage content on the Web. A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage.

Content management systems are available as installable applications and web-based user interfaces. The use of a web interface simplifies the website updating process. Additionally, most web-based CMSes are updated automatically, ensuring all users have the latest tools to manage their content.

A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage. Since the CMS manages all your content, you don't have to.

There are several web-based CMS tools available today. The following are some of the most popular ones:

- WordPress - free web software designed for creating template-based websites or blogs
- Blogger - Google's blogging tool designed specifically for maintaining a blog
- Joomla - a flexible web publishing tool that supports custom databases and extensions
- Drupal - an open source platform often used for developing community-based sites

- Weebly - a web-based platform for building simple personal and business websites
- Wix - a collection of web publishing tools for creating a highly customizable website

Introduction to WYSIWYG web authoring tools

WYSIWYG stands for "What You See Is What You Get". In such editors you edit not directly the source code of your documents, but its presentation as it will appear in the final document. So instead of writing blocks of code manually (as you e.g. would do it in Word or Notepad), you manipulate with design components using an editor window. This means that you view something very similar to the final result while the document or image is being created.

There are many easy-to-use WYSIWYG programs having all the tools needed to create a complex and fully functional websites, even by beginners. These sites even have options to work with HTML code be it design or editing. It is easier to create a Web site with an HTML editor, as software developers continue to add tools that let you develop advanced features with style. Many WYSIWYG web authoring tools offer advanced features to integrate Dynamic HTML or many other features into a site with an elegant and consistent design.

Introduction to Kompozer

KompoZer is a complete Web Authoring System that combines web file management and easy-to-use WYSIWYG web page editing capabilities found in Microsoft FrontPage, Adobe DreamWeaver and other high end programs. With kompozer you can create web pages and manage a website with no technical expertise or knowledge of HTML.

A useful feature of Kompozer is that you can use it to publish your web pages to a web hosting server. You just need to know your FTP account username and password as well as the site URL and Kompozer will log in and place your web pages on the server.

KompoZer's File Menu contains menu items for all major operations possible while using it. KompoZer's tool bar user interface consists of:

- Composition Toolbar
- Format Toolbar
- Tab Browser Toolbar
- Edit Mode Toolbar
- Status Toolbar

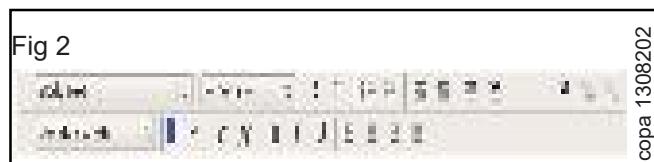
Composition Toolbar

The Composition Toolbar consists of buttons for the most used major operations. Below is the a snapshot of the default Composition Toolbar with text below each button indicating the respective button's function. (Refer Fig.1)



Format Toolbar(Refer Fig.2)

The Format Toolbar is a very useful tool while editing web pages with KompoZer. With the Format Toolbar you can apply paragraph format, choose a font, change foreground or background colour, increase or decrease size, and emphasize a block of text. You can also create ordered or unordered lists and justify a block of text to left, right or centre. To know which button does what just hover your mouse over the button and a tool tip will appear indicating the function of the button.



Tab Browser Toolbar(Refer Fig.3)

KompoZer allows you to simultaneously edit multiple web documents using different tabs for each opened document. Having multiple tabs gives a cleaner look to your desktop as it is not cluttered when multiple windows are used for each document. As a visual indicator a "red floppy icon" icon appears for pages which have been edited but not saved yet.



Edit Mode Toolbar(Refer Fig.4)

The Edit Mode Toolbar indicates the viewing mode which is presently active for the current document. Available viewing modes are the Normal view, HTML Tags view, HTML source view and the Preview mode. You can easily change your viewing mode by simply clicking any of the other three with the mouse.



Status Toolbar(Refer Fig.5)

KompoZer's status bar shows the position of the cursor with respect to the HTML tag hierarchy. You can easily edit/assign the properties of any particular tag in the status bar just by right clicking and choosing the desired option. Simple left-click of the mouse on a tag in status bar selects the text surrounded by that tag.



Sector : IT & ITES

Duration : 1 - Year

**Trade : Computer Operator and Programming Assistant 1st Semester - Trade Theory
NSQF level 4**

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FOREWORD

The Government of India has set an ambitious target of imparting skills to 30 crores people, one out of every four Indians, by 2020 to help them secure jobs as part of the National Skills Development Policy. Industrial Training Institutes (ITIs) play a vital role in this process especially in terms of providing skilled manpower. Keeping this in mind, and for providing the current industry relevant skill training to Trainees, ITI syllabus has been recently updated with the help of Mentor Councils comprising various stakeholder's viz. Industries, Entrepreneurs, Academicians and representatives from ITIs.

The National Instructional Media Institute (NIMI), Chennai, has now come up with instructional material to suit the revised curriculum for **Computer Operator and Programming Assistant Trade Theory 1st Semester in IT & ITES Sector**. The NSQF Level - 4 Trade Theory will help the trainees to get an international equivalency standard where their skill proficiency and competency will be duly recognized across the globe and this will also increase the scope of recognition of prior learning. NSQF Level - 4 trainees will also get the opportunities to promote life long learning and skill development. I have no doubt that with NSQF Level - 4 the trainers and trainees of ITIs, and all stakeholders will derive maximum benefits from these IMPs and that NIMI's effort will go a long way in improving the quality of Vocational training in the country.

The Executive Director & Staff of NIMI and members of Media Development Committee deserve appreciation for their contribution in bringing out this publication.

Jai Hind

RAJESH AGGARWAL

Director General/ Addl. Secretary
Ministry of Skill Development & Entrepreneurship,
Government of India.

New Delhi - 110 001

PREFACE

The National Instructional Media Institute (NIMI) was established in 1986 at Chennai by then Directorate General of Employment and Training (D.G.E & T), Ministry of Labour and Employment, (now under Directorate General of Training, Ministry of Skill Development and Entrepreneurship) Government of India, with technical assistance from the Govt. of the Federal Republic of Germany. The prime objective of this institute is to develop and provide instructional materials for various trades as per the prescribed syllabi under the Craftsman and Apprenticeship Training Schemes.

The instructional materials are created keeping in mind, the main objective of Vocational Training under NCVT/NAC in India, which is to help an individual to master skills to do a job. The instructional materials are generated in the form of Instructional Media Packages (IMPs). An IMP consists of Theory book, Practical book, Test and Assignment book, Instructor Guide, Audio Visual Aid (Wall charts and Transparencies) and other support materials.

The trade practical book consists of series of exercises to be completed by the trainees in the workshop. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered. The trade theory book provides related theoretical knowledge required to enable the trainee to do a job. The test and assignments will enable the instructor to give assignments for the evaluation of the performance of a trainee. The wall charts and transparencies are unique, as they not only help the instructor to effectively present a topic but also help him to assess the trainee's understanding. The instructor guide enables the instructor to plan his schedule of instruction, plan the raw material requirements, day to day lessons and demonstrations.

IMPs also deals with the complex skills required to be developed for effective team work. Necessary care has also been taken to include important skill areas of allied trades as prescribed in the syllabus.

The availability of a complete Instructional Media Package in an institute helps both the trainer and management to impart effective training.

The IMPs are the outcome of collective efforts of the staff members of NIMI and the members of the Media Development Committees specially drawn from Public and Private sector industries, various training institutes under the Directorate General of Training (DGT), Government and Private ITIs.

NIMI would like to take this opportunity to convey sincere thanks to the Directors of Employment & Training of various State Governments, Training Departments of Industries both in the Public and Private sectors, Officers of DGT and DGT field institutes, proof readers, individual media developers and coordinators, but for whose active support NIMI would not have been able to bring out this materials.

R. P. DHINGRA
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NIMI records its appreciation for the Data Entry, CAD, DTP operators for their excellent and devoted services in the process of development of this Instructional Material.

NIMI also acknowledges with thanks the invaluable efforts rendered by all other NIMI staff who have contributed towards the development of this Instructional Material.

NIMI is also grateful to everyone who has directly or indirectly helped in developing this Instructional Material.

INTRODUCTION

TRADE THEORY

The manual of trade theory consists of theoretical information for the First Semester course of the COPA Trade. The contents are sequenced according to the practical exercise contained in the manual on Trade practical. Attempt has been made to relate the theoretical aspects with the skill covered in each exercise to the extent possible. This co-relation is maintained to help the trainees to develop the perceptual capabilities for performing the skills.

The Trade Theory has to be taught and learnt along with the corresponding exercise contained in the manual on trade practical. The indicating about the corresponding practical exercise are given in every sheet of this manual.

It will be preferable to teach/learn the trade theory connected to each exercise atleast one class before performing the related skills in the system lab. The trade theory is to be treated as an integrated part of each exercise.

The material is not the purpose of self learning and should be considered as supplementary to class room instruction.

TRADE PRACTICAL

The trade practical manual is intended to be used in workshop . It consists of a series of practical exercises to be completed by the trainees during the First Semester course of the COPA trade supplemented and supported by instructions/ informations to assist in performing the exercises. These exercises are designed to ensure that all the skills in the prescribed syllabus are covered.

The manual is divided into twelve modules to maintain completeness of learning process in a stipulated time basis.

The skill training in the computer lab is planned through a series of practical exercises centred around some practical project. However, there are few instances where the individual exercise does not form a part of project.

While developing the practical manual a sincere effort was made to prepare each exercise which will be easy to understand and carry out even by below average trainee. However the development team accept that there is a scope for further improvement. NIMI, looks forward to the suggestions from the experienced training faculty for improving the manual.

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LEARNING / ASSESSABLE OUTCOME

On completion of this book you shall be able to

- **Install and setup operating system and related software in a computer.**
- **Create, format and edit document using word processing application software.**
- **Create, edit and develop a workbook by using spreadsheet application software.**
- **Create and customize slides for presentation.**
- **Create and manage database file by using MS Access**
- **Install, setup/ configure, troubleshoot and secure computer network including Internet.**
- **Develop static webpages using HTML.**

SYLLABUS

First Semester

Duration: Six Month

Week No.	Ref. Learning Outcome	Professional Skills (Trade Practical) with Indicative hours	Professional Knowledge (Trade Theory)
1.	<ul style="list-style-type: none"> • Apply safe working practices • Install and setup operating system and related software in a computer. 	<p>Safe working practices</p> <ol style="list-style-type: none"> 1. Visit COPA Lab. of the institutes and locate the electrical connections with computer system setup (6 hrs) 2. Identifying safety symbols and hazard identification.(4 Hrs) 3. Practice safe methods of fire fighting in case of electrical fire. (4 hrs) 4. Use of fire extinguishers. (4 Hrs) <p>Computer components</p> <ol style="list-style-type: none"> 5. Identify computer peripherals and internal components of a disassembled desktop computer. (6 Hrs) 6. Assemble components of desktop computer. (6 Hrs) 	<p>Safe working practices</p> <ul style="list-style-type: none"> • Scope of the COPA trade. • Safety rules and safety signs. • Types and working of fire extinguishers. <p>Introduction to Computer components</p> <ul style="list-style-type: none"> • Introduction to computer system. Concepts of hardware and Software. • Function of motherboard components and various processors. • Various Input / Output devices in use and their features.
2.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Using Windows Operating System</p> <ol style="list-style-type: none"> 7. Practice on Windows interface and navigating windows. (9 Hrs) 8. Practice on managing files and folders using removable drives. (6 Hrs) 9. Customize the desktop settings and manage user accounts. (6 Hrs) 10. View system properties and control panel details. (6 Hrs) 11. Work with keyboard shortcut commands. (6 Hrs) 12. Print and scan document using different commands.(3 Hrs) 	<p>Introduction Windows Operating System</p> <ul style="list-style-type: none"> • Introduction to operating System • Main features of Windows OS • Concept of various shortcut commands.
3.	<ul style="list-style-type: none"> • Install and setup operating system and related software in a computer. 	<p>Computer basics and Software Installation</p> <ol style="list-style-type: none"> 13. View the BIOS settings and their modifications. (3 Hrs) 14. Install Windows OS (5 Hrs) 15. Format Hard Disk and create partition (3 Hrs) 16. Identify and rectify common hardware and software issues during OS installation. (4 Hrs) 17. Install necessary application software for Windows i.e. Office Package, PDF Reader, Media Player etc. (5 Hrs) 18. Configure Bluetooth and wi-fi settings. (3 Hrs) 19. Install Drivers for printer, scanner, webcam and DVD etc. (4 Hrs) 20. Burn data, video and audio files on CD/DVD using application software. (3 Hrs) 	<p>Computer basics and Software Installation</p> <ul style="list-style-type: none"> • Introduction to the booting process. • Introduction to various types of memories and their features. • Basic Hardware and software issues and their solutions. • Usage of Application software and Antivirus.

4 - 5	<ul style="list-style-type: none"> Install and setup OS and related software in a computer. 	<p>DOS Command Line Interface & Linux Operating Systems</p> <p>21. Use basic DOS commands for directory listing (10 hrs) 22. Manage files and folders using DOS commands (6 hrs) 23. Install Linux operating system.(6 Hrs) 24. Install necessary application software for Linux i.e. Office Package, PDF Reader, MediaPlayer etc. (6 Hrs) 25. Use Basic Linux commands for directory listing, file and folder management, password etc. (10Hrs) 26. Use the Linux GUI for file and folder management, exploring the system etc. (10 Hrs) 27. Customize desktop settings and manage user accounts in Linux. (6 Hrs) 28. View system properties and manage system setting in Linux (6 Hrs)</p>	<p>Introduction to DOS Command Line Interface & Linux Operating Systems</p> <ul style="list-style-type: none"> Introduction to basic DOS Internal and External Commands. Introduction to Open Source Software. Introduction to Linux Operating System features, structure, files and processes. Basic Linux commands.
6 - 8	Create, format and edit document using word processing application software.	<p>Using Word Processing Software</p> <p>29. Open MS Word and familiarise with basic word components. (3 Hrs) 30. Practice creating, saving and renaming of word documents.(3 Hrs) 31. Edit document using basic formatting tools. (8 Hrs) 32. Practice Inserting and formatting tables and other objects. (12 Hrs) 33. Work with Page layout settings and printing documents. (6 Hrs) 34. Use templates, autocorrect tools, and record and execute a macro. (6 Hrs) 35. Use Mail merge tool. Use conditional Mail Merge, External Data Source. Practice Letters, Label & Envelop printing using Mail Merge (10 Hrs). 36. Use Table of Context, Indexing, Hyperlink, Bookmark, Comment, equation,symbols,citation, crossreference, footnote, translate, synonyms, thesaurus, spell check & grammer, compare etc. (6 Hrs) 37. Practice Typing using open source tutor. (24 Hrs) 38. Practice of using shortcut keys and use Open Office as word processor. (12 Hrs)</p>	<p>Word Processing Software</p> <ul style="list-style-type: none"> Introduction to the various applications in MS office. Introduction to Word features, Office button, toolbars. Creating, saving and formatting and printing documents using Word. Working with objects, macro, mail merge, templates and other tools in Word.
9 - 11	<ul style="list-style-type: none"> Create, format, edit and develop a workbook by using spreadsheet application software. 	<p>Using Spread Sheet Application</p> <p>39. Open MS Excel and familiarise with basic application components. (4 Hrs) 40. Practice create, save and format excel sheets. (9 Hrs) 41. Use absolute and relative referencing, linking sheets, conditional formatting etc. (9 Hrs) 42. Practice Excel functions of all major categories i.e. Financial, Logical, Text, date & time, Lookup, Math, Statistical etc. (12 Hrs) 43. Use various data types in Excel, sorting, filtering and validating data. (8 Hrs) 44. Create and format various static and dynamic charts. (10 Hrs) 45. Practice Importing & exporting excel data. (4 Hrs) 46. Perform data analysis using "what if" tools and Pivot Table and record and execute a macro. (10 Hrs) 47. Modify Excel page setup and printing and use open office as Spreadsheet application. (4 Hrs) 48. Execute simple projects using Excel & Word. (20 Hrs)</p>	<p>Spread Sheet Application</p> <ul style="list-style-type: none"> Introduction to Excel features and Data Types. Cell referencing and linking Sheets. Introduction to various functions in all categories of Excel. Concepts of sorting, filtering and validating data. Analyzing data using charts, data tables, pivot tables, goal seek and scenarios.

12 - 13	Create and customize slides for presentation.	<p>Image editing and creating Presentations</p> <p>49. Use Windows Paint or image editing software like Open Office Draw, GIMP, IrfanView or a similar tool. (6 Hrs)</p> <p>50. Perform Image editing using open source applications. (12 Hrs)</p> <p>51. Open power point presentation and familiarise with basic application components. (6 Hrs)</p> <p>52. Create Slide shows, Insert picture and theme. (6 Hrs)</p> <p>53. Add new slide, format text, link with word and excel documents. (5 Hrs)</p> <p>54. Practice animating slide transitions and objects. (4 Hrs)</p> <p>55. Create slide shows by inserting audio & video and sync with presentation. (6 Hrs)</p> <p>56. Modify slide page setup and print the slides. (3 Hrs)</p> <p>57. Create a simple presentation project using open office. (12 Hrs)</p>	<p>Image editing, Presentations</p> <ul style="list-style-type: none"> • Introduction to Open Office. • Introduction to the properties and editing of images. • Introduction to different formats of images and their uses. • Introduction to Power Point and its advantages. • Creating Slide Shows. • Fine tuning the presentation and good presentation technique.
14 - 15	Create and manage database file by using MS Access.	<p>Database Management with MS Access</p> <p>58. Create database and design a simple tables in Access. (6 Hrs)</p> <p>59. Practice enforcing integrity constraints and modify properties of tables and fields. (6 Hrs)</p> <p>60. Create relationships and join tables. (6 Hrs)</p> <p>61. Create and format Forms. (6 Hrs)</p> <p>62. Create simple queries with various criteria and calculations. (12 Hrs)</p> <p>63. Create Simple update, append, make table, delete and crosstab queries. (9 Hrs)</p> <p>64. Modify form design with controls, macros and events. (6 Hrs)</p> <p>65. Import and export data to/from Access and create and format types of reports. (6 Hrs)</p> <p>66. Compress and Encrypt databases. (3 Hrs)</p>	<p>Database Management Systems</p> <ul style="list-style-type: none"> • Concepts of Data and Databases. • Overview of popular databases, RDBMS, OODB and NOSQL. • Rules for designing good tables. Integrity rules and constraints in a table. • Relationships in tables. • Introduction to various types of Queries and their uses. • Designing Access Reports and Forms. • Introduction to macros, designer objects controls, their properties and behaviour.
16 - 17	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Configuring and using Network</p> <p>67. View Network connections. (3 Hrs)</p> <p>68. Connect a computer to a n/w and share Devices i.e. Printers, files, folders and drives. (6 Hrs)</p> <p>69. Work with various Network devices, connectors/cables. Create straight/cross cable and punch a UTP cable in the patch socket and test the connectivity. (6 Hrs)</p> <p>70. Practice IP Addressing and Subnet masking for IPV4/ IPV6 and pinging to test networks. (6 Hrs)</p> <p>71. Configure Hub and Switch. (6 Hrs)</p> <p>72. Set up and configure wired and wireless LAN in a Computer Lab within at least three computers. Use patch panel & I/O Box for wired LAN and installing & configuring Internet connection in a single PC and in a LAN. (12 Hrs)</p>	<p>Networking Concepts</p> <ul style="list-style-type: none"> • Introduction to Computer Networks, Necessity and Advantages. • Client Server and peer to Peer networking concepts. • Concept of Proxy Server and proxy firewall server. • Concept of DHCP Server. • Introduction to LAN, WAN and MAN. • Network topologies. Network components, viz. Modem, Hub, Switch, Router, Bridge, Gateway etc. • Network Cables, Wireless networks and Blue Tooth technology. • Concept of ISO - OSI 7 Layer Model. • Overview of Network protocols Viz.TCP/IP, FTP, Telnet etc.

		<p>73. Setup a proxy server/DHCP Server with firewall.(9 Hrs)</p> <p>74. Setup video conferencing using open source s/w(6 Hrs)</p> <p>75. Use various tools (by open source /free) for network troubleshooting, maintenance and security for both Wired and Wireless(6 Hrs)</p>	<ul style="list-style-type: none"> • Concept of Logical and Physical Addresses, Subnetting and Classes of Networks.
18	Install, setup/configure, troubleshoot and secure computer network including Internet.	<p>Using Internet</p> <p>76. Browse the Internet for information (use at least 3 popular browsers). (3 Hrs)</p> <p>77. Create and use e-mail for communication with attachment, priority setting, address book. (3 Hrs)</p> <p>78. Communicate with text, video chatting and social networking sites. (6 Hrs)</p> <p>79. Use online dictionary, translation software, storage space, share files with e-mail links, download manager, download & upload YouTube files, google map & earth etc. Update windows & other software. (6 Hrs)</p> <p>80. Configure Outlook, mail service in mobile phones. Use tools like Skype, Google+ etc. (6 Hrs)</p> <p>81. Browser setting for Bookmark, cookies, favourites and pop ups, default website, trusted site, restricted site, content, history and advanced setup. (6 Hrs)</p>	<p>Internet Concepts</p> <ul style="list-style-type: none"> • Introduction to www, Concept of Internet, Web Browsers, internet servers and search engines. • Concepts of Domain naming Systems and E mail communication. • Introduction to video chatting tools and Social Networking concepts.
19-21	Develop static web pages using HTML.	<p>Designing Static Web Pages</p> <p>82. Practice with basic HTML elements (e.g. head, title, body), tag and attributes. (3 Hrs)</p> <p>83. Design simple web page with text, paragraph and line break usingHTML tags. (5 Hrs)</p> <p>84. Format text, change background colour and insert pictures in web page. (6 Hrs)</p> <p>85. Design simple web page with tables and lists. (6 Hrs)</p> <p>86. Use marquees, hyperlinks and mailto link in designing web pages.(6 Hrs)</p> <p>87. Create frames, add style and design layout. (10 Hrs)</p> <p>88. Insert text, check and combo box in web page. (6 Hrs)</p> <p>89. Design web page using password field, submit button, reset button and radio button etc. (6 Hrs)</p> <p>90. Design a web page adding flash file, audio and video files. (10 Hrs)</p> <p>91. Design web page with forms and form controls using HTML tags.(8 Hrs)</p> <p>92. Create web page using Cascading Style Sheet (CSS). (12 Hrs)</p> <p>93. Use WYSIWYG (Kompozer) web design tools to design and edit web pages with various styles. (12Hrs)</p>	<p>Web Design Concepts</p> <ul style="list-style-type: none"> • Concepts of Static and Dynamic Web pages. • Introduction to HTML and various tags in HTML. • Concepts of different controls used in Web Pages. • Concepts of CSS and applying CSS to HTML. • Introduction to open source CMS viz, Joomla, Word press etc. and Web authoring tools viz. Kompozer, Front Page etc. • Concept of good web page designing techniques.
22-23	Industrial Visit/Project work	<p>1. Create a simple web site of at least 5 web pages which will include Images, tables, charts, lists and hyperlink on any topic like Student Information System, Book Store, and Organisations etc.</p> <p style="text-align: center;">OR</p> <p>2. Setup and configure a LAN using at least 3 computers connected with wire and 3 computers connected with wireless and secure it.)</p>	
24-25		Revision	
26		Examination	

Electrical safety

Objective : At the end of this lesson you shall be able to

- explain how to rescue a person who is in contact with a live wire.

The severity of an electric shock will depend on the level of current which passes through the body and the length of time of contact. Do not delay, act at once. Make sure that the electric current has been disconnected.

If the casualty is still in contact with the supply - break the contact either by switching off the power, removing the plug or wrenching the cable free. If not, stand on some insulating material such as dry wood, rubber or plastic, or using whatever is at hand to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)

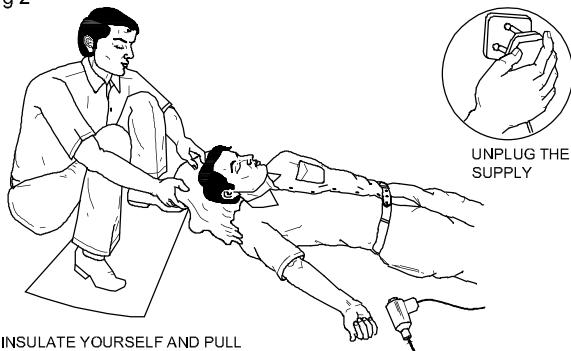
If you remain un-insulated, do not touch the victim with your bare hands until the circuit is made dead or person is moved away from the equipment.

Fig 1



EL110421

Fig 2



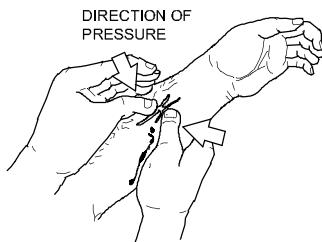
EL110422

If the victim is aloft, measures must be taken to prevent him from falling or atleast make him fall safe.

Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

If the casualty is unconscious but is breathing, loosen the clothing about the neck, chest and waist and place the casualty in the recovery position.(Fig 3)

Fig 3



EL110433

Keep a constant check on the breathing and pulse rate.

Keep the casualty warm and comfortable. (Fig 4)

Send for help.

Do not give an unconscious person anything by mouth.

Do not leave an unconscious person unattended.

If the casualty is not breathing - Act at once - don't waste

Fig 4



EL110424

Safety practice - fire extinguishers

Objectives : At the end of this lesson you shall be able to

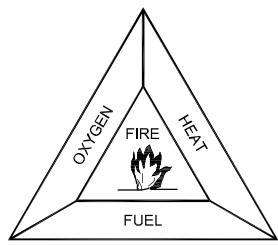
- explain how to rescue a person who is in contact with a live wire
- distinguish the different types of fire extinguishers
- determine the correct type of fire extinguisher to be used based on the class of fire
- describe the general procedure to be adopted in the event of a fire.

Fire is the burning of combustible material. A fire in an unwanted place and on an unwanted occasion and in an uncontrollable quantity can cause damage or destroy property and materials. It might injure people, and sometimes cause loss of life as well. Hence, every effort must be made to prevent fire. When a fire outbreak is discovered, it must be controlled and extinguished by immediate corrective action.

Is it possible to prevent fire? Yes, fire can be prevented by eliminating anyone of the three factors that causes fire.

The following are the three factors that must be present in combination for a fire to continue to burn. (Fig 1)

Fig 1



EL110311

Fuel: Any substance, liquid, solid or gas will burn, if there is oxygen and high enough temperatures.

Heat: Every fuel will begin to burn at a certain temperature. It varies and depends on the fuel. Solids and liquids give off vapour when heated, and it is this vapour which ignites. Some liquids do not have to be heated as they give off vapour at normal room temperature say 15°C, eg. petrol.

Oxygen: Usually exists in sufficient quantity in air to keep a fire burning.

Extinguishing of fire: Isolating or removing any of these factors from the combination will extinguish the fire. There are three basic ways of achieving this.

- **Starving** the fire of fuel removes this element.
- **Smothering** - ie. isolate the fire from the supply of oxygen by blanketing it with foam, sand etc.
- **Cooling** - use water to lower the temperature. Removing any one of these factors will extinguish the fire.

Preventing fires: The majority of fires begin with small outbreaks which burn unnoticed until they have a secure hold. Most fires could be prevented with more care and by following some simple common sense rules.

Accumulation of combustible refuse (cotton waste soaked with oil, scrap wood, paper, etc.) in odd corners are a fire risk. Refuse should be removed to collection points.

The cause of fire in electrical equipment is misuse or neglect. Loose connections, wrongly rated fuses, overloaded circuits cause overheating which may in turn lead to a fire. Damage to insulation between conductors in cables causes fire.

Clothing and anything else which might catch fire should be kept well away from heaters. Make sure that the heater is shut off at the end of the working day.

Highly flammable liquids and petroleum mixtures (thinner, adhesive solutions, solvents, kerosene, spirit, LPG gas etc.) should be stored in the flammable material storage area.

Blowlamps and torches must not be left burning when they are not in use.

Extinguishing fires: Fires are classified into four types in terms of the nature of fuel.

Different types of fires (Fig 2, Fig 3 Fig 4 & Fig 5) have to be dealt with in different ways and with different extinguishing agents.

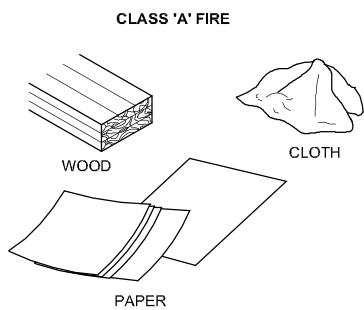
An extinguishing agent is the material or substance used to put out the fire, and is usually (but not always) contained in a fire extinguisher with a release mechanism for spraying into the fire.

It is important to know the right type of agent for extinguishing a particular type of fire; using a wrong agent can make things worse. There is no classification for 'electrical fires' as such, since these are only fires in materials where electricity is present.

Fuel

Extinguishing

Fig 2

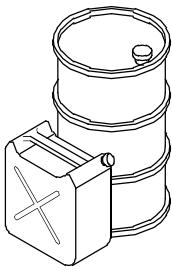


EL110312

Most effective ie. cooling with water. Jets of water should be sprayed on the base of the fire and then gradually upwards.

Fig 3

CLASS 'B' FIRE



FLAMMABLE LIQUIDS AND LIQUIFIABLE SOLIDS

EL110313

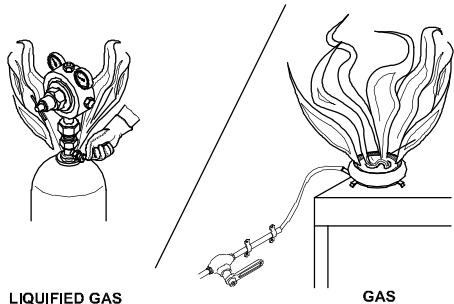
Should be smothered. The aim is to cover the entire surface of the burning liquid. This has the effect of cutting off the supply of oxygen to the fire.

Water should never be used on burning liquids.

Foam, dry powder or CO₂ may be used on this type of fire.

Fig 4

CLASS 'C' FIRE



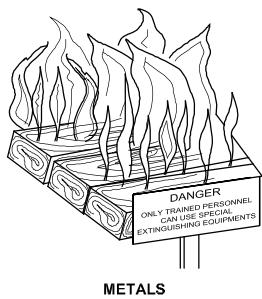
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Extreme caution is necessary in dealing with liquefied gases. There is a risk of explosion and sudden outbreak of fire in the entire vicinity. If an appliance fed from a cylinder catches fire - shut off the supply of gas. The safest course is to raise an alarm and leave the fire to be dealt with by trained personnel.

Dry powder extinguishers are used on this type of fire.

Fig 5

CLASS 'D' FIRE



EL110315

Special powders have now been developed which are capable of controlling and/or extinguishing this type of fire.

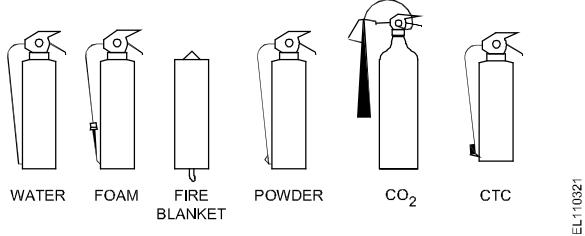
The standard range of fire extinguishing agents is inadequate or dangerous when dealing with metal fires.

Fire on electrical equipment.

Halon, Carbon dioxide, dry powder and vapourising liquid (CTC) extinguishers can be used to deal with fires in electrical equipment. Foam or liquid (eg. water) extinguishers must not be used on electrical equipment under any circumstances.

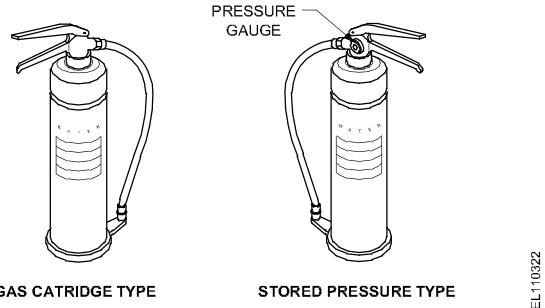
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)

Fig 1



Water-filled extinguishers: There are two methods of operation. (Fig 2)

Fig 2

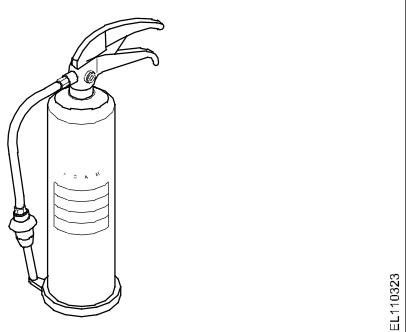


- Gas cartridge type
- Stored pressure type

With both methods of operation the discharge can be interrupted as required, conserving the contents and preventing unnecessary water damage.

Foam extinguishers (Fig 3): These may be of stored pressure or gas cartridge types. Always check the operating instructions on the extinguisher before use.

Fig 3



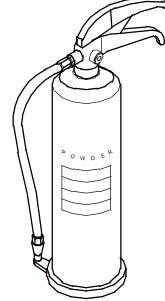
Most suitable for

- flammable liquid fires
- running liquid fires.

Must not be used on fires where electrical equipment is involved.

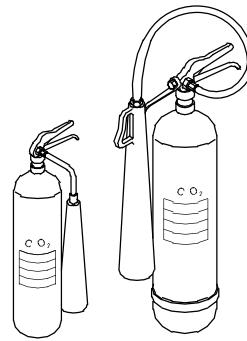
Dry powder extinguishers (Fig 4): Extinguishers fitted with dry powder may be of the gas cartridge or stored pressure type. Appearance and method of operation is the same as that of the water-filled one. The main distinguishing feature is the fork shaped nozzle. Powders have been developed to deal with class D fires.

Fig 4



Carbon dioxide (CO₂): This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5).

Fig 5

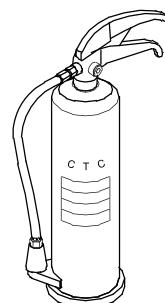


Suitable for Class B fires. Best suited where contamination by deposits must be avoided. Not generally effective in open air.

Always check the operating instructions on the container before use. Available with different gadgets of operation such as - plunger, lever, trigger etc.

Halon extinguishers (Fig 6): These extinguishers may be filled with carbon-tetrachloride and Bromochlorodifluoro methene (BCF). They may be either gas cartridge or stored pressure type.

Fig 6



They are more effective in extinguishing small fires involving pouring liquids. These extinguishers are particularly suitable and safe to use on electrical equipment as the chemicals are electrically non-conductive.

The fumes given off by these extinguishers are dangerous, especially in confined space.

The general procedure in the event of a fire:

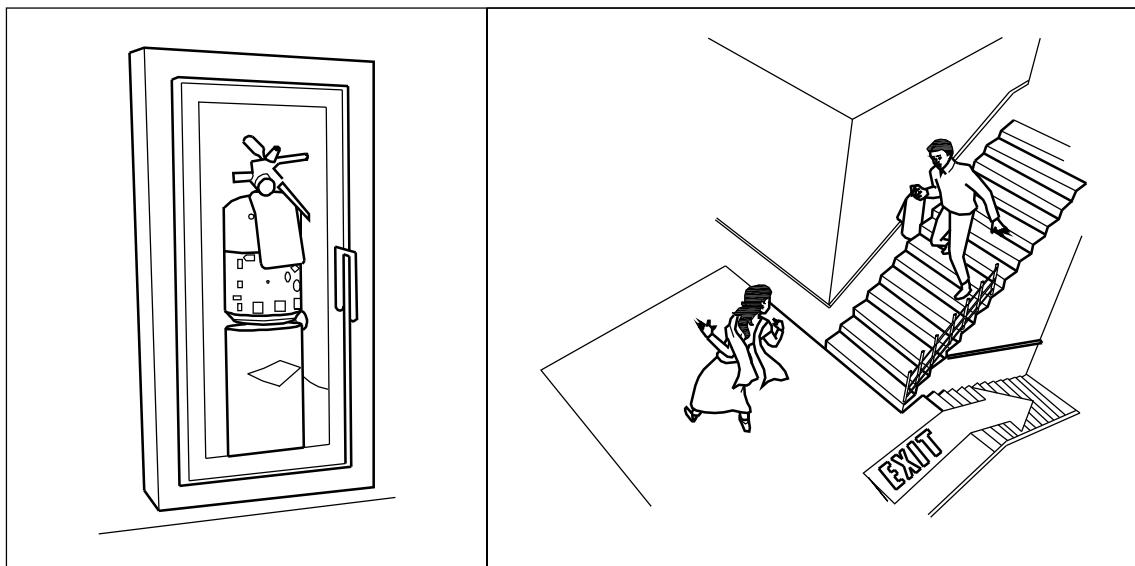
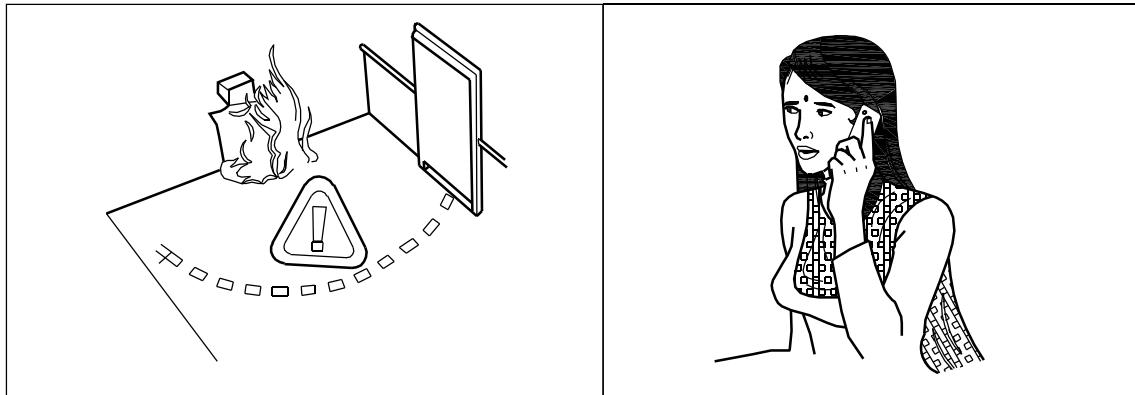
- Raise an alarm.
- Turn off all machinery and power (gas and electricity).

- Close the doors and windows, but do not lock or bolt them. This will limit the oxygen fed to the fire and prevent its spreading.
- Try to deal with the fire if you can do so safely. Do not risk getting trapped.
- Anybody not involved in fighting the fire should leave calmly using the emergency exits and go to the designated assembly point. Failure to do this may mean that some person being unaccounted for and others may have to put themselves to the trouble of searching for him or her at risk to themselves.

Practice on fire extinguishers

Objectives: At the end of this lesson you shall be able to

- state about the selection of the fire extinguishers according to the type of fire
- state the method of operation of the fire extinguisher
- explain how to extinguish the fire.



F1104E1

PROCEDURE (Fig 1)

- Alert people surrounding by shouting fire, fire, fire when observe the fire.
- Inform fire service or arrange to inform immediately.
- Open emergency exist and ask them to go away.
- Put "off" electrical power supply.

Don't allow people to go nearer to the fire

- Analyze and identify the type of fire. Refer Table1.

Table-1

Class 'A'	Wood, paper, cloth, solid material
Class 'B'	Oil based fire (grease, gasoline, oil) liquefiable gases
Class 'C'	Gas and liquefiable gases
Class 'D'	Metals and electrical equipment

Assume the fire is 'B' type (flammable liquefiable solids)

- Select CO₂ (Carbon di oxide) fire extinguisher.
- Locate and pickup, CO₂ fire extinguisher. Click for its expiry date.
- Break the seal (Fig 2)

Fig 2

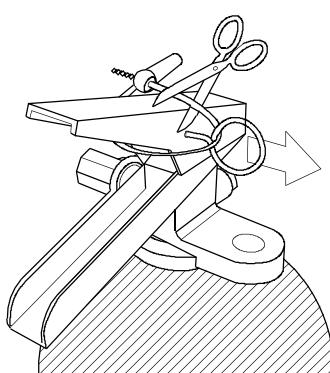


Fig104-H2

- Pull the safety pin from the handle (Pin located at the top of the fire extinguisher) (Fig 3)

Fig 3

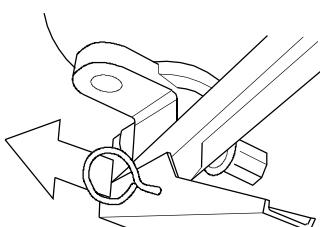


Fig104-H3

- Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 4)

Fig 4

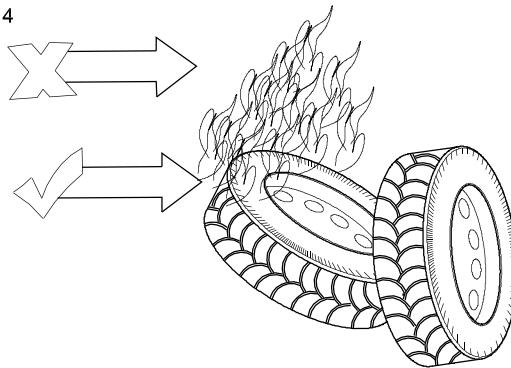


Fig104-H4

Keep your self low

- Squeeze the handle lever slowly to discharge the agent (Fig 5)
- Sweep side to side approximately 15 cm over the fuel fire until the fire is put off (Fig 5)

Fig 5

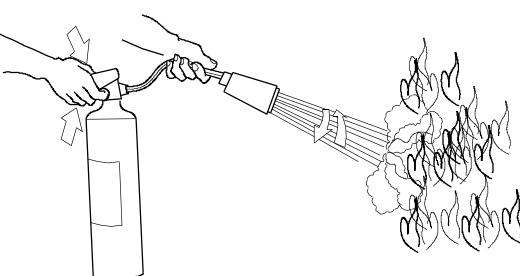


Fig104-H5

Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up
- Do not be panick belong as it put off promptly.
- If the fire doesn't respond well after you have used up the fire extinguisher move away yourself away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke leave it for the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of the extinguisher. Remember P.A.S.S. This will help you to use the fire extinguisher.

P for Pull

A for Aim

S for Squeeze

S for Sweep

Introduction to computers

Objectives : At the end of this lesson you shall be able to

- define and classify computers
- list the advantages and limitations of computers
- list the applications of computer
- describe the voltages and currents in the computer.

Computer - Definitions

A computer is an electronic machine, operating under the control of instructions stored in its own memory that can accept data (input), manipulate the data according to specified rules (process), produce results (output), and store the results for future use.

Technically, a computer is a programmable machine. This means it can execute a list of programmed instructions and respond to new instructions that it is given.

History of Computer

Charles babbage's machine

The working principles of today's computers were provided by an English mathematician Charles Babbage around 1833's invented a machine called the "Analytical Engine". A machine which could calculate and print tables of functions using limited techniques.

The Analytical Engine had four parts. A mill, which was the section which did the calculations, essentially the CPU; the store, where the information was kept recorded, essentially the memory; the reader, which would allow data to be entered using punched cards, essentially the keyboard, and the printer.

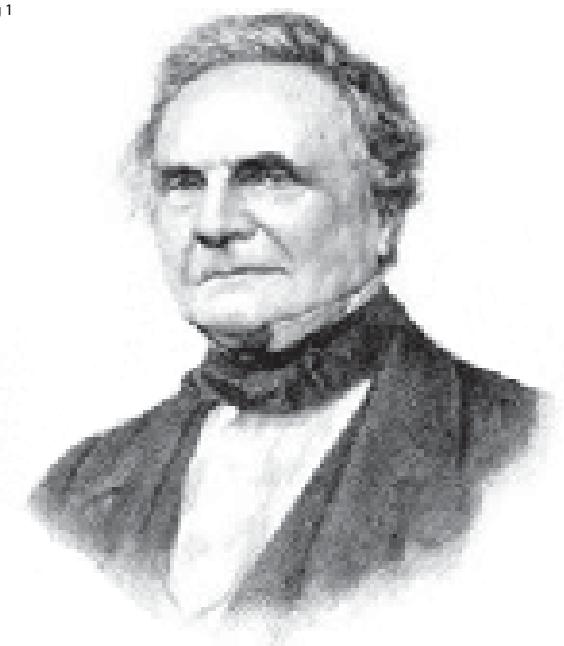
Hence, Charles Babbage is considered as the "Father of the Computer" as in fig-1.

The generations of computers are characterized by a major technological development that fundamentally changed the way computers operate, resulting in increasingly smaller, cheaper, more powerful and more efficient and reliable devices. The various generations of computers are listed below:

First Generation (1946-1954): In 1946 the digital computer using **electronic valves** (Vacuum tubes) are known as first generation computers. The first '**computer**' to use electronic valves i.e. vacuum tubes. The high cost of vacuum tubes prevented their use for main memory. They stored information in the form of propagating sound waves.

The vacuum tube consumes a lot of power. These computers were large in size and writing programs on them was difficult. Some of the computers of this generation were:

Fig 1



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Mark I :The IBM Automatic Sequence Controlled Calculator (ASCC), called the Mark I by **Harvard University**, was an **electro-mechanical computer**. Mark I is the first machine to successfully perform a long series of **arithmetic and logical operation**. Mark I is the **First Generation Computer**.

ENIAC: It was the first electronic computer built in 1946 at University of Pennsylvania, USA by John Eckert and John Mauchy. It was named Electronic Numerical Integrator and Calculator (ENIAC). The ENIAC was 30-50 feet long, weighted 30 tons, contained 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors and required 150,000 watts of electricity. Today computer is many times as powerful as ENIAC, still size is very small.

EDVAC: It stands for **Electronic Discrete Variable Automatic Computer** and was developed in 1950. The concept of storing data and instructions inside the computer was introduced here. This allowed much faster operation since the computer had rapid access to both data and instructions. The other advantage of storing instruction was that computer could do logical decision internally. The EDVAC was a **binary serial computer** with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.

EDSAC: It stands for **Electronic Delay Storage Automatic Computer** and was developed by **M.V. Wilkes at Cambridge University in 1949.** The **EDSAC** is the first **stored-program computer.** The EDSAC performed computations in the three millisecond range. It performed arithmetic and logical operations without human intervention. The key to the success was in the stored instructions which it depended upon solely for its operation.

This machine marked the beginning of the computer age.

UNIVAC-1: It stands for **Universal Automatic computer** and it was the First commercial computer developed by United States In 1951. The machine was 25 feet by 50 feet in length, contained 5,600 tubes, 18,000 crystal diodes, and 300 relays. It utilized serial circuitry, 2.25 MHz bit rate, and had an internal storage capacity 1,000 words or 12,000 characters.

The UNIVAC was used for **general purpose computing** with large amounts of input and output. The UNIVAC was also the first computer to come equipped with a magnetic tape unit and was the **first computer to use buffer memory.**

Limitations of First Generation Computer

Followings are the major drawbacks of First generation computers.

- They used valves or vacuum tubes as their main electronic component.
- They were large in size, slow in processing and had less storage capacity.
- They consumed lots of electricity and produced lots of heat.
- Their computing capabilities were limited.
- They were not so accurate and reliable.
- They used machine level language for programming.
- They were very expensive.

Second Generation (1955-1964): The second-generation computer used **transistors** for CPU components and **ferrite cores for main memory&magnetic disks** for secondary memory. They used high-level languages such as **FORTRAN (1956), ALGOL (1960) & COBOL (1960 - 1961).** Input Output (I/O)processor was included to control I/O operations.

Manufacturing cost was also very low. Thus the size of the computer got reduced considerably.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. Some of the second generation computers are IBM 1620, IBM 1401,CDC 3600.

- Transistors were used instead of Vacuum Tube.
- Processing speed is faster than First Generation Computers (Micro Second)
- Smaller in Size (51 square feet)
- The input and output devices were faster.

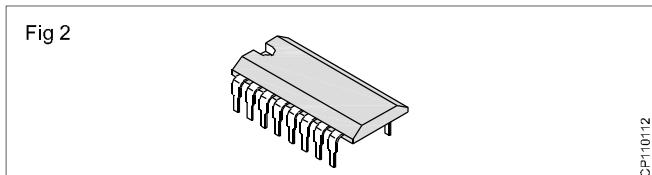
Third Generation (1964-1977): By the development of a small chip consisting of the capacity of the **300 transistors.** These Integrated Circuits (IC)s are popularly known as **Chips.**

A single IC has many transistors, registers and capacitors built on a single thin slice of silicon. So it is quite obvious that the size of the computer got further reduced. Some of the computers developed during this period were **IBM-360, ICL-1900, IBM-370, and VAX-750.** Higher level language such as **BASIC (Beginners All purpose Symbolic Instruction Code)** was developed during this period.

Computers of this generation were small in size, low cost, large memory and processing speed is very high. Very soon ICs were replaced by **LSI (Large Scale Integration)**, which consisted about 100 components.

An IC containing about 100 components is called LSI as in (Fig 2).

Features



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- They used Integrated Circuit (IC) chips in place of the transistors.
- Semiconductor memory devices were used.
- The size was greatly reduced, the speed of processing was high, and they were more accurate and reliable.
- Large Scale Integration (LSI) and Very Large Scale Integration (VLSI) were also developed.
- The mini computers were introduced in this generation.
- They used high level language for programming.

Fourth Generation (1978 - present): An IC containing about 100 components is called LSI (Large Scale Integration) and the one, which has more than 1000 such components, is called as VLSI (Very Large Scale Integration).

It uses large scale Integrated Circuits(LSIC) built on a single silicon chip called microprocessors. Due to the development of microprocessor it is possible to place computer's central processing unit(CPU) on single chip. These computers are called microcomputers.

Later very large scale Integrated Circuits(VLSIC) replaced LSICs. Thus the computer which was occupying a very large room in earlier days can now be placed on a table. The personal computer (PC) that you see in your school is a Fourth Generation Computer Main memory used fast semiconductors chips up to 4 M bits size. Some of the Fourth generation computers are IBM PC, Apple-Macintosh, etc.

Hard disks were used as secondary memory. Keyboards, dot matrix printers etc. were developed. Operating System (OS)-such as MS-DOS, UNIX, Apple's Macintosh were available. Object oriented language, C++ etc were developed.

Features

- They used Microprocessor (VLSI) as their main switching element.
- They are also called as micro computers or personal computers.
- Their size varies from desktop to laptop or palmtop.
- They have very high speed of processing; they are 100% accurate, reliable, diligent and versatile.
- They have very large storage capacity.

Fifth Generation (PRESENT AND FUTURE): 5th generation computers use ULSI (Ultra-Large Scale Integration) chips. Millions of transistors are placed in a single IC in ULSI chips.

64 bit microprocessors have been developed during this period.. Memory chips and flash memory up to 1 GB, hard disks up to 600 GB & optical disks up to 50 GB have been developed (fig. 3).

Fig 3



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Fifth generation computing devices, based on Artificial Intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.

Artificial Intelligence is the branch of computer science concerned with making computers behave like humans. The term was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. Artificial intelligence includes:

- **Games Playing:** Programming computers to play games such as chess and checkers
- **Expert Systems:** Programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms)
- **Natural Language:** Programming computers to understand natural human languages
- **Neural Networks:** Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains
- **Robotics:** programming computers to see and hear and react to other sensory stimuli

Table - 1

GENERATION	ELECTRONIC COMPONENT	ADVANTAGES	DISADVANTAGES
First	Vaccum tube	Helped in calculation and computational work	1.Big size 2.Very costly 3.Slow speed 4.Low accuracy 5.Low storage 6.High power requirements 7.High heat generation 8.High failure rate 9.Used machine language 10.No operating system
Second	Transistor	1.Smaller size 2.Less cost 3.Better speed 4.Low power consumption and less heat generation 5.Better storage capacity 6.Better accuracy and more reliability	1.Need air conditioning 2.Constant maintenance 3.No operating systems 4.Later stage computers used assembly languages
Third	Integrated Circuits(IC) small & medium scale	1.Better in all aspects compared to I & II 2.Used operating systems and high level language	1.Initial problem with manufacturers 2.No insight obtained into internal working
Fourth	VLSI or Microprocessor	1.Low cost 2.Excellent speed and reliability 3.Computers close to man	1.Less powerful than main frame computers
Fifth (Knowledge Information Processing Systems)	ULSI or Bio-Chips	1.Very cheap 2.super speeds 3.Very high storage capacity 4.Highly sophisticated OS 5.posses intelligence and decision making ability	1.New low level language needed

Classification of computers

Computers are classified according to the following criteria:

- Principle of Operation
- Computing Power, Memory Capacity and cost
- Technological Development
- Principle of operation
 - Analog computer
 - Digital Computer
 - Hybrid Computer

It is a computer that measures continuously changing physical quantities such as current, temperature, pressure etc. and converts them into quantities which can be used as data for computation. As these computers deal with continuously varying quantities they will give only approximate results. Its output is usually displayed on a meter or scale. Analog computer has low memory and fewer functions. These are used for engineering and scientific applications.

- Thermometer
- Speedometer
- Analog clock

Analog Computer

Digital Computer

A digital computer works with digital data. Digital computer uses binary number system. Binary number system consists of only two digits '0' and '1'. A digital computer represents data in digital signals. A '0' represents OFF and a '1' represents ON. Digital computer performs arithmetic and logical operations on data. It gives output in digital form.

Digital computers are very fast. These computers can

store results. They have large Memory (that is data storing capacity). Today most of the computers used in offices and homes are Digital computers.

The digital computers are further divided into the following two groups:

- Special purpose computers
- General purpose computers

Table 2

Analog Computers	Digital Computers
<p>1. Analog Computers Work on continuous values.</p> <p>2 Analog Computers have low memory.</p> <p>3 Analog computers have Slow speed.</p> <p>4 Analog computers are less reliable.</p> <p>5 Analog computers used in engineering</p> <p>6 Analog computers are used to calculate / measure analog quantities like speed and temperature.</p> <p>7 Analog computers provide less accurate results.</p> <p>8 Normally Analog Computers are specific purpose</p> <p>9 Normally Analog Computers are specific purpose</p> <p>10 Examples of Analog computers are: thermometer, analog clock, speedometer etc.</p>	<p>Digital computers Work on discrete values.</p> <p>Digital computers have a very large memory</p> <p>Digital computers have fast speed.</p> <p>Digital computers are more reliable.</p> <p>Digital computers are used in all fields of life, science and medical fields.</p> <p>Digital computers are used to calculate mathematical and logical operations. It can solve addition, subtraction, division, multiplication and other mathematical and statistical operations.</p> <p>Digital computers provide 100% accurate results.</p> <p>Digital Computers are general purpose</p> <p>Digital Computers are general purpose</p> <p>Examples of digital computers are:</p> <p>Personal Computer, laptops, smart phones etc.</p>

Special Purpose Computers

It is a computer designed to solve specific type of problem. The computers used in ships and aircrafts, etc.

General Purpose computers

It is a computer designed to solve a wide variety of problems. A General purpose Computer can store different programs and process them.

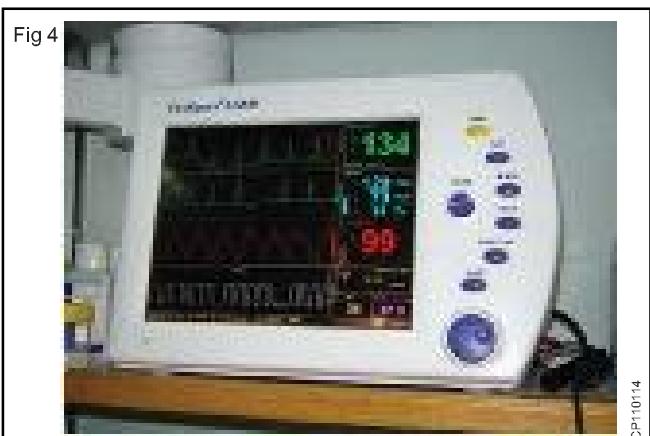
The differences between analog and digital computers are listed in table 2

Hybrid Computer (Fig. 4)

A hybrid computer is a combination of both analog and digital computer. Hybrid computer can handle both analog and digital data. A hybrid computer combines the best characteristics of both the analog and digital computer. It can accept data in both analog and digital form.

Applications

Hybrid computer devices are used in hospitals that may calculate patient's heart function, temperature and blood pressure etc. This calculation may be converted into



numbers and shown in digital form. For example, The Vital Signs Monitoring unit also called (VSM) in short. It has Blood Pressure monitor, ECG monitor, respiratory monitor, and is also used for monitoring anesthesia.

- Hybrid computers are also used in spaceships and missile system.

- Hybrid Computer Machines are generally used in scientific applications
- Hybrid computers are used for controlling industrial processes.

Computers are classified on the basis of computing power, memory capacity and cost.

- Microcomputer or Personal Computer.
- Mini Computer.
- Mainframe Computer.
- Super Computer.

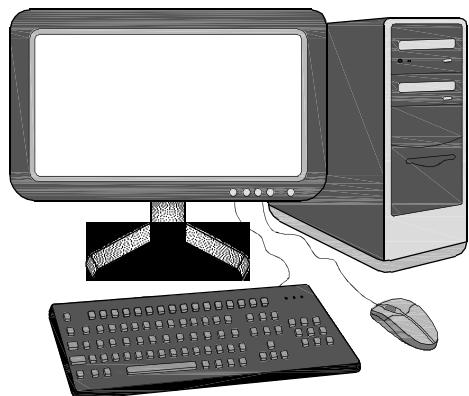
Micro Computers

Micro computer is also called personal computer. It was introduced in 1970. Examples of personal computers are PC and Apple Macintosh. The major types of personal computers are desktop computer and portable computer.

Desktop Computer

These computers can easily fit on a table or desktop, hence the name. These computers come in two models or casings. In Desktop model, the system unit is placed on the desktop or table. Monitor is placed on the system unit. In Tower model, both monitor and system unit are placed on the table as in (Fig 5).

Fig 5



TOWER MODEL COMPUTER

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Portable computer

Portable is a personal computer that can be carried from one place to other easily. Notebook computer and handheld computer (smart phone) are examples of portable computers. Notebook computer is also called laptop computer. Laptop computers are very small in size and can be placed easily on lap.

Lap top computer or notebook computer

The laptop computer or notebook computer will be as shown in fig 6a and fig 6b. It is also called as tower model computer.

Palmtop Computer/Digital Diary /Notebook /PDAs:

A handheld computer (like smart phone) is also portable. Hand held computer is known as palmtop computer.

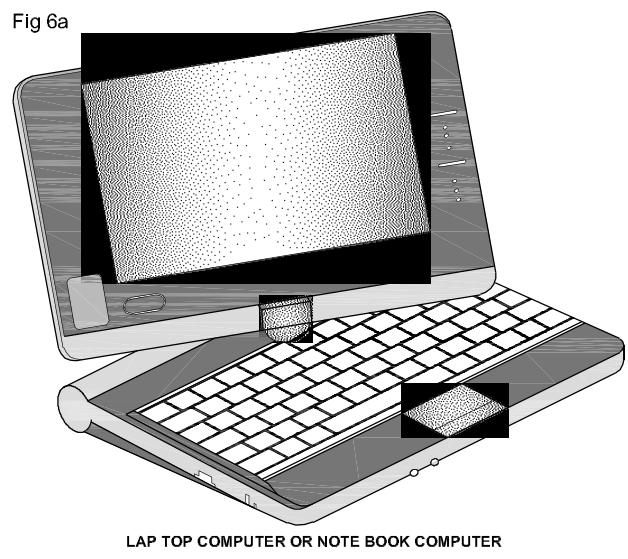


Fig 6



Palmtops have no keyboard but the screen serves both as an input and output device. It easily fits in the hand of the user.

Uses of Micro Computer

The PC is the most common type of computer used in the office. It is now widely used in many homes. These are also used for business and engineering application.

Mini Computer

Mini computers were introduced in the 1960s. Minicomputer is larger and more powerful computer than personal computer. It can execute five million instructions per second. It generally consists of two or more processors.

Minicomputer can serve up to 4000 connected users simultaneously. It is normally accessed by users via personal computer or terminal. A device with a monitor and keyboard is called terminal. It is also known as dumb terminal. It has no processing power and cannot work as stand-alone computer. Some of the minicomputers models are VAX-8800, AS400

Uses of Mini Computer

Mini computers are often used by small and medium-sized companies to provide centralized store of information.

Mainframe Computer

Mainframe computers were introduced in 1975. A mainframe computer is a very large computer in size. It is processors. It is designed to perform multiple tasks for multiple users at the same time. Mainframe computers can serve up to 50,000 users at the same time.

The users access a mainframe computer through terminal or personal computer. A typical mainframe computer can execute 16 million instructions per second. Some of the main computers models are

- NEC 610
- DEC 10

Uses of Mainframe Computer

Mainframe computers are used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, and transaction processing.

Super computer

Super computers were introduced in 1980s. Super computer is the fastest computer. Super computer is the biggest in size and the most expensive in price than any other computers.

It is the most sophisticated, complex and advanced computer. It has a very large storage capacity. It can process trillions of instructions in one second. Super Computer is the fastest and most powerful computer of a time. Supercomputers are very expensive. Supercomputers are used for highly calculation-intensive tasks. Super computers are also used for specialized applications that require immense amounts of mathematical calculations.

Applications of Super Computer

- Weather forecasting,
- Animated graphics like in Hollywood movies,
- Fluid dynamic calculations
- Nuclear energy research
- Space science
- Weapon and missile design
- Petroleum exploration, and etc.

Today, supercomputers are produced by traditional companies such as Cray, IBM and Hewlett- Packard. Since October 2010, the Tianhe-1A supercomputer has been the fastest in the world; it is located in China.

The main difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a single program as fast as possible, whereas a mainframe uses its power to execute many

programs concurrently. The modern super computer consists of thousands of microprocessors. Super computer uses high-speed facilities such as satellite for online processing.

Sum of the super computers models are CRAY-XP, ETA-10, Param and Deep Blue .

Advantages of computers

- A computer has a very high processing speed with high reliability.
- Large volume of information can be stored in the memory any particular data/program can be retrieved immediately.
- Solution to a complicated problem is possible at a very high speed.
- Processing of large volume of data saves a lot of clerical work which reduces the processing cost.
- Computers perform operations efficiently at environments where presence of human being is not possible such as furnace, poisonous atmosphere, vacuum, unmanned satellite, etc.

Limitation of computers

- High initial cost.
- Input information has to be prepared in the form of statements called program which requires a considerable amount of knowledge.
- usage of computers will be economical only when there is clerical data processing for large volume of data and are repetitive in nature
- It is a merely a machine it cannot correct errors on its own.

Functions of Computers

All computers are made up of following basic units as shown in fig (7). They are as follows:-

- 1 Input Unit
- 2 Central processing Unit (CPU)
 - a) Arithmetic Logic Unit(ALU)
 - b) Control Unit (CU)
- 3 Memory
- 4 Output Unit

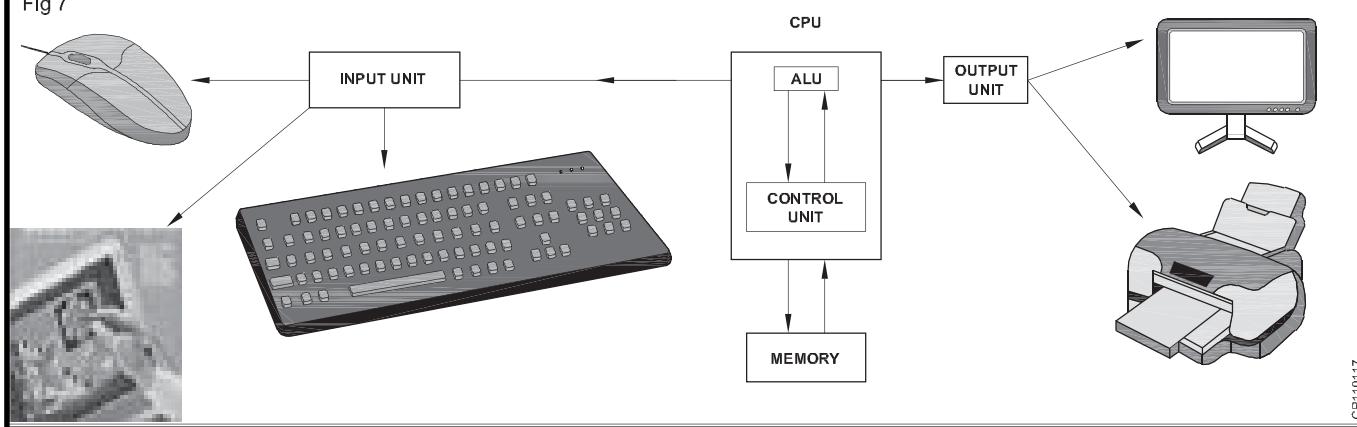
Input Unit

Computers need to receive data and instruction in order to solve any problem. Therefore we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Some of the input devices are listed in table 1.

Input devices perform the following functions.

- Accept the data and instructions from the outside world.

Fig 7



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- Convert it to a form that the computer can understand.
- Supply the converted data to the computer system for further processing.

Central Processing Unit (CPU) (Fig. 8)

The central processing unit (CPU) is the electronic brain

Fig 8



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of the computer as in fig-8. The CPU in a personal computer is usually a single chip. It organizes and carries out instructions that come from either the user or from the software. The processor is made up of many components. CPU performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

Two typical components of a **CPU** are the following:

The arithmetic logic unit (ALU), which performs arithmetic and logical operations.

The control unit (CU), which extracts instructions from memory and decodes and executes them, calling on the ALU when necessary.

Memory

Memory refers to the physical device used to store the program or data on the temporary or permanent basis for

use in a computer or other digital electronic device. There are two types of memory in computer.

- Primary Memory
- Secondary Memory

Output Unit

Output unit receive the informations from the processing unit and provide the results in human readable form.

Output Devices

The some of the output devices are

- Monitor
- Printer
- Plotter
- Speaker

Applications of computers

Science: Scientists have been using computers to develop theories and to analyse and test the data. The high speed and accuracy of the computer allow different scientific analyses to be carried out. They can be used to generate detailed studies of how earthquakes affect buildings or pollution affects weather pattern. Satellite-based applications have not been possible without the use of computers. Moreover, it would not be possible to get the information of the solar system and the cosmos without computers.

Education: Computers have also revolutionized the whole process of education. Currently, the classrooms, libraries and museums are efficiently utilizing computers to make the education much more interesting. Unlike recorded television shows, computer-aided education (CAE) and computer-based training (CBT) packages are making learning much more interactive.

Medicine and Health Care: There has been an increasing use of computers in the field of medicine. Now, doctors are using computers right from diagnosing the illness to monitoring a patient's status during complex surgery. By using automated imaging techniques, doctors are able to look inside a person's body and can study



each organ in detail (e.g. CT scans or MRI scans), which was not possible few years ago. There are several examples of special-purpose computers that can operate within the human body such as cochlear implant, a special kind of hearing aid that makes it possible for deaf people to hear.

Engineering/Architecture/Manufacturing: The architects and engineers are extensively using computers in designing and drawings. Computers can create objects

that can be viewed from all the three dimensions. By using techniques like virtual reality, architects can explore houses that have been designed but not built. The manufacturing factories are using computerized robotic arms to perform hazardous jobs. Besides, computer-aided manufacturing (CAM) can be used in designing the product, ordering the parts and planning production. Thus, computers help in coordinating the entire manufacturing process.

Entertainment: Computers are finding greater use in entertainment industry. They are used to control the images and sounds. The special effects, which mesmerize the audience, would not have been possible without the computers. In addition, computerized animation and colourful graphics have modernized the film industry.

Communication: E-mail or electronic mail is one of the communication media in which computer is used. Through e-mail, messages and reports are passed from one person to one or more persons with the aid of computer and telephone line. The advantage of this service is that while transferring the messages it saves time, avoids wastage of paper and so on. Moreover, the person who is receiving the messages can read the messages whenever he is free and can save it, reply it, forward it or delete it from the computer.

Business Application: This is one of the important uses of the computer. Initially, computers were used for batch-processing jobs, where one does not require the immediate response from the computer. Currently, computers are mainly used for real-time applications (like at the sales counter) that require immediate response from the computer. There are various concerns where computers are used such as in business forecasting, to prepare pay bills and personal records, in banking operations and data storage, in various types of life insurance business and as an aid to management. Businesses are also using the networking of computers, where a number of computers are connected together to share the data and the information. Use of e-mail and the Internet has changed the ways of doing business.

Publishing: Computers have created a field known as desktop publishing (DTP). In DTP, with the help of computer and a laser printer one can perform the publishing job all by oneself. Many of the tasks requiring long manual hours such as making table of contents and index can be automatically performed using the computers and DTP software.

Banking: Computers are extensively used in the field of banking and finance. People can use the ATM (automated teller machine) services 24 hours a day to deposit and withdraw cash. When different branches of the bank are connected through computer networks, the inter branch transactions such as cheque and draft can be performed without any delay.

Railway Reservation System

Using this system, the user can perform following operations through online. (web site: www.irctc.co.in)

- search the train and its timings
- check seats and birth availability
- booking and cancelling tickets
- status of PNR (Passenger Name Record)

Telephone / Electricity Board Billing:

The users can do the following operations through online by using this system. (Web site: portal.bsnl.in - BSNL)

- Register the telephone / electricity board number
- Check and pay the bill amount
- Register the complaints

E-Governance

E-Governance implies technology driven governance. E-Governance is the application of Information and Communication Technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between Government-to-Citizens (G2C), Government-to-Business(G2B),Government-to-Government(G2G) as well as back office processes and interactions within the entire government frame work.

E-Governance covers all the sectors with a view to providing hassle free, transparent and efficient service to the common man (both in urban and rural areas).

Introduction to CPU architecture and motherboard

Objectives: At the end of this lesson you shall be able to

- state what is hardware and test the internal and external hardware
- brief the listed hardware
- state what is partitions and their types
- explain the booting and its procedures.

Computer Hardware

The physical units of a computer are called as the hardware of a computer.

Internal hardware examples

- Blu-Ray, CD-ROM, and DVD
- CPU
- Hard drive
- Motherboard
- RAM
- Sound card
- Video card
- SMPS

External hardware examples

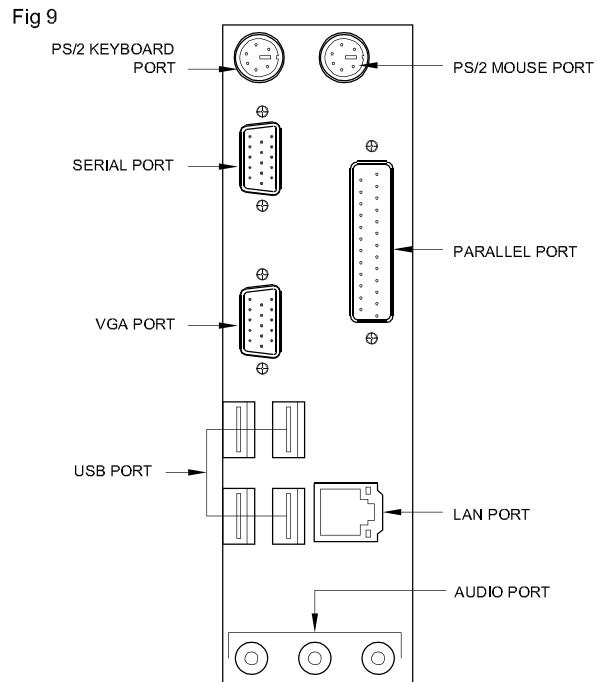
- Flat-panel, Monitor, and LCD
- Keyboard
- Mouse
- Printer
- Scanner

CPU & ALU

Central Processing Unit (CPU) is the heart of the Computer. It is the hardware that carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system.

CPU Ports and Connectors

A port is a connector at the back of a Computer cabinet where you plug in an external device such as a printer, keyboard, scanner, modem etc. This allows instructions and data to flow between the computer and the device. The computer ports are also commonly referred to as the Input/output ports (I/O ports). These ports can be either serial or parallel. Fig 1 shows the commonly available ports on a personal computer.



Most connectors are separated, permitting the cable to be plugged in only in the correct direction. The keyboard and mouse use "PS2" (Personal System 2) connectors. The PS2 connectors are color-coded. The purple connector is for the keyboard. The green connector is for the mouse.

- **PS/2 Ports:** Standard keyboards and mouse often connect to the computer via the PS/2 ports. To plug in a keyboard or mouse cable, first match the cable to the connector. Then push the cable into the connector. Be sure not to force the connector because you will end up bending the pins
- **Serial & Parallel Ports:** The serial port and parallel port allow connections to printers and other external devices. To transfer a byte through a serial port, eight bits are queued and sent bit by bit. However, in a parallel port, all the eight bits are transferred simultaneously
- The parallel port, serial port, and video port all use "D" type connectors (DB-25M, DB-9M and DB-15F respectively). These are called D connectors because of their shape, which permits the cables to be plugged in only one way.

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USB (Universal serial bus) Ports

Devices like digital cameras, scanners and printers often connect to the motherboard via the USB ports. A USB connector's distinctive rectangular shape makes it easily recognizable.

USB has a number of features that makes it particularly popular on PCs. First, USB devices are hot swappable. You can insert or remove them without restarting your system

LAN(Local Area Network) Port: The LAN port is used to connect the PC to a local network or to high speed Internet services.

VGA (Video Graphics Array) Ports: The VGA port provides access to integrated video.

Audio ports: It provides access to integrated audio.

The audio jacks are the most confusing connectors on the back panel. Although the jacks are sometimes color-coded, the devices that plug into them rarely.

CPU front Panel shown Fig 2.

Fig 2



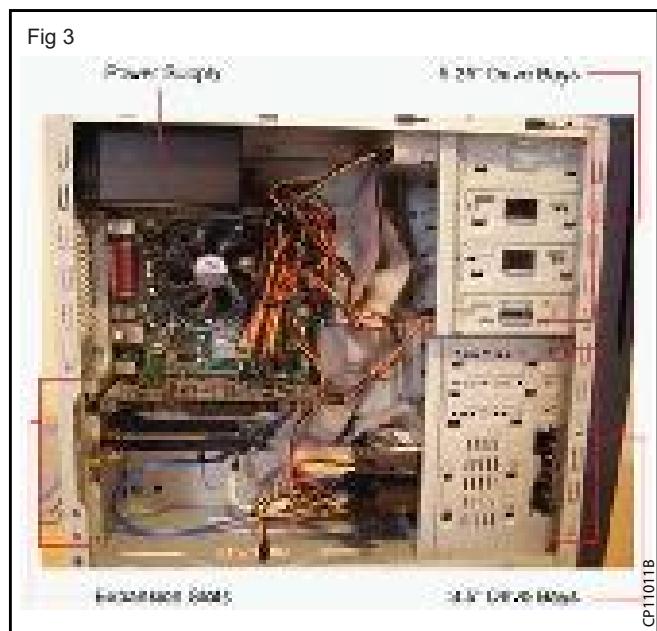
It may contain the following parts.

- Power On/Off Switch
- Power Indicator
- CD/DVD Drive
- CD/DVD Drive Open/Close Button
- CD/DVD Drive indicator
- Floppy Disk Drive
- Floppy Disk Drive Indicator
- USB Ports
- Audio and Mic connectors

Design of CPU Cabinets may vary based on the manufacturer.

The System Unit and Its Components

The system unit is a box-like unit filled with a number of useful components, each performing a discrete function. These components work together to accomplish the main function of the computer, viz. accept and process input and deliver output. This section will elaborate on these components one by one. Fig 3 shows the various components of the system unit.



Power Supply

The power supply connects to nearly every device in the PC to provide power. It is located at the rear of the case. The system unit draws power from the AC mains through a power protection device.

This power is not directly supplied to the internal components. Instead, one of the components, called the internal power supply, converts the AC input into DC output of 5 and 12 volts. Normally, the **internal power supply** is referred to as **Switched Mode Power Supply (SMPS)**.

The SMPS provides cable connectors to supply the required voltage to the other internal components like the floppy drives, the hard disk drive, the motherboard and external device such as the keyboard. The ON/OFF switch of the system unit is actually a part of the SMPS.

Fan

The **SMPS** has a small fan, called the exhaust fan, attached to **SMPS(Fig. 4)**. This fan rotates as long as the computer is switched on. Its function is to cool the **SMPS** unit.

Drive Bays: The 5.25" and 3.5" drive bays house the many kinds of storage devices a computer might contain.

Expansion Slots: An expansion slot is a slot located inside a computer mother board that allow additional peripherals to be connected to it.

Fig 4

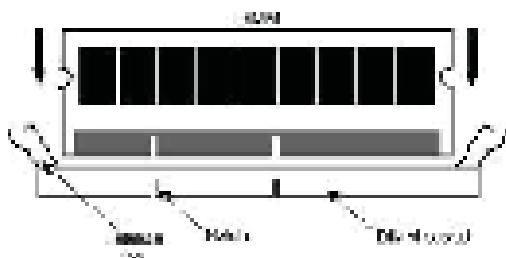


CP1010C

Memory Slot

Memory Slot is used to insert a Random Access Memory(RAM) shown in fig 5

Fig 5



CP1010D

Storage Drivers

Storage drivers such as hard drives, optical drives and floppy drives all connect to the motherboard via cables and is mounted inside the computer.

IDE & SATA Cables: Fig 6 shows two hard disk drives that connect in different ways to the motherboard. One uses the older IDE cable connection while the other uses SATA(Serial Advanced Technology Attachment) cable which provides for faster hard drive access.

Fig 6



CP1010E

Power Port: Power is delivered to drives via cables that plug into the power port on the drives.

Peripheral cards slot

The peripheral cards are the spare expansion slots available on the mother board on which peripheral cards can be inserted.

The following are the peripheral cards

- Sound card
- Video card
- Modem
- Wireless network

Fig. 7 shows the peripheral card, designed with a PCI (Peripheral component interconnect) connector.

Fig 7

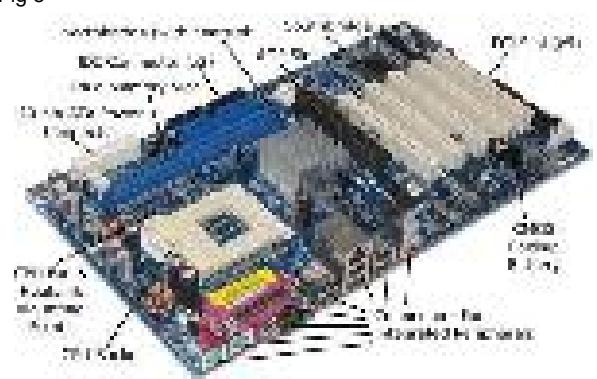


CP1010F

Motherboard

The motherboard is a printed circuit that is the foundation of a computer and allows the CPU, RAM, and all other computer hardware components to function with each other as on fig 8.

Fig 8



CP1010G

The motherboard is the primary component of the entire system. A mother board is a large board containing a number of tiny electronic circuits and other components are visible. All peripheral devices are connected to the motherboard. The components of the motherboard are:

- Keyboard / mouse port
- Parallel and Serial port
- Processor Socket
- AGP Slot
- PCI Slots
- ISA Slot
- CMOS Battery
- Data Card Connector
- Memory Slots
- Floppy Port
- Fan Header
- Main Power Connector

Floppy Port : The floppy drive connects to the computer via a 34-pin ribbon cable, which in turn connects to the motherboard. A floppy controller is one that is used to control the floppy drive.

RAM slots: Random-Access Memory (RAM) stores programs and data currently being used by the CPU.

RAM is measured in units called bytes. RAM has been packaged in many different ways

- SIMM-Single inline memory module -32 or 72 Pin
- DIMM- Dual Inline Memory module -168 pin.

In most of the PC's uses of the DIMM module

ROM BIOS Chip: This means Read Only Memory Basic Input-Output System.

The built-in software that determines what a computer can do without accessing programs from a disk. On PCs, the **BIOS** contains all the code required to control the keyboard, display screen, disk drives, serialcommunications, and a number of miscellaneous functions.

The BIOS is typically placed in a **ROM** chip that comes with the computer (it is often called a **ROM BIOS**). This ensures that the **BIOS** will always be available and will not be damaged by disk failures.

It also makes it possible for a computer to boot itself. Because RAM is faster than **ROM**, though, many computer manufacturers design systems so that the BIOS is copied from **ROM** to **RAM** each time the computer is booted. This is known as shadowing.

Many modern PCs have flash **BIOS**, which means that the **BIOS** have been recorded on a flash memory chip, which can be updated if necessary. The PC **BIOS** is fairly standardized, so all PCs are similar at this level (although there are different **BIOS** versions). Additional **DOS** functions are usually added through software modules.

This means you can upgrade to a newer version of DOS without changing the **BIOS**. PC **BIOS** that can handle Plug-and-Play (PnP) devices are known as PnPBIOS. These BIOS are always implemented with flash memory rather than ROM.

CMOS Battery

CMOS (Complementary Metal-Oxide-Semiconductor) is the term usually used to describe the small amount of memory on a computer motherboard that stores the **BIOS** settings.

Most **CMOS** batteries will last the lifetime of a motherboard (up to 10 years in most cases) but will sometimes need to be replaced. Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery.

ISA slot: (Industry Standard Architecture) It is the standard architecture of the Expansion bus. Motherboard may contain some slots to connect ISA compatible cards.

PCI slot : Intel introduced the Peripheral Component Interconnect bus protocol. The PCI bus is used to connect I/O devices to the main logic of the computer. **PCI** bus has replaced the ISA bus. PC motherboards have one PCI slot but generally more than one.

The **PCI** bus architecture is a processor-independent bus specification that allows peripherals to access system memory directly without using the CPU.

AGP slot: The Accelerated Graphics Port (AGP) is a high-speed point-to-point channel for attaching a video card to a computer's motherboard.

Power supply plug in

The Power supply, as its name implies, provides the necessary electrical power to make the PC (Personal Computer) operate. The power supply takes standard 110-V AC power and converts into +/-12-Volt, +/-5-Volt, and 3.3-Volt DC power. The power supply connector has 20-pins, and the connector can go in only one direction.

Hard Disk and Partitions

Partitioning is a process of dividing the Hard disk into several chunks, and uses any one of the portion or partition to install OS or use two or more partitions to install multiple OS..

But it can always have one partition, and use up the entire Hard disk space to install a single OS, but this will become data management nightmare for users of large Hard disks.

Now, because of the structure of the Master Boot Record (MBR), has only four partitions, and these four partitions are called **Primary Partitions**.

Extended Partition is not a usable partition by itself, but it's like a "container" and it is used to hold **Logical Drives**! That is this Extended Partition can be subdivided into multiple logical partitions.

In order to boot into a Partition, **it must be designated as bootable partition** or Active Partition. Active Partition is that partition which is flagged as bootable or which contains OS, this is generally a Primary Partition.

Types of Partitions:

- Master
- Partition
- Extended and
- Logical Extended

Master Boot Record (MBR): MBR is a small 512 bytes partition which is at the first physical sector of the hard disk. The location is denoted as CHS 0,0,1 meaning 0th Cylinder, 0th Head and 1st Sector.

MBR contains a small program known as bootstrap program which is responsible for booting into any OS. MBR also contains a table known as Partition Table.

This Partition Table is a table which lists the available Primary Partitions in the hard disk. Partition table considers whole Extended Partition as one Primary partition and lists it in the table!

So a Partition table can have two possible entries:-

- Up to 4 Primary Partitions.
- Up to 3 Primary Partitions and 1 Extended Partition.(Total not exceeding 4) .

Partition Boot Sector (PBR): This is the logical first sector, that is sector at the start of a Primary Partition. This is also 512 byte area, which contains some programs to initialize or run OS files. All Primary Partitions have its own PBRs.

Extended Boot Sector (EBR): This is the logical first sector, that is the sector at the start of the Extended Partition. This EBR contains a Partition Table, which lists the available Logical Partitions inside Extended Partition. That is it contains the Starting addresses of each Logical Partitions.

Logical Extended Boot Sector (LEBR): This is the logical first sector residing at the start of each Logical Partition. This is similar to PBR for Primary Partitions.

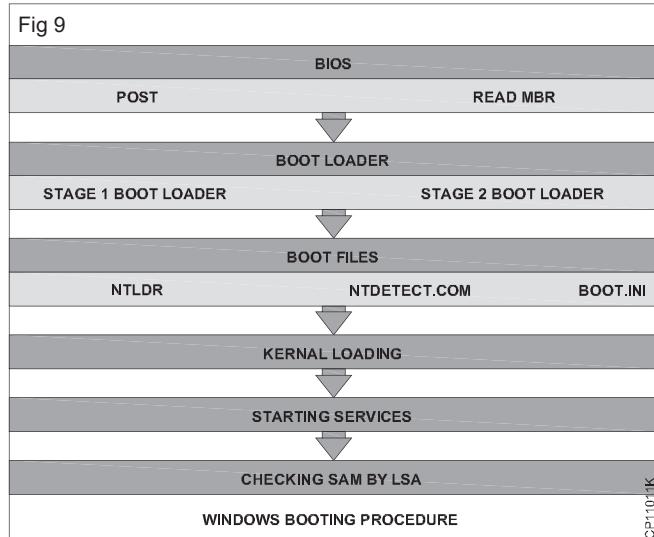
Booting

Booting is a process of loading the operating system (OS) and checking all the system software and hardware those are installed in the computer.

Booting procedure of Windows operating system

Functions of BIOS

The first process starts, when the computer switched on Basic Input Output System (BIOS) perform two functions, to conduct POST and read MBR (Fig 9).



POST - POST stands for Power On Self Test. POST checks all the hardware devices connected to a computer like RAM, hard disk etc and make sure that the system can run smoothly with those hardware devices. If the POST is a failure the system halts with a beep sound.

Now BIOS checks the **boot priority**. We can set the boot priority as CD drive, hard disk or floppy drive.

MBR - The next duty of BIOS is to read the MBR. MBR stands for Master Boot Record and it's the first sector on a hard disk. MBR contains the partition table and boot loader.

Functions of Boot loader

Now BIOS has passed the control to boot loader and boot loader is a small program which loads kernel to computers memory. Actually there are two stages of boot loaders, stage 1 boot loader and stage 2 boot loader.

The stage 1 boot loader is a link to the stage 2 boot loader. The stage 2 boot loader resides in the boot partition and it loads the kernel to memory.

Boot files and functions

There are three boot files in a Windows operating system and they are NTLDR, NTDETECT.COM and Boot.ini. The boot files are found in the active partition of hard disk and its normally C drive in a Windows machine.

NTLDR - NTLDR stands for NT Loader and it's the second stage boot loader. The path of NTLDR is C:\Windows\i386\NTLDR.

Boot.ini - Boot.ini contains the configuration files of NTLDR. When the operating system is loaded we cannot pass any arguments to kernel, so those arguments are passed through boot.ini. You can edit boot.ini by opening through notepad. The path of Boot.ini is C:\boot.ini.

NTDETECT.COM

This file detects hardware's and passes information to NTLDR. Using the collected information the NTLDR creates a hardware key and this key is used to detect hardware's.

A new hardware key is generated after each reboot of the operating system and that's why system asks to reboot after installation of a new hardware. The hardware keys created by NTLD.R can be found in Windows registry at HKEY_LOCAL_MACHINE\HARDWARES.

Kernel and its functions

After executing the functions of boot files the control is passed to Kernel. ntoskrnl.exe is the kernel file in a Windows machine and its path is C:\Windows\system32\ntoskrnl.exe.

Kernel acts as a layer between software and hardware. The library file hal.dll (C:\Windows\system32\hal.dll) helps Kernel to interact with hardware's. HAL stands for Hardware Abstraction Layer and this hal.dll file is machine specific.

Now the drivers for hardware's are loaded from the file C:\Windows\system32\config\system and the Kernel is loaded to primary memory.

Services and log in procedure

When kernel is loaded in the primary memory, services for each process is started and the registry entry for those services can be found at HKEY_LOCAL_MACHINE\System - Current control set - Services.

Winlogon.exe (C:\Windows\system32\winlogon.exe) is the last service started during this process. Winlogon.exe starts the log in procedures of windows machine. It first calls the library file msgina.dll (C:\Windows\system32\msgina.dll).

MSGINA stands for Microsoft Graphics Identification and Authentication and it provides the log in window. Now msginal.dll passes the control to LSA (Local Security Authority), it verifies the username and password from the SAM file. SAM (Security Accounts Manager) contains the information about all users created in a Windows operating system.

Now the booting procedure is over and it has reached the desktop of Windows operating system.

Voltage: Every electric charge is capable of doing work by moving another charge either by attraction or by repulsion. This ability of a charge to do work represents its potential. Voltage is generated by the separation of charges. Voltage or electric potential is the state of separated charges striving to neutralize each other. The unit of electric potential is volt. Potential difference is necessary to cause flow of electric current.

Methods of voltage generation: Voltage can be generated by several ways. Some methods of generating voltage are:

- Voltage from friction
- Voltage from moving magnets or coils
- Voltage from pressure or tension in crystals
- Voltage from heat
- Voltage from light

- Voltage from chemical reactions

Measuring voltage: Voltage exists between any two points with different levels of charge. Voltage between any two points can be measured using an instrument called VOLTMETER. Meters used to measure current is called Ammeter. There are meters which can be used to measure voltage and current and a few other electrical parameters like resistance. Such meters are called MULTIMETERS.

Types of voltage: As discussed in above paragraphs there are several sources by which voltage can be developed. Depending upon the voltage source, the voltage developed can be,

Direct voltage: It is of constant magnitude. It remains at the same amplitude from the moment it is switched ON till the moment it is switched - OFF.

Alternating voltage: In this type, voltage source changes its polarity regularly and therefore the direction of developed voltage.

A mixed voltage is a combination of direct voltage and alternating voltage. The level of voltage is not constant. It varies around a mean value.

Electric Current: Electric current is produced when electric charges move in a definite direction. This movement is not only of negative charges but also of positive charges. The strength of electric current is the quantity of charge which flows across a given cross section of a conductor every second. The unit of current strength is Ampere.

$$\text{Current strength} = \frac{\text{Quantity of charge}}{\text{time}}$$

Measuring current: Electric current is the flow of charge, in a conductor. So, to measure current must pass through the measuring device. The current measuring instrument is called the ammeter or the current meter. There are different types of ammeters used for measuring different quantities of current.

Types of current: Voltage causes electrical current to flow. If the cause of current flow is a direct voltage source, then the current caused by it is called direct current (d.c.). On the other hand, then the current caused is referred as the alternating current. If a mixed voltage AC and DC is applied to an electrical circuit, a mixed current (AC and DC) will flow through the circuit.

Types of power supply: Irrespective of how the electricity is generated, electricity can be classified into two types.

- Alternating current, generally known as AC supply.
- Direct current, generally known as DC supply.

AC supply: The term alternating current supply is given to a supply source that makes current to flow through a circuit which reverses or alternates its direction periodically.

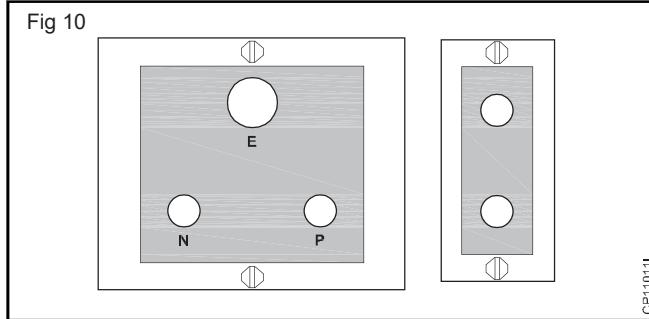
Advantages of AC supply

- Reduced transmission loss over long distances.
- Voltage levels can be changed using simple devices called transformers.
- Reduced severity of electrical shock.
- Generating equipments are simple and cheaper
- Can be easily converted to DC supply.

DC supply: The term direct current supply is given to a supply source that makes current to flow through a circuit in one direction only. Example of DC supply is batteries. Some types of generators are also designed to give d.c. supply. Such generators are called DC generators.

Low tension (LT) voltage: The domestic voltage of 240 volts AC (generated and supplied by hydro or Thermal or Nuclear generating stations) is called the low tension (LT) voltage. LT lines enters residential buildings from electricity poles called as service connection. This 240 volts is used to light up the lamps, run fans etc in homes. To connect electrical appliances at home, 240V AC is available in either two-pin or three - pin sockets. This LT voltage of 240 volts, 50Hz is also used to supply electrical and electronic gadgets such as Iron box, washing machine, personal computer etc.

Phase, Neutral and Earth points of LT supply: The domestic AC mains supply of 240V, 50Hz, is available at consumers residence either in a 2-pin outlet (Phase - Neutral) or in a 3-pin outlet (phase -Neutral and Ground). These are commercially referred to as 2/3 pin sockets. These sockets look similar to the ones shown in Fig. 10.



Phase: The line or phase point in a socket, can be termed as the point from where the electricity starts flowing into a closed circuit.

Neutral: The neutral point in the socket, can be termed as the point which receives electricity from the closed circuit.

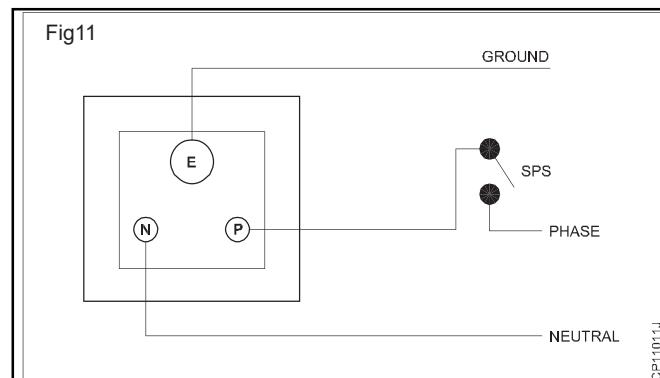
Earth / Ground: The ground (some call it Earth) point in an electrical socket provides the easiest path for the leakage current and other minor electrical defect currents of appliances.

Two pin mains sockets are used to supply main to such equipments or apparatus or gadgets generally having its cabinets/chassis made of plastic such as radio, tape

recorders etc., Hence such gadgets does not need earth pin/point on the socket.

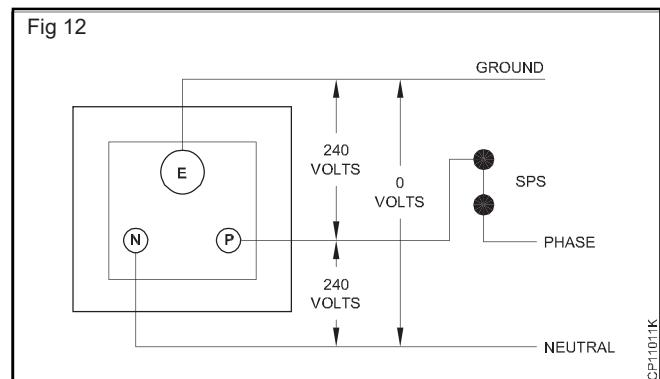
Iron box, washing machines, drill guns, Desk top computer invariably need sockets with provision of earth pin, because of the possibility of shock while using these equipments. Hence such equipments/gadgets make use of AC mains socket with earth.

Connection of 3-pin AC mains socket: Fig 11 shows how the main supply is connected to the socket.



Note that in a AC outlet be it a 2-pin or a 3-pin phase is always connected to the socket through a switch. This prevents the users from getting electrical shock when the switch is put in off position.

The standard voltage appearing across the 3-pin terminals is shown in Fig12



The voltages across the pins of the socket can be measured using an AC voltmeter or a multimeter in AC volts range.

As a quick test to find out whether or not a socket is delivering the AC supply as required, a simple instrument called line tester which looks similar to a small screw driver can be used. This instrument will have a small bulb in it which glows if it is touched to the phase pin in the socket. Ask your instructor to demonstrate the use of such line tester to check a AC mains socket.

Most Desk top computers need AC mains supply for its operation. Although the mains supply available in the 3-pin socket shown above can be used, mostly this AC supply is cleaned fro spikes before connecting to computers. The device used for cleaning the spikes in the mains AC supply are called Spike Arrestors or Spike busters.

Computers are used with spike busters because, AC spikes are likely to damage the costly computers. In addition to spike busters, most computers use other power safety devices called the voltage stabilizers and uninterrupted power supplies.

Power supply in computers: Power supply unit in computers are firmly fitted on the processing unit cabinet using torx screws. Generally there will be four such screws fitted to fix the power supply unit in the cabinet.

Windows Operating System

Objective: At the end of this exercise you shall be able to
 • list out the windows versions and features

Windows versions and its features

Microsoft Windows has seen nine major versions since its first release in 1985. Over 29 years later, Windows looks very different but somehow familiar with elements that have survived the test of time, increases in computing power and - most recently - a shift from the keyboard and mouse to the touchscreen.

Here's a brief look at the history of Windows, from its birth at the hands of Bill Gates with Windows 1 to the latest arrival under new Microsoft chief executive SatyaNadella.

Windows 1

The first version of Windows

This is where it all started for Windows. The original Windows 1 was released in November 1985 and was Microsoft's first true attempt at a graphical user interface in 16-bit.

Development was spearheaded by Microsoft founder Bill Gates and ran on top of MS-DOS, which relied on command-line input.

It was notable because it relied heavily on use of a mouse before the mouse was a common computer input device. To help users become familiar with this odd input system, Microsoft included a game, Reversi (visible in the screenshot) that relied on mouse control, not the keyboard, to get people used to moving the mouse around and clicking onscreen elements.

Windows 2

Windows 2 with overlapping windows.

Two years after the release of Windows 1, Microsoft's Windows 2 replaced it in December 1987. The big innovation for Windows 2 was that windows could overlap each other, and it also introduced the ability to minimise or maximise windows instead of "iconising" or "zooming".

The control panel, where various system settings and configuration options were collected together in one place, was introduced in Windows 2 and survives to this day.

Microsoft Word and Excel also made their first appearances running on Windows 2.

Windows 3

Windows 3.0 got colourful.

The first Windows that required a hard drive launched in 1990. Windows 3 was the first version to see more widespread success and be considered a challenger to

Apple's Macintosh and the Commodore Amiga graphical user interfaces, coming pre-installed on computers from PC-compatible manufacturers including Zenith Data Systems.

Windows 3 introduced the ability to run MS-DOS programmes in windows, which brought multitasking to legacy programmes, and supported 256 colours bringing a more modern, colourful look to the interface.

More important - at least to the sum total of human time wasted - it introduced the card-moving timesink (and mouse use trainer) Solitaire.

Windows 3.1

Windows 3.1 with Minesweeper.

Windows 1 and 2 both had point release updates, but Windows 3.1 released in 1992 is notable because it introduced TrueType fonts making Windows a viable publishing platform for the first time.

Minesweeper also made its first appearance. Windows 3.1 required 1MB of RAM to run and allowed supported MS-DOS programs to be controlled with a mouse for the first time. Windows 3.1 was also the first Windows to be distributed on a CD-ROM, although once installed on a hard drive it only took up 10 to 15MB (a CD can typically store up to 700MB).

Windows 95

Windows 95: oh hello Start menu.

As the name implies, Windows 95 arrived in August 1995 and with it brought the first ever Start button and Start.

It also introduced the concept of "plug and play" - connect a peripheral and the operating system finds the appropriate drivers for it and makes it work. That was the idea; it didn't always work in practice.

Windows 95 also introduced a 32-bit environment, the task bar and focused on multitasking. MS-DOS still played an important role for Windows 95, which required it to run some programmes and elements.

Internet Explorer also made its debut on Windows 95, but was not installed by default requiring the Windows 95 Plus! pack. Later revisions of Windows 95 included IE by default, as Netscape Navigator and NCSA Mosaic were popular at the time.

Windows 98

Windows 98, the last great DOS-based Windows.

Released in June 1998, Windows 98 built on Windows 95 and brought with it IE 4, Outlook Express, Windows

Address Book, Microsoft Chat and NetShow Player, which was replaced by Windows Media Player 6.2 in Windows 98 Second Edition in 1999.

Windows 98 introduced the back and forward navigation buttons and the address bar in Windows Explorer, among other things. One of the biggest changes was the introduction of the Windows Driver Model for computer components and accessories - one driver to support all future versions of Windows.

USB support was much improved in Windows 98 and led to its widespread adoption, including USB hubs and USB mice.

Windows ME

Windows ME was one to skip.

Considered a low point in the Windows series by many - at least, until they saw Windows Vista - Windows Millennium Edition was the last Windows to be based on MS-DOS, and the last in the Windows 9x line.

Released in September 2000, it was the consumer-aimed operating system twinned with Windows 2000 aimed at the enterprise market. It introduced some important concepts to consumers, including more automated system recovery tools.

IE 5.5, Windows Media Player 7 and Windows Movie Maker all made their appearance for the first time. Autocomplete also appeared in Windows Explorer, but the operating system was notorious for being buggy, failing to install properly and being generally poor.

Windows 2000

Windows 2000 was ME's enterprise twin.

The enterprise twin of ME, Windows 2000 was released in February 2000 and was based on Microsoft's business-orientated system Windows NT and later became the basis for Windows XP.

Microsoft's automatic updating played an important role in Windows 2000 and became the first Windows to support hibernation.

Windows XP

Windows XP still survives to this day.

Arguably one of the best Windows versions, Windows XP was released in October 2001 and brought Microsoft's enterprise line and consumer line of operating systems under one roof.

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It was based on Windows NT like Windows 2000, but brought the consumer-friendly elements from Windows ME. The Start menu and task bar got a visual overhaul, bringing the familiar green Start button, blue task bar and vista wallpaper, along with various shadow and other visual effects.

ClearType, which was designed to make text easier to read on LCD screens, was introduced, as were built-in

CD burning, autoplay from CDs and other media, plus various automated update and recovery tools, that unlike Windows ME actually worked.

Windows XP was the longest running Microsoft operating system, seeing three major updates and support up until April 2014 - 13 years from its original release date. Windows XP was still used on an estimated 430m PCs when it was discontinued.

Its biggest problem was security: though it had a firewall built in, it was turned off by default. Windows XP's huge popularity turned out to be a boon for hackers and criminals, who exploited its flaws, especially in Internet Explorer, mercilessly - leading Bill Gates to initiate a "Trustworthy Computing" initiative and the subsequent issuance of Service Pack updates that hardened XP against attack substantially.

Windows Vista

Windows Vista, arguably worse than Windows ME.

Windows XP stayed the course for close to six years before being replaced by Windows Vista in January 2007. Vista updated the look and feel of Windows with more focus on transparent elements, search and security. Its development, under the codename "Longhorn", was troubled, with ambitious elements abandoned in order to get it into production.

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It was buggy, burdened the user with hundreds of requests for app permissions under "User Account Control" - the outcome of the Trustworthy Computing initiative which now meant that users had to approve or disapprove attempts by programs to make various changes.

The problem with UAC was that it led to complacency, with people clicking "yes" to almost anything - taking security back to the pre-UAC state. It also ran slowly on older computers despite them being deemed as "Vista Ready" - a labelling that saw it sued because not all versions of Vista could run on PCs with that label.

PC gamers saw a boost from Vista's inclusion of Microsoft's DirectX 10 technology.

Windows Media Player 11 and IE 7 debuted, along with Windows Defender an anti-spyware programme. Vista also included speech recognition, Windows DVD Maker and Photo Gallery, as well as being the first Windows to be distributed on DVD. Later a version of Windows Vista without Windows Media Player was created in response to anti-trust investigations.

Windows 7

Windows 7 was everything Windows Vista should have been.

Considered by many as what Windows Vista should have been, Windows 7 was first released in October 2009. It was intended to fix all the problems and criticism faced by Vista, with slight tweaks to its appearance and a

concentration on user-friendly features and less "dialogue box overload".

It was faster, more stable and easier to use, becoming the operating system most users and business would upgrade to from Windows XP, forgoing Vista entirely.

Handwriting recognition debuted in 7, as did the ability to "snap" windows to the tops or sides of the screen, allowing faster more automatic window resizing.

Windows 7 saw Microsoft hit in Europe with antitrust investigations over the pre-installing of IE, which led to a browser ballot screen being shown to new users allowing them to choose, which browser to install on first boot.

Windows 8

Windows 8 focused more on touch than a keyboard and mouse.

Released in October 2012, Windows 8 was Microsoft's most radical overhaul of the Windows interface, ditching the Start button and Start menu in favour of a more touch-friendly Start screen.

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The new tiled interface saw programme icons and live tiles, which displayed at-a-glance information normally associated with "widgets", replace the lists of programmes and icons. A desktop was still included, which resembled Windows 7.

Windows 8 was faster than previous versions of Windows and included support for the new, much faster USB 3.0 devices.

The Windows Store, which offers universal Windows apps that run in a full-screen mode only, was introduced. Programs could still be installed from third-parties like other iterations of Windows, but they could only access the traditional desktop interface of Windows.

The radical overhaul was not welcomed by many. Microsoft attempted to tread a fine line between touchscreen support and desktop users, but ultimately desktop users wanting to control Windows with a traditional mouse and keyboard and not a touchscreen felt Windows 8 was a step back.

There were also too few touchscreens in use, or on offer, to make its touch-oriented interface useful or even necessary - despite the parallel rise of tablets such as the iPad, and smartphones, which had begun outselling PCs by the end of 2010.

Windows RT, which runs on ARM-based processors traditionally found in smartphones and non-PC tablets, was introduced at the same time as Windows 8 with the Microsoft Surface tablet.

It looked and felt like Windows 8, but could not run traditional Windows applications, instead solely relying on the Windows Store for third-party apps.

Windows 8.1

Windows 8.1 and the great reappearance of the Start button.

A free point release to Windows 8 introduced in October 2013, Windows 8.1 marked a shift towards yearly software updates from Microsoft and included the first step in Microsoft's U-turn around its new visual interface.

Windows 8.1 re-introduced the Start button, which brought up the Start screen from the desktop view of Windows 8.1. Users could also choose to boot directly into the desktop of Windows 8.1, which was more suitable for those using a desktop computer with a mouse and keyboard than the touch-focused Start screen.

Windows 10

With Windows 10, Microsoft is trying to keep some of the touch and tablet features it created for Windows 8, combine them with the familiar Start menu and desktop, and run it all on top of an improved operating system with more security, a new browser, the Cortana assistant, its own version of Office for on-the-go editing and plenty of new features intended to make life simpler.

Of course, that also means it's very different to use, whether you come from Windows 7, Windows 8 or Windows XP. You have to look in a new place even to turn your PC off.

On top of that, Windows 10 is more than just a PC operating system; it's also what will run on Windows phones - and on small tablets as well, because a 6-inch phone and a 7-inch tablet aren't such very different devices.

Microsoft is expecting people to put Windows 10 on a billion devices (which ought to encourage more app developers to at least take a look at building their apps for Windows phones and tablets, as well as for Xbox One and HoloLens).

The Start menu evolves

The full-screen Start screen of Windows 8 is back to being a Start menu in Windows 10 that tries to combine the best of both options. A scrolling Start menu that's restricted to a single column, with jump lists and flyout menus for extra options, divided into frequently used and recently installed programs, with the option to switch to a scrolling view of all the applications, sorted alphabetically.

Fig 1



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But also get an extra pane ,where can pin Windows 8-style tiles, complete with 'rotating 3D cube' animations of live tiles. drag the Start menu to be a larger size or even set it to be full screen.

Desktop Background

Another component of the Desktop is the Background. This is simply an image that appears at the back of the screen. Most computers come with a pre-selected background, but change it to any image.

To change the background, follow these steps:

1. Right-click on the background and choose "Personalize"
2. From the Personalization window, choose from a series of pre-selected pictures or browse for your own.

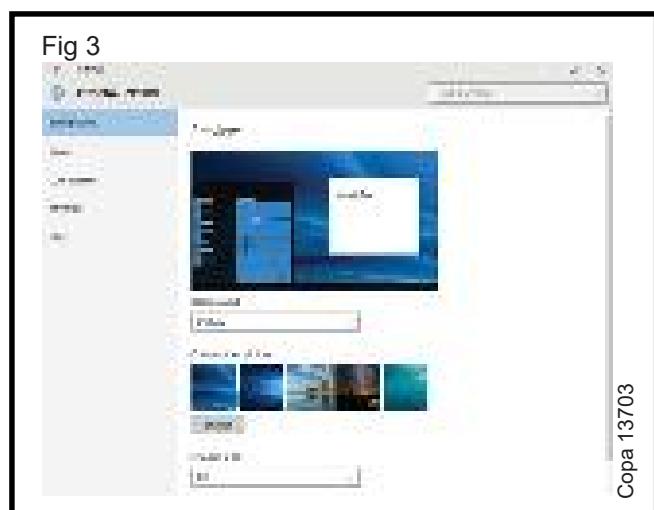
After choosing a picture, the Background will change automatically.

Start Menu

If looking for a specific application, open the Start Menu and click "All Applications". This will open an alphabetical



list of all the applications installed on computer.



File Explorer

If you are looking for a specific document, another

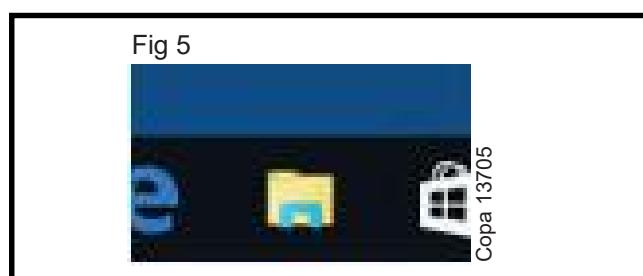
alternative is to use the File Explorer by clicking on the Folder icon on the Taskbar.

In the File Explorer window, browse all the folders and documents.

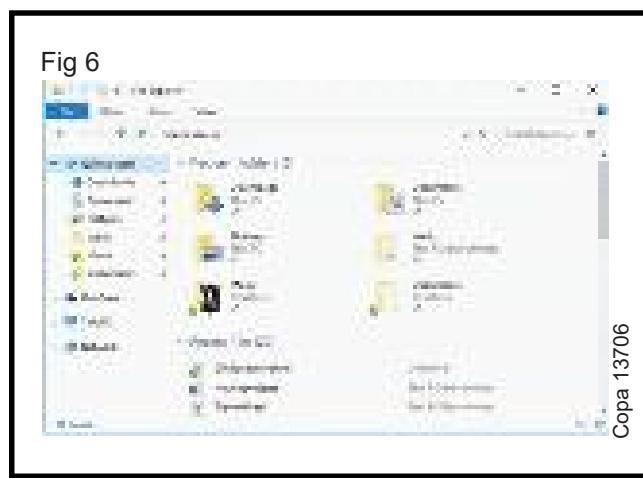


Virtual Desktops

One of the new features of Windows 10 is the addition of Virtual Desktops. This allows you to have multiple desktop screens where to keep open windows organized.



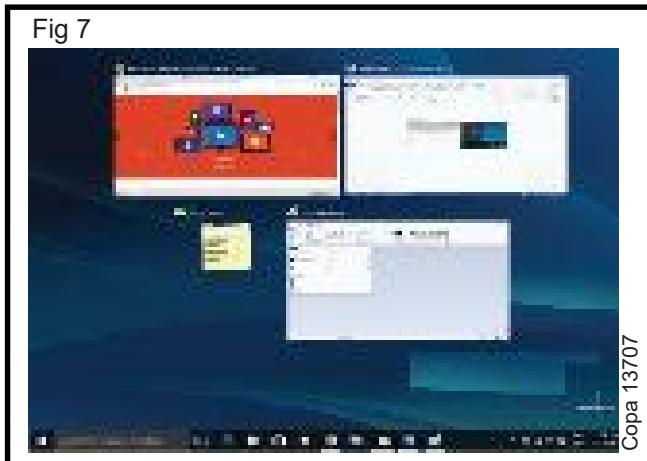
To add a virtual desktop, follow these steps:



1. Click Task View on the Taskbar
2. Click the "New desktop" option on the lower-right corner. You can access or delete the new Desktop by clicking Task View again.

Cortana helps as with search and control

Cortana, the Windows Phone assistant, shows up in

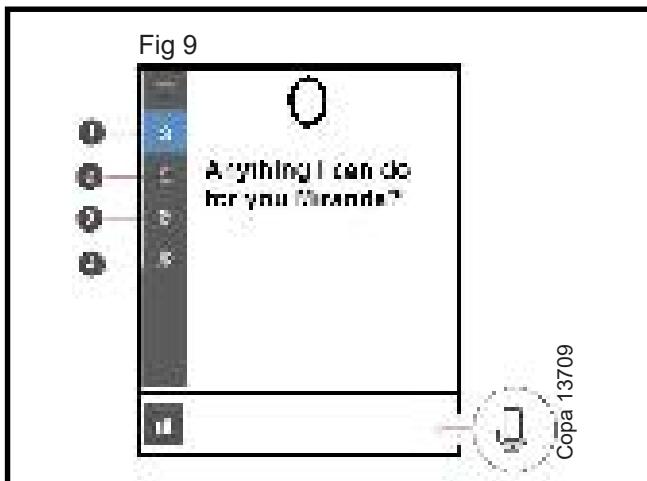


Windows 10 as a search pane on the taskbar, which can also trigger by saying 'Hey Cortana' - and when start searching the Start menu.



That gets the apps have installed, documents access to, apps could install from the Store, search results from the web and a range of other information - including from apps and services that integrate with Cortana.

Activating Cortana



If Cortana isn't active, can turn it on by typing "Cortana" in the Taskbar search to access the Cortana settings, or just clicking the "Gear" icon on the left-side of the menu.

After activating Cortana, it will start gathering information about to personalize the experience.

Task switcher

Most Windows users don't know the Alt-Tab keyboard



combination to see and switch between all running apps, so as well as having a redesigned task switcher with bigger



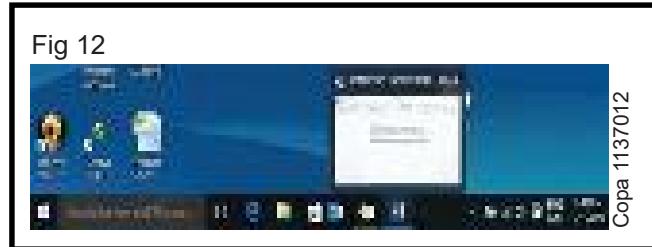
thumbnails, Windows 10 also puts a task view icon in the taskbar to help them find it.

TASKBAR

The Windows 10 taskbar sits at the bottom of the screen giving the user access to the Start Menu, as well as the icons of frequently used applications. On the right-side, the Taskbar features the Notification Area which informs the user of different things like the state of the Internet connection or the charge of the laptop battery.

The icons in the middle of the Taskbar are "pinned" applications, which is a way to have a quick access to

applications you use frequently. "Pinned" applications will stay in the Taskbar until you "unpin" them.



Pin an Application to the Taskbar

Step 1: Search for the application you want to pin in the Start Menu.

Step 2: Right-click on the application.

Step 3: Select "More" option at the top of the menu.

Step 4: Select the "Pin to taskbar" option.

Unpin an Application from the Taskbar

To "unpin" it, just right-click the icon in the Taskbar and select "Unpin from taskbar". You can "pin" it back again



any time you want.

Notification Area

The Notification Area is located at the right side of the



Taskbar. It shows different types of notifications from your computer like your Internet connection, or the volume level.

At first, the Notification Area shows a limited amount of icons. But you can click the upward arrow on its left-side to see other icons as well.

Snap Assist

Because all the apps and programs run in windows on the



desktop, instead of modern apps from the Store being in their own space, and can no longer drag across the left edge of the screen to bring another app on screen and get a split view. Instead, drag windows into the corners of the screen to get the familiar Snap view.

Now use all four corners of the screen if want each window to take up a quarter of the screen instead of half, and the space that isn't filled by the window you just dragged shows thumbnails of your other windows to make it easier to snap the next one into place.

Action Center

If we used Windows Phone 8.1 (or Android and/or iOS), we used to a notification centre can drag down from the top of the screen.

Windows 10 puts that on the right of the screen, where the charms bar was in Windows 8, with notifications from various apps at the top and the choice of various settings buttons at the bottom for quick access.

The command prompt

Those of us that use the command prompt have been stuck with pretty much the same experience since the 1990s, but in Windows 10 can finally resize the command prompt window and use familiar keyboard shortcuts to copy and paste at the command prompt.

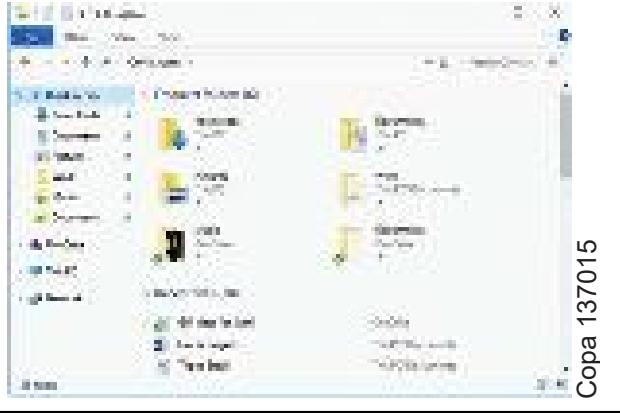
It's far from ground-breaking but it's a very welcome improvement after years of frustration.

FILE EXPLORER

File Explorer is the file management application used by Windows operating systems to browse folders and files. It provides a graphical interface for the user to navigate and access the files stored in the computer.

The main way to access the File Explorer is by clicking the folder icon in the Taskbar. After clicking the icon, the File Explorer window will open.

Fig 15



The initial File Explorer window is comprised of the following sections:

1. The **File Explorer ribbon**, which resembles the ribbon featured in Microsoft Office. The ribbon contains buttons for common tasks to perform with your files and folders.
2. The **Navigation Pane** gives you access to your libraries of documents and pictures, as well as your storage devices. It also features frequently used folders and network devices.
3. The **Frequent folders section** on the right features the folders you've worked with recently to allow for quick access to them.
4. The **Recent files section** in the lower part of the window features files and documents that you've opened recently.

The new Edge browser

To catch up with fast-moving browsers like Chrome and Firefox, Microsoft took its browser back to basics, ripping out years of code that didn't fit with web standards and making a lean, fast browser.

It's a work in progress - it won't get support for things like ad-blocking extensions until a while after Windows 10 launches - but can do plenty of neat things here. For example, and can scribble notes on a web page to send to a friend and Edge has Cortana built in to pull useful information out of web pages, like the phone number of a restaurant, or the opening hours.

Sites like Medium that didn't work properly with IE should look better and have more features in Edge.

Multiple desktops

User need to arrange a lot of windows and don't have multiple monitors, user can put them on multiple virtual desktops. And can use Alt-Tab to move between apps as usual and then Windows-Ctrl and the left and right arrow keys to move between desktops.

Schedule restarts

No more having Windows announce that you have fifteen minutes to get everything done before it restarts to apply an update. Instead of leaving Windows 10 to decide when to do that, if there's an update that will need a restart and can have Windows ask when you want to schedule that for.

user can only do that once the update has been downloaded. If user want to have certain times off-limits for restarts, they will need the features in Windows Update for Business (for Windows 10 Pro and Enterprise) which lets block restarts so they don't happen in working hours, or on certain dates.

Universal apps - including Office

Windows 10 gets a new Windows Store, where download desktop programs as well as modern Windows apps. Many of those apps will be universal apps that are the same code on a PC, a Windows phone, an Xbox One and even on HoloLens, with the interface changing to suit the different screen sizes. The Office for Windows apps like Word and Excel are universal apps, as are the Outlook Mail and Calendar apps.

Settings and control panel

The Windows 8 Settings app has taken over many more of the settings that used to be in Control Panel, and it has a Control Panel-style interface with icons to navigate with. But the old Control Panel interface is still there, for settings that aren't in the new Settings app (or if you're just used to finding things there).

Windows 10 - Keyboard Shortcuts

Like most Windows applications, there are several keyboard shortcuts you can use to make it easier or faster for some to perform certain tasks.

Most of the new Windows shortcuts use the Windows key () combined with other keys to perform several actions. The following are some of the most common or useful shortcuts used in Windows 10.

Keyboard Shortcuts for Navigating Windows 10

Press This	To Do This
Windows Logo	Toggle the Start menu
Windows Logo+A	Open the Notifications pane
Windows Logo+B	Activate the notification area's Show Hidden Icons arrow (press Enter to display the hidden icons)
Windows Logo+C	Open Cortana for voice commands
Windows Logo+D	Minimize all open windows to display the desktop
Windows Logo+E	Run File Explorer
Windows Logo+F	Display the Start menu and activate the Search box
Windows Logo+H	Display the Share pane
Windows Logo+I	Run the Settings app
Windows Logo+K	Display the Devices pane
Windows Logo+L	Lock your computer
Windows Logo+M	Minimize all windows
Windows Logo+O	Turn the tablet orientation lock on and off
Windows Logo+P	Display the Project pane to configure a second display
Windows Logo+Q	Open Cortana for voice commands
Windows Logo+R	Open the Run dialog box
Windows Logo+S	Open Cortana for keyboard commands
Windows Logo+T	Activate the taskbar icons (use the arrow keys to navigate the icons)
Windows Logo+U	Open the Ease of Access Center
Windows Logo+W	Activate the Search box
Windows Logo+X	Display a menu of Windows tools and utilities
Windows Logo+Z	Display an app's commands (although this works in only some Modern apps)
Windows Logo+=	Open Magnifier and zoom in
Windows Logo+-	Zoom out (if already zoomed in using Magnifier)
Windows Logo+,	Temporarily display the desktop
Windows Logo+Enter	Open Narrator
Windows Logo+Left	Snap the current app to the left side of the screen
Windows Logo+Right	Snap the current app to the right side of the screen
Windows Logo+Up	Restore a minimized app; maximize a restored app
Windows Logo+Down	Restore a maximized app; minimize a restored app
Windows Logo+PgUp	Move the current app to the left monitor
Windows Logo+PgDn	Move the current app to the right monitor
Windows Logo+PrtSc	Capture the current screen and save it to the Pictures folder
Windows Logo+Ctrl+D	Create a virtual desktop
Windows Logo+Ctrl+Right	Switch to the next virtual desktop
Windows Logo+Ctrl+Left	Switch to the previous virtual desktop
Windows Logo+Ctrl+F4	Close the current virtual desktop
Windows Logo+Tab	Open Task View, which displays thumbnails for each running app as well as the available virtual desktops

Handling printers

Objectives : At the end of this lesson you shall be able to

- explain about typewriter
- explain about printer
- explain types and cost of printers
- explain programming languages for printers
- explain how to locate printer driver files.

Typewriter

A typewriter is a mechanical or electromechanical device with keys that, when pressed, cause characters to be printed on a medium, usually paper as on Fig 1. Typically one character is printed per keypress, and the machine prints the characters by making ink impressions of type elements similar to the sorts used in movable type letterpress printing.

Fig 1



Fig 2



After their invention in the 1860s, typewriters quickly became indispensable tools for practically all writing other than personal correspondence. They were widely used by professional writers, in offices, and for business correspondence in private homes. By the end of the 1980s, word processors and personal computers had largely displaced typewriters in most of these uses.

Computer printer

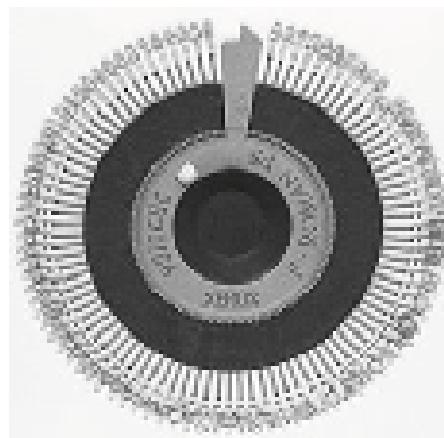
A printer is a piece of hardware for a computer as on Fig 2. It is a device that must be connected to a computer which allows a user to print items on paper, such as letters and pictures. It can also work with digital cameras to print directly without the use of a computer.

Types of printers

Today, the following types of printers are in regular use:

Daisy wheel printing is an impact printing technology invented in 1969 by David S. Lee at Diablo Data Systems as on Fig 3. It uses interchangeable pre-formed type elements, each with typically 96 glyphs, to generate high-quality output comparable to premium typewriters such

Fig 3



as the IBM Selectric, but two to three times faster. Daisy wheel printing was used in electronic typewriters, word processors and computers from 1972. According to Webster's, the daisy wheel is so named because of its resemblance to the daisy flower.

Dot-matrix printers are now almost extinct. They used a ribbon and made a lot of noise. There were models with 9 pins and models with 24 pins as on Fig 4. A dot matrix printer or impact matrix printer is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism on a typewriter.

Fig 4



Inkjet printing is a type of computer printing that creates a digital image by propelling droplets of ink onto paper as on Fig 5. Inkjet printers are the most commonly used type of printer, and range from small inexpensive consumer models to very large professional machines that can cost tens of thousands of dollars.

Fig 5



The concept of inkjet printing originated in the 20th century, and the technology was first extensively developed in the early 1950s. Starting in the late 1970s inkjet printers that could reproduce digital images generated by computers were developed, mainly by Epson, Hewlett-Packard (HP), and Canon. In the worldwide consumer market, four manufacturers account for the majority of inkjet printer sales: Canon, HP, Epson, and Lexmark, a 1991 spin-off from IBM.

The plotter is a computer printer for printing vector graphics as on Fig 6. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. It is now commonplace to refer to

Fig 6



such wide-format printers as "plotters," even though they technically are not.

Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are restricted to line art, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines.

Laser printing is a digital printing process that rapidly produces high quality text and graphics on plain paper. As with digital photocopiers and multifunction printers (MFPs), laser printers employ a xerographic printing process, but differ from analog photocopiers in that the image is produced by the direct scanning of a laser beam across the printer's photoreceptor.

A laser beam projects an image of the page to be printed onto an electrically charged rotating drum coated with selenium or, more common in modern printers, organic photoconductors. Photoconductivity allows charge to leak away from the areas exposed to light.

Dry ink (toner) particles are then electrostatically picked up by the drum's charged areas, which have not been exposed to light. The drum then prints the image onto paper by direct contact and heat, which fuses the ink to the paper.

Cost of printers

There are different costs with a printer. Printers that are more expensive to buy will usually be less expensive in the consumables (the ink, toner, or ribbon used by the printer). Therefore, laser printers are often more expensive to buy than inkjet printers, but are not expensive to use over a long period of time.

Inkjet printers on the other hand have a higher cost of consumables because the ink tanks they use are more expensive than the toner for a laser printer.

Laser printers that can print in color are usually more expensive than those that only print in black and white.

Other options, like being able to print on both sides of a sheet of paper, to automatically sort the output, or to staple the output will also make a printer more expensive.

Common programming languages for printers include:

- ESC/P
- Postscript
- PCL
- GDI
- HPGL and HPGL/2
- PDF
- VPS

How to Locate Printer Driver Files

Printers can be connected to a computer by a variety of wired and wireless methods, but all printers require drivers to be installed on a computer. The printer drivers are small programs that help communicate information from the operating system to the printer.

Driver errors can make the printer unusable. Using the Windows device manager, you can look up details about the drivers as well as pinpoint their physical location on your hard drive.

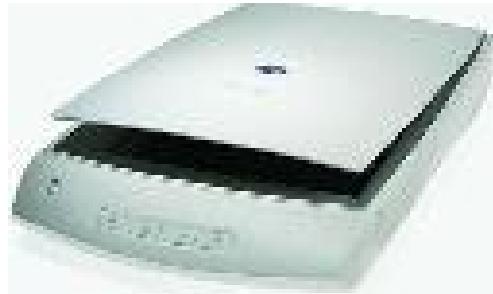
Scanner

A scanner is an electronic device which can capture images from physical items and convert them into digital formats, which in turn can be stored in a computer, and viewed or modified using software applications.

Different types of scanners are available with different resolutions. In the world of electronic data transmission, scanning is considered to be the most cost-effective and reliable way of transmitting images.

The basic principle of a scanner is to analyze an image and reproduce it to a digital one using the optical character recognition techniques.

Fig 7



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Prominent features of a scanner include:

- Reliability - Unlike certain forms of data transmission, scanning involves only transfer of hard images to digital forms. The role of the end-user is limited in case of scanning. And as they are not dependent on two-way communication, they can also help in storing important information or transmitting important information.
- Efficiency - Modern scanners are built for efficiency and speed. And it comes with ease of use as well as convenience.
- Quality - Scanning ensures the best resolution possible for digital images. Compared to fax machines, which may find it difficult to reproduce the accurate details, scanners can reproduce images with high resolution and precision. They are quite useful for photography and engineering arenas.
- Cost saving - One of the biggest advantages of scanning is the replacement of physical files/forms with digital ones. Along with saving physical space, which has to be used for storage, there are also environmental benefits by using scanner.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

- describe the functions of BIOS and CMOS
- describe the method of viewing and changing BIOS settings
- describe the meaning of partitioning and formatting
- describe the process of installing Windows operating system.

The Basic Input/Output System (BIOS), also known as System BIOS, ROM BIOS or PC BIOS is a generally accepted standard defining a firmware interface.

The fundamental purpose of the BIOS is to initialize and test the system hardware components and load an operating system from a mass memory device. The BIOS is special software that interfaces the major hardware components of the computer with the operating system. It is usually stored on a Flash memory chip on the motherboard, but sometimes the chip is another type of ROM. The BIOS is a firmware (software instructions permanently recorded on a chip located on your motherboard). (Refer Fig.1).



Functions of BIOS

The BIOS software has a number of different roles, but its most important role is to load the operating system. The BIOS checks and initializes the PC hardware each time the system powers up or restarts before handing over control to the operating system. Some of the other common tasks that the BIOS performs include:

- A power-on self-test (POST) for all of the different hardware components in the system to make sure everything is working properly
- Activating other BIOS chips on different cards installed in the computer - For example the graphics cards often have their own BIOS chips.
- Providing a set of low-level routines that the operating system uses to interface to different hardware devices. They manage things like the keyboard, the screen, and the ports, especially when the computer is booting.

- Managing a collection of settings for the hard disks, clock, etc.

CMOS Setup

The first thing the BIOS will do is check the information stored in a tiny (64 bytes) amount of RAM located on a complementary metal oxide semiconductor (CMOS) chip. The CMOS Setup provides detailed information particular to your system and can be altered as your system changes. The BIOS uses this information to modify or supplement its default programming as needed.

Configuring BIOS

The BIOS checks the CMOS Setup for custom settings. To change the CMOS settings we need to enter the CMOS setup. To enter the CMOS Setup, a certain key or combination of keys must be pressed during the initial startup sequence. Most systems use "Esc," "Del," "F1," "F2," "Ctrl-Esc" or "Ctrl-Alt-Esc" to enter setup. There is usually a line of text at the bottom of the display that tells "Press ___ to Enter Setup."

The BIOS setup shows a set of text screens with a number of options. Some of these are standard, while others vary according to the BIOS manufacturer. Common options include:

- System Time/Date - Set the system time and date
- Boot Sequence - The order that BIOS will try to load the operating system
- Plug and Play - A standard for auto-detecting connected devices; should be set to "Yes" if your computer and operating system both support it
- Mouse/Keyboard - "Enable Num Lock," "Enable the Keyboard," "Auto-Detect Mouse"...
- Drive Configuration - Configure hard drives, CD-ROM and floppy drives
- Memory - Direct the BIOS to shadow to a specific memory address
- Security - Set a password for accessing the computer
- Power Management - Select whether to use power management, as well as set the amount of time for "standby" and "suspend"

- Exit - Save your changes, discard your changes or restore default settings.

The BIOS uses CMOS technology to save any changes made to the computer's settings. With this technology, a small lithium or Ni-Cad battery can supply enough power to keep the data for years. Major BIOS manufacturers include American Megatrends Inc. (AMI), Phoenix Technologies, Winbond etc. A typical BIOS screenshot is shown in fig. given below.(Refer Fig.2)



Installing the Windows operating System

A hard disk needs to be partitioned (though not mandatory) and formatted before you can store data on it.

Partitioning

A partition, sometimes also called a volume, is an area on a hard disk that can be formatted with a file system and identified with a letter of the alphabet. For example, drive C on most Windows computers is a partition. the first three partitions you create are primary partitions. These can be used to start an operating system. If you want to create more than three partitions, the fourth partition is created as an extended partition.

An extended partition is a container that can hold one or more logical drives. Logical drives function like primary partitions except that they cannot be used to start an operating system.

Many computers are partitioned as a single partition that equals the size of the hard disk. Partitioning a hard disk into several smaller partitions is not required, but it can be useful for organizing data on your hard disk.

Creating more than one partition has the following advantages:

- Separation of the operating system (OS) and program files from user files.
- Having a separate area for operating system virtual memory swapping/paging.
- Keeping frequently used programs and data near each other.

- Use of multi-boot setups, which allow users to have more than one operating system on a single computer. For example, one could install Linux and Microsoft Windows or other operating systems on different partitions of the same HDD and have a choice of booting into any operating system at power-up.
- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected.
- Raising overall computer performance on systems where smaller file systems are more efficient.
- Partitioning for significantly less than the full size available can reduce the time for diagnostic tools such as checkdisk to run.

Formatting

Disk formatting is the process of preparing a data storage device such as a hard disk drive, solid-state drive or USB flash drive for initial use. It is the act of creating a file system on a volume, so that the operating system can store and retrieve data on that volume.

Formatting of a disk is of two categories:

- 1 Low-level formatting (i.e., closest to the hardware) marks the surfaces of the disks with markers indicating the start of a recording block. It also provides information about block checks done for future use by the disk controller to read or write data. This is intended to be the permanent foundation of the disk, and is often completed at the factory. A hard disk needs to be partitioned and formatted before you can store data on it
- 2 High-level formatting creates the file system format within a disk partition or a logical volume. This formatting includes the data structures used by the OS to identify the logical drive or partition's contents. This may occur during operating system installation, or when adding a new disk.

Installing the Windows operating System

The three basic types of windows installation procedures are as follows:

- Install on a brand new disk or computer system
- Erase the disk, format it, and install.
- Install into a new directory for dual-booting

For the first two methods, it must be ensured that the computer can boot from a DVD or any other removable drive. To do this the drive boot order needs to be changed in the BIOS. The latest Windows DVDs are bootable and run the Setup program automatically. Then the installation can be done by following the procedure step by step as indicated on the subsequent screens as in trade practicals.

CMOS setup and windows installation

Objectives : At the end of this lesson you shall be able to

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Format a hard drive

Fig 1



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There are many reasons why it is required to format a hard drive, such as to install Windows fresh, to get rid of a virus or malware or simply because a pc is refreshed or cleaned up on selling.

The process can be different depending on whether it's an only hard drive and whether there is a spare PC or not.

It cannot be formatted, the hard drive on which Windows is running. In order to do this, it is in need to boot the PC from a Windows installation disc, a USB flash drive or another bootable disc.

Format a disk?

Formatting is the process of deleting all the data on the hard drive, but beware of 'Quick Format' which leaves all data in place and makes the drive appear to be empty. A quick format is ok if there is a brand new hard drive, or need to reinstall Windows, but not if its disposing of the disk or giving it to someone else.

A word of warning: make sure to have successfully backed up any photos, videos, music and other documents from the drive before formatting it. Although deleted files can be recovered in some situations, prevention is always better than cure.

Format hard drive partitions

It's important to understand about partitions before getting started. A hard drive can be divided up into smaller sections, called partitions. It's possible to format one partition while leaving the others untouched.

If it is required to format the entire hard drive and use the entire capacity in one block, delete the partition information.

Format a hard drive from the BIOS?

Many people ask how to format a hard disk from BIOS. The short answer is no.

If it is required to format a disk and you can't do it from within Windows, create a bootable CD, DVD or USB flash drive and run a free third-party formatting tool.

One option is Darik's Boot and Nuke (DBAN), which is free for personal use. This program will totally erase and format your hard disk, allowing for a clean install of a new OS, but the process cannot be undone.

Fig 2



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DBAN is supposedly only able to create a bootable CD/DVD-R, but if don't have any blank discs or a burner, there is a workaround available in the form of a separate third-party program.

Universal USB Installer will quickly and easily convert the DBAN ISO image downloaded to run from a bootable USB. Simply insert a blank USB flash drive, run the Universal USB Installer setup program, and follow the prompts.

It will ask to scroll through and pick the Linux Distribution want to install to USB (in this case, the latest version of DBAN), followed by its location on the computer and the letter of the USB drive like to install it to.

Once that information is complete, click create.

Fig 3



To boot from this USB drive rather than usual boot device (in most cases, this would be the hard drive), it have to be changed some settings in the BIOS.

In the BIOS, navigate to the boot order settings, and change the primary boot device to the USB drive (it shouldn't need to be plugged in to make this selection). After saved the settings and exited the BIOS, insert the bootable USB, restart the computer.

Fig 4



The PC should automatically boot the DBAN software, which will guide through the process of erasing the hard drive, with options for different levels of data-wiping.

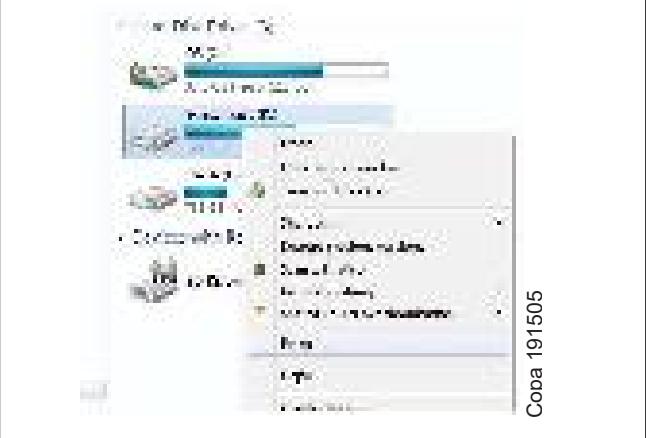
It will treat the USB as another drive so to avoid inadvertently wiping that as well, remove it after booted into DBAN.

Quick format a hard drive?

Yes, but don't use this method if want the data to be permanently erased. A quick format doesn't delete the data but instead erases only the pointers to the files.

Windows Vista, 7, 8 and 10 have a built-in Disk Management tool (see below), but the fastest way to format a hard drive is to click the Start button, then Computer and right-click on the hard drive to wipe. It can't be formatted the drive on which Windows is installed for obvious reasons.

Fig 5



By default Quick Format is checked, and choose the file system and allocation unit size as well as changing the volume label (the drive's name). Typically, leave all settings unchanged and click the Start button. In under a minute the hard drive will be formatted.

Fig 6



Choose NTFS as the file system if it isn't already selected for Windows Vista, 7, 8 or 10 and ensure the Allocation Unit Size is set to 'Default Allocation Size'.

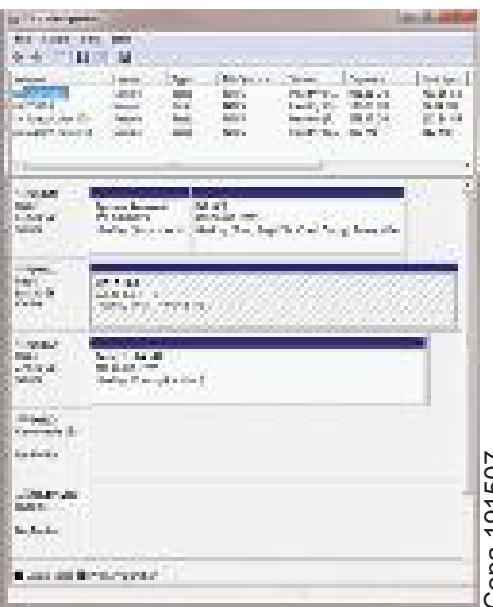
Using the Disk Management tool

Type diskmgmt.msc or Disk Management into the search box in Vista, 7, 8 or 10 and then click on only result that appears in the menu above, with the same name.

This is the easiest way to launch Disk Management, but also find it in the Control Panel if search for 'disk' and select the 'Create and format hard disk partitions'.

Disk Management isn't as powerful as a standalone partition management tool, but it is still capable of formatting data.

Fig 7



If it is to install a new (additional) hard drive in a PC, it might be a thing to wonder why it doesn't appear in Windows Explorer. The reason is because it needs to be initialised and formatted -which can be done in Disk Management.

When the tool loads, it will analyse all of the computer's drives and will prompt to initialise a new disk that it finds.

Fig 8



If the disk is larger than 2TB, opt for GPT (GUID Partition Table). This setting also lets to create more than four partitions.

If don't see a prompt, look in the list of drives and see one that says 'Not Initialized'. Right-click on it and choose Initialize Disk.

Once that's done, right-click in the hatched Unallocated space and choose New Simple Volume...

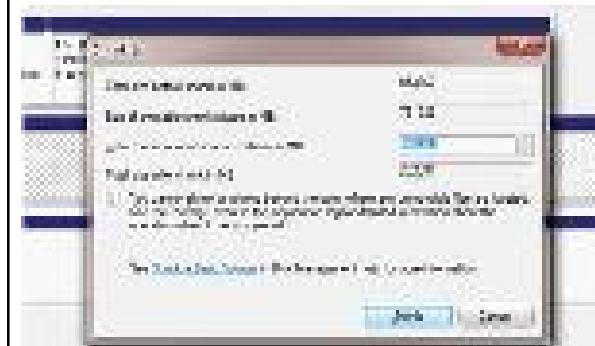
Follow the instructions, choosing how big to want the partition to be (in MB - 1024MB = 1GB), and which drive letter to assign (one will be chosen, but can opt to change it if desired).

If select a size for the partition that's smaller than the total capacity of the drive, say 500B on a 1TB drive, end up with some unallocated space on the drive which can format by repeating the process just completed.

change partition size

Disk Management can be used to expand or shrink a partition. Simply right-click on one and choose the appropriate option from the menu that appears. If shrinking, the partition will be checked to find out how much empty space it contains.

Fig 9



It's a little confusing as the numbers are displayed in MB rather than GB, but it can be adjusted the amount of space to shrink and the 'Total size after shrink' will be updated, also can't shrink a partition beyond the point where files are located - it may be able to free up space by defragmenting the drive first.

Conversely it can only expand a partition if there is unused space on the drive. If not, the option will be greyed out.

Resetting Windows

If PC is having problems and the user don't wish to lose the personal files by wiping the hard drive, then it might want to refresh or reset the PC which can be done in Windows 8 and 10.

If user looking to keep your personal files and settings, but want to have a fresh Windows install, itsall want to refresh the PC.

Do note that a refresh will remove all programs and apps installed on the machine, but will keep the Windows-default programs intact.

A reset reinstalls Windows and deletes all files, settings and programs, it is suggested performing this if have previously backed up all the files and don't mind transferring user's personal files.

Windows 10 has a slightly different approach and might confuse those coming from Windows 8. Microsoft removed the refresh option and has instead combined the refresh and reset options into one setting.

Fig 10



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To find the option, open the Start Menu, click on Settings > Update & security > Recovery > Get started (under the Reset this PC option).

Upon selecting the option, it will present with three separate options:

- Keep my files
- Remove everything
- Restore factory settings (not available on all PCs)

'Keep my files' saves personal files but deletes user settings, drivers and programs, whilst also reinstalling Windows 10.

'Remove everything' also gets rid of personal files and 'Restore factory settings' does the same actions as 'Remove everything', but also resets the PC to the version of Windows which came with the machine.

This option will only be available to those who bought a pre-built PC or laptop which came with Windows already pre-installed.

Troubleshooting computer

Objectives: At the end of this lesson you shall be able to

- state the basic steps involved in troubleshooting a PC
- explain the basic approach to solve a problem
- list the probable defects and symptoms in a faulty Computer
- analyse the causes for the complaints
- state the shortest path for servicing the defects.
- list the probable defect and symptoms in the faulty Computer
- analyse the causes for the complaint “When windows is started, system runs surface test and goes to safemode” with the help of a Problem Tree and TSC

Basic Troubleshooting

One of the difficulties while troubleshooting problems on a PC is that in most cases they are not what they seem. The cause behind a frequent hanging of a PC may be due to one of six or more well defined areas or a dozen of unidentified problems. The problem could be due to software or hardware. Even with years of experience and training, PC technicians come out with troubleshooting procedures that do not solve the real problem. For example a personal computer running windows operating system with several i/o cards connected may freeze the screen , mouse, and keyboard and take as long as 3 minutes before responding. After trying out with all the options like replacing a memory module, installing new parallel port and NIC drivers, the technician finally checks the system logs to find that a vital operating system library was corrupted and needed to be reinstalled. The issue to be mentioned here is that if the technician used a systematic approach to troubleshooting, the problem would likely have been solved much sooner. Maintaining a good troubleshooting plan certainly gives us the scope to approach the problem in a more systematic and scientific manner. A troubleshooting plan is nothing but a written check list that we use for any problem. The elements that should be included in any troubleshooting plan are as follows

- Maintenance record
- Identification of possible causes
- Identification of possible solutions
- Application and testing of solutions
- Follow-up

In the maintenance record, record the hardware installed in the PC when it is installed, all preventive maintenance activities, all software updates or additions, and all hardware installations and upgrades. Further any problems that occur and the actions you take to resolve them should be recorded . when it comes to troubleshooting a PC, with the maintenance record one can pin down a problem and devise solution for it. The first entry in such record should be a profile of the PC, which includes its configuration, operating system, and the date each component was installed.

Such tables gives an idea of the type of information one should include in the sytem configuration, as summerised below:

- The processor's make, model and speed.
- Amount of system memory(RAM) and the memory module type, size and configuration of the memory
- Hard disk size and the type of interface
- Make, model and speed of the compact disk (CD) or digital versatile disk (DVD) drive
- Memory size of the video or graphics adapter
- Make, model, type and speed of the modem
- The version number of the operating system
- A list of software applications installed on the PC
- A list of peripheral equipment attached to the PC, indicating the port to which they are attached

The maintenance record should be updated each time any maintenance work is carried over on the PC. Any time new or replacement hardware is installed, record the activity and update the system configuration. The activity entries should include

- Date of the activity or changes made to the system
- The make, model and serial number of any hardware removed or added to the PC
- The name, version and publisher of any software added to the PC
- Detailed information on any configuration changes made to the basic input/output system(BIOS) or other configuration for the new device or software.

Troubleshooting approach

For solving any problems associated with PC, first go through the maintenance record of that PC and follow a systematic procedure for isolating the problem. The standard problem solving process includes the following steps

Identify the problem: This is the most difficult part of the process. To perform this step successfully collect all the data about the problem

Identify possible causes: analyse all the symptoms of the problem and try to list all the causes in order from the most likely to the least likely.

Identify possible solutions: identify solutions for each of the causes that are identified. A possible cause could have more than one possible solution.

Analyze the possible solutions: if two solutions produce the same result, consider the one which is more economic and apply the same.

After following the above steps and on solving the problem update the maintenance record and make necessary entries into it. In some cases the problems may be very clear and the solution is very transparent and even in such cases try to follow the above mentioned steps to make it a practice to follow the systematic approach. Whenever a problem occurs with a PC, while following the steps, try to collect the information about the system by answering questions such as

- Under what circumstances this problem cropped up?
- Were there any indications in the form of beep codes/ error messages or any clear symptoms?
- What softwares were active when the problem happened?
- Has it happened for the first time or occurred in the past also?
- Were there any configuration changes made during the session that required a restart that was not performed?

Optimizing the PC:

APC which was functioning absolutely well and developed a symptom of slowing down or if it is unable to keep pace with the demands of newer software, one of the possible solutions is to consider updating or optimizing the PC to enhance its performance. Optimization steps may cost money , but many involve software you already own or software readily available on the web.

Optimizing the BIOS and Boot process:

BIOS setup configuration includes many settings in the CMOS. How quickly the system boots and performs depends on the these settings. Enabling of valuable features such as system caching or using the quick POST process are very vital for optimum performance.

Optimizing the hard disk: Windows ScanDisk and Disk Defragmenter utilities are the best tools available for optimizing the hard disk in terms of usage and access speeds. ScanDisk is used to check a disk for errors and repair them or remove unrecoverable areas of the disk from the usage tables to prevent future errors. Similarly Disk Defragmenter organizes data file fragments into a more optimized and logical format that provides for faster access times and less head movement.

Optimizing the Expansion cards: The best way to optimize I/O controllers and other expansion cards is to install them in the correct order. No harm is done even if

they are installed out of order, but there is some benefit to be gained from putting them in the proper sequence. On a Pentium system, use PCI cards and avoid ISA cards, if possible. All I/O adapters including video cards, sound cards, NICs, modems and SCSI adapters are available for the PCI expansion bus. Consult the motherboard documentation and install video card in the first PCI slot, followed by the NIC, modem, and sound card, in that order.

Optimizing the processor: One can speed up the processor in the following ways

- Replace it with a faster speed or higher level processor
- Use a utility from the processor manufacturer to apply patches or fixes to the processor's logic
- Overclock the processor

The requirement for replacing the processor with a higher level or faster processor is that your motherboard and chipset will support the new processor both logically and physically. Logically the chipset and motherboard must support the bus speed of the processor and have the supporting circuits it requires. It is often much better to replace the complete motherboard. Some times the manufacturer of the processor may release some utilities that will improve some aspect of processor's capabilities such as video processing, buffer handling, caching and other processor based functions. Overclocking a processor means running a processor at speeds faster than it was released to support. Most processors are capable of running at speeds higher than their nominal speeds. The nominal speed of a processor is the speed at which it has been tuned to run with a certain chipset, motherboard, cooling system, and other components of the PC. Raising the speed of the processor can create heating problems on the processor and lead to frequent system lockups, memory problems and other issues.

Troubleshooting sources of Non-software problems:

Any time pc fails for no apparent software reason, check the following areas

- Ensure proper AC power
- Scan the PC for a computer virus
- Ensure that CPU fan is spinning
- Ensure proper connections of external I/O connectors
- Reseat the expansion cards and check the power and data cables of internal devices
- Most of the boot problems are the result of a recent change, check out the BIOS setup configuration data
- To install any new hardware or software, visit manufacturer's web site for any known conflict or incompatibility
- Check for any resource conflict if any new hardware or software is installed.

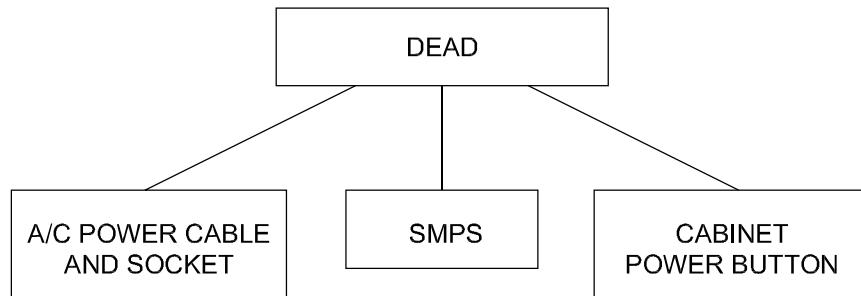
The forth coming lessons on Troubleshooting PC are provided with Problem Trees for different type of problems which a user face normally. Each Tree with a specific

problem gives scope to analyse the areas to be suspected or looked into for fixing the problem. This lesson includes a Problem Tree for a PC which is Dead with no display on monitor.

PROBLEM TREE : PT- 01

Observed symptom : Dead

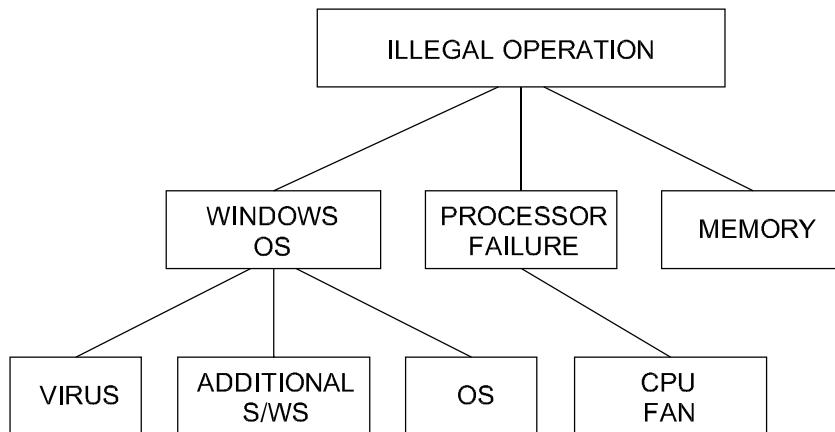
Additional symptom : No display



PROBLEM TREE : PT- 02

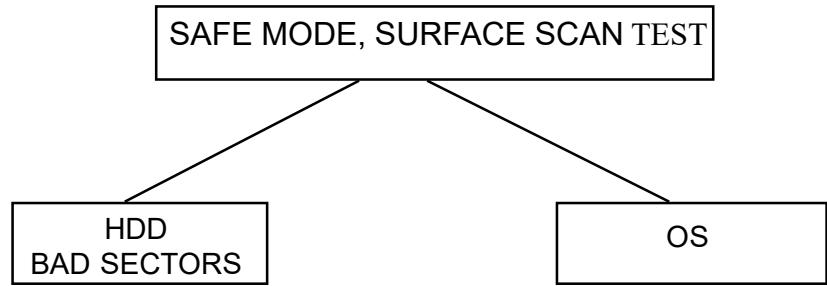
Observed symptom : Windows shows “illegal operation”

Additional symptom : Windows not working



Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”.

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

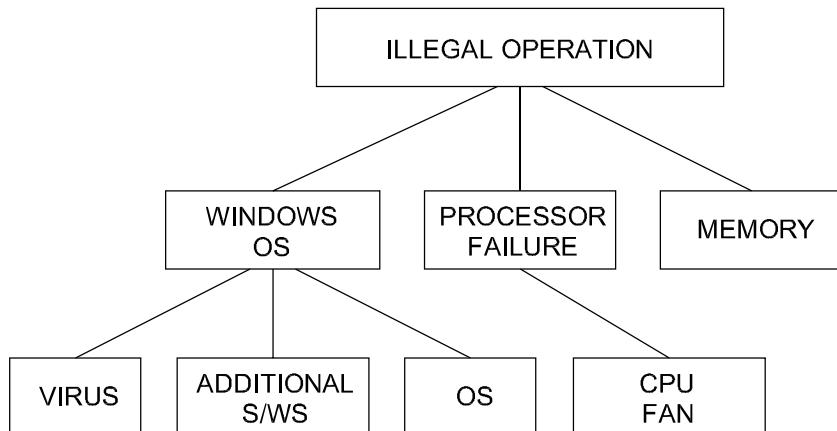


Discuss the Troubleshooting chart (TSC-01) and Service flow sequence (SFS-01) for the complaint “When windows is started system runs surface test and goes to safemode” referring to exercise 2.33

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 02

Observed symptom : Windows shows “illegal operation”
 Additional symptom : Windows not working

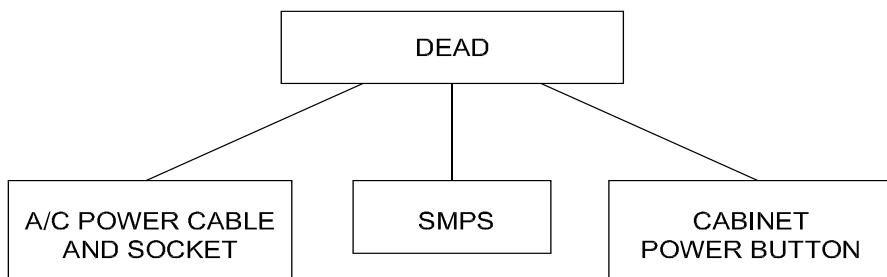


Discuss the Troubleshooting chart (TSC-02) and Service flow sequence (SFS-02) for the complaint “While working, windows shows error - illegal operation”

Various faults discussed for the above complaint shall be applied to actual Computer given to you for practical exercises.

PROBLEM TREE : PT- 03

Observed symptom : DVD drive can't read
 Additional symptom :



Application softwares

Objective: At the end of this lesson you shall be able to

- describe various software types.

Application software

Application software is a term which is used for software created for a specific purpose. It is generally a program or collection of programs used by end users. It can be called an application or simply an app.

In fact all the software other than system software and programming software are application software.

Application software definition

A software which is developed to help the user to perform specific tasks is called application software.

The different types of application software include the following:

Application Software Type	Examples
Word processing software	MS Word, WordPad and Notepad
Database software	Oracle, MS Access etc
Spreadsheet software	Apple Numbers, Microsoft Excel
Multimedia software	Real Player, Media Player
Presentation Software	Microsoft Power Point, Keynotes
Enterprise Software	Customer relationship management system
Information Worker Software	Documentation tools, resource management tools
Educational Software	Dictionaries: Encarta, Britannica Mathematical: MATLAB Others: Google Earth, NASA World Wind
Simulation Software	Flight and scientific simulators
Content Access Software browsers	Accessing content through media players, web
Application Suites	OpenOffice, Microsoft Office
Software for Engineering and Product Development	IDE or Integrated Development Environments

There are various different types of application software such as licensed, sold, freeware, shareware and open source.

Application software's either need to be installed or can run online. Application software's can also be distinguished on the basis of usage into the following:

- Utility programs
- Generic programs
- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software
- Database software
- Presentation software
- Internet Browsers
- Email Programs
- Graphic Programs (Pixel based)
- Graphic Programs (vector based)
- Communication software: Communication through audio, video or chat based means

Bluetooth devices

Objectives : At the end of this lesson you shall be able to

- describe the meaning of Bluetooth
- describe the method of using Bluetooth
- list the major applications of Bluetooth.

Introduction:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the range 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). It is a standard wire-replacement communications protocol primarily designed for low-power consumption, with a short range based on low-cost transceiver microchips in each device.

It can connect up to eight devices (items of electronic equipment) at the same time. The chip can be plugged into items such as computers, digital cameras, mobile phones and faxes. Bluetooth is particularly convenient in certain situations - for example, when transferring files from one mobile phone to another without cables. Sending music and photos between a PC and a mobile phone is another useful application.

Because the devices use a radio (broadcast) communications system, they do not have to be in visual line of sight of each other, however a quasi optical wireless path must be viable.

Range is power-class-dependent, but effective ranges vary in practice varying from 10 to 100 m.

The name 'Bluetooth' reflects the Scandinavian origins of the technology. It is named after a 10th century Danish viking, King Harald Blåtand (translating as 'Bluetooth' in English). He united and controlled Denmark and Norway, hence the association of uniting devices through Bluetooth.

Using Bluetooth

To use Bluetooth, the device must be Bluetooth enabled. For this purpose a device called "Dongle" may be used. A dongle is a device that plugs into the computer to enable it to use Bluetooth. Every manufacturer of compatible devices will have their own instructions for accessing Bluetooth. For detailed instructions you will need to see the manual, but as a general guide:

To set up Bluetooth:

(Identify the blue tooth icon on devices.)

- 1 Turn on, or enable, Bluetooth. Ensure your device is 'visible' and not 'hidden', so other nearby devices can pick up the signal.
- 2 Give your device a name to identify it when connecting to other compatible equipment.

When devices like mobile phones, laptops, tablets etc. enable Bluetooth the Bluetooth icon is on.

To establish a Bluetooth connection:

- 1 Find the file you wish to send.
- 2 Select the option to send it via Bluetooth - your device will search for other devices within range and display them.
- 3 Scroll to the device you wish to connect with and select it.
- 4 If the other device needs 'pairing', you will need to enter a passcode - a bit like a PIN number - and make sure it is entered on the other device.

When the connection is established, the data will start to send. You do not need worry about a clear line of sight between devices.

List of Bluetooth applications

Some of the Bluetooth applications are as follows:

Wireless control of and communication between a mobile phone and a handsfree headset.(Refer fig. 1)



Fig 1

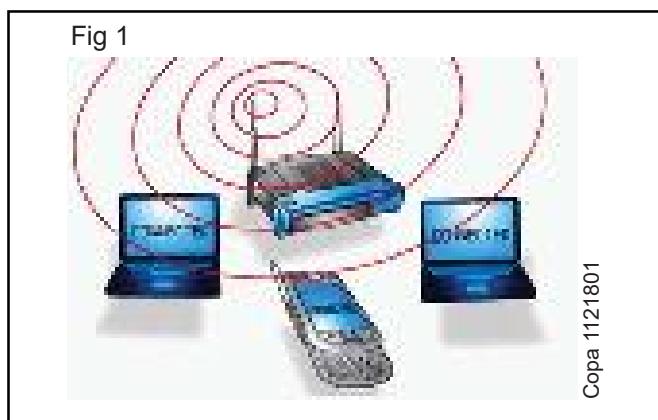
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- Wireless control of and communication between a mobile phone and a Bluetooth compatible car stereo system.
- Wireless control of and communication with tablets and speakers such as iPad and Android devices.
- Wireless networking between PCs in a confined space and where little bandwidth is required.
- Wireless communication with PC input and output devices, the most common being the mouse, keyboard and printer.

- Transfer of files, contact details, calendar appointments, and reminders between devices with OBEX(Objects exchange).
- Replacement of previous wired RS-232 serial communications in test equipment, GPS receivers, medical equipment, bar code scanners, and traffic control devices.
- Wireless bridge between two Industrial Ethernet networks.
- Wireless controllers in gaming consoles.
- Personal security application on mobile phones for prevention of theft or loss of items. The protected item has a Bluetooth marker (e.g., a tag) that is in constant communication with the phone. If the connection is broken (the marker is out of range of the phone) then an alarm is raised.

Wi-Fi:

Wi-Fi is a popular wireless networking technology. Wi-Fi stands for "wireless fidelity". The Wi-Fi was invented by NCR corporation/AT&T in Netherlands in 1991. By using this technology we can exchange the information between two or more devices. Wi-Fi has been developed for mobile computing devices, such has laptops, but it is now extensively using for mobile applications and consumer electronics like televisions, DVD players and digital cameras. There should be two possibilities in communicating with the Wi-Fi connection that may be through access point to the client connection or client to client connection. Wi-Fi is a one type of wireless technology. It is commonly called as wireless LAN (local area network). Wi-Fi allows local area networks to operate without cable and wiring. It is making popular choice for home and business networks. A computer's wireless adaptor transfers the data into a radio signal and transfers the data into antenna for users.

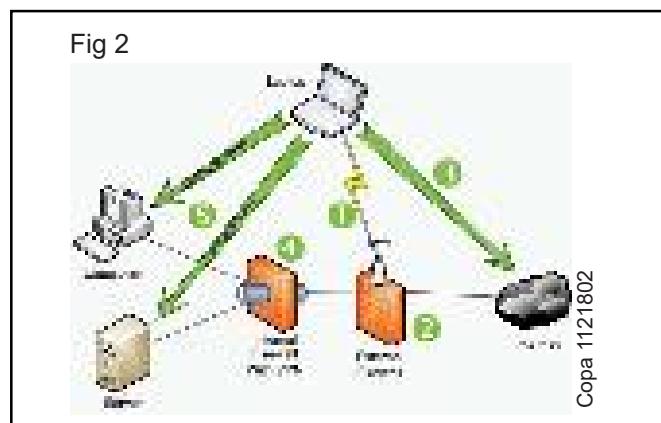


Working Principle:

Wi-Fi is a high speed internet connection and network connection without use of any cables or wires. The wireless network is operating three essential elements that are radio signals, antenna and router. The radio waves are keys which make the Wi-Fi networking possible. The computers and cell phones are ready with Wi-Fi cards. Wi-Fi compatibility has been using a new creation to constituent within the ground connected with community network. The actual broadcast is connected with in sequence in fact it is completed by way of stereo system surf as well as the worth of wires with monitor to classification prone. Wi-Fi allows the person in order to get access to web any place in the actual provided area.

And can now generate a system within Resorts, library, schools, colleges, campus, personal institutes, as well as espresso stores as well as on the open public spot to help to make the company much more lucrative as well as interact with their own customer whenever. Wi-Fi compatibility can make surf with stare to company using their inspiring cable television much a smaller amount force down.

The radio signals are transmitted from antennas and routers that signals are picked up by Wi-Fi receivers, such has computers and cell phones that are ready with Wi-Fi cards. Whenever the computer receives the signals within the range of 100-150 feet for router it connect the device immediately. The range of the Wi-Fi is depends upon the environment, indoor or outdoor ranges. The Wi-Fi cards will read the signals and create an internet connection between user and network. The speed of the device using Wi-Fi connection increases as the computer gets closer to the main source and speed is decreases computer gets further away.



Security:

Security is impairment element in the Wi-Fi technology. Security is our personal decision but having a wireless connection we should pay attention to protect our private details. We can connect easily to unsecured wireless routers. The problem is any one is connected to the wireless router using the data like download games, download apps and planning terrorist activities, sharing illegal music and movie files etc. So it is necessary to provide security to the wireless technologies based devices.

DVDs, CDs and burning DVDs

Objectives : At the end of this lesson you shall be able to

- describe the features of CDs & DVDS
- describe the main formats of DVDs
- describe DVD burning
- describe the features of CDs.

Introduction

DVD (sometimes called as "digital video disc" or "digital versatile disc") is a digital optical disc storage format. DVDs can be used with many types of players, including PCs and standalone players.

These discs are known as DVD-ROM, because data can only be read and not written or erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased multiple times.

DVD features and formats

DVDs are used in DVD-Video consumer digital video format and in DVD-Audio consumer digital audio format. They can also be used in a special AVCHD format (Advanced Video Coding High Definition) often used with AVCHD format camcorders. DVDs containing other types of information may be referred to as DVD data discs.

A typical recordable DVD can hold about 4.7 gigabytes (GB). However, the total amount of disc space that you can use to burn files to the disc is less than the amount that's often listed on the disc itself. This is because the disc capacity is calculated differently when it's used in a computer. For example, a typical DVD-R that has a listed disc capacity of 4.7 GB can only store about 4.37 GB of data on the disc. DVDs offer a storage capacity of approximately 4.7 GB. DVD discs do not deteriorate over time and are unaffected by magnetic fields.

The type of recordable disc to be used depends on a few different factors, such as:

- The types of recordable discs that work with the disc burner.
- The disc drive on the computer or device will read the disc after it is burned.
- The total size of all the files that will be burned on to a disc.

DVD burning

The process of recording source material onto an optical disc (CD or DVD) is called burning / writing or optical disc authoring. Creating an optical disc usually involves first creating a disk image with a full file system designed for the optical disc, and then actually burning the image to the disc. Many programs are available as bundled applications to create the disk image and burn the files.

The speed at which a DVD can be written is expressed as a multiplier: 16X means 16 times faster than just playing it. Speeds up to 52X are also very common.

CD or DVD formats

For burning DVDs, the two main disc formats in use are:

- Live File System and
- Mastered disc formats.

Live File System format :

Discs that use the Live File System format are often more convenient because you can copy selected files immediately and as often as you want, just like you can with a USB flash drive. This is convenient if you want to keep a disc in your CD, DVD, or Blu ray Disc burner and copy files whenever the need arises. In this format you can copy and erase files over and over again. However, the Live File System optical disc format is only readable by Windows 7, Windows Vista, and Windows XP systems. These discs are not blank after they're formatted.

Discs formatted in this format have the option name in the Burn a Disc dialog box: "Like a USB flash drive."

Mastered disc formats:

If we want to create an optical disc that can be used to transfer data files to older versions of the Windows operating system or even to another operating system, we need to use the Mastered optical disc format. Also if we want to burn music or pictures and use the disc in regular CD, DVD, or Blu ray Disc players that can play MP3 files and show digital pictures, we should use the Mastered optical disc format.

The Mastered format works just like burning CDs in Windows XP. In other words, when we write the disc, we copy a file or a group of files to the optical disc all at once. Once this is done, the disc is closed and we cannot copy more files to the disc nor can we delete the existing files. Hence it is recommended not to copy files immediately; it is a good practice to assemble the entire collection of files that needed to be copied to the disc and then burn them all at once.

Discs formatted with the Mastered option have the option in the Burn a Disc dialog box: "With a CD/DVD player."

There are many types of tools available to create data, music, video and audio discs. We can also create

backups that span across multiple discs, rip music tracks from Audio CDs and create or burn disc images in different formats. They may also provide features like automatic audio conversion from WAV, MP3, FLAC, WMA files, disc copying, compressed file backup and restore, disk erasing, VCD/SVCD support, project burning etc..

Blu - ray Discs

Blu-ray, also known as Blu-ray Disc (BD) is the name of a new optical disc format that is rapidly replacing DVD. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc.

The name Blu-ray is derived from the underlying technology, which utilizes a blue-violet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). They are referred to as "Blu-ray" discs or BDs.

The following formats are part of the present day Blu-ray Disc specification:

- 1 BD-ROM - read-only format for distribution of HD movies, games, software, etc.
- 2 BD-R - recordable format for HD video recording and PC data storage.
- 3 BD-RE - rewritable format for HD video recording and PC data storage.

At present, a single-layer disc can hold 25GB and a dual-layer disc can hold 50GB. Over 9 hours of high-definition (HD) video on a 50GB disc. About 23 hours of standard-definition (SD) video on a 50GB disc.

Command line interface with DOS

Objectives: At the end of this lesson you shall be able to

- describe the hierarchical directory system in DOS
- use dos commands to create directories and subdirectories
- use dos commands to change and list directory
- use dos commands to access specific files.

Hierarchical Directory System: Hierarchy in simple terms, is, organisation or an arrangement of entities. Entities can be anything such as objects, files, people, ideas, or any other thing.

Arrangement refers to, for example, Currency can be arranged by denomination. Pebbles can be arranged by their size .

There are many other ways to organize entities besides hierarchically. But, hierarchical organization is special because by this arrangement you can name each entity by its relationship to other entities.

In DOS, entities are the *Directories* in a directory system. Here, the hierarchy begins with the essential *core* or *root entity*. For instance, in a family tree, we may consider great-great-grand father who was the root cause of our existence as the core entity. In DOS , this core entity is referred to as the *the root directory*.

As in the example considered above, if we consider great-great-grandfather as the *root directory*, then, great-grand father, grand father, father are referred as *sub directories*. So the directories under the root directory are called subdirectories in DOS. These subdirectories can trace their paths back to the root directory.

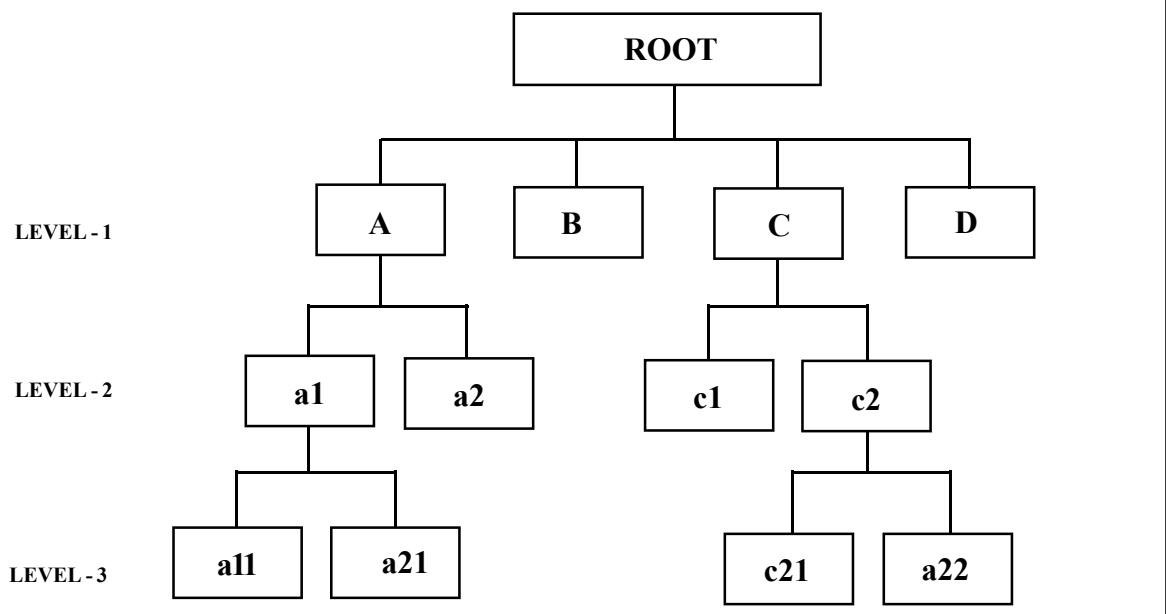
The DOS hierarchical file system is called a *tree-structured file system*. At the base of this tree structure is the root directory.

In a family tree, say, Govinda is the son of Rajappa, who is son of Ramappa who is son of Venkappa. Venkappa is the head or root of the family tree for Govinda.

One can create many directories from the root. The root will then be the parent of each of these directories. You can also create subdirectories that stem from other subdirectories that stem from other subdirectories and so on. These new subdirectories have a subdirectory as their parent directory. How subdirectories are arranged hierarchically from the root is illustrated in Fig 1. The DOS directory system is often called a *tree-structured directory system*.

Three levels of subdirectories are represented in Fig 1. Regardless of the number of levels, the relationship of the subdirectories is important. Each subdirectory, as well as the root directory, can contain user files. Two files can have the same file name and extension as long as the files reside in different directories. This is because, DOS needs to know which of two same-named files your command specifies. For this, DOS needs the name of the directories, starting from the root, that lead to the desired file. This sequence of directory names leading to a file is called a *path*.

Fig 1



A path is a chain of directory names that tell DOS how to find a file that you want. Each directory is separated from the other by a ‘\’ character. This ‘\’ is referred to as the DOS *directory delimiter*. A files full path name including the drive specifier (C: or D: etc.,) is the absolute indicator of where the file is located. Typical path notation are given below;

D:\Animals\Domestic\Pets\Dog.txt

C:\Admin\Accounts\Tours\Bata.txt

Further details of path and directory structure will be discussed at appropriate lessons.

DOS COMMANDS

1 MKDIR Makes or Creates a new Directory.

or

MD

Syntax

MKDIR C:pathname\dirname

Or

MD d:pathname\dirname

Where,

C: is the disk drive for the sub directory

path\ indicates the path to the directory that will hold the subdirectory being created.

dirname is the name of the subdirectory being creating.

Switch

(None)

Important Notes

- **MKDIR or its short form MD makes new subdirectories under the selected root directory.**
- It is possible to create as many subdirectories as you want , but remember: *DOS accepts no more than 63 characters, including backslashes, for the path name.*
- Do not create too many levels of subdirectories and with long names.
- You cannot create a directory name that is identical to a file name in the current directory.

For example, if you have a file named FLIES in the current directory, you cannot create a subdirectory by the name FLIES in this directory. However, if the file FLIES is given an extension FLIES.DOC , then the names will not conflict and you can create a subdirectory by name FLIES.

Examples

To create the subdirectory by name **Drivers** under the **current drive**, the instruction will be,

MKDIR\Drivers

Or

MD\Drivers

C:\Devices>MD \Printers

This instruction creates a subdirectory by name **Printers** under the current drive C:. Note that although the command is issued from another subdirectory named devices, the newly created subdirectory **Printers** does not get created under the directory Devices but directly under the root C:. This may be verified by issuing DIR command under C:\ and under C:\Devices.

To create a subdirectory under the directory Devices the instruction will be,

C:\Devices>MD Printers

Discuss the following different varieties of creating directories:

C:\Devices\Printers>MD C:\Devices\Plotters

2 CHDIR or CD

Changes or shows the path of the current directory.

Syntax

CHDIR d: path

Or, using the short form:

CD d : path

D : path are valid disk drive and directory names.

Switch

(None)

You have two methods for maneuvering through the hierarchical directories with CD: (1) starting at the root , or top, directory of the disk and moving down, or (2) starting with the current directory and moving in either direction.

To start at the root directory of a disk, you must begin the path with the path character (\), as in \ or B:\. When DOS sees \ as the first character in the path, the system starts with the root directory. Otherwise, DOS starts with the current directory.

Changing Drives: Computer will have built in memory, the hard disk and it will also have provision to store/read data from floppy disk, compact disk etc. Every disk is identified by a name such as C drive, A drive, B drive etc. C drive is represented by C: and A drive is represented by A: and so on. DOS allows to change from current or default drive by typing the letter identification of disk drive desired followed immediately by a colon as shown in the example below:

C> a:

This command instructs to change control from **C** drive to **D** drive.

If the disk drive is not accessed due to non availability of floppy or any other reason, DOS will display an error message

Not ready error reading drive A

Abort, Retry, Fail ?

It is required to press either A,R or F keys, which are defined below

A Directs DOS to abort the command that was responsible for the error. If this option is selected DOS will terminate the command and redisplay prompt.

R Directs DOS to retry the command that caused the error. In most cases this option is selected to correct the problem that was causing the error. (Floppy disk might not be inserted).

F Directs DOS to ignore the error and attempt to continue processing. In some cases DOS will have an error when it reads a portion of disk.

DOS COMMAND

DIR Displays a list of files and subdirectories in a directory.

Syntax

```
DIR C:pathname [/P] [/W] [/A[[:]attribs]] [/O[[:]sortord]]  
[/S] [/B] [/L] [/C[H]]
```

Where,

- **C:** is the disk drive holding the directory for displaying list of files and subdirectories
- **path/** specifies directory and/or files to list.
- **filename** specifies file or list of files to display, if file name is not specified all the files in the directory will be listed.
- **[/P] [/W]** specifies the switches for formatting the output.

Switch

/ P Pauses after each screenful of information and waits to press any key. On pressing any key another screenful or remaining information will be displayed. Command is DIR/P

/ W Uses wide format of 80-column to display file names only and information about file size, date, and time is not displayed. Command is DIR/W

/ A Displays files with specified attributes.

attribs

D Directories

R Read-only files

H Hidden files

S System files

A Files ready to archive - Prefix meaning "not"

/ O List be files in sorted order.

sorted N By name (alphabetic)

S By size (smallest first)

E By extension (alphabetic)

D By date & time (earliest first)

G Group directories first

- Prefix to reverse order

C By compression ratio (smallest first)

/ S Displays files in specified directory and all subdirectories.

/ B Uses bare format (no heading information or summary).

/ L Uses lowercase.

/ C[H] Displays file compression ratio; /CH uses host allocation unit size.

Important Notes:

- In the directory listing similar files can be listed by using wildcards (* and ?), where (*) star and (?) question mark are called wild characters or wild cards. * can replace remaining characters and ? can replace any single character.
- When DIR is used without parameters or switches, It displays the disks volume label and serial number; one directory or filename per line, including the file size in bytes, and the date and time the file was modified; and the total number of files listed, their cumulative size and the free space (in bytes) remaining on the disk.

Examples

DIR *.txt

*.txt instruction will list all files having txt extension in the specified directory.

DIR ???T.*

???T instruction will search for files having four characters which ends with T like TEST, REST etc. And * instructs that these files may have any extension like .txt, .dat etc.

Methods to display the contents of a text file

Objectives: At the end of this lesson you shall be able to

- use DOS commands to display the contents of a text file
- use DOS commands to copy, rename, delete and undelete files.

DOS Commands

TYPE Displays the contents of a text file.

Syntax

TYPE C:path/filename

Where,

- **C:** is the disk drive holding the file for displaying.
- **path/** Specifies the location of file for displaying.
- **filename** specifies file to display.

Switch

(none)

Important notes:

- **TYPE** command provides a quick way to display contents of an ASCII file without having to use another program. The file is stored on the disk as ASCII (American Standard code for Information Interchange) text which is standard way the computer translates binary (ones and zeros) into letters, numbers & symbols. If the information is not stored in the ASCII format, on using TYPE command the information will look like gibberish.
- On issuing command DOS will look in drive specified, moves into the path to reach the filename specified. Then it simply translates ASCII format into the characters, numbers and symbols and displays on the monitor. The video monitor can show 24 lines of information only. If the file contains more than 24 lines starting lines can not be seen since the type command simply scrolls all information on to the screen. Scrolling can be controlled by pressing Control + S keys together (on holding control key press S key and release both the keys is called as Control + S) scrolling of information will stop on the monitor. After viewing the contents on the screen any key can be pressed to scroll through the remaining contents. To view the contents of the file screen page by screen page, MORE command can also be used. which will stop the scrolling of information on the screen exactly after a screen page and in the screen page at 24 line a prompt message — More— is displayed. After pressing any key another screen page will be displayed. MORE is a filter e.g. it is a program that manipulates the stream of standard characters to the file to the standard output (monitor) screen page by screen page.

Examples

1 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt**

C:\COPA\ DOS\ PRACT_3 is the path to the file TEST.txt and TYPE is the command to be executed by DOS.

2 C:\>TYPE C:\COPA\ DOS\ PRACT_3>**TEST1.txt**

This results in the same output as in example1. While working from C: (C drive) this command can be issued without changing the directories.

3 C:\COPA\ DOS\ PRACT_3>**TYPE TEST1.txt | MORE**

This will also result in the same output but displayed screen page by screen page. Screen page can be changed on press of any key. Along with MORE another character is prefixed ‘|’ this called the piping command, Which will route the output of TYPE command to another command MORE and the MORE filter outputs the information.

Renaming of file(s)

RENAME This command allows to change

Or the name of a file.

REN

Syntax

REN C: PATH\filename1.ex1 filename2.ex2

Where,

- **C:** is the disk drive holding the file for displaying.
- **PATH/** Specifies the location of file for displaying.
- **filename1.ex1** is the file to be renamed
- **filename2.ex2** is the new filename

Important Notes:

- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be renamed.
- A valid file name with appropriate extension is to be given for new filename.
- Wild characters are permitted in the file names by which required group of files can be renamed.

- Only file names will be changed and contents remain same.
- If attempted to change a file name to a name that already exists in the directory.

DOS prompts an error message

Duplicate file name or file not found

- If a invalid file name or the new name is not given, then also DOS prompts an error message

Rules for the file names.

- A File name must have 1 to 8 characters.
- An optional extension of 1 to 3 characters
- A period (.) between the name and extension name, if extension is used
- All letters from A through Z (lower case letters are automatically transferred to uppercase), 0 to 9 numbers and special characters & symbols \$ # & @ ! ^ () _ - { } ' ~ are permitted in the file name.
- The control characters such as Esc, Del, or space bar cannot be used in the file name.
- The characters + = / [] : ; ? * < > : are not permitted.
- Each file name in a directory must be unique.

Examples:

1 C:\COPA\ DOS\ PRACT_3>REN TEST2.txt
CHECKED.txt

C:\COPA\ DOS\ PRACT_3\ is the drive and path to the TEST2.txt file

TEST2.txt is the file name to be renamed

CHECKED.txt is the new filename

2 C:\COPA\ DOS\ PRACT_3>REN *.pic *.jpg the pic extension will be changed to jpg extension files.

Copying files:

COPY Copies one or more files to another location.

Syntax

COPY [/A | /B] source [/A | /B] [+ source [/A | /B] [+ ...]] [destination[/A | /B]] [/V] [/Y | /-Y] source specifies the file or files to be copied. Destination specifies the directory and/or filename for the new file(s).

Switches

/A Indicates an ASCII text file.

/B Indicates a binary file.

/V Verifies that new files are written correctly.

/Y Suppresses prompting to confirm you want to overwrite an existing destination file.

/-Y Causes prompting to confirm you want to overwrite an existing destination file.

Instructor shall discuss the simple switches with at least two examples in each case .

For further details on COPY command switches refer any tutorial or hand book on DOS

Important Notes:

- DOS command COPY can duplicate one or more files. In the same directory with different names or from one directory to other directory either in the same name or in different name.
- If the drive is not specified current disk drive will be used.
- If the path is not specified current directory will be used.
- Exact file name with extension is to be given for the file to be copied
- A valid file name with appropriate extension is to be given for new copied filename
- Wild characters are permitted in the file names by which required group of files can be copied
- On copying, both source and target files will have same contents.
- Copy overwrites the target file with the same name
- Copy will not allow to copy a file to it self that is source and target files should not be same
- If the destination file name is not specified while concatenation the first file name will become the destination name. After the first file name, additional source files must be preceded by a plus (+) sign.

Example

1 C:\COPA\ DOS\ PRACT_3>**COPY TEST2.txt TRIAL.txt**

With the above command C:\COPA\ DOS\ PRACT_3 directory TEST2.txt file will be copied as TRIAL.txt file in the same directory. On listing the directory both the files will have same details and on viewing the contents of both the file will be same. After copying DOS prompts a message 1 file copied

2 C:\COPA\ DOS\ PRACT_3>**COPY *.bmp *.pic**

With the above command C:\COPA\ DOS\ PRACT_3 directory all files with bmp extension file will be copied as pic extension files in the same directory. While copying DOS prompts the name of file it has copied and after completion of copying it prompts the number of files copied.

3 C:\COPA\ DOS\ PRACT_3>**COPY *.pic C:\COPA\ DOS\ PRACT_4**

All files with pic extension in C:\COPA\ DOS\ PRACT_3 directory will be copied to C:\COPA\ DOS\ PRACT_4 directory with same name & extension.

Using *.* after the copy command will copy all files with all extension to the destination.

Copy concatenating: Multiple file can be combined to form a single file by use of + between the source files and is called as concatenation

Example 4 C:\COPA\ DOS\ PRACT_3\ COPYTEST2.txt
+ TRIAL.txt CONCAT1.txt

With the above command TEST2.txt and TRIAL.txt will be combined and CONCAT1.txt file will be created which will have the contents of first two source files.

Deleting file

DEL Deletes the files specified.

or

Erase

Syntax

DEL C: path/filename [/P]

ERASE C: path/filename [/P]

Where,

- **C:** is the disk drive holding the file to be deleted.
- **path/** Specifies the location of file to be deleted.
- **filename** is the file to be deleted

Switch

/P Prompts for confirmation before deleting the specified file. Using the /P switch

If the /P switch is used, DEL displays the name of a file and prompts with a message in the following format:

filename, Delete (Y/N)?

Press Y to confirm the deletion, N to cancel the deletion and display the next filename (if a group of files are specified), or CRTL+C to stop the DEL command.

Important Notes

- If the drive is not specified current disk drive will be used
- If the path is not specified current directory will be used
- Exact file name with extension is to be given for the file to be deleted
- Wild characters are permitted in the file names by which required group of files can be deleted
- On deleting, files name(s) will be removed from the directory.
- All the files in a directory can be deleted by typing the DEL command followed by [drive:]path. Wildcard also can be used (*) and (?) to delete more than one file at a time. However, Wildcards should be used cautiously with the DEL command to avoid deleting files unintentionally.

The following command is given for deleting all the files.

del *.*

DEL displays the following prompt:

All files in directory will be deleted! Are you sure (Y/N)?

Press Y and then ENTER to delete all files in the current directory, or

press N and then ENTER to cancel the deletion.

- Directories can not be removed with DEL command a separate command is available for removing the directory.
- Once the file is deleted it can not be recovered if the memory space is occupied by a new file. If accidentally file (s) are deleted immediately it can be recovered by using utility command.
- The space occupied by the deleted file on the disk or diskette is freed.
- Check for the typographic errors in the file names before the press of enter key to activate delete command

Example

1 C:\COPA\ DOS\ PRACT_3>DEL TEST2.txt

With the above command TEST2.txt file will be deleted from the C:\COPA\ DOS\ PRACT_3 directory. On listing the directory TEST2.txt will not be available.

2 C:\COPA\ DOS\ PRACT_4>DEL *.txt

With the above command in the C:\COPA\ DOS\ PRACT_4 directory all files with txt extension will be deleted.

3 C:\COPA\ DOS\ PRACT_3\TEMP > DEL *.*

All files with any extension in C:\COPA\ DOS\ PRACT_3\TEMP directory will be deleted.

Recovering deleted files:

UNDELETE delete protection facility

Syntax

UNDELETE C: path/filename [/DT | /DS | /DOS]

UNDELETE [/LIST | /ALL | /PURGE[DRIVE] | / STATUS | /LOAD | /UNLOAD

/UNLOAD | /S[DRIVE] | /T[DRIVE]-entries]]

Where,

- **C:** is the disk drive holding the files to be undeleted.
- **path/** Specifies the location of file to be undeleted.
- **filename** is the file to be undeleted

Switches

/LIST	Lists the deleted files available to be recovered.
/ALL	Recover files without prompting for confirmation.
/DOS	Recover files listed as deleted by MS-DOS.
/DT	Recover files protected by Delete Tracker.
/DS	Recover files protected by Delete Sentry.
/LOAD	Loads Undelete into memory for delete protection.
/UNLOAD	Unloads Undelete from memory.
/PURGE[drive]	Purges all files in the Delete Sentry directory.
/STATUS	Display the protection method in effect for each drive.
/S[drive]	Enables Delete Sentry method of protection.
/T[drive][-entries]	Enables Delete Tracking method of protection.

Important Notes:

Once a file is deleted from disk, it may not be possible to retrieve it. Although the UNDELETE command can retrieve deleted files, it can do so with certainty only if no other files have been created or changed on the disk. If a file is accidentally deleted and it is required to keep, stop what all other activities on the computer and immediately use the UNDELETE command to retrieve the file.

Example

1 C:\COPA\ DOS\ PRACT_3>UNDELETE TEST2.txt

With the above command TEST2.txt file will be recovered. On listing TEST2.txt file will be available in C:\COPA\ DOS\ PRACT_3 directory.

2 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE

With the above command multiple files can be recovered. DOS will prompt for confirmation of undeletion of each file and asks to type the first letter of the file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

3 C:\COPA\ DOS\ PRACT_4\TEMP>UNDELETE /ALL

With the above command multiple files can be recovered. DOS will not prompt for confirmation of undeletion of each file. After undeletion and listing of C:\COPA\ DOS\ PRACT_4 directory, undeleted file names can be seen.

Introduction to Linux operating system

Objectives: At the end of this lesson you shall be able to

- overview of linux
 - define futures of linux
 - explain application area of linux
 - describe about kernel.
-

Overview of Linux

The operating system

Developers need special tools (like the compilers and command lines found in GNU) to write applications that can talk to the kernel. They also need tools and applications to make it easy for outside applications to access the kernel after the application is written and installed.

This collective set of tools, combined with a kernel, is known as the operating system. It is generally the lowest layer of the computer's software that is accessible by the average user. General users get to the operating system when they access the command line.

Linux provides powerful tools with which to write their applications: developer environments, editors, and compilers are designed to take a developer's code and convert it to something that can access the kernel and get tasks done.

Like the kernel, the Linux operating system is also modular. Developers can pick and choose the operating tools to provide users and developers with a new flavor of Linux designed to meet specific tasks.

Introduction to Linux

Linux (pronounced Lih-nucks) is a UNIX-like operating system that runs on many different computers. Although many people might refer to Linux as the operating system and included software, strictly speaking, Linux is the operating system kernel, which comes with a distribution of software.

Linux was first released in 1991 by its author Linus Torvalds at the University of Helsinki. Since then it has grown tremendously in popularity as programmers around the world embraced his project of building a free operating system, adding features, and fixing problems.

Linux is popular with today's generation of computer users for the same reasons early versions of the UNIX operating system enticed fans more than 20 years ago. Linux is portable, which means you'll find versions running on name-brand or clone PCs, Apple Macintoshes, Sun workstations, or Digital Equipment Corporation Alpha-based computers. Linux also comes with source code, so you can change or customize the software to adapt to your needs. Finally, Linux is a great operating system, rich in features adopted from other versions of UNIX.

Where is Linux?

One of the most noted properties of Linux is where it can be used. Windows and OS X are predominantly found on personal computing devices such as desktop and laptop computers. Other operating systems, such as Symbian, are found on small devices such as phones and PDAs, while mainframes and supercomputers found in major academic and corporate labs use specialized operating systems such as AS/400 and the Cray OS.

Linux, which began its existence as a server OS and has become useful as a desktop OS, can also be used on all of these devices. „From wristwatches to supercomputers,“ is the popular description of Linux' capabilities.

The future of Linux

Linux is already successful on many different kinds of devices, but there are also many technological areas where Linux is moving towards, even as desktop and server development continues to grow faster than any other operating system today.

Linux is being installed on the system BIOS of laptop and notebook computers, which will enable users to turn their devices on in a matter of seconds, bringing up a streamlined Linux environment. This environment will have Internet connectivity tools such as a web browser and an e-mail client, allowing users to work on the Internet without having to boot all the way into their device's primary operating system—even if that operating system is Windows.

At the same time, Linux is showing up on mobile Internet devices (MIDs). This includes embedded devices such as smart phones and PDAs, as well as netbook devices—small laptop-type machines that feature the core functionality of their larger counterparts in a smaller, more energy-efficient package.

The growth of cloud computing is a natural fit for Linux, which already runs many of the Internet's web servers. Linux enables cloud services such as Amazon's A3 to work with superior capability to deliver online applications and information to users.

Related to Linux' growth in cloud computing is the well-known success of Linux on supercomputers, both in the high-performance computing (HPC) and high-availability (HA) areas, where academic research in physics and bioengineering, and firms in the financial and energy

industries need reliable and scalable computing power to accomplish their goals.

Many of the popular Web 2.0 services on the Internet, such as Twitter, Linked In, YouTube, and Google all rely on Linux as their operating system. As new web services arrive in the future, Linux will increasingly be the platform that drives these new technologies.

Current application of Linux operating systems

Today Linux has joined the desktop market. Linux developers concentrated on networking and services in the beginning, and office applications have been the last barrier to be taken down. They don't like to admit that Microsoft is ruling this market, so plenty of alternatives have been started over the last couple of years to make Linux an acceptable choice as a workstation, providing an easy user interface and MS compatible office applications like word processors, spreadsheets, presentations and the like. On the server side, Linux is well-known as a stable and reliable platform, providing database and trading services for companies like Amazon, the well-known online bookshop, US Post Office, the German army and many others. Especially Internet providers and Internet service providers have grown fond of Linux as firewall, proxy- and web server, and you will find a Linux box within reach of every UNIX system administrator who appreciates a comfortable management station. In post offices, they are the nerve centres that route mail and in large search engine, clusters are used to perform internet searches. These are only a few of the thousands of heavy-duty jobs that Linux is performing day-to-day across the world. It is also worth to note that modern Linux not only runs on workstations, mid- and high-end servers, but also on "gadgets" like PDA's, mobiles, a shipload of embedded applications and even on experimental wristwatches. This makes Linux the only operating system in the world covering such a wide range of hardware.

The code

Linux is also unique from other operating systems in that it has no single owner. Torvalds still manages the development of the Linux kernel, but commercial and private developers contribute other software to make the whole Linux operating system.

The kernel

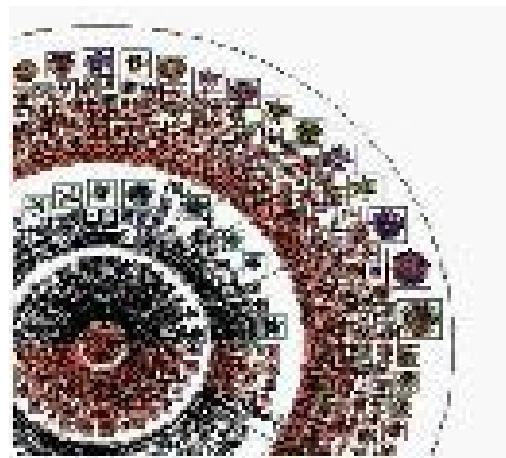
All operating systems have kernels, built around the architectural metaphor that there must be a central set of instructions to direct device hardware, surrounded by various modular layers of functionality. The Linux kernel is unique and flexible because it is also modular in nature.

Modularity is desirable because it allows developers to shed parts of the kernel they don't need to use. Typically a smaller kernel is a faster kernel, because it isn't running processes it does not need.

If a device developer wants a version of Linux to run on a cell phone, she does not need the kernel functionality that deals with disk drives, Ethernet devices, or big monitor screens. She can pull out those pieces (and others), leaving just the optimized kernel to use for the phone.

The kernel of the Window operating system (which few people outside of Microsoft are allowed to look at without

Fig 1



paying for the privilege) is a solidly connected piece of code, unable to be easily broken up into pieces. It is difficult (if not impossible) to pare down the Windows kernel to fit on a phone.

This modularity is significant to the success of Linux. The ability to scale down (or up) to meet the needs of a specific platform is a big advantage over other operating systems constrained to just a few possible platforms.

Modularity also effects stability and security as well. If one piece of the kernel code happens to fail, the rest of the kernel will not crash. Similarly, an illicit attack on one part of the kernel (or the rest of the operating system) might hamper that part of the code, but should not compromise the security of the whole device.

The environments

The windows, menus, and dialog boxes most people think of as part of the operating system are actually separate layers, known as the windowing system and the desktop environment.

These layers provide the human-oriented graphical user interface (GUI) that enables users to easily work with applications in the operating system and third-party applications to be installed on the operating system.

In Linux, there a lot of choices for which windowing system and desktop environment can be used, something that Linux allows users to decide. This cannot be done in Windows and it's difficult to do in OS X.

Like the operating system and kernel, there are tools and code libraries available that let application developers to more readily work with these environments (e.g., gtk+ for GNOME, Qt for KDE).

The applications

Operating systems have two kinds of applications: those that are essential components of the operating system itself, and those that users will install later. Closed operating systems, like Windows and OS X, will not let users (or developers) pick and choose the essential component applications they can use. Windows developers must use Microsoft's compiler, windowing system, and so on.

Linux application developers have a larger set of choices to develop their application. This allows more flexibility to build an application, but it does mean a developer will need to decide which Linux components to use.

The distributions

A Linux distribution is a collection of (usually open source) software on top of a Linux kernel. A distribution (or short, distro) can bundle server software, system management tools, documentation and many desktop applications in a central secure software repository. A distro aims to provide a common look and feel, secure and easy software management and often a specific operational purpose.

Let's take a look at some popular distributions.

Red hat

Red Hat is a billion dollar commercial Linux company that puts a lot of effort in developing Linux. They have hundreds of Linux specialists and are known for their excellent support. They give their products (Red Hat Enterprise Linux and Fedora) away for free. While Red

Hat Enterprise Linux (RHEL) is well tested before release and supported for up to seven years after release, Fedora is a distro with faster updates but without support.

Ubuntu

Canonical started sending out free compact discs with Ubuntu Linux in 2004 and quickly became popular for home users (many switching from Microsoft Windows). Canonical wants Ubuntu to be an easy to use graphical Linux desktop without need to ever see a command line. Of course they also want to make a profit by selling support for Ubuntu.

Debian

There is no company behind Debian. Instead there are thousands of well organised developers that elect a Debian Project Leader every two years. Debian is seen as one of the most stable Linux distributions. It is also the basis of every release of Ubuntu. Debian comes in three versions: stable, testing and unstable. Every Debian release is named after a character in the movie Toy Story.

Other

Distributions like Cent OS, Oracle Enterprise Linux and Scientific Linux are based on Red Hat Enterprise Linux and share many of the same principles, directories and system administration techniques. Linux Mint, Edubuntu and many other ubuntu named distributions are based on Ubuntu and thus share a lot with Debian. There are hundreds of other Linux distributions.

Handling commands and various editors

Objectives: At the end of this lesson you shall be able to

- know about terminal
- explain the command shell
- list out the directory layout of linux
- define the linux commands
- list out the special characters of linux OS
- explain various editors in linux OS.

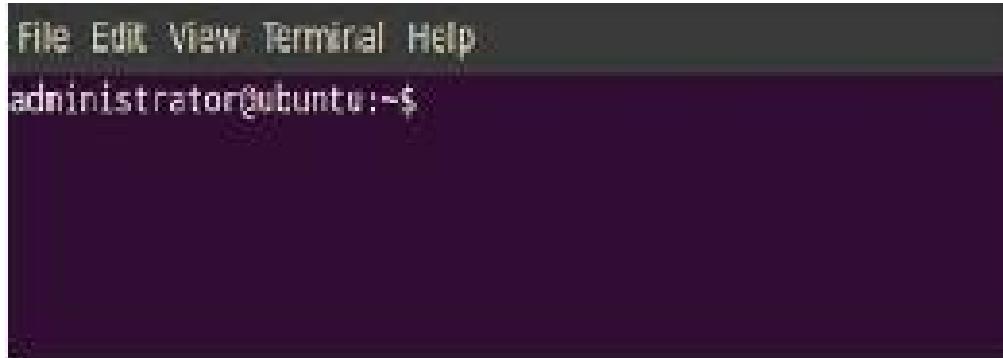
Starting up a terminal

To access the shell we will use a shell-like application, also called a terminal emulator. There is a huge number of good terminal applications out there, including the default ones in GNOME or KDE, or Yakuake, Guake, rxvt and so on. For now let's just stick with the default that

Some of the most popular shells are:

- **bash** - the Bourne-Again Shell, the default shell on most Linux systems.
- **sh** - the Bourne Shell, an older shell which is not so widely used anymore.

Fig 1



comes with your system. If you're using GNOME you can access the terminal by going to **Applications -> Accessories -> Terminal** or pressing Alt+F2 and typing gnome-terminal in the run box that appears, followed by Enter. If you're running KDE you can type instead **console** after pressing Alt+F2.

Depending on the distribution, the prompt may look something like **user@host\$**. The first part before the ampersand is the login username, and the other one is the hostname of the computer.

Command shell

A shell is a **command interpreter** which allows you to interact with the computer. The way things work is pretty simple: you type in commands, the shell interprets them, performs the tasks it was asked to do, and finally it sends the results to the standard output, which is usually the screen.

This is a list of files inside the root directory. The root directory is the first location in the file system tree hierarchy, and it is represented by the **slash** character :/.

- **csh** - the 'C' Shell, which accepts a syntax which resembles the 'C' programming language.
- **tcsh** - an improved version of the 'C' Shell.
- **ksh** - the Korn Shell, initially developed in the early 1980's.
- **dash** - Debian Almquist Shell, a shell created by the Debian distribution.

Listing of shells available in the system

```
$ cat /etc/shells/
```

The above command will display the following output as on Fig 2.

In this tutorial we will focus on **Bash**, since it is the most widely used and also one of the most powerful shells out there. Bash is a modern implementation of the older Bourne Shell (**sh**), developed by the GNU project, which provides a huge amount of tools and which, together with the Linux kernel, desktop environments like GNOME or KDE and applications which run on top of them, comprise the whole Linux platform. On a Debian or Ubuntu distribution, the default shell used by the system is specified in the file **/etc/passwd** (default being Bash).

Fig 2

```
File Edit View Terminal Help
administrator@ubuntu:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/csh
/bin/sh
/usr/bin/es
/usr/bin/ksh
/bin/ksh
/usr/bin/rc
/usr/bin/tcsh
/bin/tcsh
/usr/bin/esh
/bin/dash
/bin/bash
/bin/rbash
/usr/bin/screen
administrator@ubuntu:~$
```

How to display default shell in the system

Type the following command in the terminal

\$ echo \$SHELL

And press Enter key. The default shell will be displayed as on Fig 3.

Fig 3

```
File Edit View Terminal Help
administrator@ubuntu:~$ echo $SHELL
/bin/bash
administrator@ubuntu:~$
```

The Linux directory layout

Directory	Description
	The nameless base of the file system. All other directories, files, drives, and devices are attached to this root. Commonly (but incorrectly) referred to as the "slash" or "/" directory. The "/" is just a directory separator, not a directory itself.
/bin	Essential command binaries (programs) are stored here (bash, ls, mount, tar, etc.)
/boot	Static files of the boot loader
/dev	Device files. In Linux, hardware devices are accessed just like other files, and they are kept under this directory.
/etc	Host-specific system configuration files.
/home	Location of users' personal home directories (e.g. /home/Susan).
/lib	Essential shared libraries and kernel modules.
/proc	Process information pseudo-file system. An interface to kernel data structures
/root	The root (super user) home directory.
/sbin	Essential system binaries (fdisk, fsck, init, etc.).
/tmp	Temporary files. All users have permission to place temporary files here.
/usr	The base directory for most shareable, read-only data (programs, libraries, documentation, and much more).
/usr/bin	Most user programs are kept here (cc, find, du, etc.).
/usr/include	Header files for compiling C programs.
/usr/lib	Libraries for most binary programs
/usr/local	"Locally" installed files. This directory only really matters in environments where files are stored on the network. Locally-installed files go in /usr/local/bin, /usr/local/lib, etc.). Also often used for Software packages installed from source, or software not officially shipped with the distribution.
/usr/sbin	Non-vital system binaries (lpd, useradd, etc.)
/usr/share	Architecture-independent data (icons, backgrounds, documentation, terminfo, man pages, etc.).
/usr/src	Program source code. E.g. The Linux Kernel, source RPMs, etc.
/usr/X11R6	The X Window System
/var	Variable data: mail and printer spools, log files, lock files, etc.

What are Linux commands?

Linux commands are executable binary files which can be ran to perform certain tasks, like for example listing the files in a directory running an entire graphical application. Examples of frequently used commands are ls, cd, pwd, date or cat. With the exception of executable files, there is also a category called shell built-ins, which are commands provided by the shell itself (Bash in our case). We'll deal with those later.

The general form of a Linux command is:

command options(s) filename(s)

Which specifies a command, followed by one or more parameters, and optionally one or more files to apply it on. For example:

```
$ echo -e 'Hello, world!\n'
```

Will output the text 'Hello, world!' followed by a newline character. The **-e** parameter (also called argument, or switch in this case) tells the echo command to interpret escaped characters, like the trailing **\n**, which will add a newline after the text inside the single quotes. Ignore the leading dollar sign, it just signifies the shell prompt.

A command may or may not have arguments. An argument can be an option or a filename.

Special characters in linux operating system

It is important to know that there are many symbols and characters that the shell interprets in special ways. This means that certain typed characters: a) cannot be used in certain situations, b) may be used to perform special operations, or, c) must be "escaped" if you want to use them in a normal way.

Character	Description
\	Escape character. If you want to reference a special character, you must "escape" it with a backslash first. Example: touch /tmp/filename*
/	Directory separator, used to separate a string of directory names. Example: /usr/src/linux
.	Current directory. Can also "hide" files when it is the first character in a filename.
..	Parent directory
~	User's home directory
*	Represents 0 or more characters in a filename, or by itself, all files in a directory. Example: pic*2002 can represent the files pic2002, picJanuary2002, picFeb292002, etc.
?	Represents a single character in a filename. Example: hello?.txt can represent hello1.txt, helloz.txt, but not hello22.txt
[]	Can be used to represent a range of values, e.g. [0-9], [A-Z], etc. Example: hello[0-2].txt represents the names hello0.txt, hello1.txt, and hello2.txt
	"Pipe". Redirect the output of one command into another command. Example: ls more
>	Redirect output of a command into a new file. If the file already exists, over-write it. Example: ls > myfiles.txt
>>	Redirect the output of a command onto the end of an existing file. Example: echo .Mary 555-1234. >> phonenumbers.txt
<	Redirect a file as input to a program. Example: more < phonenumbers.txt
;	Command separator. Allows you to execute multiple commands on a single line. Example: cd /var/log ; less messages

The cd command

The cd command is used to change the current directory (i.e., the directory in which the user is currently working) in Linux and other Unix-like operating systems. It is similar to the CD and CHDIR commands in MS-DOS.

cd's syntax is

cd [option] [directory]

The items in square brackets are optional. When used without specifying any directory name, cd returns the user to the previous current directory. This provides a convenient means of toggling between two directories.

When a directory name is provided, cd changes the current directory to it. The name can be expressed as an absolute pathname (i.e., location relative to the root directory) or as a local pathname (i.e., location relative to the current directory). It is usually more convenient to use a local pathname when changing to a subdirectory of the current directory.

As an example, the following would change the current directory, regardless of where it is on the system (because it is an absolute path), to the root directory (which is represented by a forward slash):

cd /

Likewise, the following would change the current directory, regardless of its location, to the /usr/sbin directory (which contains non-vital system utilities that are used by the system administrator):

cd /usr/sbin

If a user currently in the directory /usr/local/share/man/ desired to change to the directory /usr/local/share/man/man2, which is a subdirectory of the current directory, it would be possible to change by using the absolute pathname, i.e.,

cd /usr/local/share/man/man2

However, it would clearly be much less tedious to use the relative pathname, i.e.,

cd man2

On Unix-like operating systems the current directory is represented by a singledot and its parent directory (i.e., the directory that contains it) is represented by two consecutive dots. Thus, it is possible (and often convenient) to change to the parent of the current directory by using the following:

cd ..

Another convenient feature of cd is the ability for any user to return directly to its home directory by merely using a tilde as the argument. A home directory, also called a login directory, is the directory on a Unix-like operating system that serves as the repository for a user's personal files, directories and programs. It is also the directory that a user is first in after logging into the system. A tilde is a short, wavy, horizontal line character that represents the

home directory of the current user. That is, any user can return immediately to its home directory by typing the following and then pressing the Enter key:

cd ~

This is easier than typing the full name of the user's home directory, for instance, /home/josephine in the case of a user named josephine. (And it is just one of the numerous shortcuts that help make the command line on Unix-like operating systems so easy to use.)

When followed by a space and then a hyphen, cd both returns the user to the previous current directory and reports on a new line the absolute pathname of that directory. This can further enhance the already convenient toggling capability of cd. Toggling is particularly convenient when at least one of the two directories has a long absolute pathname, such as /usr/local/share/man/man2.

cd has only two options, and neither of them are commonly used. The -P option instructs cd to use the physical directory structure instead of following symbolic links. The -L option forces symbolic links to be followed.

The pwd command

The pwd command reports the full path to the current directory.

The current directory is the directory in which a user is currently operating while using a command line interface. A command line interface is an all-text display mode and it is provided via a console (i.e., a display mode in which the entire screen is text only) or via a terminal window (i.e., a text-only window in a GUI).

The full path, also called an absolute path, to a directory or file is the complete hierarchy of directories from the root directory to and including that directory or file. The root directory, which is designated by a forward slash (/), is the base directory on the filesystem (i.e., hierarchy of directories), and it contains all other directories, subdirectories and files on the system. Thus, the full path for any directory or file always begins with a forward slash.

pwd is one of the most basic commands in Linux and other Unix-like operating systems, along with ls, which is used to list the contents of the current directory, and cd, which is used to change the current directory.

pwd's syntax is

pwd [option]

Unlike most commands, pwd is almost always used just by itself, i.e.,

Pwd

That is, it is rarely used with its options and never used with arguments (i.e., file names or other information provided as inputs). Anything that is typed on the same line after pwd, with the exception of an option, is ignored, and no error messages are returned.

As an example, if a user with the username janis is in its home directory, then the above command would typically return /home/janis/ (because, by default, all home

directories are located in the directory /home). Likewise, if a user were currently working in directory /usr/share/config (which contains a number of program configuration files), then the same command would return /usr/share/config.

pwd is useful for confirming that the current directory has actually been changed to what the user intended after using cd. For example, after issuing the cd command to change the current directory from /home/janis to /usr/share/config, pwd could be used for confirmation; that is, the following sequence of commands would be issued:

```
cd /usr/share/config/  
pwd
```

The standard version of pwd has a mere two options, both of which are employed only infrequently. The --help option is used as follows:

```
pwd --help
```

This option displays information about pwd, of which there is very little because it is such a simple command (i.e., it only has two options and accepts no arguments).

The other option is --version, which displays the version number, i.e.,

```
pwd --version
```

Although it is often thought of as standing for present working directory, pwd is actually an acronym for print working directory. The word print is traditional UNIX terminology for write or display, and it originated when computer output was typically printed on paper by default because CRT (cathode ray tube) display monitors were not yet widely available.

The echo command

echo is a built-in command in the bash and C shells that writes its arguments to standard output.

A shell is a program that provides the command line (i.e., the all-text display user interface) on Linux and other Unix-like operating systems. It also executes (i.e., runs) commands that are typed into it and displays the results. bash is the default shell on Linux.

A command is an instruction telling a computer to do something. An argument is input data for a command. Standard output is the display screen by default, but it can be redirected to a file, printer, etc.

The syntax for echo is

```
$ echo $USER  
$ echo "Hello world"
```

The items in square brackets are optional. A string is any finite sequence of characters (i.e., letters, numerals, symbols and punctuation marks).

When used without any options or strings, echo returns a blank line on the display screen followed by the command prompt on the subsequent line. This is because pressing the ENTER key is a signal to the system to start a new

line, and thus echo repeats this signal.

When one or more strings are provided as arguments, echo by default repeats those strings on the screen. Thus, for example, typing in the following and pressing the ENTER key would cause echo to repeat the phrase This is a pen. on the screen:

```
echo This is a pen.
```

It is not necessary to surround the strings with quotes, as it does not affect what is written on the screen. If quotes (either single or double) are used, they are not repeated on the screen.

Fortunately, echo can do more than merely repeat verbatim what follows it. That is, it can also show the value of a particular variable if the name of the variable is preceded directly (i.e., with no intervening spaces) by the dollar character (\$), which tells the shell to substitute the value of the variable for its name.

For example, a variable named x can be created and its value set to 5 with the following command:

```
x = 5
```

The value of x can subsequently be recalled by the following:

```
echo The number is $x.
```

Echo is particularly useful for showing the values of environmental variables, which tell the shell how to behave as a user works at the command line or in scripts (short programs).

For example, to see the value of HOME, the environmental value that shows the current user's home directory, the following would be used:

```
echo $HOME
```

Likewise, echo can be used to show a user's PATH environmental variable, which contains a colon-separated list of the directories that the system searches to find the executable program corresponding to a command issued by the user:

```
echo $PATH
```

echo, by default, follows any output with a newline character. This is a non-printing (i.e., invisible) character that represents the end of one line of text and the start of the next. It is represented by \n in Unix-like operating systems. The result is that the subsequent command prompt begins on a new line rather than on the same line as the output returned by echo.

The -e option is used to enable echo's interpretation of additional instances of the newline character as well as the interpretation of other special characters, such as a horizontal tab, which is represented by \t. Thus, for example, the following would produce a formatted output:

```
echo -e "\n Projects: \n\ntplan \n\tcode \n\nttest\n"
```

(The above command should be written on a single line, although it may render as two lines on smaller display screens.) The -n option can be used to stop echo from adding the newline to output.

By making use of output redirection, echo provides a very simple way of creating a new file that contains text. This is accomplished by typing echo followed by the desired text, the output redirection operator (which is a rightward pointing angle bracket) and finally the name of the new file. The file can likewise be formatted by using special characters. Thus, for example, the formatted output from the above example could be used to create a new file called project1:

```
echo -e "\n Project1: \n\n\tplan \n\twrite \n\ttest\n" > project1
```

The contents of the new file, including any formatting, can be verified by using a command such as cat or less, i.e.,

less project1

echo can likewise be a convenient way of appending text to the end of a file by using it together with the append operator, which is represented by two consecutive rightward pointing angle brackets. However, there is always the risk of accidentally using a single bracket instead of two, thereby overwriting all of the contents of the file, and thus, this feature is best reserved for use in scripts.

echo can also be used with pattern matching, such as the wildcard character, which is represented by the star character. For example, the following would return the phrase The gif files are followed by the names of all the .gif image files in the current directory:

```
echo -e The gif files are *.gif
```

The cal command

Displays calendar of current month.

```
$ cal
```

July 2012

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

'cal' will display calendar for specified month and year.

```
$ cal 08 1991
```

August 1991

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Date command

Display current time and date.

```
$ date
```

```
Fri Jul 6 01:07:09 IST 2012
```

If you are interested only in time, you can use 'date +%T' (in hh:mm:ss):

```
$ date +%T
```

```
01:13:14
```

tty command

Displays current terminal.

```
$ tty
```

```
/dev/pts/0
```

whoami command

This command reveals the current logged in user.

```
$ whoami
```

```
raghu
```

id command

This command prints user and groups (UID and GID) of current user.

```
$ id
```

```
uid=1000(raghu) gid=1000(raghu)
```

groups = 1000 (raghu), 4(adm), 20(dialout), 24(cdrom), 46(plugdev), 112(lpadmin), 120(admin), 122(sambashare)

By default information about current user is displayed. If another username is provided as an argument, information about that user will be printed:

```
$ id root
```

```
uid=0(root) gid=0(root) groups=0(root)
```

Clear command

This command clears the screen.

Getting help command

For all its advantages, a big disadvantage of command line is that there are a lot of commands and even more are their options and usage. But nobody can remember all commands. There are some smarter ways of using command line. Linux provides us with several such resources discussed here:

--help option

With almost every command, '--help' option shows usage summary for that command.

```
$ date --help
```

```
Usage: date [OPTION]... [+FORMAT]
```

or: date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]

Display the current time in the given FORMAT, or set the system date.

The whatis command

The whatis command provides very brief descriptions of command line programs (i.e., all-text mode programs) and other topics related to Linux and other Unix-like operating systems.

It accomplishes this by searching the short descriptions in the whatis database for each keyword provided to it as an argument (i.e., input data). This database contains just the title, section number and description from the NAME section of each page in the man manual that is built into most Unix-like systems.

The syntax for whatis is:

whatis keyword(s)

For example, the following provides a single line summary of the head command (which by default displays the first ten lines of each file that is provided to it as an argument):

whatis head

whatis can be used to simultaneously search for information about multiple topics. For example, the following would provide information about both head and tail (which by default reads the final ten lines of files):

whatis head tail

The output of whatis is limited by the fact that it provides only a single line for each keyword found in the database; thus it supplies incomplete information about even moderately complex commands. For example, the following use of whatis to obtain information about the cat command generates the output "concatenate files and print on the standard output":

whatis cat

However, this omits some important information about cat, particularly the facts that it is very convenient to use for reading files and that it is also used to create and write to files.

whatis is similar to the apropos command. However, apropos is more powerful in that its arguments are not limited to complete words but can also be strings (i.e., any finite sequences of characters) which comprise parts of words. Both commands are unusual in that they have no options.

The man command (which is used to read the built-in manual pages), when used with its -f option, produces the same output as whatis. Thus, for example,

man -f cat

is equivalent to

whatis cat

Info pages

Info documents are sometimes more elaborated than man pages. But for some commands, info pages are just the same as man pages. These are like web pages. Internal links are present within the info pages. These links are called nodes. Info pages can be navigated from one page to another through these nodes.

\$ info date

Word processors in the Linux environment

Text editors are used by many different types of people. Casual users, writers, programmers, and system administrators will all use a text editor at one time or another in Linux.

Use of text editor

A text editor is just like a word processor without a lot of features. All operating systems come with a basic text editor. Linux comes with several. The main use of a text editor is for writing something in plain text with no formatting so that another program can read it. Based on the information it gets from that file, the program will run one way or another.

vi Editor

"vi" (pronounced "vee eye") is a text editor with a deceptively simple appearance that belies its great power and efficiency. New users soon realize that there is far more to this little program than meets the eye.

vi, or one of its clones, is found in almost every version of Linux and Unix, and, in fact, it is the only editor that is available in virtually every Unix installation.

History of vi

The vi editor was developed starting around 1976 by Bill Joy, who was then a graduate student at the University of California at Berkeley. Joy later went on to help found Sun Microsystems and became its Chief Scientist.

"ed" was the original Unix text editor. Like other early text editors, it was line oriented and used from dumb printing terminals. Joy first developed "ex" as an improved line editor that supported a superset of ed commands. He then developed vi as a "visual interface" to ex. That is, it allows text to be viewed on a full screen rather than only one line at a time. vi takes its name from this fact.

vi remains very popular today in spite of the development and widespread availability of GUI (graphical user interface) mode text editors which are far more intuitive and much easier for beginners to use than text-mode text editors such as vi. GUI-mode text editors include gedit and Emacs, both of which have become very common on Linux and other Unixes today.

Features of vi

- It is present in almost every Linux Unix system, even the most minimal.
- It is very small. In fact, some versions have a total code size of less than 100KB. This makes it easy to include vi on even the tiniest versions of Linux, such as those in embedded systems and those that run from a single floppy disk.
- It is typist-friendly, at least once you get used to it. For example, the commands are very short, usually just a few keystrokes. And because vi does not use the mouse, there is never any need to remove one's hands

from the keyboard. This can speed up editing substantially.

- It is very powerful, as just a few very short commands can make sweeping changes to large documents. In fact, vi is more powerful than most of its users realize, and few of them know more than just fraction of all the commands.

Opening and closing file

vi can be used both when your system is in text mode (the entire screen is devoted to text and there are no images) and when your system is in GUI mode (the screen contains windows, images and menus). When it is in GUI mode (usually KDE or Gnome), vi runs in a terminal window. A terminal window is a text-only window, and it can usually be opened by clicking on an icon (small image) of a computer screen.

(In the case of Red Hat Linux, the terminal window can be opened by clicking on the icon of a red hat in the lower left hand corner of the screen, opening the System Tools menu and then selecting Terminal from that menu. It can be convenient to add the icon for the terminal window to the launcher panel along the bottom of the screen, if it is not already there.)

There are at least two ways to use vi to simultaneously create and open a new file. One is by just typing vi at the command line, like this:

vi

This creates an empty file that will not have a name until you save its contents to disk (i.e., transfer the text you typed into it to your hard disk, floppy disk, etc. for long term storage).

A second way to open a new file is by typing vi followed by the name of the file to be created, for example:

vi apple

This creates a new file named "apple" in the current directory (the directory or folder which is currently open on your all-text screen or your terminal window).

If you want, it could create the same file with an extension such as ".txt" added to the end of the file name. In Linux this is merely a matter of convenience (or habit), and it generally makes no real difference for the file because it remains a plain text file in either case. For example:

vi apple.txt

To close a file to which no changes have been made, hit ESC (the Esc key, which is located in the upper left hand corner of the keyboard), then type :q (a colon followed by a lower case "q") and finally press ENTER. (The term "hit" is used here instead of "press" to emphasize that it is not necessary to keep the ESC key held down but just to press it momentarily.)

To close a file to which changes have been made (such as text having been added or removed) without saving the

changes, hit ESC, type :q! and then press ENTER. This is sometimes referred to as a "forced quit."

vi works with a buffer (a block of memory in the RAM chips). When you open an existing file, vi copies that file from the hard disk (or floppy, CDROM, etc.) to a buffer. All changes that you make to a file are initially made only to the copy in the buffer, and they are only made to the file itself when you "save" your changes. "Saving" a file means writing (i.e., transferring) the contents of the buffer to the hard disk (or floppy disk).

Likewise when you open a new file. All text you enter (and subsequent edits you make to it) exists only in the buffer until you save the file to disk.

To save the changes that have been made to a file, hit ESC, type :w and then press ENTER. The "w" stands for "write." An alternative, and perhaps easier, way to save a file and quit at the same time is to hit ESC and then type ZZ (two capital Z's in succession).

After you have created a new text file and closed it, you might want to confirm that nothing went wrong and that the file actually exists. Probably the simplest way to do this is to use the standard Unix ls command, which displays a list of all of the files in the current directory.

Entering text

vi has two basic modes of operation: command mode and text insert mode. How to switch back and forth between them is probably the most confusing thing about vi for beginners. But it is actually very simple, and once you get used to it you might also find it quite efficient.

Command mode is the default mode when a file (existing or new) is opened. (This is the opposite of most text and word processors and therefore may seem counter-intuitive.) Because every file opens initially in command mode, you can not immediately begin typing text. That is, everything that is typed on the keyboard is interpreted by vi to be a command.

Examples of the many types of commands can perform on a file while in command modes are:-

- Switching to text insert mode.
- Moving the cursor around the file.
- Deleting characters or lines.
- Transposing characters.
- Changing case.
- Appending the contents of the file to another (closed) file.
- Setting vi options.
- Saving the file to disk.
- Closing the file and quitting vi.

The other mode, text insert mode, is also referred to as simply "insert mode" or "input mode." It is used for entering text into the buffer memory (and simultaneously onto the screen). In this mode everything that is typed on the keyboard is added to the text and does not become a command (although you can perform some command operations in text mode with vi clones).

The most common way to switch from command mode to the input mode is to use the i (which stands for "insert" or "input") command. This is accomplished by simply typing the letter i while in command mode. Now you are ready to start typing text.

Unlike word processors and even most word editors, there is no automatic word wrap in the traditional version of vi (although you will notice it in some clones). New lines are started by pressing ENTER.

When finished typing text or need to perform some other operation such as moving to a different position in the text or deleting some of it, hit ESC in order to return to the command mode.

Once you have typed some text, you can use the four basic commands for moving the cursor around the text. These commands enable you to go to any desired location in order to modify the text, including making insertions and deletions. The four basic cursor positioning commands are:

- h move cursor one character to left
- j move cursor one line down
- k move cursor one line up
- l move cursor one character to right

Each of these commands can be either used by itself or modified by typing an integer in front of it to indicate the number of characters or lines to move. For example, typing (in command mode, of course)

3j - will move the cursor down three lines. Or typing 2h will move it two characters to the left.

These commands can be repeated by holding the key down. If attempting an impossible movement, such as pressing k when the cursor is on the top line, the screen might flash or a beeping sound might be made (depending on how your computer is set up).

The cursor can be moved directly to any desired line by using the G command preceded by the line number. For example, typing

5G - moves the cursor to the fifth line from the top of the text. Just typing G without any number moves the cursor to the final line of text.

When you switch from command mode to input mode with the i command and then start typing text, each character you type is placed to the left of the character covered by the cursor. This causes the character covered by the cursor as well as everything to its right to be shifted to the right.

There will be times when it needs to place a character to the right of the character under the cursor. This is particularly useful when the cursor is over the last character in a line and you want to append the line. To do this, simply use the a (lower case "a," which stands for "append") command instead of the i command to switch from command mode into insert mode.

After it has saved a file that have created or modified using vi, might want to verify that its contents are really what you had intended. One way to do this is to use cat, the Unix concatenation utility. (No, this has no relationship to the popular domesticated animal whose name has the same spelling). For example, type:

```
cat /home/john/fruit/lemon
```

Editing Text

vi offers a rich assortment of commands for editing text. Among the most basic are those used for deleting or erasing.

The x (lower case "x") command deletes the character immediately under (i.e., covered by) the cursor. To delete any desired character, just switch to the command mode (if you are not already there) and then use an appropriate combination of the h, j, k and l commands (of course, one at a time) to move the cursor to that character. Then type x and the character is deleted.

By pressing x continuously instead of just hitting it once, the cursor continuously moves to the right and each character under it is successively deleted.

The X (upper case "X") command is similar except that it deletes the character to the left of the cursor rather than the character under it.

There are several additional commands for deleting text. The D (upper case "D") command removes the text on the current line from the character under the cursor to the end of the line.

The d (lower case "d") command is very flexible because it can be modified to delete any number of characters, words or lines. Typing d by itself will not do anything, but typing dw causes the character the cursor is resting on and the remaining characters to the right of it in the same word to be deleted. (The "w" stands for "word.")

Typing 2dw causes the character under the cursor, the remaining characters to the right of it in the same word and all of the characters in the next word to be deleted. For example, typing 2dw with the cursor on the "a" of the string "pineapple plantation" causes the string "apple plantation" to be deleted.

As another example, typing 3dw with the cursor on the "j" of the string "the bluejay flew south" causes the string "jay flew south" to be deleted. That is, "jay" and two words to the right of it are deleted.

Deleting an entire line can be accomplished with the dd command. This command can also be used to delete multiple lines by preceding it with an integer representing the number of lines to be removed. For example, typing

2dd will delete two consecutive lines beginning with the current line.

With some terminals, deletion of a line causes it to be replaced on the screen with an "@" character. This character merely represents an empty line and is not inserted into the text. Its purpose is to relieve the processor from having to redraw the screen (i.e., change the whole screen). This character can be removed if desired by typing r (or I on some terminals) while holding down the CTRL key.

The change command c (lower case "c") differs from the delete command in that it not only deletes a section of text but also activates insert mode to allow you to type in replacement text. After you have completed typing in the replacement text, be sure to press ESC to return to the command mode.

As is the case with d, the c command is not used by itself but is only used in combination with another letter after it and an optional integer before it.

For example, the command cw (which stands for "change word") deletes the characters in the current word under and to the right of the cursor and then switches vi to the insert mode so that you can enter text to replace the deleted characters. The number of new characters typed in can be the same as, fewer or more than the number deleted.

The amount of text to be changed can be increased by preceding the command with a number. For instance, typing 2cw will additionally remove the next word for replacement with whatever is typed in. The space between the words is not preserved.

The d and c commands can also be modified by other characters in addition to "w." For example they can be used with "b," which stands for "back." Thus, typing 3bd will delete the characters to the left of the cursor in the current word together with the two words to the left of the current word.

The cc command erases the current line, leaving it blank and awaiting replacement text. Preceding this command with an integer will delete that number of lines, beginning with the current line. For example, typing 5cc will allow you to change five consecutive lines starting with the current line.

Another change command, R, differs from the c commands in that it does not initially delete anything. Rather, it activates insert mode and lets you replace the characters under the cursor one at a time with characters that you type in.

vi supports several types of transposition. Transposing the order of two adjacent characters is easy with the xp command. Just place the cursor on the left-most of the two characters, type x to erase the left character and then type p for the deleted character to be put to the right of the cursor.

Two adjacent words can be transposed with the deep command. To use it, position the cursor in the space just to the left of the word on the left and type deep. Two adjacent

lines can be transposed with the ddp command by placing the cursor on the upper line and typing ddp.

It is also a simple matter to change the case of a letter. When the cursor is over the desired letter, hit the "~" (tilde) key. This will change a capital letter to a small letter and visa versa.

The J (upper case "J") command is used to join the next line to the current line. The opposite operation, splitting a line, is accomplished in insert mode by merely positioning the cursor over what will be the first character of the new line and then hitting ENTER.

vi also has an undo capability. The u (lower case "u") command is used to reverse the effects of an already issued command that has changed the buffer, but which is not yet written to disk. U (upper case "U") undoes all of the changes that have been made to the current line during your current visit to it

Searching Text

vi also has powerful search and replace capabilities. To search the text of an open file for a specific string (combination of characters or words), in the command mode type a colon (:), "s," forward slash (/) and the search string itself. What you type will appear on the bottom line of the display screen. Finally, press ENTER, and the matching area of the text will be highlighted, if it exists. If the matching string is on an area of text that is not currently displayed on the screen, the text will scroll to show that area.

The formal syntax for searching is:

:s/string

For example, suppose you want to search some text for the string "cherry." Type the following and press ENTER:

:s/cherry

The first match for "cherry" in your text will then be highlighted. To see if there are additional occurrences of the same string in the text, type n, and the highlight will switch to the next match, if one exists.

The syntax for replacing one string with another string in the current line is

:s/pattern/replace/

Here "pattern" represents the old string and "replace" represents the new string. For example, to replace each occurrence of the word "lemon" in a line with "orange," type:

:s/lemon/orange/

The syntax for replacing every occurrence of a string in the entire text is similar. The only difference is the addition of a "%" in front of the "s":

%s/pattern/replace/

Thus repeating the previous example for the entire text instead of just for a single line would be:

%s/lemon/orange/

Working with multiple files

It is easy to insert text into an open file from another file. All that is necessary is to move the cursor to the location where you want the text inserted, then type

:r filename

where "filename" is the name of the file to insert.

For example, if you want to copy the contents of the file "peach" into the file "fruit," you would first position the cursor to the desired line in "fruit" and then type

:r peach

Notice that this operation causes no change to the file "peach."

You can also append text from the currently open file to any other file. This is accomplished using the :w (colon + "w") command followed without a space by >>. For example, to append the contents of a currently open file named "pear" to the file named "apple," type

:w>> apple

At times it can be convenient to open multiple files simultaneously. This is efficiently accomplished by just listing all of the files to be opened after the vi command. For example, to simultaneously open files about three kinds of fruit, type:

vi apple pear orange

This allows you to edit "apple" first. After saving "apple," typing :n calls up "pear" for editing.

If you want to simultaneously open all files in the current directory, just type vi * (vi + space + asterisk).

Additional operations

As you have learned, creating and opening files in vi can be a very simple matter. However, many combinations of options are available that can add much power and flexibility for these tasks, as can be seen by looking at the full syntax for opening files:

vi [flags] [cmd] [filename]

The square brackets ([]) around each section of arguments (modifiers) of the command indicates that they are optional. (That is, a file can be opened by just typing vi alone or by typing it with any combination of the three arguments. For instance, the example of vi dog contains only the mandatory vi and the optional third argument, which is the name of the file to open.)

As only one of many possible examples of adding options for opening files, an existing file can be opened with the cursor appearing on any desired line instead of just on the first line. (One situation in which this can be particularly useful is if your file is part of a program which you are writing and the compiler reports an error on a specific line in that file.) This is accomplished by adding the + (plus sign) command followed the desired line number. For example, to open the file "apple" with the cursor located on the third line, type:

vi +3 apple

Use of the + command without any modifying number opens a file with the cursor positioned on the last line of text. This can save some keystrokes when you want to open a file just to append data to the end of it. For example:

vi + apple

You have already learned several commands for switching from command mode to insert mode, including i for inserting to the left of the cursor position, a for inserting to the right of the cursor position and the c commands for changing text. A more complete list is as follows:

a	appends after current cursor position.
A	appends at end of current line.
c	starts a change option.
C	starts a change option from current position to end of current line.
i	inserts to the left of the cursor position.
I	inserts at start of line.
o	cursor moves to new, blank line below its current position.
O	cursor moves to new, blank line above its current position.
R	replaces characters one at a time.

A simple way to obtain basic information about any file that is currently open, including name, size and the current line number, is to hold down CTRL and type g. This data appears on the bottom line of the display.

Summary of commands

The following list contains the basic commands presented in the first eight pages of this tutorial along with occasional examples of usage (shown in parenthesis). They are presented in roughly the same order in which they appear in the tutorial. (All commands that begin with a colon are followed by ENTER.)

vi	typed at the command line to open one or more files in the same directory (vi tomato.txt opens a file named "tomato.txt" in the current directory) (vi parsley sage rosemary opens the three files "parsley," "sage" and "rosemary" in the current directory)
vi *	typed at the command line to open every file in the current directory
:q	closes (quits) a file to which no changes have been made
:q!	quits without saving any changes
:w	writes (i.e., saves) the current file to disk
:wq	writes the buffer contents to disk (i.e., saves changes) and quits
zz	same as :wq
i	activates text insert mode, inserting text immediately under the current position of the cursor.
h	moves the cursor one character to the left (2h moves the cursor two characters to the left)
j	moves the cursor one line down (3j moves the cursor three lines down)
k	moves the cursor one line up
l	moves the cursor one character to the right
G	moves the cursor to the desired line; moves the cursor to the last line of text if not preceded by a modifying integer (5G moves the cursor to the fifth line)
a	switches to insert mode and allows insertion of text immediately to the right of the cursor.
x	deletes the character immediately under the cursor (xxx deletes the character immediately under cursor and then deletes the two characters to its right)
X	deletes a single character to the left of cursor
D	removes the text on the current line from the character under the cursor to the end of the line
dw	deletes the character immediately under the cursor and the remaining characters to the right of it in the same word (2dw deletes the character immediately under the cursor, the remaining characters to the right of it in same word and all of the next word)
dd	deletes the entire line containing the cursor, and the cursor then moves to the next line (2dd deletes two consecutive lines beginning with the current line)
cw	deletes the character under the cursor and to its right in the same word and allows new characters to be typed in to replace them (2cw deletes the character under the cursor and to its right in the same word and in the next word, and then allows replacement characters to be typed in)

cc	erases the current line and allows replacement text to be typed in (2cc erases the current line and the next line and allows replacement text to be typed in for both lines)
cb	deletes the characters to the left of the cursor in the current word and allows replacement characters to be typed in (3cb deletes the characters to the left of the cursor in the current word together with the two words to its left and then allows replacement text to be typed in)
R	activates text input mode allowing text under and to the right of the cursor to be overwritten one character at a time
xp	transposes two adjacent characters
deep	transposes two adjacent words
ddp	transposes two adjacent lines
~	changes case of the character under the cursor
J	joins the current line with the next line
u	reverses the effects of the most recent command that has changed the buffer
U	undoes all changes made to the current line during the current visit to it
:s/	searches the text for the first instance of a designated string (:s/cucumber searches the text for the first instance of the string "cucumber")
n	searches the text for the next instance of a designated string
:s/ / /	replaces the first instance of a designated string (:s/cucumber/radish/ replaces the first instance of the string "cucumber" with the string "radish")
:%s/ / /	replaces every instance of a designated string (:%s/cucumber/radish/ replaces every instance of the string "cucumber" with the string "radish")
:r	inserts text into the currently open file from another file (:r lettuce.txt inserts text into the currently open file from the file named "lettuce.txt")
:w>>	appends the text from the currently open file into another file (:w>> cabbage appends the text from the currently open file into the file named "cabbage")

pico editor

pico is a simple text editor in the style of the pine composer.

Syntax

pico [options] [file]

Description

pico is a simple, display-oriented text editor based on the pine message composer. As with pine, commands are displayed at the bottom of the screen, and context-sensitive help is provided. As characters are typed they are immediately inserted into the text.

Editing commands are entered using control-key combinations. As a work-around for communications programs that swallow certain control characters, you can emulate a control key by pressing ESCAPE twice, followed by the desired control character. For example, "ESC ESC c" would be equivalent to entering a ctrl-c. The editor has five basic features: paragraph justification, searching, block cut/paste, a spelling checker, and a file browser.

Paragraph justification (or filling) takes place in the paragraph that contains the cursor, or, if the cursor is between lines, in the paragraph immediately below. Paragraphs are delimited by blank lines, or by lines beginning with a space or tab. Unjustification can be done immediately after justification using the control-U key combination.

String searches are not sensitive to case. A search begins at the current cursor position and wraps around the end of the text. The most recent search string is

offered as the default in subsequent searches.

Blocks of text can be moved, copied or deleted with creative use of the command for mark (Ctrl-^), delete (Ctrl-k) and undelete (Ctrl-u). The delete command will remove text between the "mark" and the current cursor position, and place it in the "cut" buffer. The undelete command effects a "paste" at the current cursor position.

The spell checker examines all words in the text. It then offers each misspelled word for correction while highlighting it in the text. Spell checking can be cancelled at any time. Alternatively, pico will substitute for the default spell checking routine a routine defined by the SPELL environment variable. The replacement routine should read standard input and write standard output.

The file browser is offered as an option in the "Read File" and "Write Out" command prompts. It is intended to help in searching for specific files and navigating directory hierarchies. Filenames with sizes and names of directories in the current working directory are presented for selection. The current working directory is displayed on the top line of the display while the list of available commands takes up the bottom two. Several basic file manipulation functions are supported: file renaming, copying, and deletion.

Movement commands:

Depending on your system, the arrow keys or the backspace key may not work. Instead, you can use these commands to perform the same tasks.

To	Hold down Ctrl key and press	Instead of
Delete a character	backspace	backspace
Move up a line	p	up arrow
Move down a line	n	down arrow
Move left one space	b	left arrow
Move right one space	f	right arrow
Move to the end of line	e	end

Some pico editor options

^C Cancel allows you to stop a process at any time. If you make a mistake, just hold down the Ctrl key and press c.

^G get help

Get clear and concise assistance from the Pico help, in case something unexpected happens or you need additional information about a command.

^X Exit

Exit Pico at anytime. If made changes to a file or worked on a new file, but you haven't saved the changes, you see this message:

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) (y/n)?

Answering no (press n) will close Pico and bring you back to the prompt without saving your file.

Answering yes (press y) will allow you to save the file you've been working on (see Write Out section below for details).

^O WriteOut

Save the file without hassles or worries. Fill in the name of the file beside the File Name to write: prompt. If the file already has a name, then press enter.

^T To Files option lets to save the text over a file that exists in the directory. By choosing the To Files option, Pico takes you to a directory Browser.

^R Read File

Insert text from another file into your current text file. This option allows you to search through your directories for a file that you would like to add to your text. This option is especially handy if you've saved a document and would like to add its content to the new file you're working on. Text from the file you select is placed on the line directly above your cursor.

At the Insert file : prompt you may either type a file name or use the Browser options.

^T To Files option lets you import a text file directly into the file you're currently typing. By choosing the To Files option, Pico takes you to a directory Browser.

^Y Prev Pg

Move quickly to the previous page. Although you could just as easily press the up arrow key several times, this command quickly jumps your cursor up one page.

^V Next Pg

Move quickly to the next page. Although you could just as easily press the down arrow key several times, this command quickly jumps your cursor down one page.

^K Cut text

Cut a line of text. This option allows you to cut a full line of text. By using the uncut command and your arrow keys, you can then paste the cut text at another location in your document. To cut specific text in a line or to cut several lines of text, first select the text (see Selecting Text on the next page).

Selecting text

To select text for cutting and pasting use the following steps:

Move the cursor to the beginning of the text to select

Hold down the Ctrl key and press ^

Use the right arrow key or hold down Ctrl and press f to highlight text

When you have highlighted the appropriate text, hold down the Ctrl key and press k to cut it.

Paste the text you cut, anywhere in your document, using UnCut Text

^U UnCut Text

Paste text that previously cut. If use this option to undo an accidental cut of text or place cut text at another location in the document. The text you cut is pasted on the line directly above the cursor.

^C Cur Pos

Indicate the current position of the cursor, relative to the entire document. This is a helpful option if you'd like to check exactly where in the document. The status line indicates the following items:

[line 8 of 18 (44%), character 109 of 254 (42%)]

^J Justify

Even out lines of text. This command is handy when accidentally type extra spaces between words or press the key before reaching the end of a line. The option evens the length of text lines automatically.

^U UnJustify

UnJustify lines of text. For the messy line look you can always select the UnJustify option.

^W Where is

Find a particular string of text quickly. This option allows you to do a word search in your text. This option is especially handy for longer documents. If the word you designated at the Search: prompt is found, it places the cursor beside it.

^T To Spell

Check for spelling errors. The spell check option allows to correct spelling errors throughout the document. If spell

checker finds a misspelled word or a word it doesn't recognize (don't worry, this rarely happens), it will correct the word. At the Edit a replacement: prompt, type in the correct spelling of a word. However, if you don't want to make any changes, simply press the enter key.

Any words that have corrected but re-occur in the document can be automatically replaced. At the Replace a with b? [y]: prompt press y to replace all occurrences of the misspelled word or n to ignore.

Pine Editor

pine is a program for accessing email and newsgroups.

Syntax

pine [options] [address, address]

Description

pine is a screen-oriented message-handling tool. In its default configuration, pine offers an intentionally limited set of functions geared toward the novice user, but it also has a growing list of optional power-user and personal-preference features. pine's basic feature set includes:

- View, Save, Export, Delete, Print, Reply and Forward messages.
- Compose messages in a simple editor (pico) with word-wrap and a spelling checker. Messages may be postponed for later completion.
- Full-screen selection and management of message folders.
- Address book to keep a list of long or frequently-used addresses. Personal distribution lists may be defined. Addresses may be taken into the address book from incoming mail without retyping them.
- New mail checking and notification occurs automatically.
- Context-sensitive help screens.

pine supports MIME (Multipurpose Internet Mail Extensions), an Internet Standard for representing multipart and multimedia data in email. pine allows you to save MIME objects to files, and in some cases, can also initiate the correct program for viewing the object. It uses the system's mailcap configuration file to determine what program can process a particular MIME object type. pine's message composer does not have multimedia capability

itself, but any type of data file (including multimedia) can be attached to a text message and sent using MIME's encoding rules. This allows any group of individuals with MIME-capable mail software to exchange formatted documents, spread-sheets, image files, etc, via Internet email.

pine uses the "c-client" messaging API to access local and remote mail folders. This library provides a variety of low-level message-handling functions, including drivers for a variety of different mail file formats, as well as routines to access remote mail and news servers, using IMAP (Internet Message Access Protocol) and NNTP (Network News Transport Protocol). Outgoing mail is usually handed off to the send mail program but it can optionally be posted directly via SMTP.

Examples

Pine

Launch **pine**.

pine address@example.com

Launch pine, and immediately begin composing an email addressed to address@example.com.

Joe editor

'joe'- sounds like a comic strip. Actually, they are two other text editors that I like and I think are a little easier to manage. They're like 'vi' in that you use them to create and edit non-formatted text, but they're a little more user-friendly. Using 'joe' 'joe' was created by Joseph Allen, so that's why it's called Joe.

The majority of joe's commands are based on the CTRL-K keys and a third key. The most important of these is CTRL-K-H which gets 'help'. Help shows the key combinations to use with 'joe'.

The most important thing about 'joe' is the logical concept that you can just start writing if you want. Try writing anything you want.

To save it, press CTRL-K-D. To save and quit, CTRL-K-X.

To quit without saving, CTRL-C, (without the K).

The feature of 'joe' is that if edit a file again, it will save the previous file with a tilde on the end, like 'tryjoe~' That little tilde file has saved times. 'joe' is a very good option for writing those short text files.

Managing files and directories

Objectives: At the end of this lesson you shall be able to

- define manipulating files and directories
- define basic file commands
- explain other file commands
- define additional useful commands in linux OS.

Manipulating files or directories

Using Linux isn't different from any other computer operating system. You create, delete, and move files on your hard drive in order to organize your information and manage how your system works or looks. This section shows you how to do these tasks quickly and easily.

Although the graphical interface for Linux, the X Window System, may offer drag and drop or multiple selections in order to copy or delete files, many of the commands you'll learn here form the base of these operations. It is worth knowing how these programs work, even if you don't use Linux in the console mode.

Working with files

In this chapter we learn how to recognise, create, remove, copy and move files using commands like file, touch, rm, cp, mv and rename, etc...

All files are case sensitive

Files on Linux (or any Unix) are case sensitive. This means that FILE1 is different from

file1, and /etc/hosts is different from /etc/Hosts (the latter one does not exist on a typical Linux computer).

The file command

The file command attempts to classify each filesystem object (i.e., file, directory or link) that is provided to it as an argument (i.e., input). Thus, it can usually provide immediate information as to whether some specified object is, for example, a GIF89a image file, a directory, a GNU tar archive, ASCII English text, a symbolic link, an HTML document, an empty file, bzip2 compressed data, an ELF 32-bit LSB executable, etc.

File accomplishes this by probing each object with three types of tests until one succeeds. The first is a filesystem test, which uses the stat system call to obtain information from the object's inode (which contains information about a file). A system call is a request in a Unix-like operating system for a service performed by the kernel (i.e., the core of the operating system).

The second test checks to see if there is a magic number, which is a number embedded at or near the beginning of many types of files that indicates the file format(i.e., the type of file).

In the event that the first two tests fail to determine the type of a file, language tests are employed to determine if

it is plain text (i.e., composed entirely of human-readable characters), and, if so, what type of plain text, such as HTML (hypertext markup language) or source code (i.e., the original version of a program as written by a human). In this situation, file also attempts to determine the natural language (e.g., English, Turkish or Japanese) that is used in the file.

A simplified version of file's syntax is

file [option(s)] object_name(s)

File has several options, but it is most commonly used without any of them. For example, information about a file named file1 that is located in the current directory (i.e., the directory in which the user is currently working) could be obtained by merely typing the following and pressing the RETURN key:

file file1

Information about the types of all of the files in the current directory can be obtained by using the star wildcard to represent every object in that directory as follows:

file *

Likewise, information about all of the files in another directory can be obtained by using that directory as an argument and following it immediately by a forward slash and the star wildcard. For example, the following classifies all of the objects in the /boot directory:

file /boot/*

The square brackets wildcard can be used together with the star wildcard to show the file types for only those objects whose names begin with specified letters or with a specified range of letters. For example, the following would show only those objects in the current directory whose names begin with letters a through g:

file [a-g]*

The -k option tells file to not stop at the first successful test, but to keep going; this can result in the reporting of additional information about some filesystem objects. The -b (i.e., brief) option tells file to not prepend filenames to output lines, which can be useful when compiling statistics about file types. The -v option returns information about the version of file that is installed.

Creating files and directories command

mkdir command

The mkdir command is used to create new directories.

A directory, referred to as a folder in some operating systems, appears to the user as a container for other directories and files. However, Unix-like operating systems treat directories as merely a special type of file that contains a list of file names and their corresponding inode numbers. Each inode number refers to an inode, which is located in inode tables (which are kept at strategic locations around the filesystem) and which contains all information about a file (e.g., size, permissions and date of creation) except its name and the actual data that the file contains.

mkdir has the following example

```
$ mkdir example
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

directory_name is the name of any directory that the user is asking mkdir to create. Any number of directories can be created simultaneously.

Thus, for example, the following command would create three directories within the current directory (i.e., the directory in which the user is currently working) with the names dir_1, dir_2 and dir_3:

```
mkdir dir_1 dir_2 dir_3
```

If a directory name provided as an argument (i.e., input) to mkdir is the same as that of an existing directory or file in the same directory in which the user is asking mkdir to create the new directory, mkdir will return a warning message such as mkdir: cannot create directory `dir_1': File exists and will not create a file with that name. However, it will then continue to create directories for any other names provided as arguments.

It is necessary for a user to have write permission (i.e., permission from the system to create or change a file or directory) in the parent directory (i.e., the directory in which the new directory is to be created) in order to be able to create a new directory.

Directories created by mkdir automatically include two hidden directories, one representing the directory just created (and represented by a single dot) and the other representing its parent directory (and represented by two consecutive dots). This can be seen by using the ls (i.e., list) command with its -a option, which tells ls to show all directories and files, (including hidden ones) in any directory provided to it as an argument, or in the current directory if there are no arguments, i.e.,

```
ls -a
```

mkdir's -m option is used to control the permissions of new directories. New directories are by default created with the read, write and execute (i.e., run as a program if

a program) permissions enabled for the owner (i.e., the creator of the directory by default) and group and the read and execute permissions enabled for other users. Thus, for example, to create a directory named dir_4 for which all three types of permissions were enabled for all users, the sequence 777 would be employed after -m, for example:

```
mkdir -m 777 dir_4
```

The first digit represents the owner, the second represents the group and the third represents other users. The number 7 represents all three types of permission (i.e., read, write and execute), 6 stands for read and write only, 5 stands for read and execute, 4 is read only, 3 is write and execute, 2 is write only, 1 is execute only and 0 is no permissions.

Thus, for example, to create a new directory named dir_5 for which the owner has read and write permissions, the group has read permission and other users have no permissions, the following would be used:

```
mkdir -m 640 dir_5
```

The -p (i.e., parents) option creates the specified intermediate directories for a new directory if they do not already exist. For example, it can be used to create the following directory structure:

```
mkdir -p food/fruit/citrus/oranges
```

It is very easy to confirm that this series of directories has been created by using the du (i.e., disk usage) command with the name of the first directory as an argument. In the case of the above example this would be

du food

Other options include -v (i.e., verbose), which returns a message for each created directory, --help, which returns brief information about mkdir, and --version, which returns the version number of the currently installed mkdir program

touch command

The touch command updates the access and modification times of each FILE to the current system time.

If you specify a FILE that does not already exist, touch creates an empty file with that name.

If the FILE argument is a dash ("") is handled specially and causes touch to change the times of the file associated with standard output.

```
$ touch file1 file2 file3
```

```
$ ls -l
```

```
total 4
```

```
drwxr-xr-x 2 raghu raghu 4096 2012-07-06 14:09 example
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file2
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

A feature of touch is that, in contrast to some commands such as cp (which is used to copy files and directories) and mv (which is used to move or rename files and

directories), it does not automatically overwrite (i.e., erase the contents of) existing files with the same name. Rather, it merely changes the last access times for such files to the current time.

Several of touch's options are specifically designed to allow the user to change the timestamps for files. For example, the -a option changes only the access time, while the -m option changes only the modification time. The use of both of these options together changes both the access and modification times to the current time, for example:

touch -am file3

The -r (i.e., reference) option followed directly by a space and then by a file name tells touch to use that file's time stamps instead of current time. For example, the following would tell it to use the times of file4 for file5:

touch -r file4 file5

The -B option modifies the timestamps by going back the specified number of seconds, and the -F option modifies the time by going forward the specified number of seconds. For example, the following command would make file7 30 seconds older than file6.

touch -r file6 -B 30 file7

The -d and -t options allow the user to add a specific last access time. The former is followed by a string (i.e., sequence of characters) in the date, month, year, minute:second format, and the latter uses a [[CC]YY]MMDDhhmm[.ss] format. For example, to change the last access time of file8 to 10:22 a.m. May 1, 2005, 1 May 2005 10:22 would be enclosed in single quotes and used as follows, i.e.,:

touch -d '1 May 2005 10:22' file8

Partial date-time strings can be used. For example, only the date need be provided, as shown for file9 below (in which case the time is automatically set to 0:00):

touch -d '14 May' file9

Just providing the time, as shown below, automatically changes the date to the current date:

touch -d '14:24' file9

The most commonly used way to view the last modification date for files is to use the ls command with its -l option. For example, in the case of a file named file10 this would be

ls -l file10

The complete timestamps for any file or directory can be viewed by using the stat command. For example, the following would show the timestamps for a file named file11:

stat file11

The --help option displays a basic list of options, and the --version option returns the version of the currently installed touch program.

Copy, move and remove commands

Copy command

The cp command is used to copy files and directories. The copies become independent of the originals (i.e., a subsequent change in one will not affect the other).

cp's basic syntax is

\$cp source destination

As a safety precaution, by default cp only copies files and not directories. If a file with the same name as that assigned to the copy of a file (or a directory with the same name as that assigned to the copy of a directory) already exists, it will be overwritten (i.e., its contents will be lost). However, the owner, group and permissions for the copy become the same as those of the file with the same name that it replaced. The last access time of the source file and the last modification time of the new file are set to the time the copying was performed.

When a copy is made of a file or directory, the copy must have a different name than the original if it is to be placed in the same directory as the original. However, the copy can have the same name if it is made in a different directory. Thus, for example, a file in the current directory (i.e., the directory in which the user is currently working) named file1 could be copied with the same name into another directory, such as into /home/john/, as follows:

cp file1 /home/john/file1

Any number of files can be simultaneously copied into another directory by listing their names followed by the name of the directory. cp is an intelligent command and knows to do this when only the final argument (i.e., piece of input data) is a directory. The files copied into the directory will all have the same names as the originals. Thus, for example, the following would copy the files named file2, file3 and file4 into a directory named dir1:

cp file2 file3 file4 dir1

The -r (i.e., recursive) option, which can also be written with an upper case R, allows directories including all of their contents to be copied. (Directories are not copied by default in order to make it more difficult for users to accidentally overwrite existing directories which have the same name as that assigned to the copy being made and which might contain critical directory structures or important data.) Thus, for example, the following command would make a copy of an existing directory called dir2, inclusive of all its contents (i.e., files, subdirectories, their subdirectories, etc.), called dir3:

cp -r dir2 dir3

The -i (i.e., interactive) option prompts the user in the event that any name assigned to a copy is already in use by another file and that file would thus be overwritten. Entering the letter y (either lower case or upper case) in response to the prompt causes the command to continue; any other answer prevents the command from overwriting the file. Thus, for example, if it is desired to make a copy of a directory called dir4 and call it dir5 and if a directory named

dir4 already exists, the following would prompt the user prior to replacing any files with identical names in the latter directory:

```
cp -ri dir4 dir5
```

The -a option preserves as much of the structure and attributes of the original directory and its contents as possible in the new directory and is thus useful for creating archives. It is similar to the -r option in that it copies directories recursively; however, it also never follows symbolic links. It is equivalent to the -rdp combination of options.

All the files in a directory can be copied to another directory by using the star wildcard. The star character represents any single character or any combination of characters. Thus, for example, the following would copy all of the files in a directory named dir6 into another existing directory called dir7:

```
cp dir6/* dir7
```

cp can also be used with the star wildcard or other pattern matching characters to selectively copy files and directories. For example, to copy all of the files in the current directory that have the filename extension .html into another existing directory called dir8, the following would be used:

```
cp *.html dir8
```

In this case, the star wildcard represents anything whose name ends with the .html extension.

Among the other options for cp are -b, which makes backup copies of each destination file, -f (i.e., force), which removes destination files that cannot be opened and tries again, -s, which makes symbolic links instead of copying, -u (i.e., update), which copies only if the source file is newer than the destination file or if the destination file is missing, -v (i.e., verbose), which makes brief comments about what is going on, and -x, which tells cp to stay on the same filesystem.

Move command

The mv command is used to rename and move files and directories. Its general syntax is:

```
$ mv source destination
```

The arguments are names of files and directories. If two file names are provided as arguments, mv renames the first as the second. If a list of arguments is provided and the final argument in the sequence is the name of an existing directory, mv moves all of the other items into that directory. If the final argument is not an existing directory and more than two arguments are provided, an error message is returned.

If the destination file is located in the same directory as the source file, then the source file can only be renamed. If both are in different directories, then the source file is moved to the directory named in the destination argument, in which it can keep its original name or be assigned a new name. If the target is a directory, then the source file

or directory is moved into that directory and retains its original name.

Thus, for example, the following would rename a file called file1 to file2, while keeping it in the current directory (i.e., the directory in which the user is currently working):

```
mv file1 file2
```

The following would move a file named file3, without changing its name, from the current directory to an existing subdirectory of the current directory named dir1:

```
mv file3 dir1/file3
```

mv can be used to move any number of files and directories simultaneously. For example, the following command moves all files and directories, including all the contents of those directories, from the current directory to the directory /home/alice/new/:

```
mv * /home/alice/new/
```

The asterisk is a wildcard character that represents any string (i.e., sequence of characters). Thus, in the above example it represents the name of every file and directory in the current directory.

mv makes it as easy to move a file or directory up the hierarchy of directories (i.e., closer to the root directory) as down it. For example, the following would move a file named file4, which is currently located in the sub-subdirectory dir/dir/ of the user's home directory, to the top level in the user's home directory:

```
mv dir/dir/file4 ~
```

The root directory is the directory that contains all other directories on a Unix-like operating system and which is at the top of the hierarchy of directories. A user's home directory is the directory in which a user finds itself by default after logging into the system and which can be represented by the tilde (wavy horizontal linecharacter).

By default, mv does not provide any confirmation on the display screen if its action is completed without problems. This is consistent with the rule of silence tenet of the Unix philosophy.

Thus it is wise for users new to Unix-like operating systems to always use the -i option, which makes mv interactive in the situation in which files and/or directories with the same name already exist in the destination directory. For example, the above command would be made interactive as follows:

```
mv -i * /home/alice/new/
```

Among mv's few other options are -b, which tells it to make a backup copy of each file that would otherwise be overwritten or removed, and -v, which tells it to be verbose and display the name of each file before moving it. Detailed information (including all options) about mv can be obtained by using its --help option, and information about the current version can be obtained by using its --version option.

Remove or Delete

\$ rmdir

'rmdir' command removes any empty directories, but cannot delete a directory if a file is present in it. To use 'rmdir' command, you must first remove all the files present the directory you wish to remove (and possibly directories if any).

Remove files and directories

The rm (i.e., remove) command is used to delete files and directories on Linux and other Unix-like operating systems.

The general syntax for rm is:

rm [options] [-r directories] filenames

The items in square brackets are optional. When used just with the names of one or more files, rm deletes all those files without requiring confirmation by the user. Thus, in the following example, rm would immediately delete the files named file1, file2 and file3, assuming that all three are located in the current directory (i.e., the directory in which the user is currently working):

rm file1 file2 file3

Error messages are returned if a file does not exist or if the user does not have the appropriate permission to delete it. Write-protected files prompt the user for a confirmation (with a y for yes and an n for no) before removal. Files located in write-protected directories can never be removed, even if those files are not write-protected.

The -f (i.e., force) option tells rm to remove all specified files, whether write-protected or not, without prompting the user. It does not display an error message or return error status if a specified file does not exist. However, if an attempt is made to remove files in a write-protected directory, this option will not suppress an error message.

The -i (i.e., interactive) option tells rm to prompt the user for confirmation before removing each file and directory. If both the -f and -i options are specified, the last one specified takes affect.

As a safety measure, rm does not delete directories by default. In order to delete directories, it is necessary to use the -r option, which is the same as the -R option. This option recursively removes directories and their contents in the argument list; that is, the specified directories will first be emptied of any subdirectories (including their subdirectories and files, etc.) and files and then removed. The user is normally prompted for removal of any write-protected files in the directories unless the -f option is used.

If a file encountered by rm is a symbolic link, the link is removed, but the file or directory to which that link refers will not be affected. A user does not need write permission to delete a symbolic link, as long as the user has write permission for the directory in which that link resides.

The rm command supports the -- (two consecutive dashes) parameter as a delimiter that indicates the end of the options. This is useful when the name of a file or directory

begins with a dash or hyphen. For example, the following removes a directory named -dir1:

rm -r -- -dir1

Other options include -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rm, and --version, which tells the version of rm that is currently in use. Some differences exist among the various versions of rm, so it is always wise to read the documentation for the particular system.

The rmdir command differs from rm in that it is only used to remove empty directories

The rmdir command

The rmdir command is used to remove empty directories in Linux

The syntax for rmdir is

rmdir [option] directory_names

When used without any options, rm will delete any empty directories whose names are supplied as arguments (i.e., inputs) regardless of whether such directories have write permission or not. Thus, for example, the following command would remove two empty directories named dir1 and dir2 that are located in the current directory (i.e., the directory in which the user is currently working):

rmdir dir1 dir2

The ability to remove only empty directories is a built-in safeguard that helps prevent the accidental loss of data. This is important because once deleted, it is extremely difficult or impossible to recover deleted data on Unix-like operating systems1.

The -p (i.e., parents) option tells rmdir to remove the parent directories of the specified directory if each successive parent directory will, in turn, become empty and if each parent directory has write permission. Thus, for example, the following would remove dir5, dir4 and dir3 if dir5 were empty, dir4 only contained dir5 and dir3 only contained dir4 (which, in turn, contained dir5):

rmdir -p dir3/dir4/dir5

This provides a symmetry with the -p option of the mkdir command, which is used to create directories. Thus, the above set of nested directories could be easily created with the following:

mkdir -p dir3/dir4/dir5

In contrast to the rm command, which is used to delete both files and directories, there is no -r option for rmdir. at least on the GNU version that is standard on Linux. That option allows rm to recursively delete a directory by first deleting all of its contents, beginning with those in the lowest levels of subdirectories. Thus, if a user wants to remove an entire directory structure, it is usually most efficient to use rm with its -r option rather than trying to first remove the contents of each directory, its subdirectories, etc.

Three options that rmdir shares with rm are -v (i.e., verbose), which provides additional information about what is happening, --help, which provides basic documentation about rmdir, and --version, which tells the version of rmdir that is currently in use. Some differences exist among the various versions of rmdir, so it is always wise to read the documentation for the particular system.

Listing and combining files with the cat command

The cat (concatenate file) command is used to send the contents of files to your screen. This

command may also be used to send files' contents into other files. Hour 6 covers terms such as standard input, standard output, and redirection, and this section shows you some basic uses for this command.

Although cat may be useful for reading short files, it is usually used to either combine, create, overwrite, or append files. To use cat to look at a short file, you can enter

\$ cat test.txt

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

The cat command also has a number of options. If you'd like to see your file with line

numbers, perhaps to note a specific phrase, you can use the -n option:

\$ cat -n test.txt

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

and also use cat to look at several files at once, because cat accepts wildcards, for example:

\$ cat -n test*

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.
- This is the first line of test2.txt.
- This file was also created by cat.
- This is the last line of test2.txt.

As you can see, cat has also included a second file in its output, and has numbered each line of the output, not each file. Note that also see both files with

\$ cat test.txt test2.txt

The output will be exactly the same as if had used a wildcard. But looking at several files is only one way to use cat. You can also use the cat command with the redirection operator > to combine files. For example, if you would like to combine test.txt and test2.txt into a third file called test3.txt, you can use

\$ cat test* > test3.txt

check the result with

ls -l test*

In this case, user first decide whether you want the contents of test.txt to go into test2.txt, or the contents of test2.txt to go into test.txt . Then, using cat with the >> redirection operator, you might type

\$ cat test.txt >> test2.txt

This appends the contents of test.txt to the end of the test2.txt . To check the results, use cat again:

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

This text file was created by the cat command.

Cat could be the world's simplest text editor.

If you read this book, you'll learn how to use cat.

This is the last line of text in this file.

Note that if you had entered the command.

\$ cat -n test.txt >> test2.txt

The test2.txt file would look like

\$ cat test2.txt

This is the first line of test2.txt.

This file was also created by cat.

This is the last line of test2.txt.

- This text file was created by the cat command.
- Cat could be the world's simplest text editor.
- If you read this book, you'll learn how to use cat.
- This is the last line of text in this file.

Finally, here's a trick you can use if you want to create a short text file without running a word processor or text editor. Because the cat command can read the standard input (more about this in Hour 6), you can make the cat command create a file and fill it with your keystrokes.

Here's how:

\$ cat > myfile.txt

Now, enter some text:

\$ cat > myfile.txt

This is the cat word processor.

This is the end of the file.

Then, when you're done typing, press Ctrl+D to close the file. To see if this works, try

```
$ ls -l myfile.txt
```

```
-rw-rw-r-- 1 bball bball 61 Nov 12 18:26 myfile.txt
```

```
$ cat myfile.txt
```

This is the cat word processor.

This is the end of the file.

user should also know that the cat command will print out the contents of any file, and not

just text files. Although cat may be useful to look at one or several short files,

Other file commands

The clear Command

The clear command is used to remove all previous commands and output from consoles and terminal windows in Unix-like operating systems.

A console is an all-text mode user interface that occupies the entire screen of the display device and which does not sit on top of a graphical user interface (GUI). A terminal window is a text-only window in a GUI that emulates a console and which can be opened by clicking the appropriate icon (i.e., small image) or menu item.

Clear is one of the very few commands in Unix-like operating systems that accepts neither options nor arguments (i.e., input files). That is, it is only used as follows:

Clear

After the clear command has been issued, all that remains on the display screen is the command prompt in the upper left hand corner. A command prompt, also referred to as a prompt, is a short text message at the start of a line that informs the user that the system is ready for the next command, data element or other input.

The descriptions are rather terse, and they can seem somewhat cryptic to new users. However, users typically find them to be increasingly useful as they become more familiar with them and gain experience in the use of Unix-like operating systems.

The man command itself is extremely easy to use. Its basic syntax is

```
man [option(s)] keyword(s)
```

man is most commonly used without any options and with only one keyword. The keyword is the exact name of the command or other item for which information is desired. For example, the following provides information about the ls command (which is used to list the contents of any specified directory):

```
man ls
```

As another example, the following displays the man page about the man pages:

```
man man
```

man automatically sends its output through a pager, usually the program less. A pager is a program that causes the output of any program to be displayed one screenful at a time, rather than having a large amount of text scroll down the screen at high (and generally unreadable) speed.

less writes a colon at the bottom of the screen to indicate the end of the on-screen page. The user can move to the next page by pushing the space bar and can return to the previous page by pressing the b key. Pressing the q exits the man pages and returns the user to the shell program.

Each man page is a self-contained article that is divided into a number of sections, the headers for which are labeled with upper case letters. The sections for commands are typically something like NAME, SYNOPSIS, DESCRIPTION, OPTIONS, AUTHOR, BUGS, COPYRIGHT, HISTORY and SEE ALSO, although there may be some differences according to the particular command. Some of these might be broken down into subsections, particularly OPTIONS in the case of a command that has numerous options.

Also, the man pages as a whole are organized into sections, each containing pages about a specific category of topics as shown below. The section to which an article belongs is indicated in parenthesis in the top line, before the NAME header.

1. executable programs or shell commands
2. system calls
3. library routines
4. special files (i.e., devices in the /dev directory)
5. file formats
6. games
7. macro packages
8. system administration commands
9. kernel routines

Some topic names will have multiple articles, depending on context. For instance, there are two articles for mount, one corresponding to its use as a command in system management (i.e., to logically attach partition or other devices to the main filesystem) and the other for use in the C programming language. Generally, the most commonly used topic is displayed by default, and there are references to any other topics with the same name in the SEE ALSO section at the bottom of the final on-screen page.

The syntax to specify an article from a particular section is:

```
man section_number keyword
```

Thus, for example, the following would display the article about mount from Section 2 instead of from the default Section 8:

man 2 mount

The -w and -W options tell man to not actually display the man pages, but to provide the location(s) of the file(s) that would be formatted or displayed. If no arguments (i.e., input files) are provided, a list of directories that is searched by man for man pages is returned.

The -f option produces the same output as the whatis command. whatis provides very brief descriptions of commands from a database that is automatically created from the first line of the NAME section of each relevant man page.

The Whoami and who command

The whoami command writes the user name (i.e., login name) of the owner of the current login session to standard output. Standard output is, by default, the display screen, unless redirected to a file, printer, etc.

whoami is particularly useful when using shells such as ash and sh that do not show the name of the current user in the command prompt (a short text message at the start of the command line on an all-text display). It is also useful for confirming the current owner of a session after using the su (i.e., substitute user) command, which changes the owner of the session without the original owner having to first log out.

A shell is a program that provides the traditional, text-only user interface for Unix-like operating systems. Its primary function is to read commands that are typed into a console (i.e., an all-text display mode) or terminal window (an all-text window in a GUI) and then execute (i.e., run) them.

The formal syntax for whoami is:

whoami [option]

When used without any options or redirection, as it usually is, i.e.,

Whoami

and followed by pressing the ENTER key, whoami displays on the monitor screen the user name of the owner of the current session.

There are only two options for whoami: --help and --version. The former outputs the very brief description that is contained in the man (i.e., built-in system manual) pages, and the latter outputs the number of the version currently installed on the system.

whoami produces the same result as the id command (which by default provides more detailed information about the current user than does whoami) when id is used with its -u and -n options, i.e.,

id -un

The -u option tells id to provide only the identification for the current owner of the session, and the -n option tells it to present that identification as the user name instead of as a number.

The who command differs from whoami in that it provides a list of all users currently logged into the system as well

as additional information about each of those users (including login times and terminal numbers). It also differs in that, in the event of a change in ownership of a login session through the use of the su command, it reports the original owner of the session, whereas whoami provides the user name of the effective (i.e., current) owner of the session.

stat command

File Stat - Display Information About File

For example, to find out more information about 101hacks.txt file, execute the stat command as shown below.

\$ stat 101hacks.txt

File: '/home/sathiyamoorthy/101hacks.txt'

Size: 854 Blocks: 8 IO Block: 4096 regular file

Device: 801h/2049d Inode: 1058122 Links: 1

Access: (0600/-rw-----) Uid: (1000/ sathiya)
Gid: (1000/ sathiya)

Access: 2009-06-28 19:29:57.000000000 +0530

Modify: 2009-06-28 19:29:57.000000000 +0530

Change: 2009-06-28 19:29:57.000000000 +0530

Details of Linux stat command output

- **File:** '/home/sathiyamoorthy/101hacks.txt' - Absolute path name of the file.
- **Size:** 854 - File size in bytes.
- **Blocks:** 8 - Total number of blocks used by this file.
- **IO Block:** 4096 - IO block size for this file.
- **Regular file** - Indicates the file type. This indicates that this is a regular file. Following are available file types.
 - regular file. (ex: all normal files).
 - directory. (ex: directories).
 - socket. (ex: sockets).
 - symbolic link. (ex: symbolic links.)
 - block special file (ex: hard disk).
 - character special file. (ex: terminal device file).
- Device: 801h/2049d - Device number in hex and device number in decimal
- Inode: 1058122 - Inode number is a unique number for each file which is used for the internal maintenance by the file system.
- Links: 1 - Number of links to the file
- Access: (0600/-rw---): Access specifier displayed in both octal and character format. Let us see explanation about both the format.

- **Uid:** (1000/ sathiya) - File owner's user id and user name are displayed.
- **Gid:** (1000/ sathiya) - File owner's group id and group name are displayed.
- **Access:** 2009-06-28 19:29:57.000000000 +0530 - Last access time of the file.
- **Modify:** 2009-06-28 19:29:57.000000000 +0530 - Last modification time of the file.
- **Change:** 2009-06-28 19:29:57.000000000 +0530 - Last change time of the inode data of that file.

Dir Stat - Display Information About Directory You can use the same command to display the information about a directory as shown below.

\$ stat /home/ramesh

File: '/home/ramesh'

Size: 4096 Blocks: 8 IO Block: 4096 directory

Device: 803h/2051d Inode: 5521409 Links: 7

Access: (0755/drwxr-xr-x) Uid: (401/ramesh)
Gid: (401/ramesh)

Access: 2009-01-01 12:17:42.000000000 -0800

Modify: 2009-01-01 12:07:33.000000000 -0800

Change: 2009-01-09 12:07:33.000000000 -0800

head command

The head command reads the first few lines of any text given to it as an input and writes them to standard output (which, by default, is the display screen).

head's basic syntax is:

head [options] [file(s)]

The square brackets indicate that the enclosed items are optional. By default, head returns the first ten lines of each file name that is provided to it.

For example, the following will display the first ten lines of the file named aardvark in the current directory (i.e., the directory in which the user is currently working):

head aardvark

If more than one input file is provided, head will return the first ten lines from each file, precede each set of lines by the name of the file and separate each set of lines by one vertical space. The following is an example of using head with two input files:

head aardvark armadillo

If it is desired to obtain some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, the above example could be modified to display the first 15 lines from each file:

head -n15 aardvark armadillo

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in

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between. Thus, the following command would produce the same result:

head -n 15 aardvark armadillo

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell head how many lines to return. Thus, the following would produce the same result as the above commands:

head -15 aardvark armadillo

head can also return any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the start of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, the following would display the first five bytes of each of the two files provided:

head -c 5 aardvark anteater

When head counts by bytes, it also includes the newline character, which is an un-printing (i.e., invisible) character that is designated by a backslash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the start of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or on paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would display the first five kilobytes of the file aardvark:

head -c5k aardvark

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case head would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like head: aardvark: invalid number of bytes:

head -c aardvark

If head is used without any options or arguments (i.e., file names), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the first ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

head -n3

As is the case with other command line (i.e., all-text mode) programs in Linux and other Unix-like operating systems, the output from head can be redirected from the display monitor to a file or printer using the output redirection operator (which is represented by a rightward-pointing angular

bracket). For example, the following would copy the first 12 lines of the file Yuriko to the fileDecember:

head -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two consecutive rightward pointing angle brackets) could be used to add the output from head to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

head -n 12 Yuriko >> December

The output from other commands can be sent via a pipe (represented by the vertical bar character) to head to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to head, which, in turn, displays the first ten lines of the output that it receives from ls:

ls | head

This output could easily be redirected, for example to the end of a file namedfile1 as follows:

ls | head >> file1

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reverse alphabetic order prior to appending file1:

ls | head | sort -r >> file1

The -q (i.e., quiet) option causes head to not show the file name before each set of lines in its output and to eliminate the vertical space between each set of lines when there are multiple input sources. Its opposite, the -v (i.e., verbose) option, causes head to provide the file name even if there is just a single input file.

The tail command is similar to the head command except that it reads the final lines in files rather than the first lines.

As is the case with other commands on Unix-like operating systems, additional information can be obtained about head and tail by using the man and infocommands to reference the built-in documentation, for example

man head

or

info tail

tail command

The tail command reads the final few lines of any text given to it as an input and writes them to standard output (which, by default, is the monitor screen).

The basic syntax for tail is:

tail [options] [filenames]

\$ tail -n 4 /etc/passwd

The square brackets indicate that the enclosed items are optional. By default, tail returns the final ten lines of each file name that is provided to it.

For example, the following command will print (traditional Unix terminology for write) the last ten lines of the file named aardvark in the current directory (i.e., the director in which the user is currently working) to the display screen:

tail aardvark

If more than one input file is provided, tail will print the last ten lines from each file to the monitor screen. Each set of lines will be preceded by the name of the file and separated by one vertical space from other sets of lines. The following is an example of using tail with multiple input files:

tail file1 file2 file3

If it is desired to print some number of lines other than the default ten, the -n option can be used followed by an integer indicating the number of lines desired. For example, to print the final 15 lines from each file in the above example, the command would be modified as follows:

tail -n15 file1 file2 file3

-n is a very tolerant option. For example, it is not necessary for the integer to directly follow it without a space in between. Thus, the following command would produce the same result:

tail -n 15 file1 file2 file3

In fact, the letter n does not even need to be used at all. Just the hyphen and the integer (with no intervening space) are sufficient to tell tail how many lines to print. Thus, the following would produce the same result as the above commands:

tail -15 file1 file2 file3

tail can also print any desired number of bytes (i.e., a sequence of eight bits and usually long enough to represent a single character) from the end of each file rather than a desired number of lines. This is accomplished using the -c option followed by the number of bytes desired. For example, to view the final five bytes of each of the two files aardvark and anteater, the following command would be used:

tail -c 5 file1 file2

When tail counts by bytes, it also includes the newline character, which is a non-printing (i.e, invisible) character that is designated by a backward slash and the letter n (i.e., \n). Thus, for example, if there are three new, blank lines at the end of a file, they will be counted as three characters, along with the printing characters (i.e., characters that are visible on the monitor screen or paper).

The number of bytes or lines can be followed by a multiplier suffix. That is, adding the letter b directly after the number of bytes multiplies it by 512, k multiplies it by 1024 and m multiplies it by 1048576. Thus, the following command would print the last five kilobytes of the file aardvark:

tail -c5k file1

The -c option is less tolerant than the -n option. That is, there is no default number of bytes, and thus some integer must be supplied. Also, the letter c cannot be omitted as can the letter n, because in such case tail would interpret the hyphen and integer combination as the -n option. Thus, for example, the following would produce an error message something like tail: aardvark: invalid number of bytes:

tail -c file1

If tail is used without any options or arguments (i.e., inputs), it will await input from the keyboard and will successively repeat (i.e., each line will appear twice) on the monitor screen each of the final ten lines typed on the keyboard. If it were desired to repeat some number of lines other than the default ten, then the -n option would be used followed by the integer representing that number of lines (although, again, it is not necessary to include the letter n), e.g.,

tail -n3

As is the case with other command line (i.e., all-text mode) programs in Unix-like operating systems, the output of tail can be redirected from the monitor to a file or printer using the redirection operator (which is represented by a rightward pointing angular bracket). For example, the following would write the final 12 lines of the file Yuriko to the file December:

tail -n 12 Yuriko > December

If the file named December did not yet exist, the redirection operator would create it; if it already existed, the redirection operator would overwrite it. To avoid erasing data on an existing file, the append operator (which is represented by two rightward pointing angular brackets) could be used to add the output from tail to the end of a file with that name if it already existed (or otherwise create a new file with that name), i.e.,

tail -n 12 Yuriko >> December

The output from other commands can be piped (i.e., sent) to tail to use as its input. For example, the following sends the output from the ls command (which by default lists the names of the files and directories in the current directory) to tail, which, in turn, prints the final ten lines of the output that it receives from ls to the monitor screen:

ls | tail

This output could easily be redirected, for example to a file named last_filenames as follows:

ls | tail >> last_filenames

It could also be piped to one or more filters for additional processing. For example, the sort filter could be used with its -r option to sort the output in reversealphabetic order prior to writing to a file:

ls | tail | sort -r >> last_filenames

The -q (i.e., quiet) option causes tail to not print the file name before each set of lines and to eliminate the vertical space between each set of lines when there are multiple input sources. The -v (i.e., verbose) option causes tail to print the file name even if there is just a single input file.

Tail could be viewed as a counterpart of the head command, which always starts reading from the beginning of files and which can continue until any specified distance from the beginning. However, there are a few differences. Perhaps the most useful of these is that tail is somewhat more flexible in that, in addition to being able to start reading any specified distance from the end of a file, it can also start at any specified distance from the beginning of a file.

Tail can be instructed to begin printing from some number of lines or bytes from the start of a file by preceding the number with a plus sign instead of a minus sign. For example, the following would print each of the designated files to the display monitor beginning with the seventh line and until the end:

tail +7 file1 file2 file3

The c option could be used to tell tail to print each of the designated files beginning with the seventh byte instead of the seventh line:

tail +7c file1 file2 file3

A particularly common application for tail is examining the most recent entries in log files. This is because the newest entries are appended to the ends of such files, which tail excels in showing. As log files can be a rather long, this can eliminate a lot of scrolling that would be necessary if some other command were used to read them. For example, the most recent entries to the log /var/log/messages can easily be viewed by using the following:

tail /var/log/messages

wc command

The wc (i.e., word count) command by default counts the number of lines, words and characters in text.

wc defines a word as a set of contiguous letters, numbers and/or symbols which are separated from other characters by one or more spaces, tabs and/or newline characters (which are generated when the RETURN key is pressed). When counting the number of characters, all characters are counted, not only letters, numbers and symbols, but also spaces, tabs and newline characters. A line is only counted if it ends with a newline character.

wc's syntax is

wc [options] [file_name(s)]

The items in square brackets are optional. If no file names are provided, wc reads from its standard input, which by default is text entered at the keyboard.

This can be seen by typing.

wc

at the command line (i.e., in the all-text mode), pressing the ENTER key to move to a new line and then typing some text on one or more lines. The command isexecuted (i.e., run) by pressing the ENTER key again and then pressing the CONTROL and d keys simultaneously. This causes wc to write in a new line (under the lines of text) its count of the numbers of lines, words and characters in the text.

The following command counts the number of lines, words and characters in a file named file1 that resides in the current directory (i.e., the directory in which the user is currently working) and likewise writes them, followed by the name of the file, to standard output, which is by default the display monitor:

wc file1

wc can provide its output for multiple files by listing the name of each separated by a space. For example,

wc file1 file2 file3

The numbers of lines, words and characters for each file along with its name will be displayed on a separate line and in the order that the files are listed as arguments(i.e., input files). In the case of multiple arguments such as this, wc also provides an additional line that shows the total number of lines, words and characters for all the files.

Likewise, wc can provide a count for all of the text files within a directory. This is accomplished by using the star wildcard character, which represents everythingand is designated by an asterisk (*). For example, the following will display the number of lines, words and characters for each file in the current directory (which is represented by a dot) as well as totals for all files in the directory:

wc . *

wc has only a few options, the most commonly used of which restrict the information it provides. The -l option tells wc to count only the number of lines, the -woption tells it to count only the number of words, the -m option tells it to count only the number of characters and the -c option tells wc to count only the number ofbytes. Thus, for example, the following displays just the number of words in a file named file4:

wc -w file4

The following displays the number of characters in the same file:

wc -m file4

As is generally the case with commands in Unix-like operating systems, any combination of options can be used together. For example, the following would count both the numbers of lines and words in a file named file5:

wc -lw file5

Redirection can be used with wc to create more complex commands. For example, the output from the above command can be redirected using the standard output redirection operator (which is designated by a rightward pointing angle bracket) from the display screen to a file named file6 with the following:

wc -lw file5 > file6

If file6 already exists, its contents will be overwritten; if it does not exist, it will be created. The contents of file6 can be easily confirmed with a text editor or with a command such as cat, which is commonly used to read text files, i.e.,

cat file6

grep command

grep is used to search text for patterns specified by the user. It is one of the most useful and powerful commands on Linux and other Unix-like operating systems.

grep's basic syntax is:

grep [option(s)] pattern [file(s)]

The items in square brackets are optional. When used with no options and no arguments (i.e., input files), grep searches standard input (which by default is text typed in at the keyboard) for the specified pattern and returns each line that contains a match to standard output (which by default is the display screen).

A line of text is defined in this context not as what appears as a line of text on the display screen but rather as all text between two newline characters. Newline characters are invisible characters that are represented in Unix-like operating systems by a backslash followed by the letter n and which are created when a user presses the ENTER key when using a text editor (such as gedit). Thus, a line of text returned by grep can be as short as a single character or occupy many lines on the display screen.

grep can search any number of files simultaneously. Thus, for example, the following would search the three files file1, file2 and file3 for any line that contains thestring (i.e., sequence of characters) Lin:

grep Lin file1 file2 file3

Each result is displayed beginning on a separate line, and it is preceded by the name of the file in which it was found in the case of multiple files. The inclusion of the file names in the output data can be suppressed by using the -h option.

grep is not limited to searching for just single strings. It can also search for sequences of strings, including phrases. This is accomplished by enclosing the sequence of strings that forms the pattern in quotation marks (either single or double). Thus, the above example could be modified to search for the phrase Linux is:

grep 'Linux is' file1 file2 file3

Text searches with grep can be considerably broadened by combining them with wildcards and/or performing recursive searches. A wildcard is a character that can represent some specific class of characters or sequence of characters. The following is a modification of the above example that uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to search all text files in the current directory (i.e., the directory in which the user is currently working):

grep 'Linux is' *

grep's search area can be broadened even further by using its -r option to search recursively through an entire directory tree (i.e., a directory and all levels of subdirectories within it) rather than just the files within a specified directory. For example, the following would search all files in the current

directory and in all of its subdirectories (including their subdirectories, etc.) for every line containing the full name of the creator of Linux:

```
grep -r 'Linus Torvalds' *
```

One of the most commonly employed of grep's many options is -i, which instructs it to ignore case, that is, to ignore whether letters in the pattern and text searched are lower case (i.e., small letters) or upper case (i.e., capital letters). Thus, for instance, the previous example could very easily be converted to a case-insensitive search as follows:

```
grep -ir 'Linus Torvalds' *
```

This would produce the same results as

```
grep -ir 'linUS torvAlds' *
```

Another frequently used option is -c, which causes grep to only report the number of times that the pattern has been matched for each file and to not display the actual lines. Thus, for instance, the following would show the total number of times that the string inu appears in a file named file4:

```
grep -c inu file4
```

Another useful option is -n, which causes grep to precede each line of output with the number of the line in the text file from which it was obtained. The -v option inverts the match; that is, it matches only those lines that do not contain the given pattern.

The -w option tells grep to select only those lines that contain an entire word or phrase that matches the specified pattern. The -x option tells grep to select only those lines that match exactly the specified pattern.

The -l option tells grep to not return the lines containing matches but to only return the names of the files that contain matches. The -L option is the opposite of the -l option (and analogous to the -v option) in that it will cause grep to return only the names of files that do not contain the specified pattern.

grep does not search the names of files for a specified pattern, only the text contained within files. However, sometimes it is useful to search the names of files, as well as of directories and links, rather than the contents of files. Fortunately, this can easily be accomplished by first using the ls command to list the contents of a directory and then using a pipe (which is represented by the vertical bar character) to transfer its output to grep for searching. For example, the following would provide a list of all files, directories and links in the current directory that contain the string linu in their names:

```
ls | grep linu
```

The following example uses ls with its -l (i.e., long) option (which is unrelated to grep's -l option) to find all filesystem objects in the current directory whose permissions have been set so that any user can read, write and execute them:

```
ls -l | grep rwxrwxrwx
```

grep is very useful for obtain information from log and configuration files. For example, it can be used to obtain information about the USB (universal serial bus) devices on a system by filtering the output from the dmesg command (which provides the messages from the kernel as a system is booting up) as follows:

```
dmesg | grep -i usb
```

Among grep's other options are --help, which provides a very compact summary of some of its many capabilities, and -V, or --version, which provides information about the currently installed version.

grep's search functionality can be even further refined through the use of regular expressions. These are a pattern matching system that uses strings constructed according to pre-defined syntax rules to find desired patterns in text. Additional information about grep, including its use with regular expressions, can be obtained from its built-in manual page by using the man command, i.e.,

man grep

The name grep comes from a command in ed, which was the original text editor on the UNIX operating system. The command takes the form g/re/p, which means to search globally for matches to the regular expression (i.e., re), and print (which is UNIX terminology for write on the display screen) lines that are found.

In command

In command is used to create links. Links are a kind of shortcuts to other files. The general form of command is:

```
$ In TARGET LINK_NAME
```

There are two types of links, soft links and hard links. By default, hard links are created. If you want to create soft link, use -s option. In this example, both types of links are created for the file usrlisting.

```
$ In usrlisting hard_link
```

```
$ In -s usrlisting soft_link
```

```
$ ls -l
```

```
total 12
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file1
```

```
-rw-r--r-- 1 raghu raghu 0 2012-07-06 14:20 file3
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 hard_link
```

```
lrwxrwxrwx 1 raghu raghu 10 2012-07-09 14:00 soft_link -> usrlisting
```

```
-rw-r--r-- 1 raghu raghu 491 2012-07-06 16:02 usrcopy
```

```
-rw-r--r-- 2 raghu raghu 491 2012-07-06 14:23 usrlisting
```

Some additional useful commands

alias command

'alias' is another name for a command. If no argument is given, it shows current aliases. Aliases can be used for short names of commands. For example, you might use clear command frequently. You can create an alias for it:

\$ alias c="clear"

Next time enter c on command line, your screen will be clear. Current aliases can be checked with 'alias' command:

\$ alias

```
alias alert='notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e \'s/^\\s*[0-9]+\\s*//;s/[;&]\\s*alert$//\'")'
```

alias c='clear'

alias egrep='egrep --color=auto'

alias fgrep='fgrep --color=auto'

alias grep='grep --color=auto'

alias l='ls -CF'

alias la='ls -A'

alias ll='ls -alF'

alias ls='ls --color=auto'

w command

The w command shows who is logged in to the system and what they are doing.

A login, logging in or logging on is the entering of identifier information into a system by a user in order to access that system (e.g., a computer or a website). It generally requires the user to enter two pieces of information, first a user name and then a password.

The basic syntax of w is:

w [options] [username1, username2, ...]

The square brackets indicated that the enclosed items are optional. When used without any options, w sends to standard output (which is by default the display screen) a header line followed by a table that contains a line of data for each user currently logged in.

The header shows six items: the current time, how long the system has been running (in minutes) since it was booted up (i.e., started up), how many users are currently logged on, and the system load averages, i.e., the average number of processes active, during the last one, five and 15 minutes. A process is an executing(i.e., running) instance of a program.

The main part of w's output consists of a table showing eight items of information for each user currently logged into the system. The eight columns are labeled USER, TTY, FROM, LOGIN@, IDLE, JCPU, PCPU and WHAT.

USER is the login name of the user. TTY (which now stands for terminal type but originally stood for teletype) is the name of the console or terminal (i.e., combination of monitor and keyboard) that the user logged into, which can also be found by using the tty command. Every time a user logs in across the network, a new tty is assigned to that user.

The consoles can be real or virtual. A feature of Linux systems is the use of virtual consoles, which act as

independent logical consoles that run in separate login sessions, but which are accessed from the same physical console (i.e., the same keyboard and screen). That is, each virtual console can have a different, or the same, user logged into it. On a Red Hat system, seven virtual consoles are configured and active by default.

FROM is the remote host (i.e., the name of some other computer), if any, that the user logged into. LOGIN@ is the time at which the user logged in. IDLE is the number of hours and minutes since the user last typed anything at the keyboard.

JCPU is the number of minutes accumulated by all processes attached to the tty. It does not include past background processes (i.e., low priority processes that operate only in gaps between higher priority foreground processes), but it does include currently running background processes.

PCPU is the time consumed by the current process, named in the WHAT column. WHAT lists the name of the current process along with any options and arguments(i.e., input files) used with the command that launched it.

Among the more useful of w's few options is -h, which tells it to omit the header header line from its output. The -s option tells it to use the short format, which omits the login time, JCPU and PCPU columns. The -l option creates a long listing, which is the same as the default. The -V option displays the version number of the currently installed w program.

By default, w reports on all users. However, it can be made to report on only a specified set of users by providing those usernames in a comma-separated list.

w provides information similar to that which would be provided by a combination of the uptime, who and ps -a commands. uptime produces a single line of output that is the same as w's header line. who shows who is currently logged into the system. ps -a lists all processes with a tty except session leaders (i.e., processes that created sessions).

w can be useful, but there are some faults with the information it provides, and thus its output should only be considered approximate. In particular, the notion of thecurrent process is unclear and there are some problems detecting background processes, even though they usually account for much of the load on the system. Also, the CPU time is only an estimate; for example, if a user leaves a background process running after logging out, the time is credited to the person currently on that terminal.

last command

Display information about the users who logged in and out of the system. The output of last can be very large, so the following output has been filtered (through head) to display top 10 lines only:

```
$ last | head
root tty1 Mon Jul 9 10:06 still logged in
root tty1 Mon Jul 9 10:06 - 10:06 (00:00)
raghu pts/1 :0.0 Mon Jul 9 10:05 - 10:06 (00:00)
raghu pts/0 :0.0 Mon Jul 9 09:34 still logged in
raghu tty7 :0 Mon Jul 9 09:19 still logged in
reboot system boot 2.6.38-13-generi Mon Jul 9 09:09 -
10:12 (01:02)
raghu tty7 :0 Sun Jul 8 23:36 - 00:30 (00:54)
reboot system boot 2.6.38-13-generi Sun Jul 8 23:36 -
00:30 (00:54)
raghu tty7 :0 Sun Jul 8 21:07 - down (01:06)
reboot system boot 2.6.38-13-generi Sun Jul 8 21:07 -
22:14 (01:07)
```

A similar command is lastb that shows last bad login attempts. But this command must be run as root otherwise would get an error of permission denied

```
$ lastb
raghu tty2 Mon Jul 9 10:16 - 10:16 (00:00)
UNKNOWN tty2 Mon Jul 9 10:15 - 10:15 (00:00)
ubuntu tty8 :1 Mon Jul 2 10:23 - 10:23 (00:00)
btmp begins Mon Jul 2 10:23:54 2012
```

du command

du command determines disk usage of a file. If the argument given to it is a directory, then it will list disk usage of all the files and directories recursively under that directory:

```
$ du /etc/passwd
4 /etc/passwd
$ du hello/
52 hello/HelloApp
4 hello/orb.db/logs
20 hello/orb.db
108 hello/
```

df command

df reports file system usage. For example:

```
$ df
Filesystem 1K-blocks Used Available Use% Mounted on
/dev/sda7 10079084 7372872 2194212 78% /
none 1522384 768 1521616 1% /dev
none 1529012 252 1528760 1% /dev/shm
none 1529012 108 1528904 1% /var/run
none 1529012 4 1529008 1% /var/lock
/dev/sda8 5039616 3758824 1024792 79% /home
```

```
/dev/sda2 209715196 196519248 13195948 94%
media/Data
```

fdisk command

The fdisk is the tool for getting partition information, adding and removing partitions. The fdisk tool requires super user privileges. To list all the partitions of all the hard drives available:

```
$ fdisk -l
Disk /dev/sda: 320.1 GB, 320072933376 bytes
255 heads, 63 sectors/track, 38913 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x396f396f

Device Boot Start End Blocks Id System
/dev/sda1 1 2611 20971520 7 HPFS/NTFS
/dev/sda2 2611 28720 209715200 7 HPFS/NTFS
/dev/sda3 * 28720 38914 81882113 5 Extended
  /dev/sda5 28720 33942 41943040 7 HPFS/NTFS
  /dev/sda6 33942 34464 4194304 7 HPFS/NTFS
  /dev/sda7 34464 35739 10240000 83 Linux
  /dev/sda8 35739 36376 5120000 83 Linux
  /dev/sda9 36376 36886 4096000 82 Linux swap / Solaris
  /dev/sda10 36887 38276 11164672 83 Linux
  /dev/sda11 38277 38914 5117952 83 Linux
```

fdisk is an interactive tool to edit the partition table. It takes a device (hard disk) as an argument, whose partition table needs to be edited.

\$ fdisk /dev/sda

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to switch off the mode (command 'c') and change display units to sectors (command 'u').

Command (m for help): m

Command	action
a	toggle a bootable flag
b	edit bsd disk label
c	toggle the dos compatibility flag
d	delete a partition
l	list known partition types
m	print this menu
n	add a new partition
o	create a new empty DOS partition table
p	print the partition table
q	quit without saving changes

s	create a new empty Sun disklabel
t	change a partition's system id
u	change display/entry units
v	verify the partition table
w	write table to disk and exit
x	extra functionality (experts only)

Pressing 'm' at the fdisk prompt prints out above help that lists all the commands available for fdisk. A new partition can be created with n and an existing partition can be deleted with d command. When you are done editing the partitions, press w to write the changes to the disk, and finally, q to quit from fdisk (q dies not save changes).

netstat command

'netstat' is the command used to check the network statistics of the system. It will list the current network connections, routing table information, interface statistics, masquerade connections and a lot more information.

\$ netstat | head

Active Internet connections (w/o servers)

Proto Recv-Q Send-Q Local Address Foreign Address State

Active UNIX domain sockets (w/o servers)

Proto RefCnt Flags Type State I-Node Path

unix 13 [] DGRAM 8498 /dev/log

unix 2 [] DGRAM 6824 @/org/kernel/udev/udevd

unix 3 [] STREAM CONNECTED 56738 /var/run/dbus/
system_bus_socket

unix 3 [] STREAM CONNECTED 56113

unix 3 [] STREAM CONNECTED 29138

unix 3 [] STREAM CONNECTED 29137

history command

This command shows the commands you have entered on your terminal so far.

passwd command

Change your password with 'passwd' command.

shutdown -h now

Finally shut down your system using this command.

Understanding and using file permissions

In Linux and Unix, everything is a file. Directories are files, files are files and devices are files. Devices are usually referred to as a node; however, they are still files.

All of the files on a system have permissions that allow or prevent others from viewing, modifying or executing. If the file is of type Directory then it restricts different actions than files and device nodes. The super user "root" has the ability to access any file on the system. Each file has access restrictions with permissions, user restrictions with owner/group association. Permissions are referred to as bits.

If the owner read & execute bit are on, then the permissions are:

There are three types of access restrictions:

Permission	Action	Chmod option
read	(view)	r or 4
write	(edit)	w or 2
execute	(execute)	x or 1

There are also three types of user restrictions:

User	ls output
owner	-rwx----
group	---rwx---
other	-----rwx

**The restriction type scope is not inheritable:
the file owner will be unaffected by restrictions
set for his group or everybody else.**

Folder/Directory Permissions

Directories have directory permissions. The directory permissions restrict different actions than with files or device nodes.

Permission	Action	chmod option
Read	(view contents, i.e. ls command)	r or 4
Write	(create or remove files from dir)	w or 2
execute	(cd into directory)	x or 1

1. read restricts or allows viewing the directories contents, i.e. ls command
2. write restricts or allows creating new files or deleting files in the directory. (Caution: write access for a directory allows deleting of files in the directory even if the user does not have write permissions for the file!)
3. execute restricts or allows changing into the directory, i.e. cd command

Folders (directories) must have 'execute' permissions set (x or 1), or folders (directories) will NOT FUNCTION as folders (directories) and WILL DISAPPEAR from view in the file browser (Nautilus).

Permissions in Action

```
$ ls -l /etc/hosts
```

```
-rw-r--r-- 1 root root 288 2005-11-13 19:24 /etc/hosts
```

Using the example above we have the file "/etc/hosts" which is owned by the user root and belongs to the root group.

The permissions from the above /etc/hosts ls output

```
-rw-r--r--
```

owner = Read & Write (rw-)

group = Read (r--)

other = Read (r--)

Changing permissions

The command to use when modifying permissions is chmod. There are two ways to modify permissions, with numbers or with letters. Using letters is easier to understand for most people. When modifying permissions be careful not to create security problems. Some files are configured to have very restrictive permissions to prevent unauthorized access. For example, the /etc/shadow file (file that stores all local user passwords) does not have permissions for regular users to read or otherwise access.

```
$ ls -l /etc/shadow
```

```
-rw-r----- 1 root shadow 869 2005-11-08 13:16 /etc/shadow
```

Permissions:

owner = Read & Write (rw-)

group = Read (r--)

other = None (---)

Ownership:

owner = root

group = shadow

chmod with Letters

Usage: chmod {options} filename

Options	Definition
U	owner
G	group
O	other
A	all (same as ugo)
X	execute
W	write
R	read
+	add permission
-	remove permission
=	set permission

Here are a few examples of chmod usage with letters (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
```

```
$ ls -l
```

```
total 0
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod u+x file1
```

```
$ ls -l file1
```

```
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod o+wx file2
```

```
$ ls -l file2
```

```
-rwxr--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod g-r file3
```

```
$ ls -l file3
```

```
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod ugo+rwx file4
```

```
$ ls -l file4
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
```

```
$
```

chmod with Numbers

Usage: chmod {options} filename

Options	Definition
#-	owner
#	group
-#	other
1	execute
2	write
4	read

Owner, Group and Other is represented by three numbers. To get the value for the options determine the type of access needed for the file then add.

For example if need a file that has -rw-rw-rwx permissions will use the following:

Owner	Group	Other
read & write 4+2=6	read & write 4+2=6	read, write & execute 4+2+1=7

\$ chmod 667 filename

Another example if you want a file that has --w-r-x-- permissions you will use the following:

Owner	Group	Other
write 2	read & execute 4+1 = 5	execute 1

\$ chmod 251 filename

Here are a few examples of chmod usage with numbers (try these out on your system).

First create some empty files:

```
$ touch file1 file2 file3 file4
$ ls -l
total 0
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
-rw-r--r-- 1 user user 0 Nov 19 20:13 file3
-rw-r--r-- 1 user user 0 Nov 19 20:13 file4
```

Add owner execute bit:

```
$ chmod 744 file1
$ ls -l file1
-rwxr--r-- 1 user user 0 Nov 19 20:13 file1
```

Add other write & execute bit:

```
$ chmod 647 file2
$ ls -l file2
-rw-r--rwx 1 user user 0 Nov 19 20:13 file2
```

Remove group read bit:

```
$ chmod 604 file3
$ ls -l file3
-rw----r-- 1 user user 0 Nov 19 20:13 file3
```

Add read, write and execute to everyone:

```
$ chmod 777 file4
$ ls -l file4
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file4
$
```

chmod with sudo

Changing permissions on files that do not have ownership of: (Note that changing permissions the wrong way on the wrong files can quickly mess up the system a great deal!

Please be careful when using sudo!)

```
$ ls -l /usr/local/bin/somefile
-rw-r--r-- 1 root root 550 2005-11-13 19:45 /usr/local/bin/
somefile
```

\$

```
$ sudo chmod o+x /usr/local/bin/somefile
```

```
$ ls -l /usr/local/bin/somefile
```

```
-rw-r--r-x 1 root root 550 2005-11-13 19:45 /usr/local/
bin/somefile
```

\$

Recursive permission changes

To change the permissions of multiple files and directories with one command. Please note the warning in the chmod with sudo section and the Warning with Recursive chmod section.

Recursive chmod with -R and sudo

To change all the permissions of each file and folder under a specified directory at once, use sudo chmod with -R

```
$ sudo chmod 777 -R /path/to/someDirectory
```

```
$ ls -l
```

```
total 3
```

```
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rwxrwxrwx 1 user user 0 Nov 19 20:13 file2
```

Recursive chmod using find, pipemill, and sudo

To assign reasonably secure permissions to files and folders/directories, it's common to give files a permission of 644, and directories a 755 permission, since chmod -R assigns to both. Use sudo, the find command, and a pipemill to chmod as in the following examples.

To change permission of only files under a specified directory.

```
$ sudo find /path/to/someDirectory -type f -print0 | xargs
-0 sudo chmod 644
```

```
user@host:/home/user$ ls -l
```

```
total 3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
drwxrwxrwx 2 user user 4096 Nov 19 20:13 folder
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

To change permission of only directories under a specified directory (including that directory):

```
$ sudo find /path/to/someDirectory -type d -print0 | xargs
-0 sudo chmod 755
```

```
$ ls -l
```

```
total 3
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file1
```

```
drwxr-xr-x 2 user user 4096 Nov 19 20:13 folder
```

```
-rw-r--r-- 1 user user 0 Nov 19 20:13 file2
```

Warning with Recursive chmod

WARNING: Although it's been said, it's worth mentioning in context of a gotcha typo. Please note, Recursively deleting or chown-ing files are extremely dangerous. You will not be the first, nor the last, person to add one too many spaces into the command. This example will hose your system:

```
$ sudo chmod -R / home/john/Desktop/tempfiles
```

Note the space between the first / and home. You have been warned.

Changing the file owner and group

A file's owner can be changed using the chown command. For example, to change the foobar file's owner to tux:

```
$ sudo chown tux foobar
```

To change the foobar file's group to penguins, you could use either chgrp or chown with special syntax:

```
$ sudo chgrp penguins foobar
```

```
$ sudo chown :penguins foobar
```

Finally, to change the foobar file's owner to tux and the group to penguins with a single command, the syntax would be:

```
$ sudo chown tux:penguins foobar
```

Note that, by default, you must use sudo to change a file's owner or group.

Difference between chown and chgrp

- 1) Chown command is used to change ownership as well as group name associated to different one, whereas chgrp can change only group associated to it.
- 2) Many people say that regular user is only able to use chgrp to change the group if the user belongs to them. But it's not true; a user can use chown and chgrp irrespective of changing group to one of their groups because chown is located in /bin folder so everyone can use it with some limited access.

umask - Set default permissions

The umask command controls the default permissions given to a file when it is created.

It uses octal notation to express a mask of bits to be removed from a file's mode attributes.

```
[me@linuxbox ~]$ rm -f foo.txt
```

```
[me@linuxbox ~]$ umask
```

```
0002
```

```
[me@linuxbox ~]$ > foo.txt
```

```
[me@linuxbox ~]$ ls -l foo.txt
```

```
-rw-rw-r-- 1 me me 0 2008-03-06 14:53 foo.txt
```

We first removed any old copy of foo.txt to make sure we were starting fresh. Next,

we ran the umask command without an argument to see the current value. It responded with the value 0002 (the value 0022 is another common default value), which is the octal representation of our mask. We next create a new instance of the file foo.txt and observe its permissions.

We can see that both the owner and group both get read and write permission, while everyone else only gets read permission. The reason that world does not have write permission is because of the value of the mask.

```
$ rm foo.txt
```

```
$ umask 0000
```

```
$ > foo.txt
```

```
$ ls -l foo.txt
```

```
-rw-rw-rw- 1 me me 0 2008-03-06 14:58 foo.txt
```

When we set the mask to 0000 (effectively turning it off), we see that the file is now

world writable. To understand how this works, we have to look at octal numbers again.

If we take the mask and expand it into binary, then compare it to the attributes.

Original file mode	--- rw- rw- rw-
Mask	000 000 000 010
Result	--- rw- rw- r--

Ignore for the moment the leading zeros (we'll get to those in a minute) and observe that

where the 1 appears in our mask, an attribute was removed—in this case, the world

write permission. That's what the mask does. Everywhere a 1 appears in the binary value

of the mask, an attribute is unset. If we look at a mask value of 0022, we can see what it does:

Original file mode	--- rw- rw- rw-
Mask 000 000 010 010	000 000 000 010
Result	--- rw- r-- r--

Again, where a 1 appears in the binary value, the corresponding attribute is unset. Play with some values (try some sevens) to get used to how this works. When you're done, remember to clean up:

```
$ rm foo.txt; umask 0002
```

The Tar command

The tar (i.e., tape archive) command is used to convert a group of files into an archive.

An archive is a single file that contains any number of individual files plus information to allow them to be restored to their original form by one or more extraction programs. Archives are convenient for storing files as well as for transmitting data and distributing programs. Moreover, they are very easy to work with, often much more so than dealing with large numbers of individual files.

Although tar was originally designed for backups on magnetic tape, it can now be used to create archive files anywhere on a file system. Archives that have been created with tar are commonly referred to as tar balls.

Unlike some other archiving programs, and consistent with the Unix philosophy that each individual program should be designed to do only one thing but do it well, tar does not perform compression. However, it is very easy to compress archives created with tar by using specialized compression utilities.

tar's basic syntax is

tar option(s) archive_name file_name(s)

tar has numerous options, many of which are not frequently used. Unlike many commands, tar requires the use of at least one option, and usually two or more are necessary.

tar files are created by using both the -c and -f options. The former instructs tar to create an archive and the latter indicates that the next argument (i.e., piece of input data in a command) will be the name of the new archive file. Thus, for example, the following would create an archive file called file.tar from the three files named file1, file2 and file3 that are located in the current directory (i.e., the directory in which the user is currently working):

tar -cf file.tar file1 file2 file3

It is not absolutely necessary that the new file have the .tar extension; however, the use of this extension can be very convenient because it allows the type of file to be visually identified. It is necessary, however, that the -f option be the final option in a sequence of contiguous, single-letter options; otherwise, the system will become confused as to the desired name for the new file and will use the next option in the sequence as the name.

The -v (i.e., verbose) option is commonly used together with the -c and -f options in order to display a list of the files that are included in the archive. In such case, the above example would become

tar -cvf file.tar file1 file2 file3

tar can also be used to make archives from the contents of one or more directories. The result is recursive; that is, it includes all objects (e.g., directories and files) within each level of directories. For example, the contents of two directories named dir1 and dir2 could be archived into a file named dir.tar with the following:

tar -cvf dir.tar dir1 dir2

It is often convenient to use tar with a wildcard (i.e., a character which can represent some specific class of characters or sequence of characters). The following example uses the star wildcard (i.e., an asterisk), which represents any character or sequence of characters, to create an archive of every object in the current directory:

tar -cf *

By default, tar creates an archive of copies of the original files and/or directories, and the originals are retained.

However, they can be removed when using tar by adding the --remove-files option.

As it has no compression and decompression capabilities of its own, tar is commonly used in combination with an external compression utility. A very handy feature of the GNU version (which is standard on Linux) is the availability of options that will cause standard compression programs to compress a new archive file as soon as it has been created. They are -j (for bzip2), -z (for gzip) and -Z (for compress). Thus, for example, the following would create an archive named files.tar.bz2 of the files file4, file5 and file6 that is compressed using bzip2:

tar -cvjf files.tar.bz2 file4 file5 file6

tar can also be used for unpacking tar files. However, before doing this, there are several steps that should be taken. One is to confirm that sufficient space is available on the hard disk drive (HDD). Another is to move to an empty directory (which usually involves creating one with an appropriate name) to prevent the reconstituted files from cluttering up the current directory and overwriting any files or directories with same names that are in it. In addition, if the archive has been compressed, it must first be decompressed using the appropriate decompression program (which can usually be determined by the filename extension).

In order to unpack a tar file, the -x (for extract) and -f options are required. It is also common to add the -v option to provide a running listing of the files being unpacked. Thus, for example, to unpack the archive file.tar created in a previous example the following would be used:

tar -xvf file.tar

Just as options are available to allow three compression programs to automatically compress newly created tar files, the same options can be used to have the compression programs automatically decompress tar files prior to extraction. Thus, for instance, the following would decompress and extract the contents of the compressed archive files.tar.bz2 that was created in an above example:

tar -xjvf files.tar.bz2

Files can be added to an existing archive using the -r option. As is always the case with tar, it is also necessary to use the -f option to indicate that the following string (i.e., sequence of characters) is the name of the archive. For example, the following would append a file named file7 to file.tar:

tar -rf file.tar file7

The --delete option allows specified files to be completely removed from a tar file (except when the tar file is on magnetic tape). However, this is different from an extraction, as copies of the removed files are not made and placed in the current directory. Thus, for example, the files file1 and file2 can be removed from file.tar with the following:

tar -f file.tar --delete file1 file2

The -t option tells tar to list the contents of an uncompressed archive without performing an extraction. Thus, the following would list the contents of file.tar:

```
tar -tf file.tar
```

Input, output and error redirection in linux

Input/output redirection means the text that is showing on the screen while you are running any command(program)in the shell, that information can be redirect elsewhere and even it can store this output in a file or can be print directly.

This function called Redirection, and can also redirect the input of program.

In Linux systems everything consider as a file.

A file descriptor is number that is associated with every file

When run a program in shell (i.e when execute a command) on the back end Linux access 3 special files.

Standard input - 0 file descriptor(example = mouse,)

Standard output - 1 file descriptor(example = Screen)

Standard error output - 2 file descriptor(example=Screen)

So it can redirect these files to other files. If user redirect standard output (Descriptor = 1) to the printer, instead of showing these outputs on the screen and the computer start getting print on paper.

Output Redirection

Output Redirection is most commonly used, when execute a command it's normally appears on the terminal . If extract any tar file you will notice all the output scrolls down rapidly. And can redirect this output in a file for inspecting the output or can send anybody via email. This is called Output Redirection. Using this operator '>' in shell can redirect the output in a file.

Example :

```
$ ls > output.txt  
$ cat output.txt  
bin  
boot  
dev  
etc  
home  
lib  
lib64  
lost+found  
media  
mnt  
opt  
output.txt  
proc
```

```
root  
sbin  
selinux  
srv  
sys  
tmp  
usr  
var  
$
```

If output.txt file is already exist then '>' operator will overwrite the file for append more output into output.txt use '>>' instead of '>'.

Input Redirection

You can redirect your input by using '<' operator. Cannot run input redirection on all programs or commands. And can use only with that programs or commands that accept Input from keyboard.

Example : user going to send an email and already have Template of that email. and can put template in the email body using input redirect.

```
$ mail ali < mail_template.txt
```

above command launch email program with mail_template.txt contents.

Now due to advancement in GUI, and also lots of good email clients, method is rarely used.

Error Redirection

Error Redirection is very helpful when in trouble. In this case user trying to open a file that is not readable for my user will get permission denied errors. it will redirect these error into error.txt file.

Example :

```
$ cat ali.txt 2> /home/H.Ali/error.txt  
$ cat /home/H.Ali/error.txt  
cat: ali.txt: Permission denied
```

In the above command 2 is descriptor of error redirection file by typing '2>' you are saying redirect any kind of error to the file error.txt

Pipes ' | ' in Linux

Linux pipes allow us connect output stream of 'command a' to input stream of 'command b'. here in my case i will pipe cat commands output into less as input.

Example : cat /var/log/messages | less

we can also use pipe for searching strings specially from large text files.

```
cat /var/log/messages | grep kernal | less
```

grep is a line searcher it will search lines for specific piece of text.

above command will search a keyword 'kernel' with grep and then pipe it again to less.

Pipes in linux

A pipe is a form of redirection that is used in Linux and other Unix-like operating systems to send the output of one program to another program for further processing.

Redirection is the transferring of standard output to some other destination, such as another program, a file or a printer, instead of the display monitor (which is its default destination). Standard output, sometimes abbreviated stdout, is the destination of the output from command line (i.e., all-text mode) programs in Unix-like operating systems.

Pipes are used to create what can be visualized as a pipeline of commands, which is a temporary direct connection between two or more simple programs. This connection makes possible the performance of some highly specialized task that none of the constituent programs could perform by themselves. A command is merely an instruction provided by a user telling a computer to do something, such as launch a program. The command line programs that do the further processing are referred to as filters.

This direct connection between programs allows them to operate simultaneously and permits data to be transferred between them continuously rather than having to pass it through temporary text files or through the display screen and having to wait for one program to be completed before the next program begins.

Examples

A pipe is designated in commands by the vertical bar character, which is located on the same key as the backslash on U.S. keyboards. The general syntax for pipes is:

command_1 | command_2 [| command_3 . . .]

This chain can continue for any number of commands or programs.

A very simple example of the benefits of piping is provided by the dmesg command, which repeats the startup messages that scroll through the console (i.e., the all-text, full-screen display) while Linux is booting (i.e., starting up). dmesg by itself produces far too many lines of output to fit into a single screen; thus, its output scrolls down the screen at high speed and only the final screenful of messages is easily readable. However, by piping the output of dmesg to the filter less, the startup messages can conveniently be viewed one screenful at a time, i.e.,

dmesg | less

less allows the output of dmesg to be moved forward one screenful at a time by pressing the SPACE bar and back one screenful at a time by pressing the b key. The command can be terminated by pressing the q key. (The more command could have been used here instead of less; however, less is newer than more and has additional functions, including the ability to return to previous pages of the output.)

The same result could be achieved by first redirecting the output of dmesg to a temporary file and then displaying the contents of that file on the monitor. For example, the following set of two commands uses the output redirection operator (designated by a rightward facing angle bracket) to first send the output of dmesg to a text file called tempfile1 (which will be created by the output redirection operator if it does not already exist), and then it uses another output redirection operator to transfer the output of tempfile1 to the display screen:

dmesg > tempfile1

tempfile1 > less

However, redirection to a file as an intermediate step is clearly less efficient, both because two separate commands are required and because the second command must await the completion of the first command before it can begin.

The use of two pipes to chain three commands together could make the above example even more convenient for some situations. For example, the output of dmesg could first be piped to the sort filter to arrange it into alphabetic order before piping it to less:

dmesg | sort -f | less

The -f option tells sort to disregard case (i.e., whether letters are lower case or upper case) while sorting.

Likewise, the output of the ls command (which is used to list the contents of a directory) is commonly piped to the less (or more) command to make the output easier to read, i.e.,

ls -al | less

or

ls -al | more

ls reports the contents of the current directory (i.e., the directory in which the user is currently working) in the absence of any arguments (i.e., input data in the form of the names of files or directories). The -l option tells ls to provide detailed information about each item, and the -a option tells ls to include all files, including hidden files (i.e., files that are normally not visible to users). Because ls returns its output in alphabetic order by default, it is not necessary to pipe its output to the sort command (unless it is desired to perform a different type of sorting, such as reverse sorting, in which case sort's -r option would be used).

This could just as easily be done for any other directory. For example, the following would list the contents of the /bin directory (which contains user commands) in a convenient paged format:

ls -al /bin | less

The following example employs a pipe to combine the ls and the wc (i.e., word count) commands in order to show how many filesystem objects (i.e., files, directories and links) are in the current directory:

ls | wc -l

ls lists each object, one per line, and this list is then piped to wc, which, when used with its -l option, counts the number of lines and writes the result to standard output (which, as usual, is by default the display screen).

The output from a pipeline of commands can be just as easily redirected to a file (where it is written to that file) or a printer (where it is printed on paper). In the case of the above example, the output could be redirected to a file named, for instance, count.txt:

```
ls | wc -l > count.txt
```

The output redirection operator will create count.txt if it does not exist or overwrite it if it already exists. (The file does not, of course, require the .txt extension, and it could have just as easily been named count, lines or anything else.)

The following is a slightly more complex example of combining a pipe with redirection to a file:

```
echo -e "orange \npeach \ncherry" | sort > fruit
```

The echo command tells the computer to send the text that follows it to standard output, and its -e option tells the computer to interpret each \ as the newline symbol (which is used to start a new line in the output). The pipe redirects the output from echo -e to the sort command, which arranges it alphabetically, after which it is redirected by the output redirection operator to the file fruit.

As a final example, and to further illustrate the great power and flexibility that pipes can provide, the following uses three pipes to search the contents of all of the files in current directory and display the total number of lines in them that contain the string Linux but not the string UNIX:

```
cat * | grep "Linux" | grep -v "UNIX" | wc -l
```

In the first of the four segments of this pipeline, the cat command, which is used to read and concatenate (i.e., string together) the contents of files, concatenates the contents of all of the files in the current directory. The asterisk is a wildcard that represents all items in a specified directory, and in this case it serves as an argument to cat to represent all objects in the current directory.

The first pipe sends the output of cat to the grep command, which is used to search text. The Linux argument tells grep to return only those lines that contain the string Linux. The second pipe sends these lines to another instance of grep, which, in turn, with its -v option, eliminates those lines that contain the string UNIX. Finally, the third pipe sends this output to wc -l, which counts the number of lines and writes the result to the display screen.

Find hardware devices in Ubuntu Linux with lshw

There are a variety of ways to find out what kind of hardware running in linux, but one of the easiest ways that gives a large amounts of valuable data is to use lshw (Hardware Lister). And lshw is installed by default. Testing of lshw command as shown below...

```
$ sudo lshw
```

Installing

lshw is available on most package management systems.

If use APT (Debian-based distros: Ubuntu, Linux Mint, and others), run the following command in terminal:

```
$ sudo apt-get install lshw
```

If use Yum (Red Hat, Fedora, CentOS, Yellow Dog Linux, etc), run the following command in terminal:

```
$ sudo yum install lshw
```

If these instructions don't match your package manager, look for specific instructions on the lshw site to get it installed on your system.

Using lshw

If you just run lshw by itself on the command line, your screen will be flooded with large amounts of text. Fortunately, it is very easy to get lshw to give you output that meets your needs.

Shorter output

If you just quickly want to quickly find the chipset version of a piece of hardware is, you can run the following to provide a very short output that should give you what you need:

```
$ sudo lshw -short
```

For example, here is a sample when I run this on my Dell Studio 17 laptop (Note: I've removed a large portion of the output to make this fit):

```
$ sudo lshw -short
```

Device class	Description
system	Studio 1735
bus	0H275K
memory	64KiB BIOS
processor	Intel(R) Core(TM)2 Duo CPU T8100 @ 2.10GHz
memory	32KiB L1 cache
memory	3MiB L2 cache
memory	4GiB System Memory
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
memory	2GiB DIMM DDR Synchronous 667 MHz (1.5 ns)
display	Mobility Radeon HD 3650
multimedia	RV635 Audio device [Radeon HD 3600 Series]
multimedia	82801H (ICH8 Family) HD Audio Controller
eth1 network	BCM4322 802.11a/b/g/n Wireless LAN Controller
eth0 network	NetLink BCM5784M Gigabit Ethernet PCIe
/dev/sda disk	250GB WDC WD2500BEVS-7

This of course leaves out a lot of detail. Maybe we just need to store the data somewhere so it's easier to work with.

Storing output to a file

If you'd like to put all the lshw output into a file, you can do so easily from the terminal with output redirection.

```
$ sudo lshw > hardware.txt
```

This will run the lshw command and put all the output into a file in the current directory called hardware.txt. Note that this will replace any file in the current directory called hardware.txt. Make sure that you either backup the file, give the output file a unique name, or are prepared to lose that original file's information.

Now you can open the hardware.txt file with your favorite editor and look through the informations.

Creating HTML or XML Output

lshw has the ability to format its output in either HTML or XML. This can be very helpful if you want to post your hardware specs somewhere online to be viewed or to send the data to a storage system.

To create HTML output, simply give lshw the -html option:

```
$ sudo lshw -html > hardware.html
```

This will format the output into a HTML document and save the output in a file called hardware.html.

Creating XML is done with the -xml option:

```
$ sudo lshw -xml > hardware.xml
```

Like before, this will output the document in XML format and save it to hardware.xml.

Date command examples to display and set system date time

Date command is helpful to display date in several formats. It also allows you to set systems date and time.

Here few examples on how to use date command with practical examples.

When execute date command without any option, it will display the current date and time as shown below.

```
$ date
```

```
Mon May 20 22:02:24 PDT 2013
```

1. Display Date from a String Value using -date Option

If you have a static date or time value in a string, you can use -d or -date option to convert the input string into date format as shown below.

Please note that this doesn't use the current date and time value. Instead is uses the date and time value that you pass as string.

The following examples takes an input date only string, and displays the output in date format. If you don't specify time, it uses 00:00:00 for time.

```
$ date --date="12/2/2014"
```

```
Tue Dec 2 00:00:00 PST 2014
```

```
$ date --date="2 Feb 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

```
$ date --date="Feb 2 2014"
```

```
Sun Feb 2 00:00:00 PST 2014
```

The following example takes an input date and time string, and displays the output in date format.

```
$ date --date="Feb 2 2014 13:12:10"
```

```
Sun Feb 2 13:12:10 PST 2014
```

2. Read Date Patterns from a file using -file option

This is similar to the -d or -date option that we discussed above. But, you can do it for multiple date strings. If you have a file that contains various static date strings, you can use -f or -file option as shown below.

In this example, we can see that datefile contained 2 date strings. Each line of datefile is parsed by date command and date is outputted for each line.

```
$ cat datefile
```

```
Sept 9 1986
```

```
Aug 23 1987
```

```
$ date --file=datefile
```

```
Tue Sep 9 00:00:00 PDT 1986
```

```
Sun Aug 23 00:00:00 PDT 1987
```

3. Get Relative Date Using -date option

You can also use date command to get a future date using relative values.

For example, the following examples gets date of next Monday.

```
$ date --date="next mon"
```

```
Mon May 27 00:00:00 PDT 2013
```

If string=@is given to date command, then date command convert seconds since the epoch (1970-01-01 UTC) to a date.

It displays date in which 5 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@5
```

```
Wed Dec 31 16:00:05 PST 1969
```

It displays date in which 10 seconds are elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@10
```

```
Wed Dec 31 16:00:10 PST 1969
```

It displays date in which 1 minute (i.e. 60 seconds) is elapsed since epoch 1970-01-01 UTC:

```
$ date --date=@60
```

```
Wed Dec 31 16:01:00 PST 1969
```

4. Display past date

You can display a past date using the -date command. Few possibilities are shown below.

```
$ date --date='3 seconds ago'
```

```
Mon May 20 21:59:20 PDT 2013
```

```
$ date --date="1 day ago"
```

```
Sun May 19 21:59:36 PDT 2013
```

```
$ date --date="yesterday"
```

```
Sun May 19 22:00:26 PDT 2013
```

```
$ date --date="1 month ago"
```

```
Sat Apr 20 21:59:58 PDT 2013
```

```
$ date --date="1 year ago"
```

```
Sun May 20 22:00:09 PDT 2012
```

5. Set Date and Time using -set option

You can set date and time of your system using -s or -set option as shown below..

In this example, initially it displayed the time as 20:09:31. We then used date command to change it to 21:00:00.

```
$ date
```

```
Sun May 20 20:09:31 PDT 2013
```

```
$ date -s "Sun May 20 21:00:00 PDT 2013"
```

```
Sun May 20 21:00:00 PDT 2013
```

```
$ date
```

```
Sun May 20 21:00:05 PDT 2013
```

6. Display Universal Time using -u option

You can display date in UTC format using -u, or -utc, or -universal option as shown below.

```
$ date
```

```
Mon May 20 22:07:53 PDT 2013
```

```
$ date -u
```

```
Tue May 21 05:07:55 UTC 2013
```

7. Display Last Modification Time using -r option

In this example, the current time is 20:25:48

```
$ date
```

```
Sun May 20 20:25:48 PDT 2013
```

The timestamp of datefile is changed using touch command. This was done few seconds after the above date command's output.

```
$ touch datefile
```

The current time after the above touch command is 20:26:12

```
$ date
```

```
Sun May 20 20:26:12 PDT 2013
```

Finally, use the date command -r option to display the last modified timestamp of a file as shown below. In this example, it displays last modified time of datefile as 20:25:57. It is somewhere between 20:25:48 and 20:26:12 (which is when we execute the above touch command to modify the timestamp).

```
$ date -r datefile
```

```
Sun May 20 20:25:57 PDT 2013
```

8. Various Date command formats

You can use formatting option to display date command in various formats using the following syntax:

```
$ date +%<format-option>
```

Command	Description
• apropos whatis	Show commands pertinent to string. See also threadsafe
• man -t ascii ps2pdf - > ascii.pdf	make a pdf of a manual page
which command	Show full path name of command
time command	See how long a command takes
• time cat	Start stopwatch. Ctrl-d to stop. See also sw
dir navigation	
• cd -	Go to previous directory
• cd	Go to \$HOME directory
(cd dir && command)	Go to dir, execute command and return to current dir
• pushd .	Put current dir on stack so you can popd back to it
file searching	
• alias l='ls -l --color=auto'	quick dir listing. See also l
• ls -lrt	List files by date. See also newest and find_mm_yyyy
• ls /usr/bin pr -T9 -W\$COLUMNS	Print in 9 columns to width of terminal
find -name '*.[ch]' xargs grep -E 'expr'	Search 'expr' in this dir and below. See also findrepo
find -type f -print0 xargs -r0 grep -F 'example'	Search all regular files for 'example' in this dir and below
find -maxdepth 1 -type f xargs grep -F 'example'	Search all regular files for 'example' in this dir
find -maxdepth 1 -type d while read dir; do echo \$dir; echo cmd2; done	Process each item with multiple commands (in while loop)
• find -type f ! -perm -444	Find files not readable by all (useful for web site)
• find -type d ! -perm -111	Find dirs not accessible by all (useful for web site)
• locate -r 'file[^/]*\.txt'	Search cached index for names. This re is like glob *file*.txt
• look reference	Quickly search (sorted) dictionary for prefix
• grep --color reference /usr/share/dict/words	Highlight occurrences of regular expression in dictionary
archives and compression	
gpg -c file	Encrypt file
gpg file.gpg	Decrypt file
tar -c dir/ bzip2 > dir.tar.bz2	Make compressed archive of dir/
bzip2 -dc dir.tar.bz2 tar -x	Extract archive (use gzip instead of bzip2 for tar.gz files)
tar -c dir/ gzip gpg -c ssh user@remote 'dd of=dir.tar.gz.gpg'	Make encrypted archive of dir/ on remote machine

	<code>find dir/ -name '*.txt' xargs cp -a --target-directory=dir_txt/ --parents</code>	Make copy of subset of dir/ and below
	<code>(tar -c /dir/to/copy) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) copy/ dir to /where/to/ dir
	<code>(cd /dir/to/copy && tar -c .) (cd /where/to/ && tar -x -p)</code>	Copy (with permissions) contents of copy/ dir to /where/to/
	<code>(tar -c /dir/to/copy) ssh -C user@remote 'cd /where/to/ && tar -x -p'</code>	Copy (with permissions) copy/ dir to remote:/where/to/ dir
	<code>dd bs=1M if=/dev/sda gzip ssh user@remote 'dd of=sda.gz'</code>	Backup harddisk to remote machine

rsync (Network efficient file copier: Use the --dry-run option for testing)

	<code>rsync -P rsync://rsync.server.com/path/to/file file</code>	Only get diffs. Do multiple times for troublesome downloads
	<code>rsync --bwlimit=1000 fromfile tofile</code>	Locally copy with rate limit. It's like nice for I/O
	<code>rsync -az -e ssh --delete ~/public_html/ remote.com:'~/public_html'</code>	Mirror web site (using compression and encryption)
	<code>rsync -auz -e ssh remote:/dir/ . && rsync -auz -e ssh . remote:/dir/</code>	Synchronize current directory with remote one

ssh (Secure SHell)

	<code>ssh \$USER@\$HOST command</code>	Run command on \$HOST as \$USER (default command=shell)
•	<code>ssh -f -Y \$USER@\$HOSTNAME xeyes</code>	Run GUI command on \$HOSTNAME as \$USER
	<code>scp -p -r \$USER@\$HOST: file dir/</code>	Copy with permissions to \$USER's home directory on \$HOST
	<code>scp -c arcfour \$USER@\$LANHOST: bigfile</code>	Use faster crypto for local LAN. This might saturate GigE
	<code>ssh -g -L 8080:localhost:80 root@\$HOST</code>	Forward connections to \$HOSTNAME:8080 out to \$HOST:80
	<code>ssh -R 1434:imap:143 root@\$HOST</code>	Forward connections from \$HOST:1434 in to imap:143
	<code>ssh-copy-id \$USER@\$HOST</code>	Install public key for \$USER@\$HOST for password-less log in

networking (Note ifconfig, route, mii-tool, nslookup commands are obsolete)

	<code>ethtool eth0</code>	Show status of ethernet interface eth0
	<code>ethtool --change eth0 autoneg off speed 100 duplex full</code>	Manually set ethernet interface speed
	<code>iw dev wlan0 link</code>	Show link status of wireless interface wlan0
	<code>iw dev wlan0 set bitrates legacy-2.4 1</code>	Manually set wireless interface speed
•	<code>iw dev wlan0 scan</code>	List wireless networks in range
•	<code>ip link show</code>	List network interfaces
	<code>ip link set dev eth0 name wan</code>	Rename interface eth0 to wan
	<code>ip link set dev eth0 up</code>	Bring interface eth0 up (or down)
•	<code>ip addr show</code>	List addresses for interfaces

	ip addr add 1.2.3.4/24 brd + dev eth0	Add (or del) ip and mask (255.255.255.0)
•	ip route show	List routing table
	ip route add default via 1.2.3.254	Set default gateway to 1.2.3.254
•	ss -tupl	List internet services on a system
•	ss -tup	List active connections to/from system
	host pixelbeat.org	Lookup DNS ip address for name or vice versa
•	hostname -i	Lookup local ip address (equivalent to host `hostname`)
•	whois pixelbeat.org	Lookup whois info for hostname or ip address

windows networking (Note samba is the package that provides all this windows specific networking support)

•	smbtree	Find windows machines. See also findsmb
	nmblookup -A 1.2.3.4	Find the windows (netbios) name associated with ip address
	smbclient -L windows_box	List shares on windows machine or samba server
	mount -t smbfs -o fmask=666,guest //windows_box/share /mnt/share	Mount a windows share
	echo 'message' smbclient -M windows_box	Send popup to windows machine (off by default in XP sp2)

text manipulation (Note sed uses stdin and stdout. Newer versions support inplace editing with the -i option)

	sed 's/string1/string2/g'	Replace string1 with string2
	sed 's/(.*\1)\1/\2/g'	Modify anystring1 to anystring2
	sed '/^ *#/d; /^ *\$/d'	Remove comments and blank lines
	sed ':a; /\\$\N; s/\n//; ta'	Concatenate lines with trailing \
	sed 's/[\t]*\$//'	Remove trailing spaces from lines
	sed 's/\\([`"\$\`])\\1/g'	Escape shell metacharacters active within double quotes
•	seq 10 sed "s/^/ /; s/ *\(\.\{7,\}\)/\1/"	Right align numbers
•	seq 10 sed p paste - -	Duplicate a column
	sed -n '1000{p;q}'	Print 1000th line
	sed -n '10,20p;20q'	Print lines 10 to 20
	sed -n 's/.*<title>\(.*)</title>.*/\1/ip;T;q'	Extract title from HTML web page
	sed -i 42d ~/.ssh/known_hosts	Delete a particular line
	sort -t. -k1,1n -k2,2n -k3,3n -k4,4n	Sort IPV4 ip addresses
•	echo 'Test' tr '[:lower:]' '[:upper:]'	Case conversion
•	tr -dc '[:print:]' < /dev/urandom	Filter non printable characters
•	tr -s '[:blank:]' '\t' </proc/diskstats cut -f4	cut fields separated by blanks
•	history wc -l	Count lines
•	seq 10 paste -s -d ''	Concatenate and separate line items to a

set operations (Note you can export LANG=C for speed. Also these assume no duplicate lines within a file)

sort file1 file2 uniq	Union of unsorted files
sort file1 file2 uniq -d	Intersection of unsorted files
sort file1 file1 file2 uniq -u	Difference of unsorted files
sort file1 file2 uniq -u	Symmetric Difference of unsorted files
join -t'\0' -a1 -a2 file1 file2	Union of sorted files
join -t'\0' file1 file2	Intersection of sorted files
join -t'\0' -v2 file1 file2	Difference of sorted files
join -t'\0' -v1 -v2 file1 file2	Symmetric Difference of sorted files

math

• echo '(1 + sqrt(5))/2' bc -l	Quick math (Calculate φ). See also bc
• seq -f '4/%g' 1 2 99999 paste -sd-+ bc -l	Calculate n the unix way
• echo 'pad=20; min=64; (100*10^6)/((pad+min)*8)' bc	More complex (int) e.g. This shows max FastE packet rate
• echo 'pad=20; min=64; print (100E6)/((pad+min)*8)' python	Python handles scientific notation
• echo 'pad=20; plot [64:1518] (100*10**6)/((pad+x)*8)' gnuplot -persist	Plot FastE packet rate vs packet size
• echo 'obase=16; ibase=10; 64206' bc	Base conversion (decimal to hexadecimal)
• echo \$((0x2dec))	Base conversion (hex to dec) ((shell arithmetic expansion))
• units -t '100m/9.58s' 'miles/hour'	Unit conversion (metric to imperial)
• units -t '500GB' 'GiB'	Unit conversion (SI to IEC prefixes)
• units -t '1 googol'	Definition lookup
• seq 100 paste -s -d+ bc	Add a column of numbers. See also add and funcpy

calendar

• cal -3	Display a calendar
• cal 9 1752	Display a calendar for a particular month year
• date -d fri	What date is it this friday. See also day
• [\$(date -d '12:00 today +1 day' +%d) = '01'] exit	exit a script unless it's the last day of the month
• date --date='25 Dec' +%A	What day does xmas fall on, this year
• date --date='@2147483647'	Convert seconds since the epoch (1970-01-01 UTC) to date
• TZ='America/Los_Angeles' date	What time is it on west coast of US (use tzselect to find TZ)
• date --date='TZ="America/Los_Angeles" 09:00 next Fri'	What's the local time for 9AM next Friday on west coast US

locales

• printf "%'d\n" 1234	Print number with thousands grouping appropriate to locale
-----------------------	--

• BLOCK_SIZE='\1 ls -l	Use locale thousands grouping in ls. See also l
• echo "I live in `locale territory`"	Extract info from locale database
• LANG=en_IE.utf8 locale int_prefix	Lookup locale info for specific country. See also ccodes
• locale -kc \$(locale sed -n 's/\(LC_\)\{4,\}\)=.*/\1/p') less	List fields available in locale database

recode (Obsoletes iconv, dos2unix, unix2dos)

• recode -l less	Show available conversions (aliases on each line)
recode windows-1252.. file_to_change.txt	Windows "ansi" to local charset (auto does CRLF conversion)
recode utf-8/CRLF.. file_to_change.txt	Windows utf8 to local charset
recode iso-8859-15..utf8 file_to_change.txt	Latin9 (western europe) to utf8
recode ../b64 < file.txt > file.b64	Base64 encode
recode /qp.. < file.qp > file.txt	Quoted printable decode
recode ..HTML < file.txt > file.html	Text to HTML
• recode -lf windows-1252 grep euro	Lookup table of characters
• echo -n 0x80 recode latin-9/x1..dump	Show what a code represents in latin-9 charmap
• echo -n 0x20AC recode ucs-2/x2..latin-9/x	Show latin-9 encoding
• echo -n 0x20AC recode ucs-2/x2..utf-8/x	Show utf-8 encoding

CDs

gzip < /dev/cdrom > cdrom.iso.gz	Save copy of data cdrom
mkisofs -V LABEL -r dir gzip > cdrom.iso.gz	Create cdrom image from contents of dir
mount -o loop cdrom.iso /mnt/dir	Mount the cdrom image at /mnt/dir (read only)
wodim dev=/dev/cdrom blank=fast	Clear a CDRW
gzip -dc cdrom.iso.gz wodim -tao dev=/dev/cdrom -v -data -	Burn cdrom image (use --prcap to confirm dev)
cdparanoia -B	Rip audio tracks from CD to wav files in current dir
wodim -v dev=/dev/cdrom -audio -pad *.wav	Make audio CD from all wavs in current dir (see also cdrdao)
oggenc --tracknum=\$track track.cdda.wav -o track.ogg	Make ogg file from wav file

disk space

• ls -lSr	Show files by size, biggest last
• du -s * sort -k1,1rn head	Show top disk users in current dir. See also dutop
• du -hs /home/* sort -k1,1h	Sort paths by easy to interpret disk usage
• df -h	Show free space on mounted filesystems
• df -i	Show free inodes on mounted filesystems
• fdisk -l	Show disks partitions sizes and types (run as root)

• rpm -q -a --qf '%10{SIZE}\t%{NAME}\n' sort -k1,1n	List all packages by installed size (Bytes) on rpm distros
• dpkg-query -W -f='\${Installed-Size;10}\t\${Package}\n' sort -k1,1n	List all packages by installed size (KBytes) on deb distros
• dd bs=1 seek=2TB if=/dev/null of=ext3.test	Create a large test file (taking no space). See also truncate
• > file	truncate data of file or create an empty file

monitoring/debugging

• tail -f /var/log/messages	Monitor messages in a log file
• strace -c ls >/dev/null	Summarise/profile system calls made by command
• strace -f -e open ls >/dev/null	List system calls made by command
• strace -f -e trace=write -e write=1,2 ls >/dev/null	Monitor what's written to stdout and stderr
• ltrace -f -e getenv ls >/dev/null	List library calls made by command
• lsof -p \$\$	List paths that process id has open
• lsof ~	List processes that have specified path open
• tcpdump not port 22	Show network traffic except ssh. See also tcpdump_not_me
• ps -e -o pid,args --forest	List processes in a hierarchy
• ps -e -o pcpu,cpu,nice,state,cputime,args --sort pcpu sed '/^ 0.0 /d'	List processes by % cpu usage
• ps -e -orss=,args= sort -b -k1,1n pr -TW\$COLUMNS	List processes by mem (KB) usage. See also ps_mem.py
• ps -C firefox-bin -L -o pid,tid,pcpu,state	List all threads for a particular process
• ps -p 1,\$\$ -o etime=	List elapsed wall time for particular process IDs
• watch -n.1 pstree -Uacp \$\$	Display a changing process subtree
• last reboot	Show system reboot history
• free -m	Show amount of (remaining) RAM (-m displays in MB)
• watch -n.1 'cat /proc/interrupts'	Watch changeable data continuously
• udevadm monitor	Monitor udev events to help configure rules

system information

• uname -a	Show kernel version and system architecture
• head -n1 /etc/issue	Show name and version of distribution
• cat /proc/partitions	Show all partitions registered on the system
• grep MemTotal /proc/meminfo	Show RAM total seen by the system
• grep "model name" /proc/cpuinfo	Show CPU(s) info
• lspci -tv	Show PCI info

• lsusb -tv	Show USB info
• mount column -t	List mounted filesystems on the system (and align output)
• grep -F capacity: /proc/acpi/battery/BAT0/info	Show state of cells in laptop battery
# dmidecode -q less	Display SMBIOS/DMI information
# smartctl -A /dev/sda grep Power_On_Hours	How long has this disk (system) been powered on in total
# hdparm -i /dev/sda	Show info about disk sda
# hdparm -T /dev/sda	Do a read speed test on disk sda
# badblocks -s /dev/sda	Test for unreadable blocks on disk sda
interactive	
• readline	Line editor used by bash, python, bc, gnuplot, ...
• screen	Virtual terminals with detach capability, ...
• mc	Powerful file manager that can browse rpm, tar, ftp, ssh, ...
• gnuplot	Interactive/scriptable graphing
• links	Web browser
• xdg-open .	open a file or url with the registered desktop application

MS WORD 2010 THEORY

Objectives : At the end of this lesson you shall be able to

- state what is MS Office
- brief what is MS Word and starting steps
- explain various screen blocks of MS Word
- explain procedures to create, save, print a document!

Microsoft office is a application software package introduced by Microsoft Corporation. MS Office consists of the following popular packages :

- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint
- Microsoft Access
- Microsoft Outlook

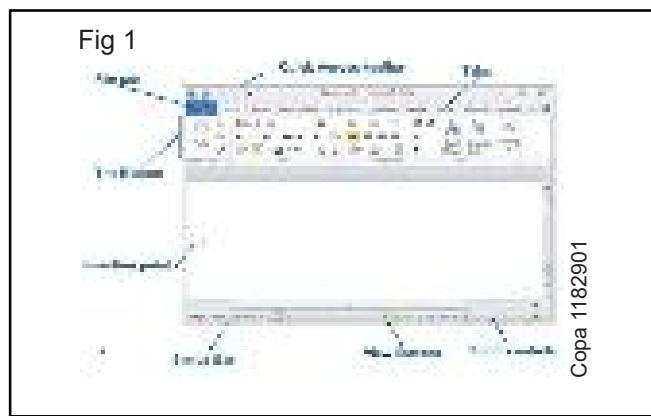
Word 2010

It is a word processor package that helps to create and edit a document. It is the most known word processor of nowadays. It makes professional looking documents by providing a comprehensive set of tools for creating and formatting a document, memos, letters, reports, brochures, business documents and even internet web pages.

Starting Word

Click on the Start > (windows Logo) All programmes > Microsoft office > Microsoft Word. MS Word opens along with a default blank document with default settings page layout.

Fig 1 - Default page layout

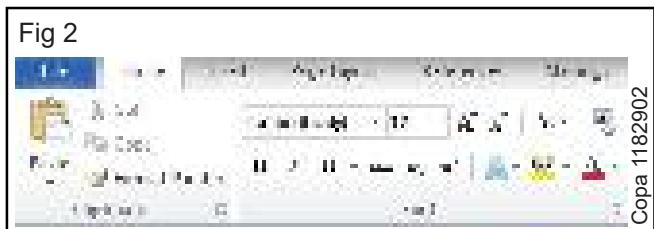


Unlike previous version, MS Office 2010 has a common set of features for all the components. It makes it easy to understand and common utilities to remain available on all the packages of MS Office including Word, Excel, PowerPoint, Access, etc. Many features are redesigned so as enabling the diverted users of other packaged can afford with. These enhancements and utilities in Word 2010 are described as below.

The Ribbon tab of Word has eight major parts viz. File, Home, Insert, Page Layout, References, Mailings, Review and View.

File tab of the ribbon is useful to create a new file, a blank or a template page as required. Ctrl + N always create a new blank document in Office Package. The documents so created can be saved as default word document or given compatible format. Furthermore, permission for accessing a documents can be fixed, share a document on a network, even manage a document to be compatible with previous and external versions. Print option makes the document to get a hard copy or a pdf format according to the installed printer features. Recently opened files can also be viewed to find it easy to work again. Help on word is there in the same tab.

Fig. 2 Home Tab



Home tab has clipboard options including cut, copy, paste and paste special. The Font block has all the options of setting fonts, size, superscript, subscript, bold, italic, underline, strikethrough, font colors, etc.

Fig 3 - Paragraph Group



Paragraph group creates the formatting paragraphs with alignments left, right, center, justify and indentations, para and line spacing. Line and page breaks allows to create pagination options and exceptions of formatting.

Fig 4 - Styles and Editing Group

Fig 4



The Styles group allows preformatted text styles like Heading styles, Paragraph styles, Subtitles, etc. Custom styles can also be stored with altered specifications. The Editing group used to select specific area, find and / or replace option in a specified area in text.

The Insert tab has 7 groups. Fig 5 - Pages, Tables and Illustrations blocks (Fig 5)

Fig 5



Page group makes cover pages, blank pages insertion and page breaks. Tables group helps to insert a table in a text document with ready specified row-column set or a customized table format. Illustration group inserts pictures from external sources, cliparts, shapes, smart art, charts of data, even screenshot into the text document.

Fig 6 - Links and Header/Footer Groups

Fig 6



Links group creates hyperlink on texts, bookmarks and cross references in a document.

The header and footer group inserts header, footer to be appearing on every page and page numbers to display as to placement area.

Fig 7 - Text and Symbols block

Fig 7



Text group allows creating text box, quick parts likely to create brochures, designed text as WordArt, paragraph styles, a signature line, date and time and an object insert option.

Symbols group inserts symbols of equations like math equations or symbols like currency, math symbols, etc.

Fig 8 - Themes and Page Setup Group

Fig 8



Page Layout tab has five major groups. Themes block creates predefined template setup using themes on documents. Even new themes customized can be created and saved for future use.

Page setup group has features on margin around, page orientation i.e. vertical or horizontal, paper size, columns to display, breaks, line numbers and hyphenation.

Fig 9 - Page Background and Paragraph Group

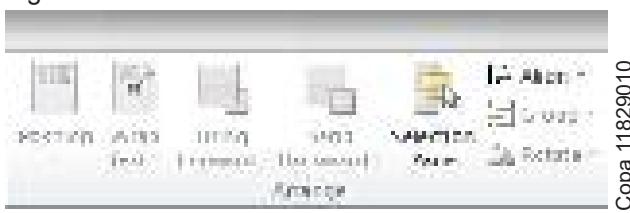
Fig 9



Page Background group creates a watermark, page Background color and page borders. Paragraph block has specified options already discussed in Home -> Paragraph group.

Fig 10 - Arrange Group

Fig 10



The arrange group creates position of objects, text elements, text wrapping, arranging objects, aligning of objects, grouping and transformations.

References tab has six blocks.

Fig 11 - TOC and Footnotes Group

Fig 11

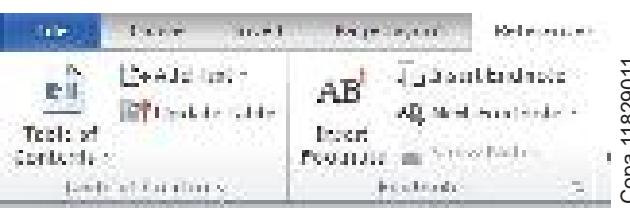


Table of contents creates the TOC of a particular publication document automatically and upon modifications updatable. Footnotes tab creates footnotes of a page, block area which includes explanatory phrases or references. Endnote makes the note at the end of the document.

Fig 12 - Citations, Bibliography and Captions Group



Citation and Bibliography makes an external source as citation, reference tables and credits of authors related to the publication. Captions tab inserts a caption, table of figures, cross references inside a text.

Fig 13 - Index and Table of Authorities Group



Index enters a value on a main topic or sub topic and create the index accordingly. Table of authorities has the citation mark includes the list of the cases, statutes and other authorities cited in the document.

Fig 14 - Create and Mailmerge Groups



Mailings tab used to create mailing of a letter or order using common mailing features. Create block makes envelopes print using predefined formats as well as custom formats. Labels can also be printed to which the delivery address is mentioned.

Mail merge block is used to create mail merge of a letter, email. If a common letter is created and to be sent to many recipients, this option allows to create an Address block where the recipient's info should appear. Even selective recipients can be listed as well as a new recipient list can be created.

Fig 15 - Write and Insert fields Group



While writing a letter, it has many parts, which this mail merge creates fields of Address Block, Greetings Line, Merged field of content, labels, etc.

Fig 16 - Preview Results and Finish Groups



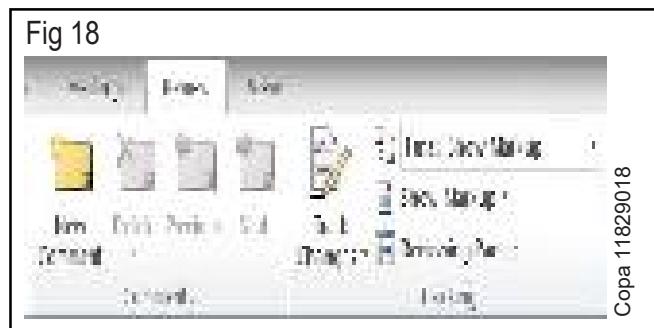
On successful completion of mail merge, it can be previewed and checked for errors for each recipients and edit accordingly. Upon validation the mail merge gets finished.

Fig 17 - Proofing and Language Groups



Review tab here is used for the various document areas to be reviewed. Proofing makes easier to check Spelling and Grammar of a document. Accidental errors can be corrected here. Research refines the search not only inside the document, but also the referenced documents. Thesaurus identifies the completeness of the document using the standard language compatibility of the region like English UK or English USA etc. Word count shows the analysis of the document as total words, total characters, with and without spaces, no. of paragraphs, lines, etc. Here Text blocks can also be included for such analysis.

Language Block helps to translate a page into the installed other languages and to change the proofing language. It requires the direct translator service from Microsoft Online.

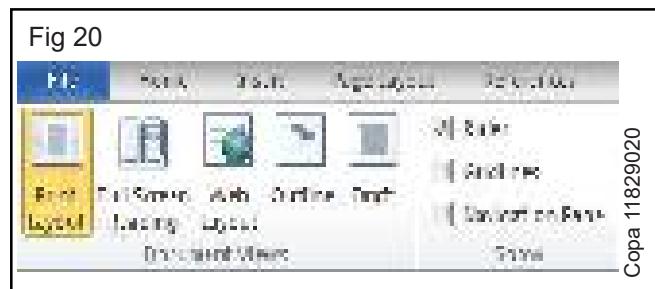
Fig 18 - Comments & Tracking Group

Comments group inserts a comment for a specific paragraph or text block.

Tracking group finds the changes made on a document by other authors in a protected mode. For example, if a document is created by user X and edited by user Y, is tracked separately with Track marks.

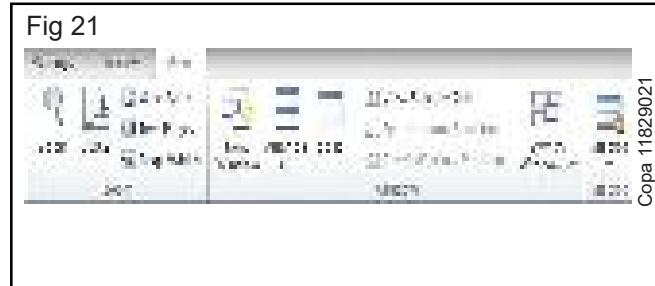
Fig 19 - Changes, Compare and Protect Groups

Changes hence made on the documents can either then accepted or rejected. More than a document can be compared for similarity using Compare. Also the document can be protected from editing by other authors.

Fig 20 - Document views and show Groups

View tab shows the way of displaying the word document. Document views have a Print Layout, a common view of Word, Full Screen Reading, minimises the tabs and ribbons to disappear and easy to read, Web Layout, which previews a html compatible view, Outline, views the basic version of document in mere text mode and Draft mode for a text editing mode.

The Rulers, Gridlines and Navigation Pane can be shown or hidden according to user preferences.

Fig 21 - Zoom / Window / Macro Groups

Also the view of the page can be Zoomed to full page, two pages view, 100% of the document and custom view. To make easy editing a document the window can be split into two, a new window for a document to cut paste, etc. can be created and all open word documents can be arranged for view. While formatting the documents, for repetition of commands the Macro option can be used. It uses the Record option to store the set of commands and repeat it again on other part of document or on another document on a single click.

Creating a file, save and other options

Objectives: At the end of this lesson you shall be able to

- explain how to create a new document, save and print
- state how to edit, format text and document styles
- brief using tables inside word document with data
- explain how to create styles in a document and save for future use
- explain Few unique features of Word 2010
- brief the mail merge processing

Fig 1 - File Info view



Word 2010 new document can be created as usual with Ctrl + N or through File menu New option. Basically the file created is saved as a word document extended format as docx in word file.

Fig 2 - Save options in Word



It can be saved using save as option in any compatible format or old versions of office, like 2003 or earlier versions. Main utility of the word software is the creation of word processing documents. It may be any of a format like publication, letter, brochure, etc. Word supports all type of formatting to design a text based presentation. Also it supports output files in major accepted formats according to industry standards.

Fig 3 - Print options in word

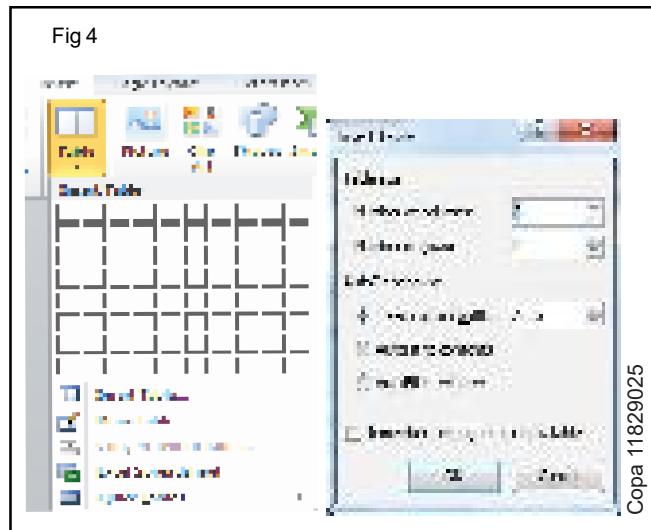


The saved documents can be printed using the File Menu → Print option and the installed printer support makes it easy to get the document printed. If Adobe Acrobat Professional is installed, the same document can be stored as a PDF file for sharing purposes. Apart from printing and storage, the file created can be published in web as a web page or template that can be used for future publications in same format.

Basic concepts to be noted while using Word are Text properties. It includes Font type, Font size, Text Color, and usual decorations of text. Also creating of paragraphs styles are to be kept in mind. Paragraph alignment has left, right, center and justified settings. Text elements may contain items like ordered list, unordered list, subsection lists. They are found there paragraph formatting block of Home Tab. Indenting of text for creating Quotes is also there inside the same tab. According to the page size, line spacing and paragraph spacing can be adjusted, like before and after paragraph spaces, line heights, etc. The Styles can be predefined to use as ready to put on places where it required. Standard templates are available but it allows to create custom styles too.

Tables can be inserted for various utilities. Normal table has adjustable width and columns so it can simply inserted with Insert > Table option directly.

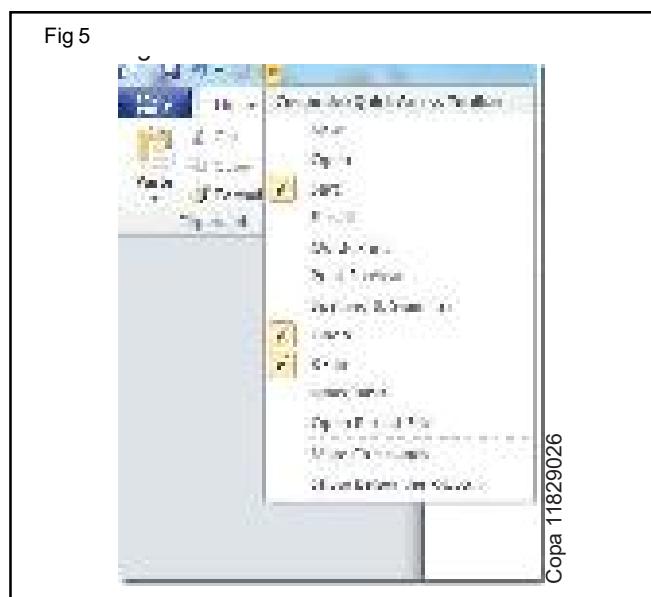
Fig 4 - Table insert wizard options



In case of custom sized table is required, it can be created using insert table / draw table options. Insert table allows custom values for columns, width and other properties. Draw table creates custom table using a pen drawing tool through which new table can be drawn according to the available text contents.

Customizable Quick Access Tool Bar

Word 2010's Quick Access Toolbar displays all the commonly used options. It is located in the top left side corner of the application window, near the office button. By default it displays the following three options, Save, Undo and Redo, but is customizable and you may easily add more options to it. (Fig 5)



Paste Preview

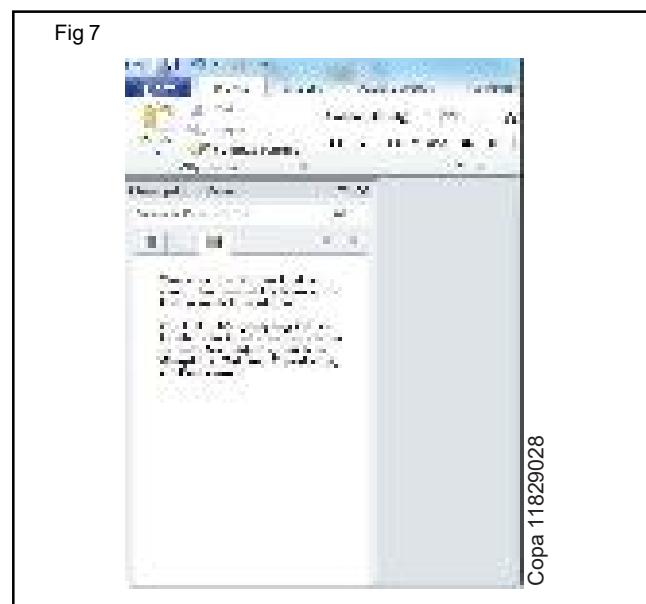
It happens with most users that after copying and pasting something into their document, they need to undo the some changes. Word 2010 has made it easy for users, now you may eliminate this unnecessary step by using the paste preview option. It allows users to paste only the values or the formatting. (Fig 6)

Fig 6



Navigation Pane

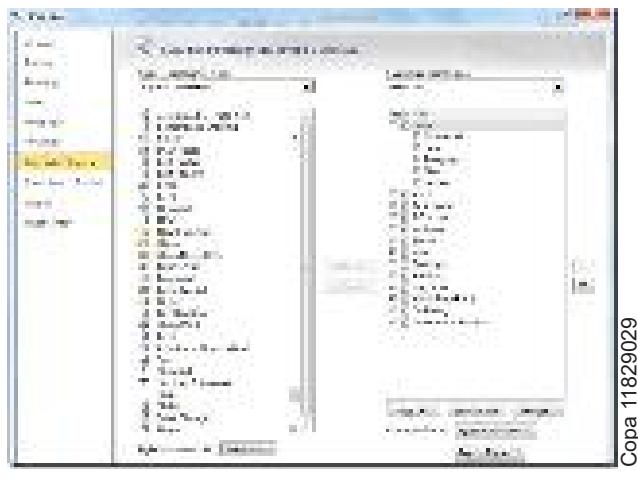
In the previous versions of Microsoft Office, one has to use the Ctrl+F hotkey to find any word or phrase from within a document. Word 2010 has added a new magic to this option, Ctrl+F now summons a Navigation Pane that appears on the left side of the document. You will see the three views available by clicking on their respective tabs, the Heading View, Thumbnail Page View, and the Search Result View. (Fig 7)



Customizable Ribbon Button

Apparently the Ribbon button in Word 2010 looks like the one in Word 2007. But there is one big addition, you may customize the word 2010's Ribbon button. In order to customize the Ribbon button navigate to the following option Office Button > Word Option > Customize Ribbon. (Fig 8)

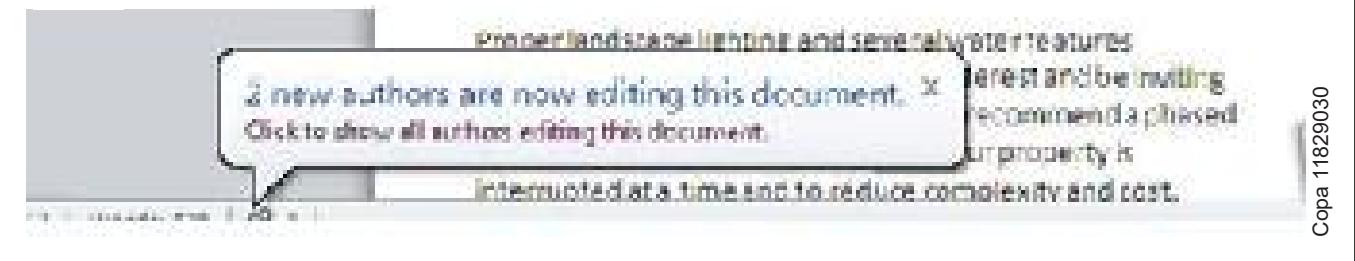
Fig 8



Improved Collaborations

Microsoft Word 2010 has a new feature called co-authoring. It allows more than one authors to edit a document at the same time. Word 2010 tells you how many authors are editing the document and their changes can be viewed too. (Fig 9)

Fig 9



Screen Capture Tool

Word 2010 includes a feature called Screen Capturing, now there is no need to use a third party or additional tool to capture a screenshot in order to use it in Word, just simply use Word 2010's built in tool to capture any area of the screen. A Screenshot may be taken by navigating to the following option Insert > Screenshot. (Fig 10)

Fig 10



Artistic Effects

In Word 2010 users can now apply a number of snazzy artistic effects to the pictures. In order to add the artistic effects to your document, Navigate to the following option Insert > Illustrations > Picture. Then browse and select the picture you want, Once the picture is added to your document, then the Picture Tools contextual tab is displayed and you will be able to see the new Artistic Effects drop down button over here. (Fig 11)

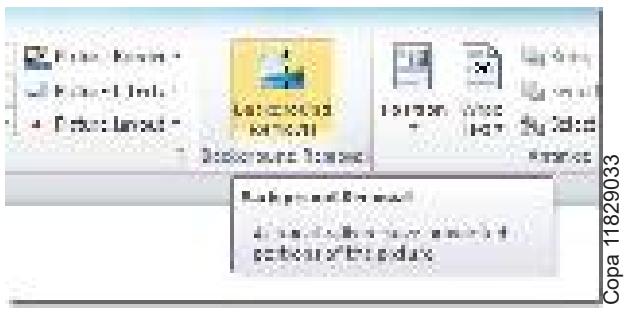
Fig 11



The Background Removal Option

Office 2010 has an awesome option by the name of Background Removal, which simply removes the background of any image. Yes, you don't need Photoshop anymore to remove the background. First insert the picture in your Word document from the Insert > Picture option. Then locate the Background Removal tool and get rid of the background. (Fig 12)

Fig 12



Office Backstage

The Office Backstage is a new concept, it is the enhanced form of the plain old office button and provides a much user-friendly menu. It helps users to manage documents, presentations, or spreadsheets at a greater level. (Fig 13)

Fig 13

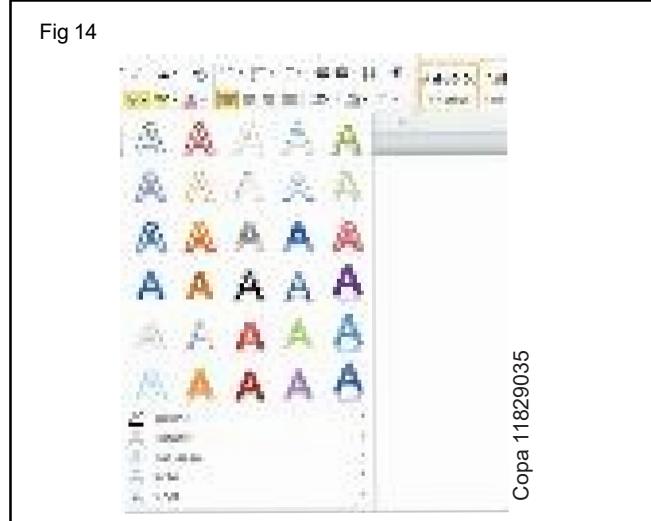


Interesting feature, right? Read more about it here.

New Art Effects in WordArt

Just like other features, WordArt has been updated with new colorful art effects. Select the text, then click Word Art and a list of all the available options will be displayed. (Fig 14)

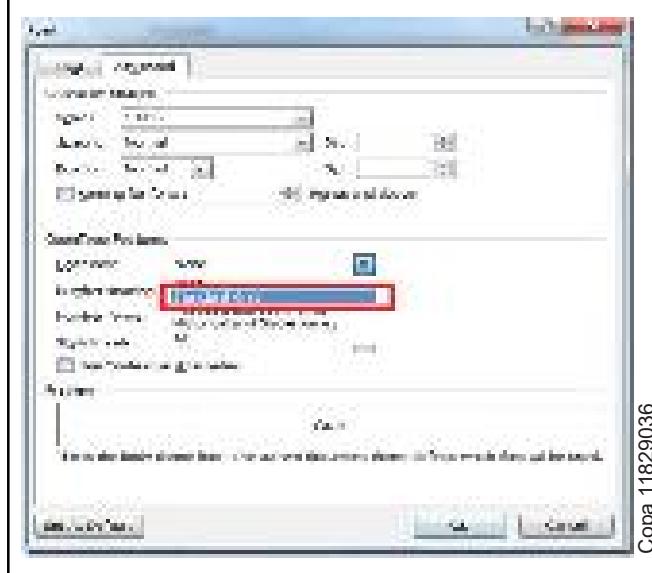
Fig 14



Ligatures

You might have heard about Ligatures. They make the fonts look fancy and they are also used to keep letters separate allowing you to search the text as if the font were regular. Its true that not all fonts support ligatures, but a large variety of the fonts supports them. You may enable them from Font Preferences > advanced, then select the standard only option in the ligatures drop down box. (Fig 15)

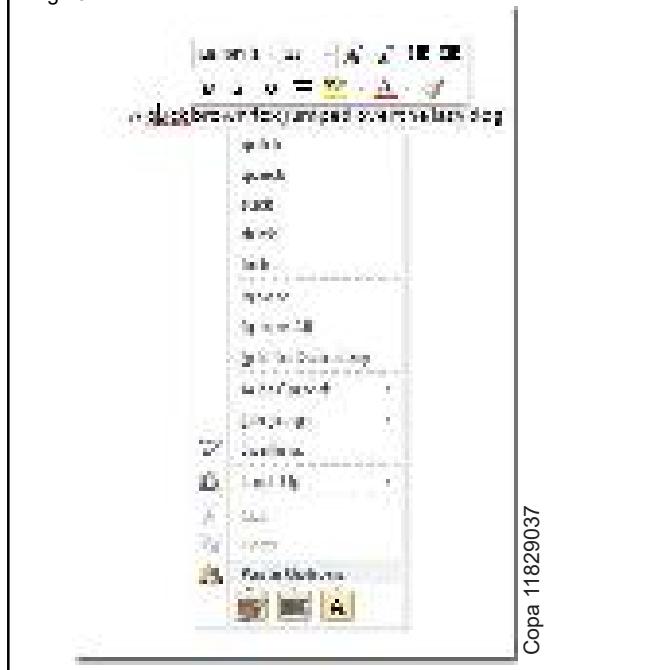
Fig 15



Improved Spell Checks

Word 2010 has added some new features to its spell checker, now it will detect the mistake and suggest changing the sentence.

Fig 16



Shortcut keys in Word 2010

Objective : at the end of the lesson you shall be able to

- Learn the shortcut keys in MS Word.

CTRL+SHIFT+A	converts the selected text to capital letters or vice versa
CTRL+SHIFT+F	Displays the Font dialog box.
CTRL+SHIFT+G	Displays the Word Count dialog box.
CTRL+SHIFT+S	Displays the Apply Styles task pane.
ALT+R	Displays the Review tab
ALT+CTRL+1	Apply Heading 1, Similarly ALT + CTRL + 2 will apply heading 2
CTRL+SHIFT+L	Applies Bullets
CTRL+SHIFT+F5	Bookmark
CTRL + B	Bold Text
CTRL + I	Italic Text
CTRL + U	Underline Text
CTRL+PAGE DOWN	Next
CTRL+E	Navigate to the center Paragraph
CTRL+SHIFT+ENTER	Column Break
CTRL+SHIFT+C	Copy Format
ALT+SHIFT+F7	Dictionary
ALT+CTRL+S	Splits the Document
CTRL+SHIFT+D	Double Underline
CTRL+END	End of Document
END	End of line
CTRL+SHIFT+P	Font size select
SHIFT+F5 or ALT+CTRL+Z	Go Back to previous state

CTRL+SHIFT+.	Grow Font
CTRL+]	Grow Font one point
ALT+SHIFT+R	Header Footer Link
CTRL+K	Hyperlink
CTRL+M	Indentation
CTRL+J	Justifies Paragraph
ALT+F8	Inserts Macros
ALT+SHIFT+K	Mail Merge Check
F10	Menu Mode
ALT+F7	Moves to the Next Misspelling
CTRL+H	Replace
CTRL+P	Print
CTRL+SHIFT+F12	Also launches Print
ALT+SHIFT+BACKSPACE	Redo
F12	Save As
CTRL+SHIFT+K	Small Caps
CTRL+SHIFT+S	Style
SHIFT+F7	Thesaurus
ALT+SHIFT+T	Time Field
CTRL+SHIFT+M	Unindent
	-

Typing practice using open source typing tutor tools

Objectives : At the end of this lesson you shall be able to

- understand about typing software
 - typing Tutor tools.
-

You will be able to learn touch typing quickly and efficiently with the program's intelligent practice lessons, useful support functions and an extensive progress tracker. You can also play a typing game and expand the program with open lessons or make your own to meet your specific needs.

Full courses for Beginner, Advanced and Expert typists

- Introduction course. First time using keyboard. The course covers all characters typed on your keyboard.
- Beginner course. This course helps to learn the position of keys on the keyboard. After completing this course, you will know which finger to use to hit each key without looking at the keyboard. The course also covers upper-case letters, special symbols, and the numeric pad.
- Advanced course, helps to improve your typing speed by memorizing frequently used syllables and words.

Expert course helps you to perfect the skills acquired by typing an actual text.

Progress Tracking

- The statistics reflect your typing speed, accuracy and time-out, complete with a summary at the end of each lesson.
- and it suggests your next step: Go to the next lesson or Try again comparing the results with Course goals.
- You can evaluate your own performance or students at any time by simply looking at charts.
- overall lesson rate, typing speed(WPM, CPM, KPM, WPS, CPS, KPS), accuracy and time-out are enabled in the both: table and chart presentation
- also, for each lesson, statistics by each character and keystroke in the column charts

The Typing Tutor Advantage

- Easy to Get Started
Create classes to group your students, and Import your entire student roster using our simple Student Import tool.
- Reporting
Access and export detailed reporting data. Reports and graphs exist for all levels of data.
- Statistical Graphs & Charts
Both students and teachers have access to detailed graphs and statistics to track progress.
- Complete Course - Novice to Professional
Beginner, Intermediate, Advanced, and Specialty Lessons to help typists of all levels.
- Fun Interactive Typing Games
Students can take a break from the exercises to practice with several educational typing games.
- Typing Test
Students can repeat the typing test to track their progress over time.
- Helpful Typing Hints & Tips
Tips and helpful technique information is constantly provided to reinforce proper typing techniques.
- On-Screen Keyboard & Hand Diagram
Key position and proper finger placement is always displayed to keep beginners from looking at their hands.

Introduction to MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
 - formulas and Functions
 - move Around in Excel 2010
 - conditional Formatting
 - link Excel Spreadsheet Data
-

Features & Functions of Microsoft Excel

Whether for work or home use, an Excel spreadsheet is the best tool in Microsoft Office for organizing data and making lists. Although Word documents can include tables and columns, Excel makes laying out information easier. Excel also has a range of functions for designing formulas that automate calculations. Although Excel looks intimidating at first, the program's layout is similar to other Office applications.

Cells and Worksheets

The main portion of Excel's window consists of a spreadsheet -- or worksheet of cells. Just as with a paper spreadsheet, each cell can contain any numbers or any text -- unlike working with an Access database, Excel allows to simply click on any cell and fill it however best fits the project.

In some cases, such as to track spending, if want to use an organized series of rows and columns. Other times, such as building a list of team members, cell order and positioning won't play a major role. One advantage to Excel is how simple it makes reorganizing data: select a cell and drag its border to move it to a new spot on the sheet.

Excel Workbooks

Every Excel file, called a workbook, contains one or more worksheets. To switch between sheets in a workbook, use the tabs in the lower left corner of the window. Since Excel 2010, most workbooks use the file extension XLSX,

whereas older versions used XLS files. New copies of Excel can read these old files, but to open a new workbook in an old edition, the old PC needs the Office compatibility pack.

Formulas and Functions

In addition to containing plain text and numbers, cells can contain formulas, which always start with an equals sign. With a formula, Excel displays the result of an equation in a cell, but automatically keeps that result up-to-date as you change its components. A basic formula can take the place of a calculator: write "=2+4" and Excel displays "6." Formulas also work with data in other cells: "=A1+B1" adds the values of cells A1 and B1.

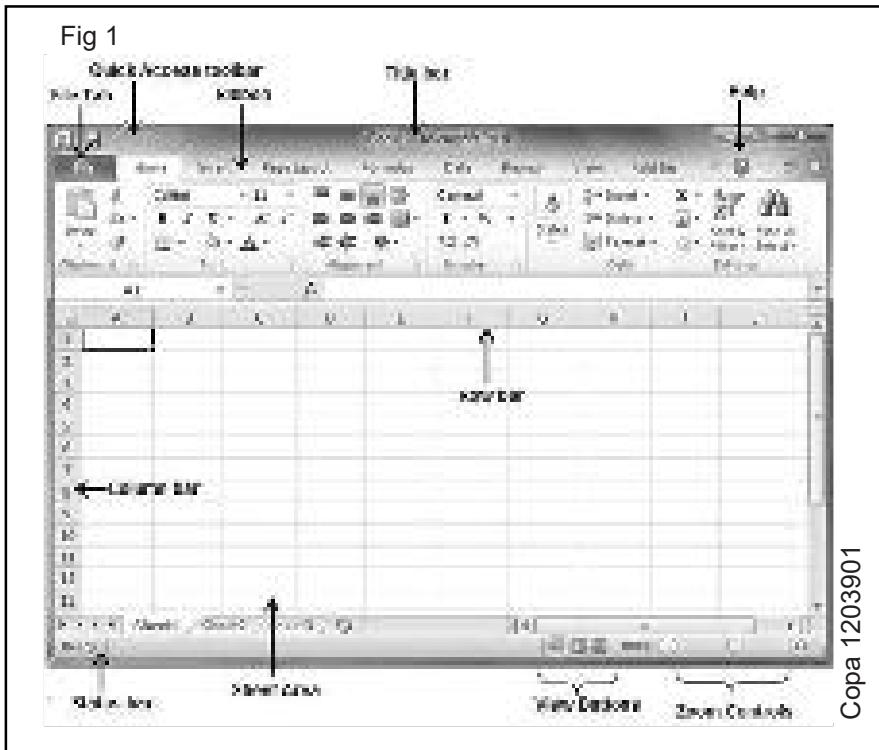
For procedures other than direct arithmetic, use functions to perform various operations on data. Functions' abilities range from simple math, such as "AVERAGE" to average a range of cells, to modifying text, such as "LOWER" to convert a line to lower case.

The two terms are often confused, but remember that each cell can contain only one formula, but each formula can use multiple functions, such as "=AVERAGE(A1, B1)+SUM(A2, B2)" to add the sum of two cells to the average of two other cells.

The following basic window appears when you start the excel application. Let us

now understand the various important parts of this window as shown in fig-1.

Ribbon Tabs



As with the rest of Office since 2007, Microsoft has replaced Excel's menus with ribbon tabs as shown in fig-2. The tab as visual menus that remain open each tab contains a set of related features with explanatory icons. For example, the Home tab contains the most common options, such as font and text color, while the Insert tab offers ways to insert tables, text boxes and charts. One tab, File, behaves differently. File still contains basic tasks including "New," "Open" and "Save," but displays these tasks in a full-screen area with extra options, called the backstage view. For example, the "New" button in the backstage view offers a searchable selection of templates for new workbooks.

Ribbon contains commands organized in three



components:

Tabs: They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout is the examples of ribbon tabs.

Groups: They organize related commands; each group name appears below the group on the Ribbon. For example, group of commands related to fonts or group of commands related to alignment etc.

?Home: Use this tab when creating, formatting, and editing a spreadsheet.

This tab is arranged into the Clipboard, Font, Alignment, Number, Styles, Cells, and Editing groups.

Insert: Use this when adding particular elements (including graphics, PivotTables, charts, hyperlinks, and headers and footers) to a spreadsheet. This tab is arranged into the Tables, Illustrations, Sparkline, Filter, Charts, Links, and Text groups.

Page Layout: Use this tab when preparing a spreadsheet for printing or reordering graphics on the sheet. This tab is arranged into the Themes, Page Setup, Scale to Fit, Sheet Options, and Arrange groups.

Formulas: Use this tab when adding formulas and functions to a spreadsheet or checking a worksheet for formula errors. This tab is arranged into the Function Library, Defined Names, Formula Auditing, and Calculation groups. Note that this tab also contains a Solutions group when activate certain add-in programs,

Data: Use this tab when importing, querying, outlining, and subtotaling the data placed into a worksheet's data list. This tab is arranged into the Get External Data, Connections, Sort & Filter, Data Tools, and Outline groups.

Review: Use this tab when proofing, protecting, and marking up a spreadsheet for review by others. This tab is arranged into the Proofing, Language, Comments, and Changes groups. Note that this tab also contains an Ink group with a sole Start Inking button if you're running Office 2010 on a Tablet PC or on a computer equipped with some sort of electronic input tablet.

View: Use this tab when changing the display of the Worksheet area and the data it contains. This tab is arranged into the Workbook Views, Show, Zoom, Window, and Macros groups.

Title Bar

This lies in the middle and at the top of the window. Title bar shows the program and the sheet titles.

Help

The Help Icon can be used to get excel related help anytime you like. This provides nice tutorial on various subjects related to excel.

Zoom Control

Zoom control lets to zoom in for a closer look at your text. The zoom control consists of a slider that user can slide left or right to zoom in or out. The + buttons can be clicked to increase or decrease the zoom factor.

View Buttons

The group of three buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch among excel's various sheet views.

Normal Layout view: This displays the page in normal view.

Page Layout view: This displays pages exactly as they will appear when printed. This gives a full screen look of the document.

Page Break view: This shows a preview of where pages will break when printed.

Sheet Area

The area where to enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type.

Row Bar

Rows are numbered from 1 onwards and keeps on increasing as to keep entering data. Maximum limit is 1,048,576 rows.

Column Bar

Columns are numbered from A onwards and keeps on increasing as to keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.

Status Bar

This displays the sheet information as well as the insertion point location. From left to right, this bar can contain the total number of pages and words in the document, language etc.

User can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list

File Tab

The File tab replaces the Office button from Excel 2010. User can click it to check the Backstage view, where user come to open or save files, create new sheets, print a sheet, and do other file-related operations.

Quick Access Toolbar

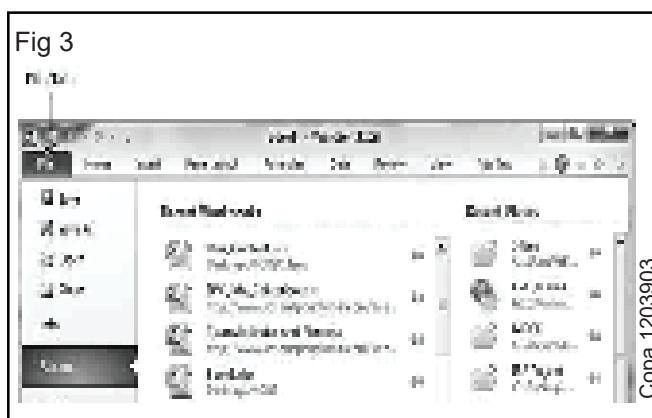
The File tab and its purpose is to provide a convenient resting place for the Excel's most frequently used commands. And customize this toolbar based on the comfort.

Dialog Box Launcher(Fig-3)

This appears as a very small arrow in the lower-right corner of many groups on the Ribbon. Clicking this button opens a dialog box or task pane that provides more options about the group.

If already have an opened sheet then it will display a window showing the

details about the opened sheet as shown fig-4. Backstage view shows three columns when select most of the available options in the first column.



First column of the backstage view will have the following options as shown in

Table-1:

Option	Description
Save	If an existing sheet is opened, it would be saved as is, otherwise it will display a dialogue box asking for the sheet name.
Save As	A dialogue box will be displayed asking for sheet name and sheet type. By default, it will save in sheet 2010 format with extension .xlsx.
Open	This option is used to open an existing excel sheet.
Close	This option is used to close an opened sheet.
Info	This option displays the information about the opened sheet.

Option	Description
Recent	This option lists down all the recently opened sheets.
New	This option is used to open a new sheet.
Print	This option is used to print an opened sheet.
Save & Send	This option saves an opened sheet and displays options to send the sheet using email etc.
Help	You can use this option to get the required help about excel 2010.
Options	Use this option to set various option related to excel 2010.
Exit	Use this option to close the sheet and exit.

Sheet Information

When click Info option available in the first column, it displays the following information in the second column of the backstage view:

Compatibility Mode: If the sheet is not a native excel 2007/2010 sheet, a Convert button appears here, enabling to easily update its format. Otherwise, this category does not appear.

Permissions: This option used to protect the excel sheet. And can set a password so that nobody can open the sheet, or lock the sheet so that nobody can edit the sheet.

Prepare for Sharing: This section highlights important information should know about the sheet before send it to others, such as a record of the edits the made as developed the sheet.

Versions: If the sheet has been saved several times, and may be able to access previous versions of it from this section.

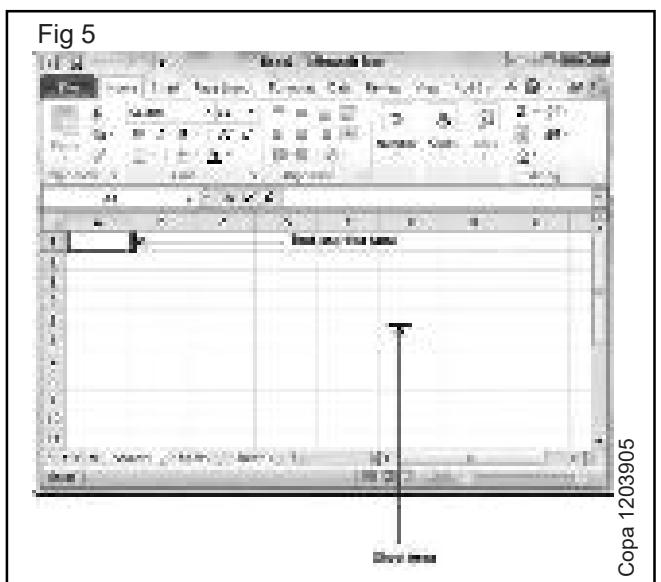
Sheet Properties

When click Info option available in the first column, it displays various properties in the third column of the backstage view. These properties include sheet size, title, tags, categories etc.

User can also edit various properties. Just try to click on the property value and if property is editable, then it will display a text box where can add the text like title, tags, comments, Author.

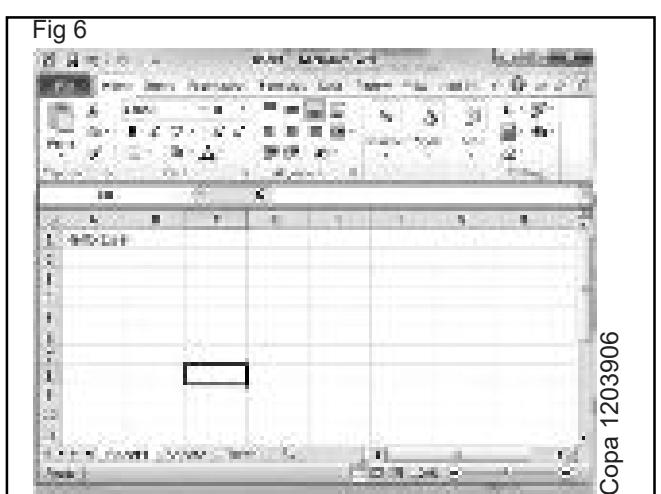
Entering values

A new sheet is displayed by default when open an excel sheet as shown in the fig-5 screen shot.



Sheet area is the place of type the text. The flashing vertical bar is called the insertion point and it represents the location where text will appear when type. When click on a box then the box is highlighted. When double click the box, the flashing vertical bar appears and can start entering the data.

So, just keep the mouse cursor at the text insertion point and start typing whatever text would like to type. We have typed only two words "HelloExcel" as shown fig-6. The text appears to the left of the insertion point.



There are following three important points, which would help while typing:

- Press Tab to go to next column.
- Press Enter to go to next row.
- Press Alt + Enter to enter a new line in the same column.

Move Around in Excel 2010

Excel provides a number of ways to move around a sheet using the mouse and the keyboard.

First of all, let us create some sample text before we proceed. Open a new excel sheet and type any data. A sample data table as shown table-2 and fig-7.

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

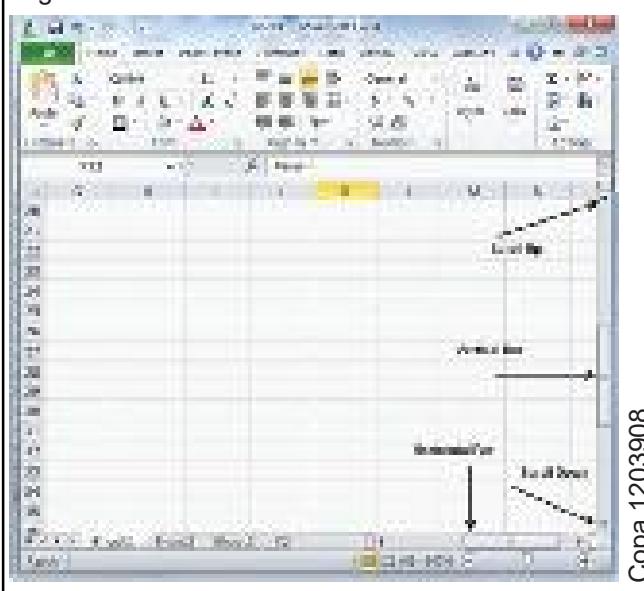
Fig 7 Table-2

OrderDate	Region	Rep	Item	Units	Unit Cost	Total
1/6/2010	East	Jones	Pencil	95	1.99	189.05
1/23/2010	Central	Kivell	Binder	50	19.99	999.5
2/9/2010	Central	Jardine	Pencil	36	4.99	179.64
2/26/2010	Central	Gill	Pen	27	19.99	539.73
3/15/2010	West	Sorvino	Pencil	56	2.99	167.44
4/1/2010	East	Jones	Binder	60	4.99	299.4
4/18/2010	Central	Andrews	Pencil	75	1.99	149.25
5/5/2010	Central	Jardine	Pencil	90	4.99	449.1
5/22/2010	West	Thompson	Pencil	32	1.99	63.68
6/8/2010	East	Jones	Binder	60	8.99	539.4
6/25/2010	Central	Morgan	Pencil	90	4.99	449.1
7/12/2010	East	Howard	Binder	29	1.99	57.71
7/29/2010	East	Parent	Binder	81	19.99	1,619.19
8/15/2010	East	Jones	Pencil	35	4.99	174.65

Moving with Mouse

Mouse can easily move the insertion point by clicking in the text anywhere on the screen. Sometime if the sheet is big then user cannot see a place need to move. In such situations, to use the scroll bars, as shown fig-8 screen shot.

Fig 8



user can scroll the sheet by rolling mouse wheel, which is equivalent to clicking the up-arrow or down-arrow buttons in the scroll bar.

Moving with Scroll Bars

As shown in the above screen capture, there are two scroll bars: one for moving vertically within the sheet, and one for moving horizontally. Using the vertical scroll bar, user may ?

- Move upward by one line by clicking the upward-pointing scroll arrow.
- Move downward by one line by clicking the downward-pointing scroll arrow.
- Move one next page, using next page button (footnote).
- Move one previous page, using previous page button (footnote).
- Use Browse Object button to move through the sheet, going from one chosen object to the next.

Moving with Keyboard

The following keyboard commands, used for moving around your sheet, also move the insertion point -

Keystroke	Where the Insertion Point Moves
→	Forward one box
←	Back one box
↑	Up one box
↓	Down one box
PageUp	To the previous screen
PageDown	To the next screen
Home	To the beginning of the current screen
End	To the end of the current screen

User can move box by box or sheet by sheet. Now click in any box containing data in the sheet. It would have to hold down the Ctrl key while pressing an arrow key, which moves the insertion point as described here -

Key Combination	Where the Insertion Point Moves
Ctrl + →	To the last box containing data of the current row.
Ctrl + ←	To the first box containing data of the current row.
Ctrl + ↑	To the first box containing data of the current column.
Ctrl + ↓	To the last box containing data of the current column.
Ctrl + Page Up	To the sheet in the left of the current sheet.
Ctrl + Page Down	To the sheet in the right of the current sheet.
Ctrl + Home	To the beginning of the sheet.
Ctrl + End	To the end of the sheet.

Moving with Go To Command

Press F5 key to use Go To command as shown in fig-9, which will display a dialogue box contains various options to reach to a particular box.

Normally, we use row and column number, for example K5 and finally press Go To button.

Fig 9



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Conditional Formatting

MS Excel 2010 Conditional Formatting feature enables to format a range of values so that the values outside certain limits, are automatically formatted.

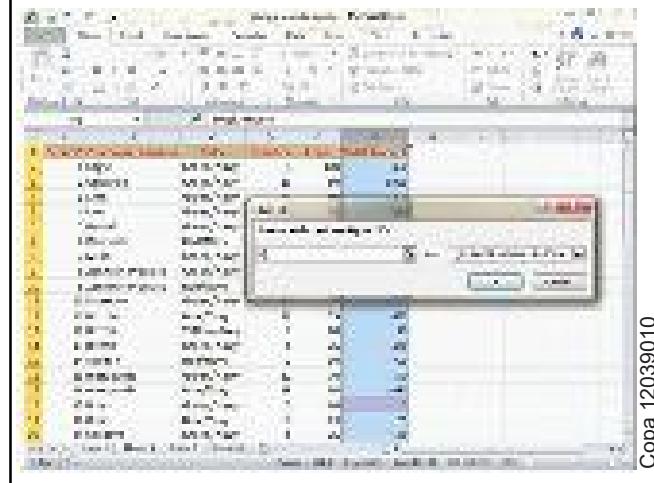
Choose Home Tab " Style group " Conditional Formatting dropdown.

Various Conditional Formatting Options

- **Highlight Cells Rules ?** It opens a continuation menu with various options for defining the formatting rules that highlight the cells in the cell selection that contain certain values, text, or dates, or that have values greater or less than a particular value, or that fall within a certain ranges of values.

Suppose to find cell with Amount 0 and Mark them as red. Choose Range of cell " Home Tab " Conditional Formatting DropDown " Highlight Cell Rules " Equal To as on fig-10.

Fig 10



After Clicking ok, the cells with value zero are marked as red as shown in fig-11.

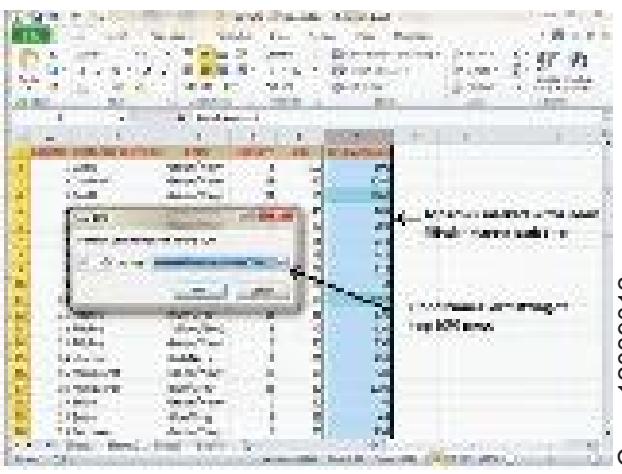
Fig 11

1	Chait	Green,White	10	30	300
2	Carmell	Green,White	10	30	300
3	Caroli	Green,White	10	30	300
4	Jad	Green,White	10	30	300
5	Kirpal	Green,White	10	30	300
6	Kiranpal	Amber	10	30	300
7	Kiran	Green,White	10	30	300
8	Kushalpreet	Green,White	10	30	300
9	Kushalpreet	Amber	10	30	300
10	Kwan	Green,White	10	30	300
11	Kwan	Amber	10	30	300
12	Kwan	Yellow,White	10	30	300
13	Kwan	Green,White	10	30	300
14	Kwan	Amber	10	30	300
15	Kwan	Yellow,White	10	30	300
16	Kwan	Green,White	10	30	300
17	Kwan	Amber	10	30	300
18	Kwan	Yellow,White	10	30	300
19	Carma	Green,White	10	30	300
20	Carma	Amber	10	30	300

- **Top/Bottom Rules:** It opens a continuation menu with various options for defining the formatting rules that highlight the top and bottom values, percentages, and above and below average values in the cell selection.

Suppose want to highlight the top 10% rows user can do this with these Top/Bottom rules as shown in fig-12.

Fig 12

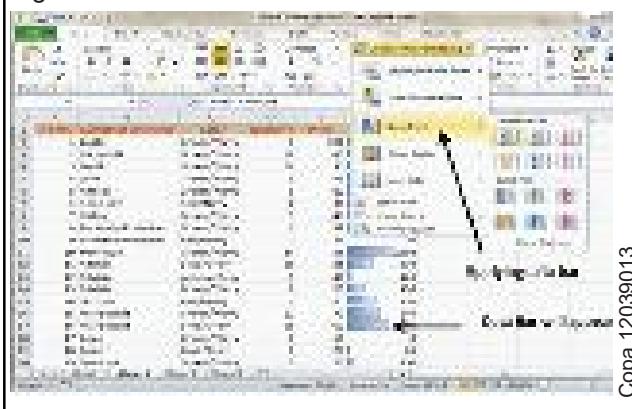


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- **Data Bars(fig-13):** It opens a palette with different color data bars that can apply to the cell selection to indicate their values relative to each other by clicking the data bar thumbnail.

With this conditional Formatting data Bars will appear in each cell.

Fig 13

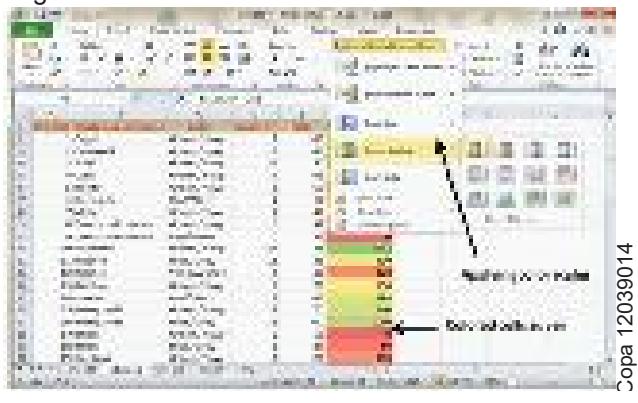


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- **Color Scales (Fig-14):** It opens a palette with different three- and two-colored scales that can apply to the cell selection to indicate their values relative to each other by clicking the color scale thumbnail.

See the below screenshot with Color Scales, conditional formatting applied.

Fig 14



- **Icon Sets** (Fig-15)? It opens a palette with different sets of icons that can apply to the cell selection to indicate their values relative to each other by clicking the icon set.

See the below screenshot with Icon Sets conditional formatting applied.

Fig 15



- **New Rule:** It opens the New Formatting Rule dialog box, where define a custom conditional formatting rule to apply to the cell selection.
- **Clear Rules:** It opens a continuation menu, where can remove the conditional formatting rules for the cell selection by clicking the Selected Cells option, for the entire worksheet by clicking the Entire Sheet option, or for just the current data table by clicking the This Table option.
- **Manage Rules:** It opens the Conditional Formatting Rules Manager dialog box, edit and delete particular rules as well as adjust their rule precedence by moving them up or down in the Rules list box.

Link Excel Spreadsheet Data

Microsoft Excel provides the ability for cells in one worksheet to be linked to cells in one or more other worksheets. This is a great productivity tool and can reduce the need for additional worksheets!

Linking Excel Worksheet Data Overview

In Excel, a link is a formula that dynamically pulls in data from a cell in another worksheet. The worksheet can be in the same workbook or a different workbook.

The destination worksheet is the worksheet that contains the link formula. The worksheet containing the data that will be brought in is called the source worksheet.

Any time the cell value in the source worksheet changes, the cell containing the link formula will be updated as well the next time the spreadsheet containing the link formula is opened. This is just one of many reasons the Excel software program is so powerful.

Need for Linking Spreadsheet Data

The ability to create links often eliminates the need to have identical data entered and updated in multiple sheets. This saves time, reduces errors, and improves data integrity. For example, a company's prices can be stored in a 'Master Price List' worksheet, and others needing pricing data can link to that worksheet.

Consider a Sales Manager who has a detailed spreadsheet for each salesperson, but would like a summary sheet to compare salespersons' performance and create grand totals. The summary sheet (destination) would bring in data from all the salespersons' sheets (source).

Create the Worksheet Link

Before creating the link, format the cell containing the link formula in the destination worksheet to equal the format of the source data.

For example, if the data from the source spreadsheet is currency with 2 decimal points, then first format the target cell for currency with 2 decimal places.

METHOD ONE

1. In the source worksheet, select the cell need to link to and click the Copy button on the Home tab. Or press **Ctrl+C**, or right-click and select **Copy**.
2. Switch to the destination spreadsheet and click the cell want to link. Then, depending on the version of Excel:
 - Excel 2007, 2010, and 2013: On the Home tab, click the down arrow below Paste and click **Paste Link**. In newer versions also right-click and select the **Paste Link** from the Paste menu.
 - Excel 2003 and older versions: On the Edit menu, click **Paste Special**, and then click **Paste Link**.
3. Return to the source worksheet and press **ESC** to remove the animated border around the cell.

METHOD TWO

This is a fast method that works in a different order than Method One.

1. In the destination worksheet cell that will contain the link formula, enter an equal sign (=).

2. In the source worksheet, click in the cell that contains the data and press the Enter key.

Link Formula Example(Fig-16)

In the example below, using Method One, we click in cell B6 in the source worksheet and click Copy. Then, on the destination worksheet, we click in cell B3, and paste the link. The value (\$3,500) automatically displays.

Follow the same steps to link the data from the Denver and Seattle worksheets to the Store Totals worksheet. And first formatted the cells to display the data as Currency. (Fig 16)

Fig 16

Source Worksheet

A	B	C
Atlanta Store	Date: 08/20/09	
	\$ Collected	
1 Register #1	\$1,800	
2 Register #2	\$1,000	
3 Register #3	\$1,200	
Total:	\$3,500	

Destination Worksheet

A	B	C
Store Totals for:	08/20/09	
	\$ Collected	
1 Atlanta	\$3,500	Paste as Link
2 Denver	\$2,900	
3 Seattle	\$3,200	
Total:	\$9,600	

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Functions and formulas in MS-Excel 2010

Objectives : At the end of this lesson you shall be able to

- features & Functions of Microsoft Excel
- formulas and Functions
- move Around in Excel 2010
- conditional Formatting
- link Excel Spreadsheet Data

Formulas in MS Excel

formula, worksheet will be just simple tabular representation of data. A formula consists of special code, which is entered into a cell. It performs some calculations and returns a result, which is displayed in the cell.

Formulas use a variety of operators and worksheet functions to work with values and text. The values and text used in formulas can be located in other cells, which makes changing data easy and gives worksheets their dynamic nature. For example, it can quickly change the data in a worksheet and formulas works.

Elements of Formulas

A formula can consist of any of these elements ?

- Mathematical operators, such as +(for addition) and *(for multiplication)

Example -

=A1+A2 Adds the values in cells A1 and A2.

- Values or text

Example -

=200*0.5 Multiplies 200 times 0.5. This formula uses only values, and it always returns the same result as 100.

- Cell references (including named cells and ranges)

Example -

=A1=C12 Compares cell A1 with cell C12. If the cells are identical, the formula returns TRUE; otherwise, it returns FALSE.

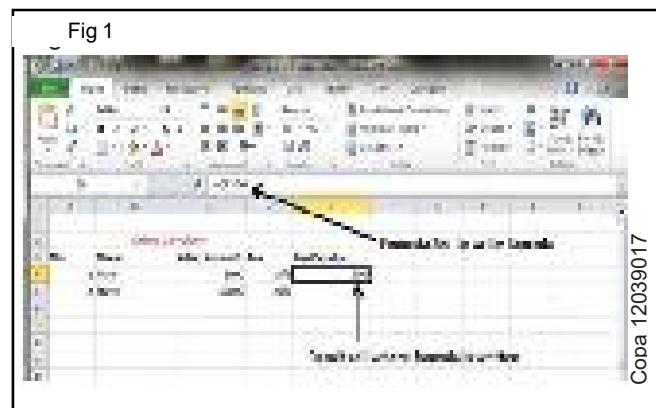
- Worksheet functions (such as SUM or AVERAGE)

Example -

=SUM(A1:A12) Adds the values in the range A1:A12.

Creating Formula

For creating a formula need to type in the Formula Bar. Formula begins with '=' sign. When building formulas manually, and can either type in the cell addresses or can point to them in the worksheet. Using the Pointing method to supply the cell addresses for formulas is often easier and more powerful method of formula building. When using built-in functions, to click the cell or drag through the cell range that want to use when defining the function's arguments in the Function Arguments dialog box as shown in Fig 1.



As soon as complete a formula entry, Excel calculates the result, which is then displayed inside the cell within the worksheet (the contents of the formula, however, continue to be visible on the Formula bar anytime the cell is active). If you make an error in the formula that prevents Excel from being able to calculate the formula at all, Excel displays an Alert dialog box suggesting how to fix the problem.

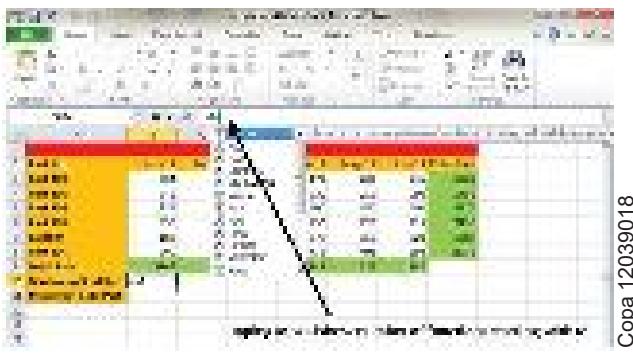
Functions in Formula

Many formulas are created using available worksheet functions. These functions enable to greatly enhance the power of the formulas and perform calculations that are difficult if use only the operators. For example, one can use the LOG or SIN function to calculate the Logarithm or Sin ratio. And cannot do this complicated calculation by using the mathematical operators alone.

Using Functions

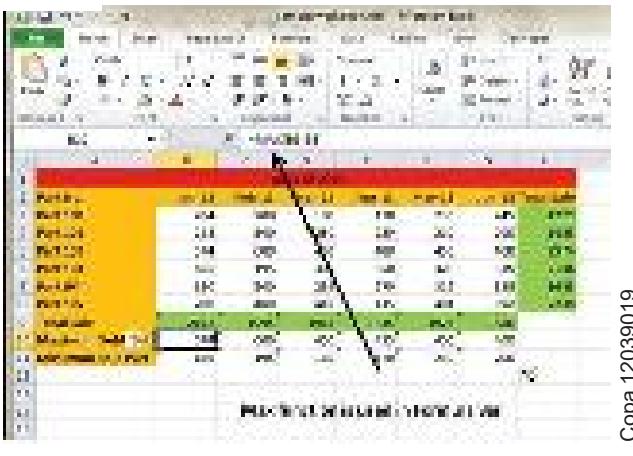
When type = sign and then type any alphabet the searched functions will show fig 2.

Fig 2



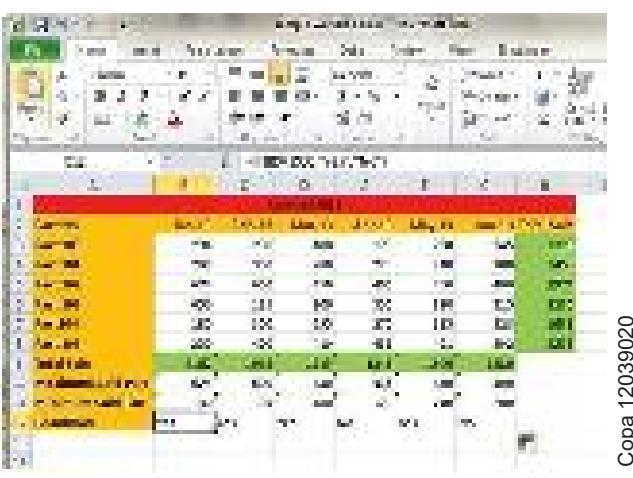
Suppose need to determine the largest value in a range. A formula can't tell the answer without using a function. We will use formula that uses the MAX function to return the largest value in the range B3:B8 as **=MAX(A1:D100)** as shown in fig 3.

Fig 3



Another example of functions. Suppose to find if the cell of month is greater than 1900 then we can give Bonus to Sales representative. The we can achieve it with writing formula with IF functions as **=IF(B9>1900,"Yes","No")** as shown in fig 4.

Fig 4



Function Arguments

In the above examples, notice that all the functions used parentheses. The information inside the parentheses is the list of arguments.

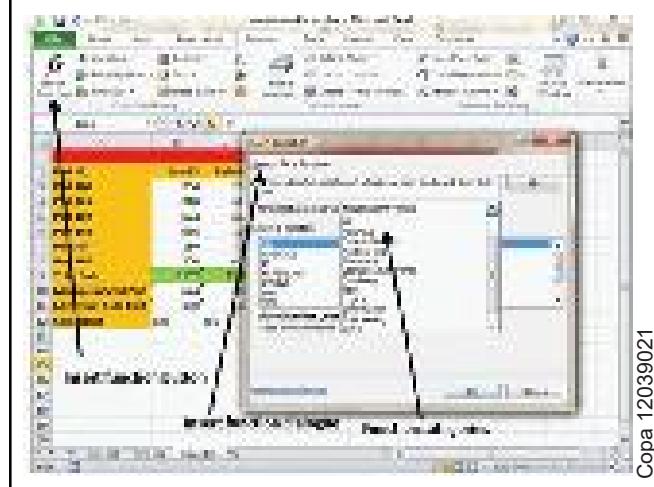
Functions vary in how they use arguments. Depending on what it has to do, a function may use.

- **No arguments** - Examples ? Now(), Date(), etc.
- **One argument** - UPPER(), LOWER(), etc.
- **A fixed number of arguments** - IF(), MAX(), MIN(), AVERAGE(), etc.
- **Infinite number of arguments**
- **Optional arguments**

Built In Functions

MS Excel has many built in functions, which we can use in our formula. To see all the functions by category, choose Formulas Tab " Insert Function as shown in fig-5. Then Insert function Dialog appears from which we can choose the function.

Fig 5



Functions by Categories

Let us see some of the built in functions in MS Excel.

Text Functions

LOWER: Converts all characters in a supplied text string to lower case

UPPER : Converts all characters in a supplied text string to upper case

TRIM : Removes duplicate spaces, and spaces at the start and end of a text string

CONCATENATE : Joins together two or more text strings.
Fig 4

LEFT : Returns a specified number of characters from the start of a supplied text string.

MID : Returns a specified number of characters from the middle of a supplied text string

RIGHT : Returns a specified number of characters from the end of a supplied text string.

LEN: Returns the length of a supplied text string

FIND: Returns the position of a supplied character or text string from within a supplied text string (case-sensitive).

Date & Time

DATE: Returns a date, from a user-supplied year, month and day.

TIME: Returns a time, from a user-supplied hour, minute and second.

DATEVALUE: Converts a text string showing a date, to an integer that represents the date in Excel's date-time code.

TIMEVALUE: Converts a text string showing a time, to a decimal that represents the time in Excel.

NOW: Returns the current date & time.

TODAY: Returns today's date.

Statistical

MAX: Returns the largest value from a list of supplied numbers.

MIN: Returns the smallest value from a list of supplied numbers.

AVERAGE: Returns the Average of a list of supplied numbers.

COUNT: Returns the number of numerical values in a supplied set of cells or values.

COUNTIF: Returns the number of cells (of a supplied range), that satisfies a given criteria.

SUM: Returns the sum of a supplied list of numbers

Logical

AND: Tests a number of user-defined conditions and returns TRUE if ALL of the conditions evaluate to TRUE, or FALSE otherwise

OR: Tests a number of user-defined conditions and returns TRUE if ANY of the conditions evaluate to TRUE, or FALSE otherwise.

NOT: Returns a logical value that is the opposite of a user supplied logical value or expression i.e. returns FALSE if the supplied argument is TRUE and returns TRUE if the supplied argument is FALSE.

Math & Trig

ABS: Returns the absolute value (i.e. the modulus) of a supplied number.

SIGN: Returns the sign (+1, -1 or 0) of a supplied number.

SQRT: Returns the positive square root of a given number.

MOD: Returns the remainder from a division between

two supplied numbers.

Filters in MS Excel

Filtering data in MS Excel refers to displaying only the rows that meet certain conditions. (The other rows gets hidden.)

Using the store data, if user interested in seeing data where Shoe Size is 36, then set filter to do this. Follow the below mentioned steps to do this.

- Place a cursor on the Header Row.
- Choose **Data Tab > Filter** to set filter as shown in fig 6.

Fig 6

The screenshot shows a Microsoft Excel spreadsheet with a data table. The columns are labeled 'Shoe ID', 'Shoe Model', 'Shoe Size', and 'Shoe Price'. The 'Shoe Size' column has a dropdown arrow icon next to its header. The data includes various shoe models like 'Adidas', 'Puma', 'Nike', etc., with their respective sizes and prices. Some rows are highlighted in yellow, indicating they are visible due to the filter.

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- Click the drop-down arrow in the Area Row Header and remove the check mark from SelectAll, which unselects everything.
- Then select the check mark for Size 36 which will filter the data and displays data of Shoe Size 36 as shown in fig-23.
- Some of the row numbers are missing; these rows contain the filtered (hidden) data.
- There is drop-down arrow in the Area column now shows a different graphic - an icon that indicates the column is filtered. (Fig 7)

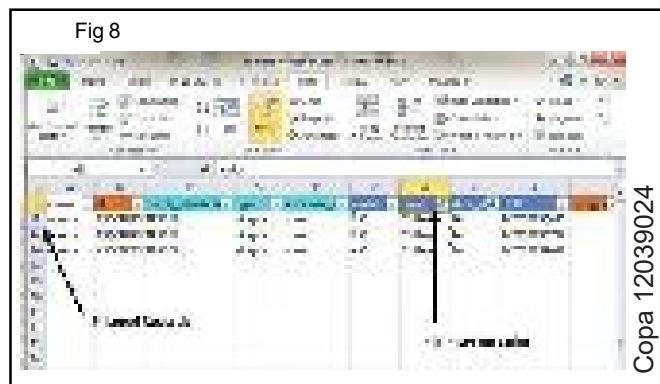
Fig 7

This screenshot shows the same Excel spreadsheet as Fig 6, but with a filter applied to the 'Shoe Size' column. The dropdown arrow icon next to the 'Shoe Size' header now has a different appearance, indicating it is a filtered column. The data table shows only rows where the 'Shoe Size' is 36, while other rows are hidden.

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Using Multiple Filters(fig-24)

Filtering of records by multiple conditions i.e. by multiple column values. Suppose after size 36 is filtered, need to have the filter where color is equal to Coffee. After setting filter for Shoe Size, choose Color column and then set filter for color. (Fig 8)

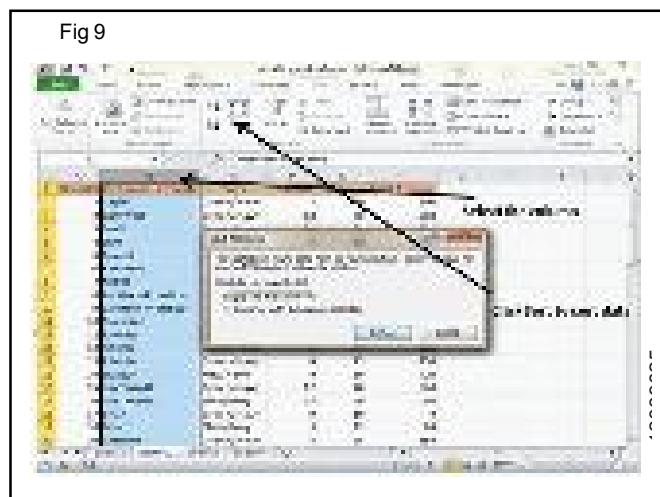


Sorting in MS Excel

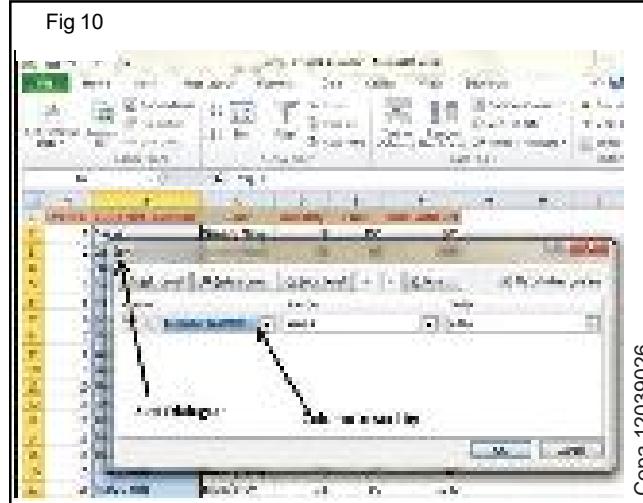
Sorting data in MS Excel rearranges the rows based on the contents of a particular column. sort a table to put names in alphabetical order Or sort data by Amount from smallest to largest or largest to smallest.

To Sort the data follow the steps mentioned below.

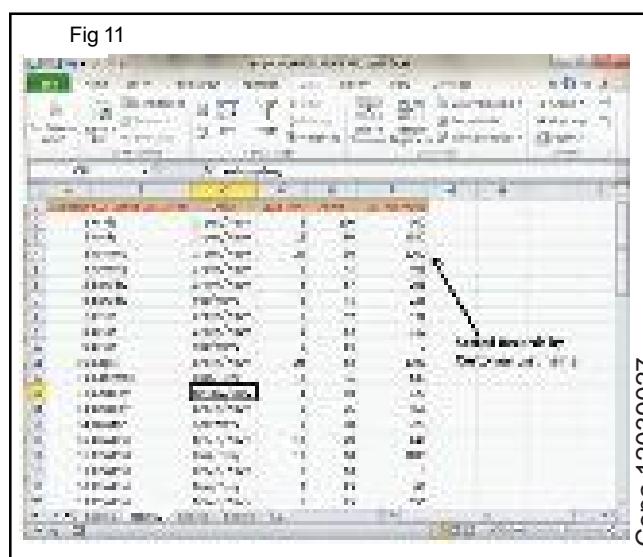
- Select the Column to sort data as on fig 9.



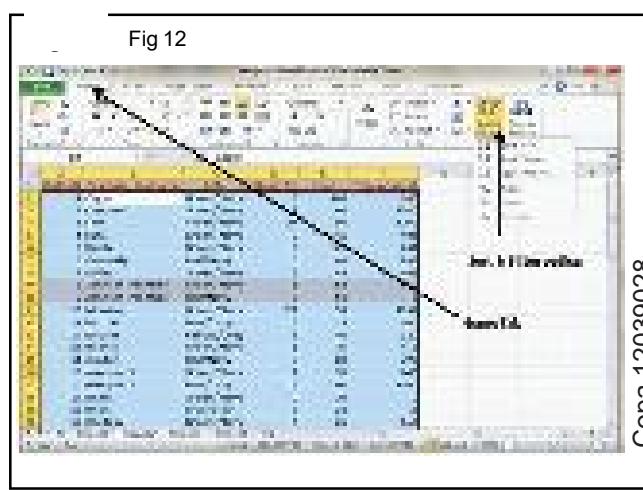
- Choose Data Tab " Sort Below dialog appears.
- If the user sort data based on a selected column, Choose Continue with the selection or if the data sorting based on other columns, choose Expand Selection.
- Sort the data based on the below Conditions as on fig 10.



- **Values** - alphabetically or numerically.
- **Cell Color** - Based on Color of Cell.
- **Font Color** - Based on Font color.
- **Cell Icon** - Based on Cell Icon.
- Clicking Ok will sort the data as on fig 11.



Sorting option is also available from the Home Tab. Choose Home Tab " Sort & Filter. You can see the same dialog to sort records as on fig 12.



Ranges in MS Excel:

A cell is a single element in a worksheet that can hold a value, some text, or a formula. A cell is identified by its address, which consists of its column letter and row number. For example, cell B1 is the cell in the second column and the first row.

A group of cells is called a range. You designate a range address by specifying its upper-left cell address and its lower-right cell address, separated by a colon.

Example of Ranges:

- C24** - A range that consists of a single cell.
- A1:B1** - Two cells that occupy one row and two columns.
- A1:A100** - 100 cells in column A.
- A1:D4** - 16 cells (four rows by four columns).

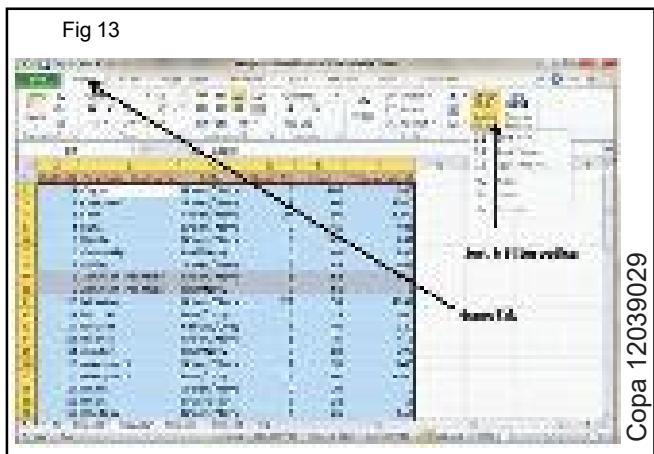
Selecting Ranges (Fig-29)

Selecting a range in several ways ?

- Press the left mouse button and drag, highlighting the range. Then release the mouse button. If drag to the end of the screen, the worksheet will scroll.
- Press the Shift key while uses the navigation keys to select a range.
- Press F8 and then move the cell pointer with the navigation keys to highlight the range. Press F8 again

to return the navigation keys to normal movement.

- Type the cell or range address into the Name box and press Enter. Excel selects the cell or range that specified. (Fig 13)



Selecting Complete Rows and Columns (Fig-30)

When user need to select an entire row or column.and can select entire rows and columns in much the same manner as select ranges:

- Click the row or column border to select a single row or column.
- To select multiple adjacent rows or columns, click a row or column border and drag to highlight additional rows or columns.
- To select multiple (nonadjacent) rows or columns, press Ctrl while click the row or column borders. (Fig 14)

Fig 14

SL	NAME	GRADE	MARKS	PERCENTAGE
1	Cagle	General Navy	100	100%
2	Connie B	General Navy	100	100%
3	Dorell	General Navy	90	100%
4	Lori C	General Navy	85	100%
5	Reita	General Navy	85	100%
6	Suzanne	Family Navy	85	100%
7	T. Miller	General Navy	85	100%
8	Janice Thompson	General Navy	85	100%
9	Zane Smith	Family Navy	85	100%

Multiple columns selected

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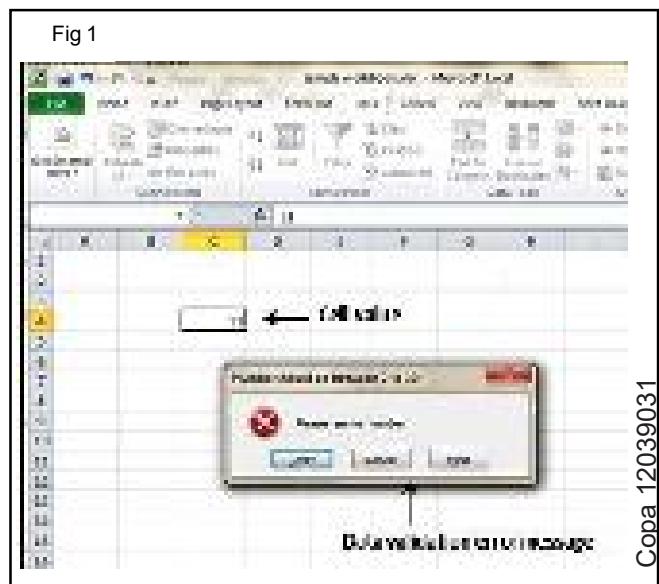
Data validations and Table management in MsExcel 2010

Objectives : At the end of this lesson you shall be able to

- data Validation
- data Table with Example
- charts and its types
- pivot table and pivot chart
- page setup and printing worksheet
- excel shortcut keys

Data Validation

MS Excel data validation feature allows to set up certain rules that dictate what can be entered into a cell. For example, user want to limit data entry in a particular cell to whole numbers between 0 and 10. If the user makes an invalid entry, and display a custom message as shown fig 1.



Validation Criteria

To specify the type of data allowable in a cell or range, follow the steps below, which shows all the three tabs of the Data Validation dialog box.

- Select the cell or range.
- Choose Data " Data Tools " Data Validation. Excel displays its Data Validation dialog box having 3 tabs settings, Input Message and Error alert.

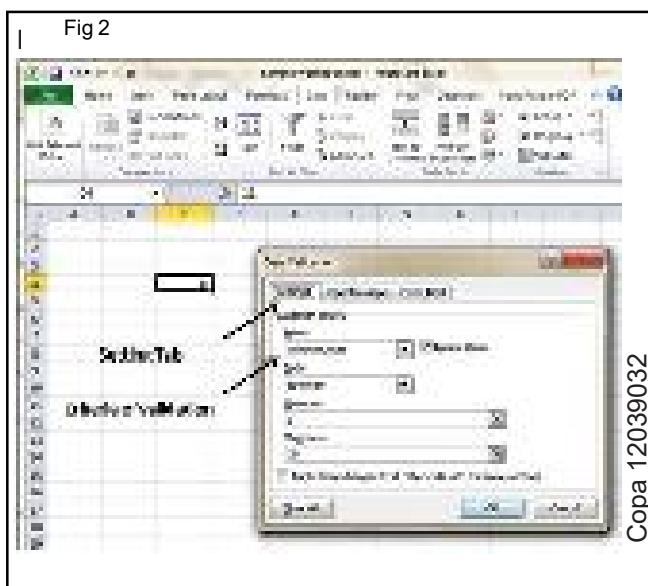
Settings Tab

Here user can set the type of validation. Choose an option from the Allow drop-down list. The contents of the Data Validation dialog box will change, displaying controls based on your choice.

- **Any Value** - Selecting this option removes any existing data validation.
- **Whole Number** - The user must enter a whole number. For example, you can specify that the entry must be a whole number greater than or equal to 50.

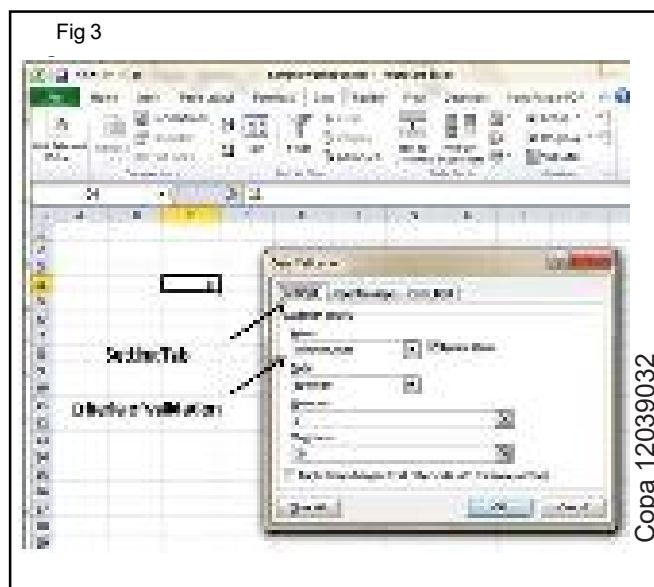
- **Decimal** - The user must enter a number. For example, you can specify that the entry must be greater than or equal to 10 and less than or equal to 20.
- **List** - The user must choose from a list of entries you provide. You will create drop-down list with this validation. You have to give input ranges then those values will appear in the drop-down.
- **Date** - The user must enter a date. You specify a valid date range from choices in the Data drop-down list. For example, you can specify that the entered data must be greater than or equal to January 1, 2013, and less than or equal to December 31, 2013.
- **Time** - The user must enter a time. Specify a valid time range from choices in the Data drop-down list. For example, user can specify that the entered data must be later than 12:00 p.m.
- **Text Length** - The length of the data (number of characters) is limited. specify a valid length by using the Data drop-down list. For example, that the length of the entered data be 1 (a single alphanumeric character).
- **Custom** - To use this option, must supply a logical formula that determines the validity of the user's entry (a logical formula returns either TRUE or FALSE).

Input Message Tab (fig 2)



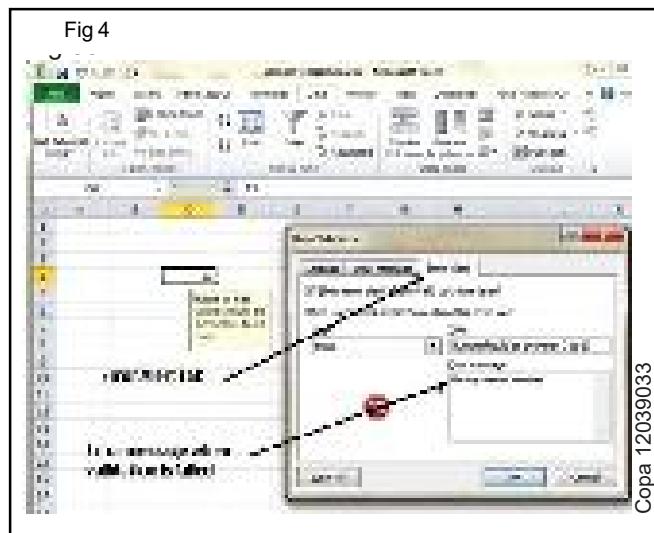
User can set the input help message with this tab. Fill the title and Input message of the Input message tab and the input message will appear when the cell is selected.

Error Alert Tab (fig 3)

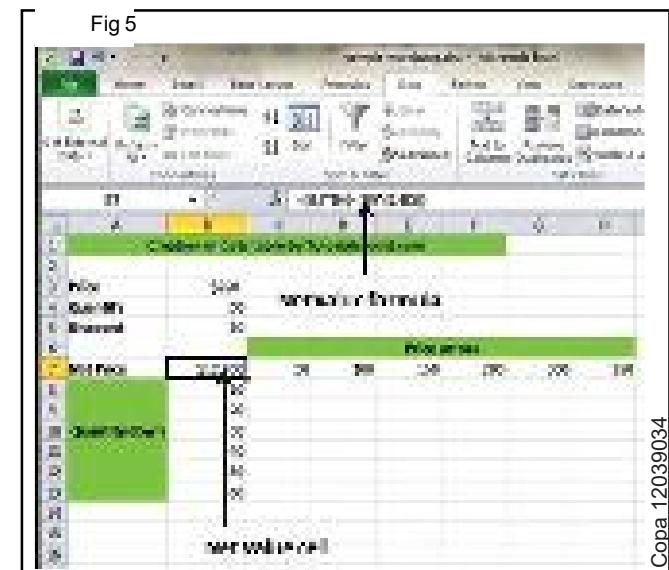


User specify an error message with this tab. Fill the title and error message. Select the style of the error as stop, warning or Information as per user need.

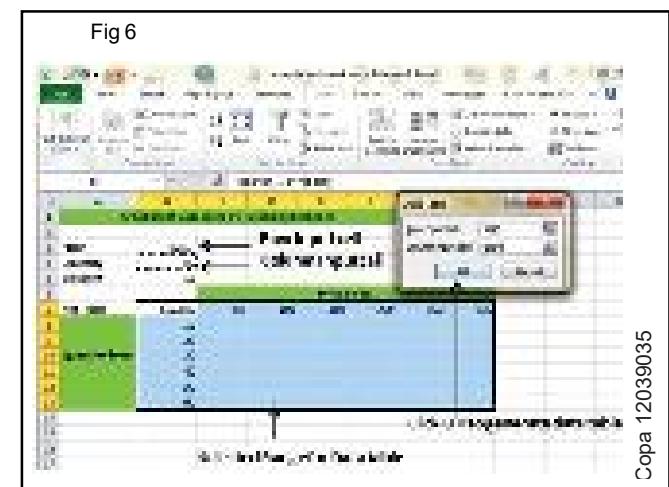
Data Table with Example (Fig 4)



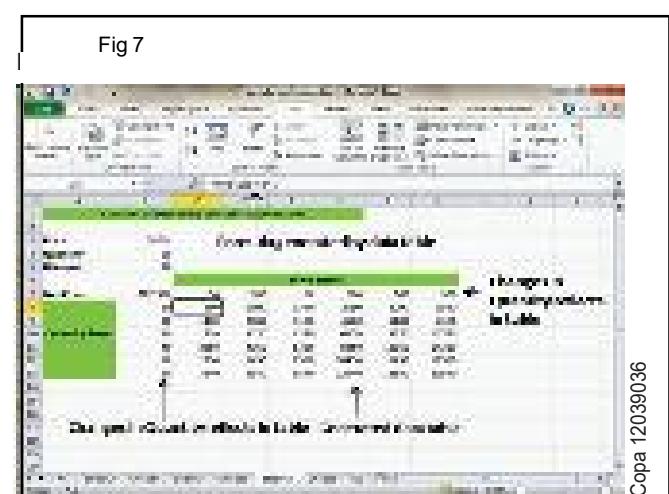
Here user have the Price and quantity of many values. Also, have the discount for that as third variable for calculating the Net Price. And can keep the Net Price value in the organized table format with the help of the data table. The Price runs horizontally to the right while quantity runs vertically down. We are using a formula to calculate the Net Price as Price multiplied by Quantity minus total discount (Quantity * Discount for each quantity) as shown in fig 5.



Now, for creation of data table select the range of data table. Choose Data Tab " What-If analysis dropdown " Data table. It will display dialogue asking for Input row and Input Column. Give the Input row as Price cell (In this case cell B3) and Input column as quantity cell (In this case cell B4) as shown in fig 6.



Clicking OK will generate data table as shown in fig 7. It will generate the table formula. And change the price horizontally or quantity vertically to see the change in the Net Price.



Charts

A chart is a visual representation of numeric values. Charts (also known as graphs) have been an integral part of spreadsheets. Charts generated by early spreadsheet products were quite crude, but they have improved significantly over the years. Excel provides you with the tools to create a wide variety of highly customizable charts. Displaying data in a well-conceived chart can make your numbers more understandable. Because a chart presents a picture, charts are particularly useful for summarizing a series of numbers and their interrelationships.

Types of Charts

There are various chart types available in MS Excel as shown in fig 8.



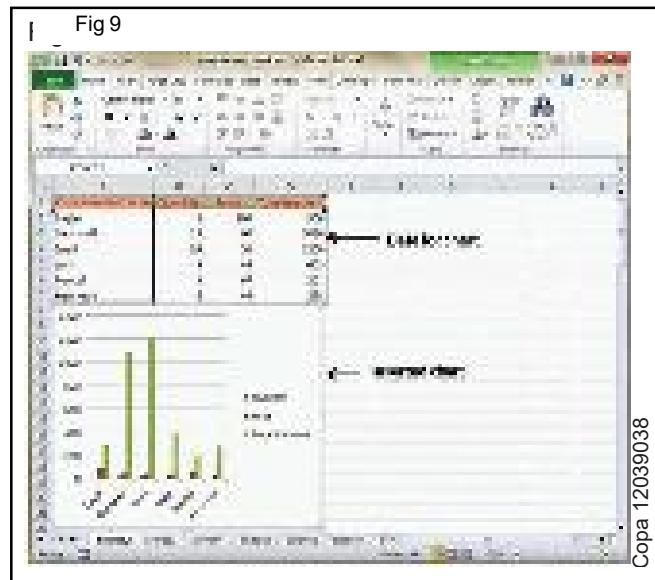
- **Column:** Column chart shows data changes over a period of time or illustrates comparisons among items.
- **Bar:** A bar chart illustrates comparisons among individual items.
- **Pie:** A pie chart shows the size of items that make up a data series, proportional to the sum of the items. It always shows only one data series and is useful to emphasize a significant element in the data.
- **Line:** A line chart shows trends in data at equal intervals.
- **Area:** An area chart emphasizes the magnitude of change over time.
- **X Y Scatter:** An xy (scatter) chart shows the relationships among the numeric values in several data series, or plots two groups of numbers as one series of xy coordinates.

- **Stock:** This chart type is most often used for stock price data, but can also be used for scientific data (for example, to indicate temperature changes).
- **Surface:** A surface chart is useful to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.
- **Doughnut:** Like a pie chart, a doughnut chart shows the relationship of parts to a whole; however, it can contain more than one data series.
- **Bubble:** Data that is arranged in columns on a worksheet, so that x values are listed in the first column and corresponding y values and bubble size values are listed in adjacent columns, can be plotted in a bubble chart.
- **Radar:** A radar chart compares the aggregate values of a number of data series.

Creating Chart

To create charts for the data by below mentioned steps.

- Select the data for which you want to create the chart.
- Choose Insert Tab " Select the chart or click on the Chart group to see various chart types.
- Select the chart of the choice and click OK to generate the chart as shown in fig 9.

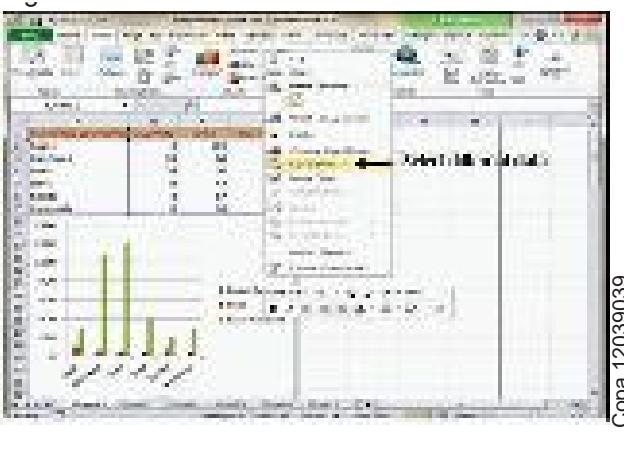


Editing Chart

You can edit the chart at any time after you have created it.

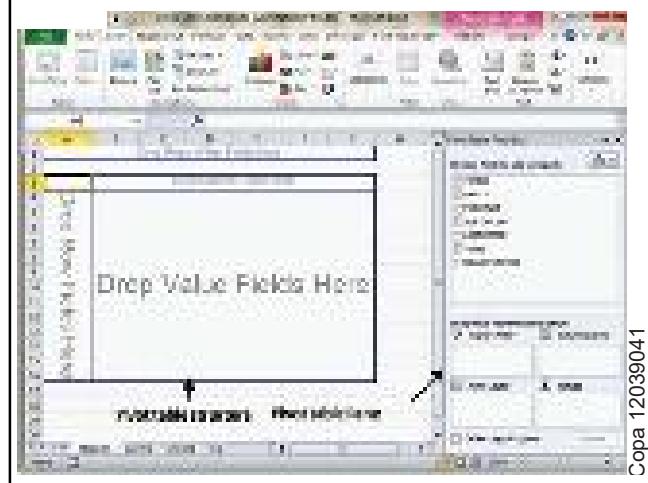
- select the different data for chart input with Right click on chart " Select data. Selecting new data will generate the chart as per the new data, as shown in fig 10.

Fig 10



This will generate the Pivot table pane as shown in fig-41. various options available in the Pivot table pane. And can select fields for the generated pivot table. (Fig 13)

Fig 12



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- change the X axis of the chart by giving different inputs to X-axis of chart.
- change the Y axis of chart by giving different inputs to Y-axis of chart.

Pivot Tables

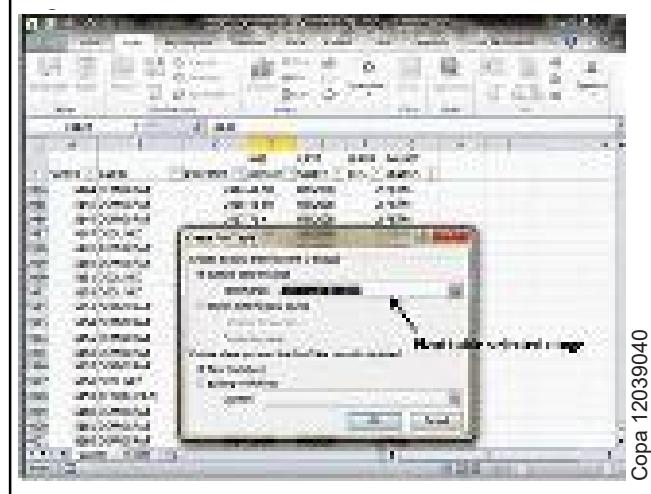
A pivot table is essentially a dynamic summary report generated from a database. The database can reside in a worksheet (in the form of a table) or in an external data file. A pivot table can help transform endless rows and columns of numbers into a meaningful presentation of the data. Pivot tables are very powerful tool for summarized analysis of the data.

Pivot tables are available under Insert tab " PivotTable dropdown " PivotTable.

Pivot Table Example (Fig-40)

Now, let us see Pivot table with the help of example. Suppose huge data of voters and need to see the summarized data of voter Information per party, use the Pivot table for it. Choose Insert tab " Pivot Table to insert pivot table. MS Excel selects the data of the table. and select the pivot table location as existing sheet or new sheet. (Fig 11)

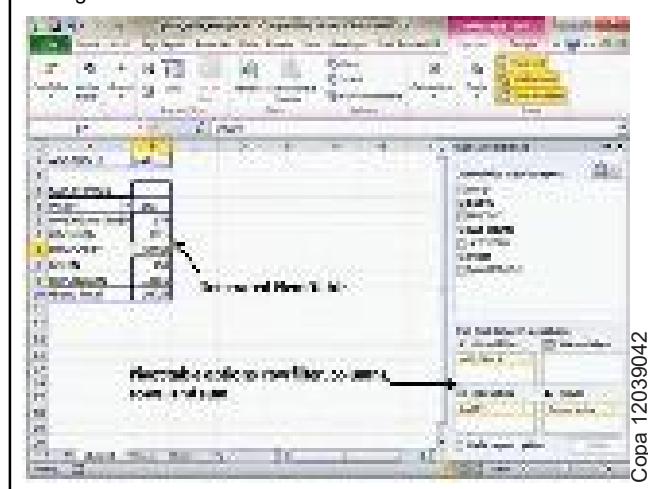
Fig 11



- **Column labels:** A field that has a column orientation in the pivot table. Each item in the field occupies a column.
- **Report Filter:** User can set the filter for the report as year, and then data gets filtered as per the year.
- **Row labels:** A field that has a row orientation in the pivot table. Each item in the field occupies a row.
- **Values area:** The cells in a pivot table that contain the summary data. Excel offers several ways to summarize the data (sum, average, count, and so on).

After giving input fields to the pivot table, it generates the pivot table with the data as shown in fig 13.

Fig 13



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Pivot Charts

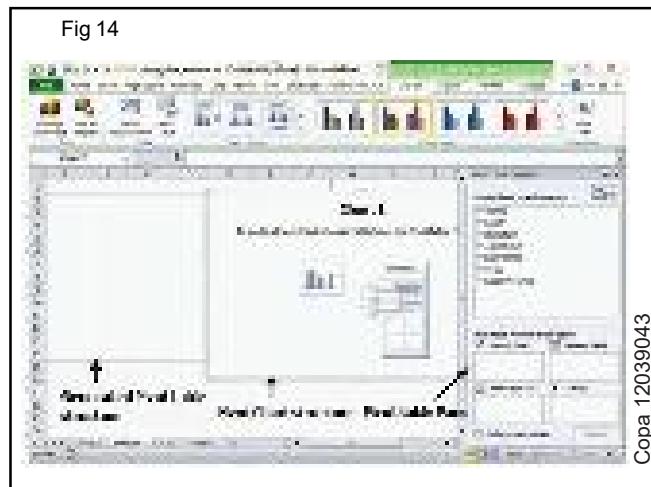
A pivot chart is a graphical representation of a data summary, displayed in a pivot table. A pivot chart is always based on a pivot table. Although Excel lets to create a pivot table and a pivot chart at the same time, user can't create a pivot chart without a pivot table. All Excel charting features are available in a pivot chart.

Pivot charts are available under **Insert tab > PivotTable dropdown > PivotChart**.

Pivot Chart Example

Suppose huge data of voters and need to see the summarized view of the data of voter

Information per party in the form of charts, then use the Pivot chart for it. Choose **Insert tab > Pivot Chart** to insert the pivot table. (Fig 14)



MS Excel selects the data of the table. And select the pivot chart location as an existing sheet or a new sheet. Pivot chart depends on automatically created pivot table by the MS Excel. generate the pivot chart in the below fig 15.



Quick Print

If user want to print a copy of a worksheet with no layout adjustment, use the Quick Print option. There are two ways in which we can use this option.

- Choose File " Print (which displays the Print pane), and then click the Print button as shown in fig 16.

- Press Ctrl+P and then click the Print button (or press Enter).

Fig 16



Adjusting Common Page Setup Settings

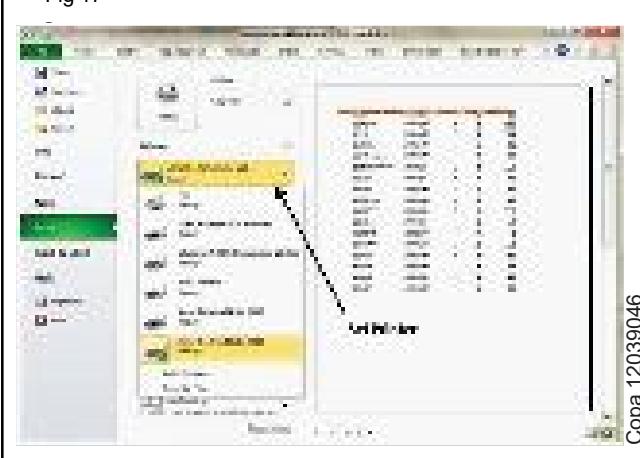
User can adjust the print settings available in the Page setup dialogue in different ways as discussed below. Page setup options include Page orientation, Page Size, Page Margins, etc.

- The Print screen in Backstage View, displayed when choose File " Print.
- The Page Layout tab of the Ribbon.

Choosing Your Printer(fig-46)

To switch to a different printer, choose **File > Print** and use the drop-down control in the Printer section to select any other installed printer. (Fig 17)

Fig 17



Specifying What You Want to Print(Fig 18)

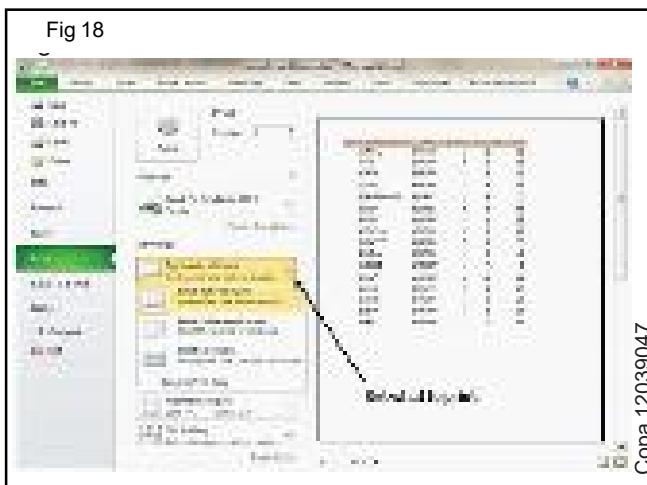
Sometimes print only a part of the worksheet rather than the entire active area. Choose **File > Print** and use the controls in the Settings section to specify what to print.

- Active Sheets:** Prints the active sheet or sheets that you selected.

- **Entire Workbook:** Prints the entire workbook, including chart sheets.
- **Selection:** Prints only the range that selected before choosing **File > Print**.

MS Excel Keyboard Short-cuts

MS Excel offers many keyboard short-cuts. Below is the list of all the major shortcut keys in Microsoft Excel. (Fig 18)



- **Ctrl + A** - Selects all contents of the worksheet.
- **Ctrl + B** - Bold highlighted selection.
- **Ctrl + I** - Italicizes the highlighted selection.
- **Ctrl + K** - Inserts link.
- **Ctrl + U** - Underlines the highlighted selection.
- **Ctrl + 1** - Changes the format of selected cells.
- **Ctrl + 5** - Strikethrough the highlighted selection.
- **Ctrl + P** - Brings up the print dialog box to begin printing.
- **Ctrl + Z** - Undo last action.
- **Ctrl + F3** - Opens Excel Name Manager.
- **Ctrl + F9** - Minimizes the current window.
- **Ctrl + F10** - Maximize currently selected window.
- **Ctrl + F6** - Switches between open workbooks or windows.
- **Ctrl + Page up** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Page down** - Moves between Excel work sheets in the same Excel document.
- **Ctrl + Tab** - Moves between Two or more open Excel files.
- **Alt + =** - Creates a formula to sum all of the above cells
- **Ctrl + '** - Inserts the value of the above cell into cell currently selected.
- **Ctrl + Shift + !** - Formats the number in comma format.
- **Ctrl + Shift + \$** - Formats the number in currency format.
- **Ctrl + Shift + #** - Formats the number in date format.
- **Ctrl + Shift + %** - Formats the number in percentage format.
- **Ctrl + Shift + ^** - Formats the number in scientific format.
- **Ctrl + Shift + @** - Formats the number in time format.
- **Ctrl + Arrow key** - Moves to the next section of text.

- **Ctrl + Space** - Selects the entire column.
- **Shift + Space** - Selects the entire row.
- **Ctrl + -** - Deletes the selected column or row.
- **Ctrl + Shift + =** - Inserts a new column or row.
- **Ctrl + Home** - Moves to cell A1.
- **Ctrl + ~** - Switches between showing Excel formulas or their values in cells.
- **F2** - Edits the selected cell.
- **F3** - After a name has been created F3 will paste names.
- **F4** - Repeat last action. For example, if you changed the color of text in another cell pressing F4 will change the text in cell to the same color.
- **F5** - Goes to a specific cell. For example, C6.
- **F7** - Spell checks the selected text or document.
- **F11** - Creates chart from the selected data.
- **Ctrl + Shift + ;** - Enters the current time.
- **Ctrl + ;** - Enters the current date.
- **Alt + Shift + F1** - Inserts New Worksheet.
- **Alt + Enter** - While typing text in a cell pressing Alt + Enter will move to the next line allowing for multiple lines of text in one cell.
- **Shift + F3** - Opens the Excel formula window.
- **Shift + F5** - Brings up the search box.

Image editing, presentations

Objectives : At the end of this lesson you shall be able to

- Introduction to Power Point and its advantages
- Creation of slide shows
- Fine tuning of presentations

Introduction

PowerPoint is a presentation graphics software program that is part of the Microsoft Office package. It uses a graphical approach for the presentations in the form of slide shows that accompany the oral delivery of the topic. This program is widely used in business and classrooms and is an effective tool when used for training purposes.

PowerPoint is one of the simplest computer programs to learn. It is the easiest program used worldwide for presentations that creates professional looking presentations. It is easy to customize presentations with company logo and has design templates that come with the programs. In addition to an on screen slide show, PowerPoint has printing options that allow the presenter to provide handouts and outlines for the audience as well as notes pages for the speaker to refer to during the presentation.

PowerPoint 2010 allows to create presentations for printing or online viewing using a variety of tools. These include wizards to help with the content and look and feel of the presentations to animation tools to create moving images.

Presentation

A presentation is a collection of data and information that is to be delivered to a specific audience. A PowerPoint presentation is a collection of electronic slides that can have text, pictures, graphics, tables, sound and video. This collection can run automatically or can be controlled by a presenter.

Advantage and application of PowerPoint 2010

- Professional looking presentations
- Animated presentations shown on a monitor or overhead screen
- Notes for the speaker
- Handouts for the audience
- Paper printouts of your slide
- Overhead projector transparencies
- Movies

Working with PowerPoint 2010

Step 1: Click the Start button.



Step 2: Click All Programs option from the menu.



Step 3: Search for Microsoft Office from the sub menu and click it.



Step 4: Search for Microsoft PowerPoint 2010 from the submenu and click it.

Fig 4

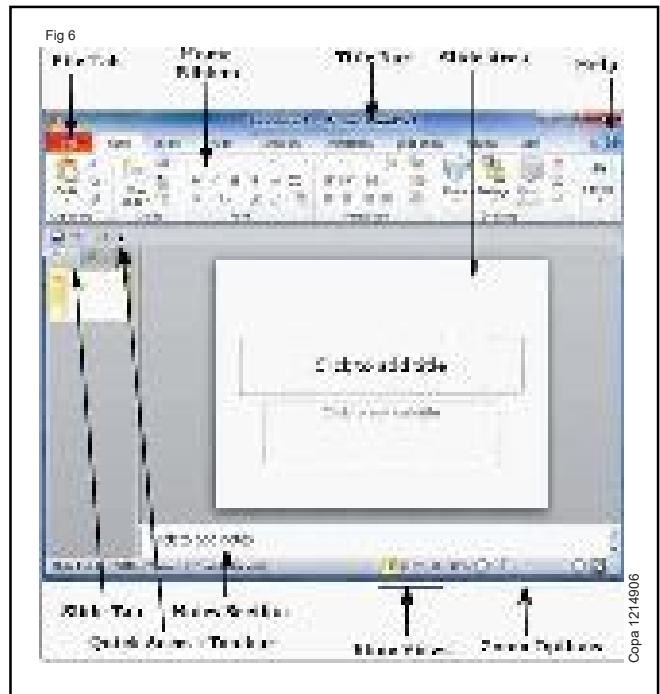


This will launch the Microsoft PowerPoint 2010 application and the following is the presentation window.

Fig 5



PowerPoint Screen



File Tab

This tab opens the Backstage view which basically allows to manage the file and settings in PowerPoint. This can save presentations, open existing ones and create new presentations based on blank or predefined templates. The other file related operations can also be executed from this view.

Ribbon

Fig 7



The ribbon contains three components:

- **Tabs:** They appear across the top of the Ribbon and contain groups of related commands. Home, Insert, Page Layout are examples of ribbon tabs.
- **Groups:** They organize related commands; each group name appears below the group on the Ribbon. For example, a group of commands related to fonts or a group of commands related to alignment, etc.
- **Commands:** Commands appear within each group as mentioned above.

Title Bar

This is the top section of the window. It shows the name of the file followed by the name of the program which in this case is Microsoft PowerPoint.

Slide Area

This is the area where the actual slide is created and edited. Add, edit and delete text, images, shapes and multimedia is supported in this section.

Help

The Help Icon can be used to get PowerPoint related help anytime. Clicking on the "?" opens the PowerPoint Help window where there is a list of common topics to browse from. Specific topics from the search bar at the top can also be used for searching.

Zoom Options

The zoom control zooms in for a closer look at the text. The zoom control consists of a slider that can slide left or right to zoom in or out, - and + buttons to can be used to increase or decrease the zoom factor. The maximum zoom supported by PowerPoint is 400% and the 100% is indicated by the mark in the middle.

Slide Views

The group of four buttons located to the left of the Zoom control, near the bottom of the screen, lets to switch between PowerPoint views.

- Normal Layout view: This displays page in normal view with the slide on the right and a list of thumbnails to the left. This view allows user to edit individual slides and also rearrange them.

- Slide Sorter view: This displays all the slides as a matrix. This view only allows the user to rearrange the slides but not edit the contents of each slide.
- Reading View: This view is like a slideshow with access to the Windows task bar in case the user need to switch windows. However, like the slideshow user cannot edit anything in this view.

Notes Section

This sections allows user to add notes for the presentation. These notes will not be displayed on the screen during the presentation; these are just quick reference for the presenter.

Quick Access Toolbar

The Quick Access Toolbar is located just under the ribbon. This toolbar offers a convenient place to group the most commonly used commands in PowerPoint. User can customize this toolbar to suit their needs.

Slide Tab

This section is available only in the Normal view. It displays all the slides in sequence. User can add, delete and reorder slides from this section.

Backstage View in Powerpoint 2010

In Office 2010, Microsoft replaced the traditional file menu with the new Backstage view. This view not only offers all the menu items under the file menu, but additional details which makes management of files a lot easier.

Accessing Backstage View

User can access the Backstage view simply by clicking on the File tab. They can exit this view by clicking on any tab (including the File tab again). 'Esc' button on the keyboard can also be pressed for the same.

Organization of Backstage View

The backstage view has three sections or panes.



- First Pane ? This is the commands pane which consists of all the commands that would typically found in the file menu of older versions. it also has the Options menu which edits the options on the program like customizing the ribbon.

Various commands under the first pane are described in the table below ?

S.No	Command & Description
1	Save This allows user to save a new file or an existing file in standard format. If user is working on a previously saved file this will save the new changes in the same file format. If user is working on a new file, this command would be similar to the Save As command.
2	Save As Allows user to specify the file name and the file type before saving the file.
3	Open Allows user to open new PowerPoint files.
4	Close Allows user to close an existing file.
5	Info Displays the information about the current file.
6	Recent Lists series of recently viewed or edited PowerPoint files.
7	New Allows user to create a new file using blank or pre-defined templates.
8	Print Allows user to select the printer settings and print the presentation.
9	Save & Send Allows user to share your presentation with larger audience via emails, web, cloud services, etc.
10	Help Provides access to PowerPoint Help.
11	Options Allows user to set various options related to PowerPoint program.
12	Exit Closes the presentation and exits the program.
	• Second Pane ? This is the subcommands pane. This will list all the commands related to the main command chosen in the first pane. For example, if user selects Print in the first pane, user get to choose the printer and adjust the print settings in the second pane.

- Third Pane ? This is the preview or file information page. Depending on the command and the subcommand user select, this pane will either display the properties of the file or give a preview of the file.

Creating Presentation using Powerpoint 2010

PowerPoint offers a host of tools that will aid the user in creating a presentation. These tools are organized logically into various ribbons in PowerPoint. The table below describes the various commands that can be accessed from the different menus.

Menu Category	Ribbon Commands
Home	Clipboard functions, manipulating slides, fonts, paragraph settings, drawing objects and editing functions.
Insert	Insert tables, pictures, images, shapes, charts, special texts, multimedia and symbols.
Design	Slide setup, slide orientation, presentation themes and background.
Transitions	Commands related to slide transitions.
Animations	Commands related to animation within the individual slides.
Slide Show	Commands related to slideshow set up and previews.
Review	Proofing content, language selection, comments and comparing presentations.
View	Commands related to presentation views, Master slides, color settings and window arrangements.

Besides these depending on the objects selected in the slide, there are other menu tabs that get enabled.

Add New Slides in Powerpoint 2010

The following are the steps that allows the user to insert a new slide .

Step 1: Right-click in the Navigation Pane under any existing slide and click on the New Slide option.

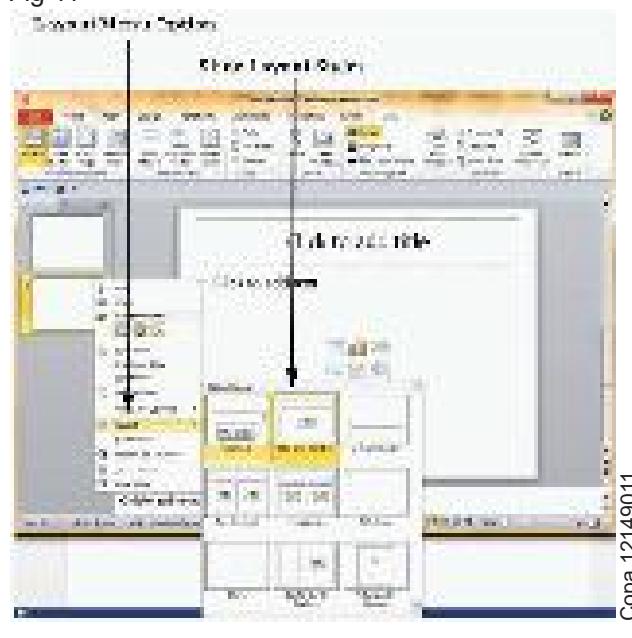


Step 2: The new slide is inserted. The layout of this slide can be changed to suit the design requirements.



Step 3: To change the slide layout, right-click on the newly inserted slide and go to the Layout option where user can choose from the existing layout styles available .

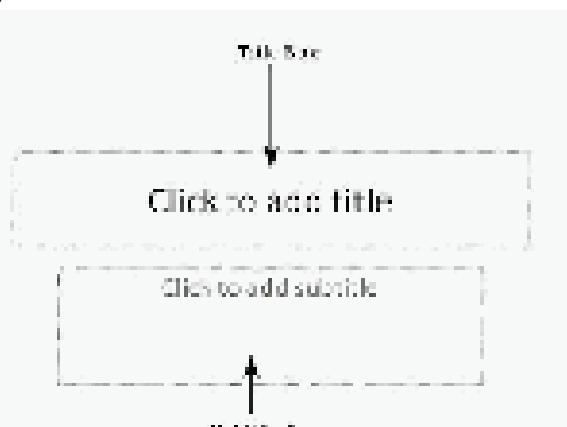
Fig 11



Subtitle Box

This is found only in slides with the Title layout. This is indicated by "Click to add subtitle"

Fig 13

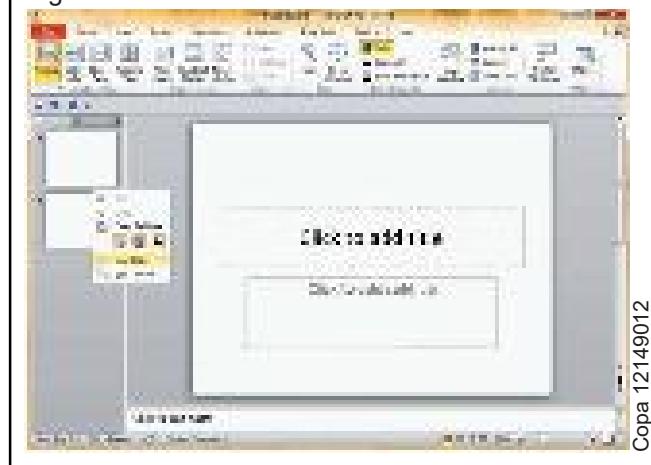


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Same steps can be followed to insert a new slide in between existing slides or at the end on the slide list.

When we insert a new slide, it inherits the layout of its previous slide with one exception. If inserting a new slide after the first slide (Title slide), the subsequent slide will have the Title and Content layout.

Fig 12



Adding Text in Boxes in PowerPoint 2010

PowerPoint allows users to add text to the slide in a well-defined manner to ensure the content is well distributed and easy to read. The procedure to add the text in a PowerPoint slide is always the same - just click in the text box and start typing. The text will follow the default formatting set for the text box, although this formatting can be changed later as required.

The most common content blocks in PowerPoint are:

Title Box

This is typically found on slides with the title layout and in all the slides that have a title box in them. This box is indicated by "Click to add title".

Content Box

This is found in most of the slides that have a placeholder for adding content. This is indicated by "Click to add text". This box allows user to add text as well as non-text content. To add text to such a box, click anywhere on the box, except on one of the content icons in the center and start typing.

Fig 14



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Text Only Box

This is not a default content box available in PowerPoint, but user can create it using Slide Master, if required. This is also indicated by "Click to add text". The only difference between the Text Only Box and the Content Box is that the former only supports text in the content area.

Fig 16



Adding New Text Boxes in Powerpoint 2010

Most of the standard layouts come with the text box option. As mentioned, text boxes will have "Click to add text" as the default text. Here are the steps to add new text boxes in slide.

Step 1: Click on the Text Box icon in the Home ribbon under the Drawing section.

Fig 16



Step 2 : User will get the insert text box cursor that looks like an inverted cross.

Fig 17



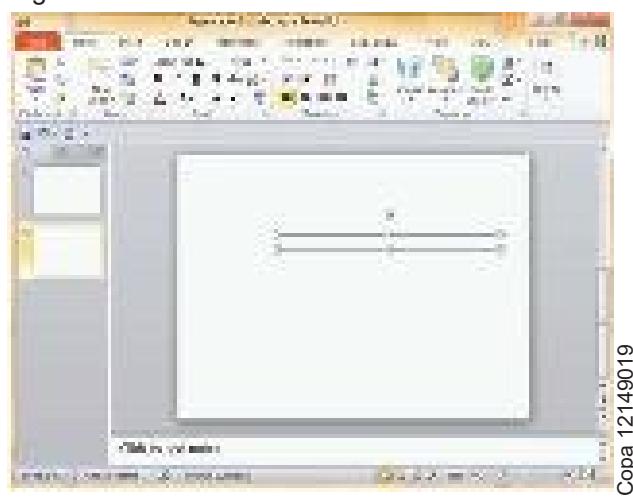
Step 3: Click to insert a text box. User can now start typing directly into the text box.

Fig 18



Step 4: Alternately, user can click and drag the cursor without releasing the click to create a text box.

Fig 19

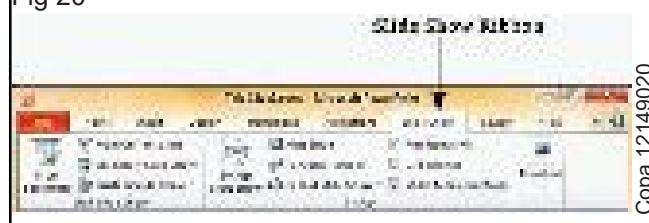


The size of the text box can be adjusted by selecting one of the edges marked by squares or corners marked by circles.

Slide Show in Powerpoint 2010

Most PowerPoint presentations are created to be run as a slideshow. Most of these features of PowerPoint 2010 are really to help user create a good slideshow without having to go through the entire presentation over and over again after every minor change. Features related to running the slideshow are grouped under the Slideshow ribbon.

Fig 20



Section	Menu Item	Description
Start Slideshow	From Beginning From Current Slide Broadcast Slideshow Custom Slideshow	Starts slideshow from beginning Starts slideshow from the current slide Allows users to broadcast the slideshows using Microsoft's PowerPoint Broadcast Service Builds a custom slideshow by picking the slides you want to run
Set Up	Set Up Slideshow Hide Slide Rehearse Timing Record Slideshow Slideshow Checkboxes	Helps set up the slideshow including browser/ full screen display, show options with or without narration/ animation, pen and laser color during the slideshow and the slides to be presented during the show Helps mark/ unmark the slide as hidden, so it is skipped or shown during the slideshow respectively Allows users to rehearse the timing on each slide and the entire slideshow Records the slideshow including narration and animation Helps set or avoid the use of narrative audio and rehearsed timings during the show. Display media controls in the slideshow view
Monitors	Resolution Show Presentation on Use Presenter View	Defines resolution in slideshow view Picks the monitor to display the presentation one - in case of multiple monitors Run presentation in Presenter view rather than just slideshow view

Concepts of data and Databases

Objectives : At the end of this lesson you shall be able to

- explain database structure and control
- describe Ms access database utilities.

Microsoft Access is a Database Management System (DBMS) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the professional and higher editions.

- Microsoft Access is just one part of Microsoft's overall data management product strategy.
- It stores data in its own format based on the Access Jet Database Engine.
- Like relational databases, Microsoft Access also allows you to link related information easily. For example, customer and order data. However, Access 2013 also complements other database products because it has several powerful connectivity features.
- It can also import or link directly to data stored in other applications and databases.
- As its name implies, Access can work directly with data from other sources, including many popular PC database programs, with many SQL (Structured Query Language) databases on the desktop, on servers, on minicomputers, or on mainframes, and with data stored on Internet or intranet web servers.
- Access can also understand and use a wide variety of other data formats, including many other database file structures.
- You can export data to and import data from word processing files, spreadsheets, or database files directly.
- Access can work with most popular databases that support the Open Database Connectivity (ODBC) standard, including SQL Server, Oracle, and DB2.
- Software developers can use Microsoft Access to develop application software.

Microsoft Access stores information which is called a database. To use MS Access, you will need to follow these four steps:

- **Database Creation:** Create your Microsoft Access database and specify what kindof data you will be storing.
- **Data Input:** After your database is created, the data of every business day canbe entered into the Access database.
- **Query:** This is a fancy term to basically describe the process of retrievinginformation from the database.

- **Report (optional):** Information from the database is organized in a nicepresentation that can be printed in an Access Report.

Architecture

- Access calls anything that can have a name an object. Within an Access desktop database, the main objects are tables, queries, forms, reports, macros, data macros, and modules.
- If you have worked with other database systems on desktop computers, you might have seen the term database used to refer to only those files in which you store data.
- But, in Access, a desktop database (.accdb) also includes all the major objects related to the stored data, including objects you define to automate the use of your data.

RDBMS

In the computing system (web and business applications), there are enormous data that comes out every day from the web. A large section of these data is handled by Relational database management systems (RDBMS). The idea of relational model came with E.F.Codd's 1970 paper "A relational model of data for large shared data banks" which made data modeling and application programming much easier. Beyond the intended benefits, the relational model is well-suited to client-server programming and today it is predominant technology for storing structured data in web and business applications.

MS Access - RDBMS

Microsoft Access has the look and feel of other Microsoft Office products as far as its layout and navigational aspects are concerned, but MS Access is a database and, more specifically, a relational database.

- Before MS Access 2007, the file extension was ***.mdb**, but in MS Access 2007 the extension has been changed to ***.accdb** extension.
- Early versions of Access cannot read accdb extensions but MS Access 2007 and later versions can read and change earlier versions of Access.
- An Access desktop database (.accdb or .mdb) is a fully functional RDBMS.
- It provides all the data definition, data manipulation, and data control features that you need to manage large volumes of data.

- You can use an Access desktop database (.accdb or .mdb) either as a standalone RDBMS on a single workstation or in a shared client/server mode across a network.
- A desktop database can also act as the data source for data displayed on webpages on your company intranet.
- When you build an application with an Access desktop database, Access is the

RDBMS.

Data Definition

Let us now understand what Data Definition is:

- In document or a spreadsheet, you generally have complete freedom to define the contents of the document or each cell in the spreadsheet.
- In a document, you can include paragraphs of text, a table, a chart, or multiple columns of data displayed with multiple fonts.
- In spreadsheet, you can have text data at the top to define a column header for printing or display, and you might have various numeric formats within the same column, depending on the function of the row.
- An RDBMS allows you to define the kind of data you have and how the data should be stored.
- You can also usually define rules that the RDBMS can use to ensure the integrity of your data.
- For example, a validation rule might ensure that the user can't accidentally store alphabetic characters in a field that should contain a number.

Data Manipulation

Working with data in RDBMS is very different from working with data in a word processing or spreadsheet program.

- In a word processing document, you can include tabular data and perform a limited set of functions on the data in the document.
- You can also search for text strings in the original document and, with ActiveX controls, include tables, charts, or pictures from other applications.
- In a spreadsheet, some cells contain functions that determine the result you want, and in other cells, you enter the data that provides the source information for the functions.
- An RDBMS provides you many ways to work with your data. For example,
- You can search a single table for information or request a complex search across several related tables.
- You can update a single field or many records with a single command.

- You can write programs that use RDBMS commands to fetch data that you want to display and allow the user to update the data.

Access uses the powerful SQL database language to process data in your tables. Using SQL, you can define the set of information that you need to solve a particular problem, including data from perhaps many tables.

Data Control

Spreadsheets and word processing documents are great for solving single-user problems, but they are difficult to use when more than one person needs to share the data.

- When you need to share your information with others, RDBMS gives you the flexibility to allow multiple users to read or update your data.
- An RDBMS that is designed to allow data sharing also provides features to ensure that no two people can change the same data at the same time.
- The best systems also allow you to group changes (which is also known as transaction) so that either all the changes or none of the changes appear in your data.
- You might also want to be sure that no one else can view any part of the order until you have entered all of it.
- Because you can share your Access data with other users, you might need to set some restrictions on what various users are allowed to see or update.

Designing a Database

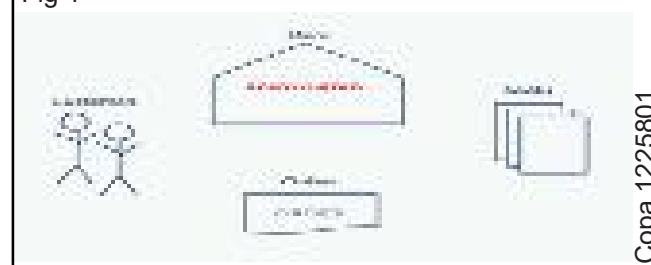
The first step in creating a database is to think about why you need it-what is its purpose? Once you know the answer, you can begin designing your own database. Ask yourself questions like What kinds of information will it store? How will I have to break down this information so it can be stored in my database? How will I use the data once it's in there?

The bookstore scenario

The best way to learn about designing a database is to jump right in to the process. Let's pretend we work for the bookstore, and we need to build a database for the store to use. Let's think about what we might need the database to do for us.

The following diagram shows that we have **customers** and sell **books** via **orders**, both in the store and online.

Fig 1



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The store needs a way to keep track of these things.

Determine the purpose of the database

The first step of designing a database is to determine the purpose of the database. What do we need it to do?

At Ready-2-Read, our customers will place orders for books. At the very least, we will want our database to track the books we sell, the customers we sell them to, and the date of each of the orders.

The database will also be able to tell us where our customers live when we need to send them books or coupons. Additionally, we can use it to track our sales or to make a bestseller list to post in the store.

Plan database tables

Once we've established its purpose, we can begin about how to break up the information into the tables the database will need to store data. Recall that a table is a collection of records, and each record is broken up into the smallest pieces of needed information, called fields.

Because we're planning a database to track our customers, the books we have, and the orders our customers place, we will need a table for each one of these.

- Customers
- Orders
- Books

Plan table fields

Once you know what tables you need, the next step is deciding what fields belong in each table. Remember that fields are the smallest chunk of information in any record.

Let's look at our Ready-2-Read bookstore example again. There will be several fields in our Customers table. We'll obviously want each customer's first name and last name. We'll also need an address if we need to send a customer his order. Email will be necessary if we need to contact the customer if there is an issue with the order.

Customers	Books	Orders
First Name	Title	Customer
Last Name	Author First	Book
Street	Author Last	Date
City	Price	
State	Category	
Pin/Zip Code		
Email		

We will also need several fields in the Books table. Title and Author make sense for books. We'll need a Price for each book. Category will help us know what type of books sell the best so we can order more books that fit into this category.

The Orders table will have fewer fields. We'll need this table to track the Customer who is placing the order, the

Book the customer is ordering, and the Date the order is placed.

Creating a new database with Access

When you launch Access 2007/2010, you will see the Getting Started window.

In the left pane, the template categories-including the featured local templates-are listed, as well as the categories on Office Online. Templates are prebuilt databases focused on a specific task that you can download and use immediately.

You will also see the New Blank Database option, which allows you to build your own database from scratch.

Fig 2



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When you choose the New Blank Database option at the top of the window, you will be prompted to rename the database from the default name, which is Database1.accdb. Rename the database whatever you want. In the example below, we named the database Ready2Read because it's the name of the store in our scenario.

Fig 3



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Click Create to finish naming the database.

Setting up tables

The new database opens with one table showing as a default. It also defaults to naming this table Table1 in both the navigation pane and the Table tab itself. You will want to name your tables based on your database design plan.

Fig 4

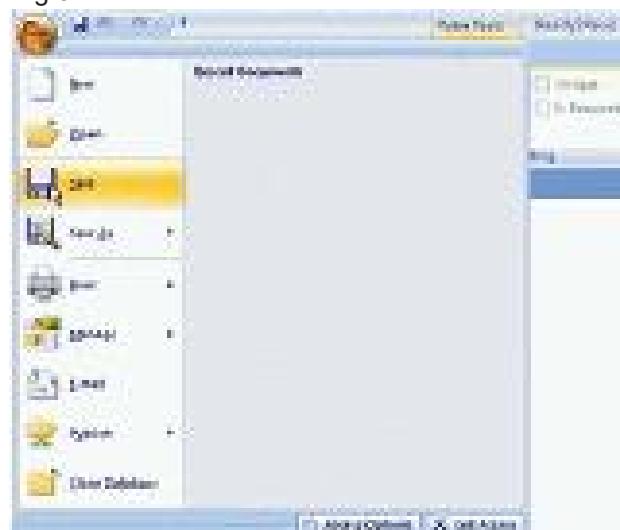


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Naming a table

To give the table a unique name, you must first click on the Microsoft Office button in the upper-left corner of the application.

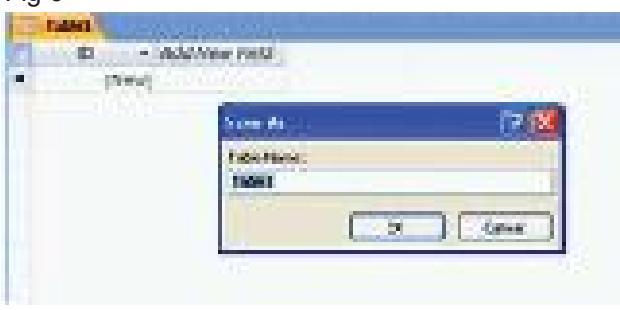
Fig 5



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Next, select Save from the menu. The Save As dialog box will appear to let you save the table whatever name you want.

Fig 6



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The new table names appear in both the navigation pane and the Table tab itself, as you can see in the picture below.

Fig 7



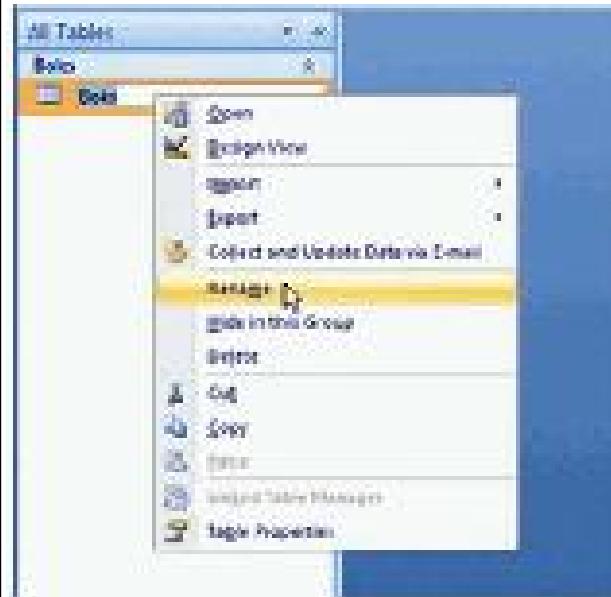
Copa 1225807

TIP: Give your tables logical, easy-to-understand names.

To rename a table:

With the table closed, right-click the Table you want to rename in the navigation pane. Select the Rename option that appears in the menu.

Fig 8



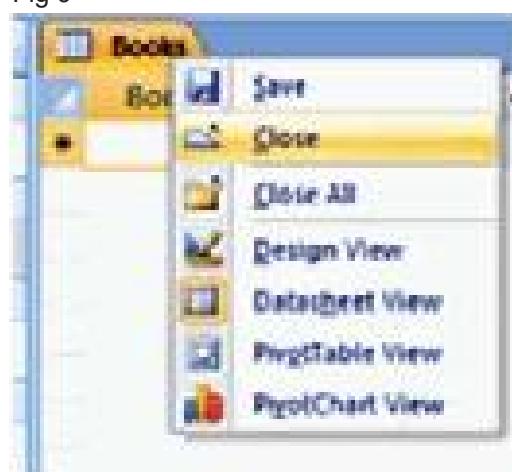
Copa 1225808

The table name will be highlighted and a cursor will appear, which means you can now type the new name right there. Left-click anywhere outside of the table name to make the change.

To close a table:

There are several ways to close an active table. You can right-click the Table tab and choose Close from the menu.

Fig 9



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A more common method is to click the X that appears in the top-right corner of the active database object window.

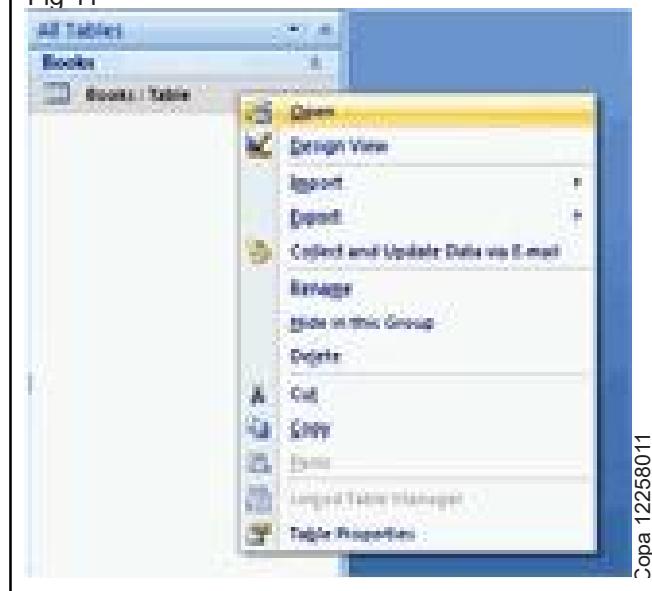
Fig 10



To open a table:

To open a table, right-click the Table name of the table you want to open in the navigation pane, then choose Open from the menu.

Fig 11



A more common method is to double-click the table name in the navigation pane. The selected table will open in the active database object window.

Adding more tables to the database

By default, Access 2007 starts out with one table. To add more tables to the database, click the Create tab on the Ribbon.

Fig 12



Next, select Table from the Tables command group. A new table will open in the active database object window. You must name your table using the Save command from Microsoft Office menu.

Adding fields to a table

Access 2007 allows you to add fields to tables when you are:

- Working in Datasheet view, which looks like a spreadsheet
- Working in Design view, where you are able to set more controls for your fields

Either way, you need to know how to switch between the two views.

To switch views:

Select the Views command group from either the Home tab (seen below) or the Datasheet tab on the Ribbon. Select the view option you want from the menu.

Fig 13



Adding fields in Datasheet view

By default, Access 2007 creates one field in each new table: the ID field. This field auto-numbers to give each record in the table a unique number identifier. Recall that records are the rows in a table. You may want to rename the ID field with a unique name because the ID field appears automatically in every table you create. While this is not necessary, it may help avoid confusion when setting up table relationships.

Fig 14



To add more fields to a table in Datasheet view, double-click the Add New Field header.

Fig 15

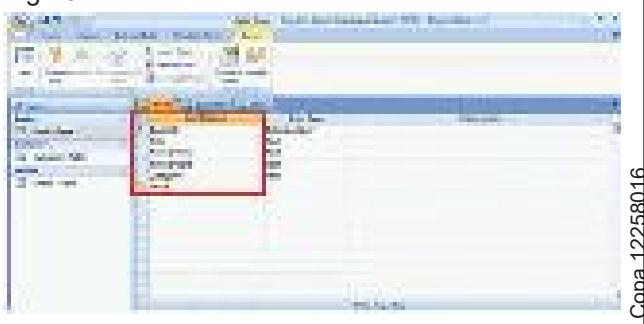


The Add New Field text will disappear from the header. Name the field by typing the name directly into the header. Press the Tab key on your keyboard to move to the next field.

Adding fields in Design view

In Design view, the field names are along the lefthand column instead of across the top like in Datasheet view, as seen below.

Fig 16



To add a new field to a table in Design view, click in the cell where you want the new field and type the field name. When you switch back to Datasheet view, your new field appears as its own column, as seen below.

Fig 17



Datatypes

Every field in a table has properties and these properties define the field's characteristics and behavior. The most important property for a field is its data type. MS Access supports different types of data, each with a specific purpose.

- The data type determines the kind of the values that users can store in any given field.
- Each field can store data consisting of only a single data type.

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require characters. calculating (e.g. phone numbers).	Up to 255
Long Text	Lengthy text or combinations of text and numbers. characters.	Up to 63, 999
Number	Numeric data used in mathematical (16 bytes if set to calculations. Replication ID).	1, 2, 4, or 8 bytes
Date/Time	Date and time values for the years 100 through 9999.	8 bytes.
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes.
AutoNumber	A unique sequential (incremented by 1) number or random number assigned by set to Replication Microsoft Access whenever a new record is ID). added to a table.	4 bytes (16 bytes if
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or	1 bit.

Here are some of the other more specialized data types, you can choose from in Access.

Data Types	Description	Size
Attachment	Files, such as digital photos. Multiple files can be attached per record. This data type is not available in earlier versions of Access.	Up to about 2 GB.
OLE objects	OLE objects can store pictures, audio, video, or other BLOBS (Binary Large Objects)	Up to about 2 GB.
Hyperlink	Text or combinations of text and numbers stored as	Up to 8,192 (each part of a Hyperlink data type can contain up to 2048 characters).
Lookup	The Lookup Wizard entry in the Data Type column in the Design view is not actually a data type. When you choose this entry, a wizard starts to help you define either a simple or complex lookup field.	Dependent on the data type of the lookup field.
Wizard	A simple lookup field uses the contents of another table or a value list to validate the contents of a single value per row. A complex lookup field allows you to store multiple values of the same data type in each row.	
Calculated	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.	You can create an expression that uses data from one or more fields. You can designate different result data types from the expression.

MS Access - Adding Data

Adding records to tables

When you enter records into your table, you are populating the database. In Access 2007, you can do this a few different ways.

To add records in the new record row:

- Click the record row with the asterisk that appears at the bottom of the table.

Fig 18



- Type the data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record navigation button:

- Click the New Record button in the navigation bar. The navigation bar is located in the bottom-left corner of the open object pane.

Fig 19



- Type data into the appropriate fields.
- Hit Enter or the Tab key to move to the next field.

To add records with the New Record command:

- Click the New Record command in the Records group in the Ribbon.

Fig 20



- Type the data into the appropriate fields.
- Hit the Enter or the Tab key to move to the next field.

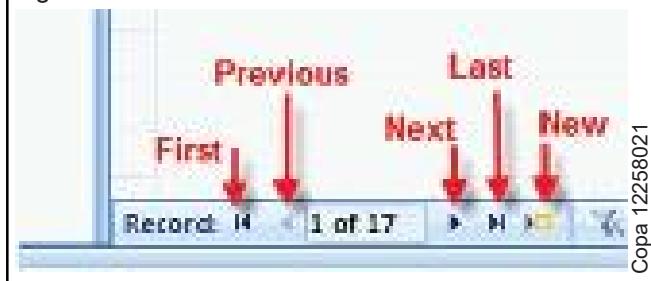
Editing records in tables

Sometimes it is necessary to edit records in the database. Like with every other task in Access 2007, this can be done several different ways.

To edit a record directly:

- Scroll through the records, or use the navigation buttons on the navigation bar to find the record to edit.

Fig 21



- Click the cell containing the information that must be edited. A pencil icon appears to indicate edit mode.

Fig 22



- Type the new information into the field.
- Click outside of the record row to apply the change.

To edit a record using Find and Replace:

- Click the Find command in the Find group on the Ribbon.

Fig 23



- The Find and Replace dialog box opens.

Fig 24



- Tell Access what to find by typing it into the Find What: area.
- Type the replace term in the Replace With: area.
- Tell Access where to look with the Look In: drop-down list. The first choice in the drop-down list is the field you were last in within the table.
- Tell Access what to Match: Any part of the field, the whole field, or just the start of the field.
- Tell Access how to Search: Up finds records above the cursor, Down finds records below the cursor, and All searches all records.
- Click one of the action options:
 - Find Next will find the next instance of the word in the table.

- Replace will put the new word into the table, overwriting what is currently there.
- Cancel stops the editing process.

CAUTION: DO NOT use Replace All because it will overwrite every instance of the Find term in the table, which can have a serious impact on your data.

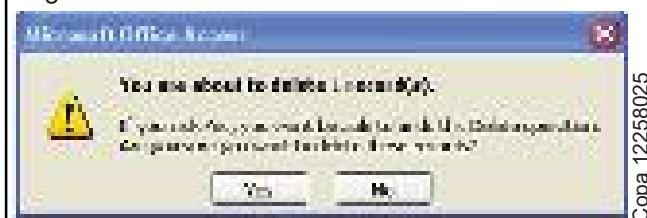
To copy and paste a Record:

- Select the record you want to copy. Right-click, then select Copy.
- Select the new record row. Right-click and select Paste. The record information appears with a new record ID number.

To delete a record:

- Select the record you want to delete, then right-click and select Delete Record.
- A dialog box appears, telling you the action cannot be undone and asking if you are sure you want to delete the record.

Fig 25



There may be other records that rely on the record you are trying to delete. DO NOT delete a record without knowing how it will impact the rest of your database.

Fig 26

	Record ID	Title	Author	Year Published	Genre
X	1	The Great Gatsby	F. Scott Fitzgerald	1925	Novel
X	2	The Catcher in the Rye	J. D. Salinger	1951	Novel
X	3	1984	George Orwell	1949	Science Fiction
X	4	Brave New World	George Orwell	1932	Science Fiction
X	5	The Handmaid's Tale	Margaret Atwood	1985	Science Fiction
X	6	The Old Man and the Sea	Ernest Hemingway	1952	Novel
X	7	One Hundred Years of Solitude	Gabriel García Márquez	1967	Novel
X	8	The Lord of the Rings	J. R. R. Tolkien	1954	Novel
X	9	The Hobbit	J. R. R. Tolkien	1937	Novel
X	10	The Great Gatsby	F. Scott Fitzgerald	1925	Novel
X	11	The Catcher in the Rye	J. D. Salinger	1951	Novel
X	12	1984	George Orwell	1949	Science Fiction
X	13	1984	George Orwell	1949	Science Fiction
X	14	The Handmaid's Tale	Margaret Atwood	1985	Science Fiction
X	15	The Old Man and the Sea	Ernest Hemingway	1952	Novel
X	16	The Hobbit	J. R. R. Tolkien	1937	Novel
X	17	The Lord of the Rings	J. R. R. Tolkien	1954	Novel
X	18	The Hobbit	J. R. R. Tolkien	1937	Novel

When you delete a record, the record number is permanently deleted from the database table. If you delete the last record from a table and then add a new record, your new record numbers will appear to be out of sequence.

Data validation

Data validation is an important database concept. It is the process by which Access tests the data that is being entered into the database to make sure it is in an acceptable-or valid-format.

Let's say one of your database users has entered an order date of January 4, 2008, in the month/date/year format as 01/04/2008. Another user has entered an order placed on that same date in the day/month/year format as 04/01/2008. If the database is tracking all sales for the month of January 2008, it may not show both orders as placed in January, even though both were placed on the same date.

Access 2007 allows you to set **field properties** and **data validation** rules to force the person entering data to follow a specific format.

Data types and validation rules

Data validation begins when data types are set during the process of building tables and fields. For example, if a field data type had been set to Currency and a text value is entered in that table field during data entry, Access will not accept an invalid format and will display a validation error, like the one below.

Fig 27



Data validation is accomplished by setting data validation rules and other field properties for various fields.

To set data validation rules:

- In Design view, highlight the field that requires a validation rule.
- In the Field Properties section at the bottom half of the window, set your validation rule using the Expression Builder. The Expression Builder offers common syntax to set up a data validation rule.

Fig 28

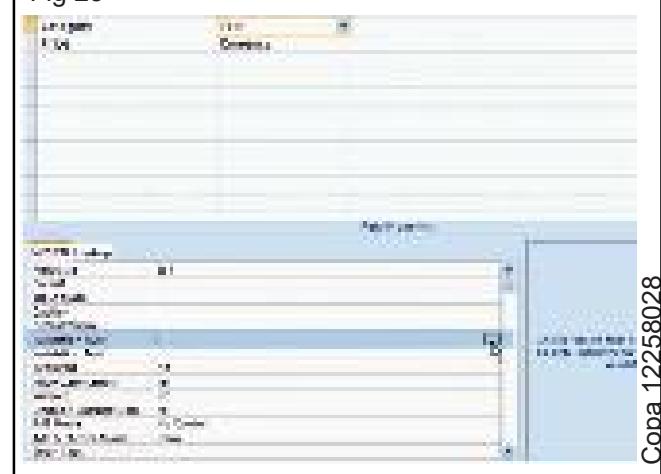
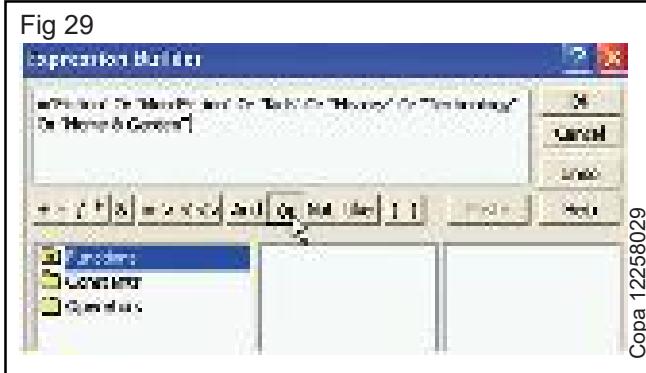


Fig 29



Validation rules work most easily with numerical fields. Rules for text fields require you to enclose each acceptable value inside its own quotation marks, separating them with Or, as seen above.

Validation text

Validation text is a specialized error message you can set to have Access tell the user entering data the specific way you want that person to enter it.

To set the validation text, enter the error message exactly as you want it to appear to users in the row directly beneath the Validation Rule row in the Field Properties section of Design view. For the validation rule we set for Category, you'd set the validation text like this:

Fig 30



The image below shows the resulting error message users would see when the Category validation rule has been broken.

Fig 31



Using field properties to ensure data integrity

Another way to ensure data integrity is by setting field properties such as Field Size, Format, and Required.

- Field Size can be set to hold a specific number of characters, up to as many as 255 for text fields. If you were using a text field to hold the two-letter state postal abbreviation, the field size could be set to 2 to ensure no one enters a full state name into this field.
- The Format field property can be set to display text or numbers in a standardized way. For example, text can be set to show as all uppercase, and numbers can be set to show scientific numbers, percentages, or decimals.
- Set the Required property to Yes if you want users entering data to be required to enter something in the field. Choose No if users are allowed to leave the field blank.

These are just some ways Access helps you ensure data being entered into your database is valid.

Forms, quires, and reports in access

Objectives : At the end of this lesson you shall be able to

- explain database relationship and forms
- explain quires and reports in as access

In a relational database (Access), the data in one table is related to the data in other tables. In general, tables can be related in one of three different ways: one-to-one, one-to-many or many-to-many. The relationship is used to cross reference information between tables.

One to One

In a one-to-one relationship each record in one table has at most one related record in another table.

In a one-to-one relationship, each record in Table A can have only one matching record in Table B, and each record in Table B can have only one matching record in Table A. This type of relationship is not common, because most information related in this way would be in one table. You might use a one-to-one relationship to divide a table with many fields, to isolate part of a table for security reasons, or to store information that applies only to a subset of the main table.

One to Many

A one-to-many relationship, often referred to as a "master-detail" or "parent-child" relationship.

A one-to-many relationship is the most common type of relationship. In a one-to-many relationship, a record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A.

Many to Many

In a many-to-many relationship, a record in Table A can have many matching records in Table B, and a record in Table B can have many matching records in Table A. This type of relationship is only possible by defining a third table (called a junction table) whose primary key consists of two fields the foreign keys from both Tables A and B. A many-to-many relationship is really two one-to-many relationships with a third table.

A many-to-many relationship means that for each record in one table there can be many records in another table and for each record in the second table there can be many in the first.

Many-to-many relationships can not be directly represented in relational database programs and have to be built by using two or more one-to-many relationships.

Defining relationships

You define a relationship by adding the tables that you want to relate to the Relationships window, and then dragging the key field from one table and dropping it on the key field in the other table.

- The kind of relationship that Microsoft Access creates depends on how the related fields are defined:
- A one-to-many relationship is created if only one of the related fields is a primary key or has a unique index.
- A one-to-one relationship is created if both of the related fields are primary keys or have unique indexes.
- A many-to-many relationship is really two one-to-many relationships with a third table whose primary key consists of two fields the foreign keys from the two other tables.

move a table that appears in the relationship map:

- Place your mouse over the table you want to move.
- Hold down the left mouse button, then drag the table to a new location.
- Release the mouse button to drop the table in its new place.

Understanding the relationship map

The relationship map lists all of the tables that were selected to relate, as well as all of the fields that were previously set up for that table. Notice that the first field has a key icon next to it. This is the primary key for the table.



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Primary and foreign keys

A primary key is the first field in each table of the database. You may recall that this field auto-numbers by default, so every record in the table has its own unique number to identify it. Access uses this number to quickly pull information together when you run queries or reports, which are covered later.

In the example above, the primary key for the Customers table is Customer ID, the primary key for the Orders table is Order ID, and the primary key for the Books table is Book ID.

A foreign key is a field that is the primary field in its own table but that shows up in another table. If you look closely at the Orders table, the fields Customer ID and Book ID appear there, as well as in their own respective tables. These fields are the primary key in their own tables, but in the Orders table, they are considered foreign keys.



Forms

A form is a database object that you can use to enter, edit, or display data from a table or a query. You can use forms to control access to data, such as which fields of data are displayed. For example, certain users may not need to see all of the fields in a table. Providing those users with a form that contains just the necessary fields makes it easier for them to use the database.

create a form with a single click,

1. Open the table or query upon which you want to base the form.
2. To create a form on which all fields from the underlying table or query are placed, displaying one record at a time, on the Create tab, click Form.



Forms in Access are like display cases in stores that make it easier to view or get the items that you want. Since forms are objects through which you or other users can add, edit, or display the data stored in your Access desktop database, the design of your form is an important aspect. There's a lot you can do design-wise with forms in Microsoft Access. You can create two basic types of forms -

- Bound forms
- Unbound forms

Bound Forms

- Let us now understand what Bound Forms are ?
- Bound forms are connected to some underlying data source such as a table, query, or SQL statement.
- Bound forms are what people typically think of when they think of the purpose of a form.
- Forms are to be filled out or used to enter or edit data in a database.
- Examples of bound forms will typically be what users use to enter, view or edit data in a database.

Unbound Forms

Let us look into Unbound Forms:

- These forms are not connected to an underlying record or data source.
- Unbound forms could be dialog boxes, switch boards, or navigation forms.
- In other words, unbound forms are typically used to navigate or interact with the database at large, as opposed to the data itself.

Types of Bound Forms

There are many types of bound forms you can create in Access. Let us understand the types ?

Single Item Form

This is the most popular one and this is where the records are displayed - one record at a time.

Multiple Item Form

This displays multiple records at a time from that bound data source.

Split Form

The form is divided into halves, either vertically or horizontally. One half displays a single item or record, and the other half displays a list or provides a datasheet view of multiple records from the underlying data source.

Form Controls

Every object on a form or report is a control and has its own set of properties (displayed in the Property list) that determine the characteristics of the data it contains. Some controls are linked to fields in the underlying table or query and some are merely text or graphical objects not related to any data source. Two of the most commonly used controls in a form or report are text boxes and labels.

- 1) Label: displays unchanging or informational text often times as headings or titles. Labels do not come from a source in the database such as a field or expression. This is called an unbound control because it is not bound to any data source.
- 2) Text Box: displays data as text and is a bound control. A bound control displays information that is stored in a field from the data. Text boxes are used to display, enter, and update values from fields in your database.

Form Sections

Forms consist of header, footer, and detail sections. In forms, there are two types of headers/footers. Form headers and footers are visible on every page of the form. Page headers/footers only appear on a printed copy of a form. There are never visible in Form View. Information about individual records appears in the detail sections.

Sizing Sections

Adjust the size of the area for any of the sections (headers, footers, detail), by dragging the horizontal border for that section with your mouse. To adjust line spacing in the detail section, drag the Detail border. There is no other line spacing control.

Working with Queries

Queries are questions you ask of your database. They allow you to select certain fields out of a table, or pull together data from various related tables and display it together. Queries can be used to perform calculations, and to edit the data in your tables. Queries can also form the basis of forms and reports.

Query Results

- If a query contains fields from two or more related tables, the results will only include records that have related records in all the tables. (In other words, in the query shown above, customers without records in the Orders table will not appear in the query results.) To display such records, use an outer join (see page 6) in your query.
- WARNING!** Any change you make in a query (adding, deleting or editing data) WILL BE CHANGED IN THE TABLES TOO!!!

Sort query results

In Design View, click the Sort row in the column you wish to sort by. A dropdown arrow appears; choose Ascending or Descending. If you sort by more than one column, the sorts will be done left-to-right.

Create a concatenated field in a query

Concatenated fields combine information from two or more fields into one. Ex: Combine first and last names into one field, called "FullName". In Design View, click in a blank column and type the following:

FullName:[FirstName]&" "&[LastName]

(Type a space between the two sets of quotation marks, and use square brackets around the field names.)

Create a calculated field in a query

In Design View, click in a blank column and type a mathematical expression, typing field names in square brackets. Any of the normal mathematical operators (+ - * / ^) can be used. If desired, give the expression a name as in the sample below. The following expression calculates a total cost by multiplying quantity times price:

Item Total:[Quantity]*[Price]

Use the Expression Builder to create calculated or concatenated fields

Fig 35

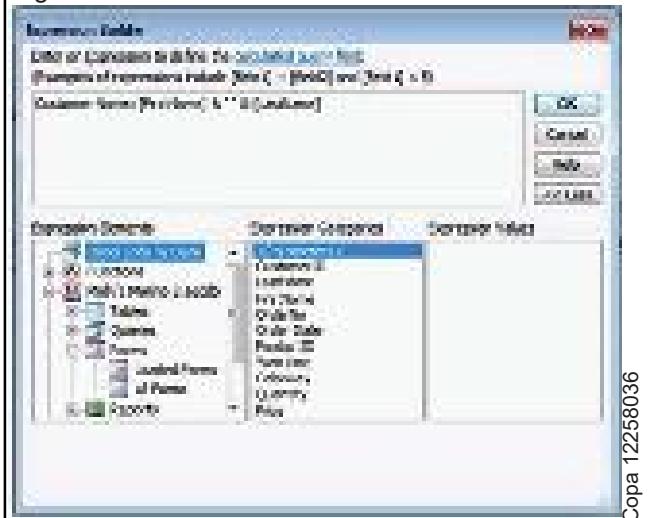


You can simplify the process of creating concatenated fields and other expressions with the Expression Builder. Create a blank column in your query grid and then click the Builder button in the Query Setup group on the Query Design Ribbon. The Expression Builder opens.

Type the expression in the large box at the top. One advantage is that you have way more room to type and see your expression than you have at the top of a query grid column!

A second advantage is that you can add fields to the expression by double clicking them in the Expression Categories column rather than by typing them. This removes the possibility of typos.

Fig 36



Specify criteria in a query (Filtering)

In Query Design View, click in the criteria row for the field you want to filter, and type the criteria (ex: type "OH" in the criteria row of the State field). When you run the query, only records matching the criteria.

Fig 37



Using Multiple Criteria

You can type criteria in more than one field.

- Criteria typed on the same line must all be met for a record to be displayed ("AND" logic). Ex: "OH" in the state field and "Smith" in the LastName field pulls up only Ohio-dwelling Smiths.
- If criteria are typed on different lines, records matching any of them will be retrieved ("OR" logic). Ex: "WA" and "OH" on different lines in the State field retrieves records for both states.

Criteria Ranges

Criteria ranges broaden and customize a search. Type a criteria range instead of a single value in the Criteria row of the query grid.

Criteria	Example	Description and Result
<	<14	Finds records where the field is less than a certain value. Records will have values under 14.
<=	<= #2/2/2006#	Finds records where the field is less than or equal to a certain value. Records will have dates on or before February 2, 2006 Note: dates are enclosed between # signs.
>	>100	Similar to above: Finds records where the value is
>=	>=100	greater than 100. The second expression displays records where the value is greater than or equal to 100.
=	="Diana"	Finds records where the value in the field is Diana. Note: text is enclosed in double quotes.

Expressions like these may be combined - for example, a criteria of <49 Or>=100 would return records with values below 49, or 100 or above, but not ones with values between 49 and 99.99.

Between __ And __	Between 1 and 4	Finds records where the field is between the endpoints.
Is Null	Is Null	Finds records where the field is empty.
Is Not Null	Is Not Null	Finds records where the field is not empty.
Like	Like U* Like "[U-X]*" Like "Korea" Like "ina" Like "Chi???" Like "*4.99"	Finds records where the criteria match parts of the field. The * wildcard stands for any number of characters, and the ? wildcard stands for a single character. The sample criteria will return records where the field 1) starts with U; 2) starts with U, V, W or X, 3) contains the letters 'Korea'; 4) ends in the letters 'ina' as in ballerina; 5) has five letters and begins with the letters 'Chi' as in Chile or China; 6) is a number and ends in the digits '4.99' as in 24.99.

Create a parameter query

Parameters make queries flexible by letting users choose their own criteria each time they run the query. In the criteria box, type a phrase in square brackets; Access will use this phrase to prompt the user for a value. Ex: In a State field, type [Enter a state]. If the user types CA, only California records will be retrieved.

Specify a range in a parameter query

In the criteria box, type the following:

Between [] And []

Inside the brackets, type text telling the user what kind of information to enter.

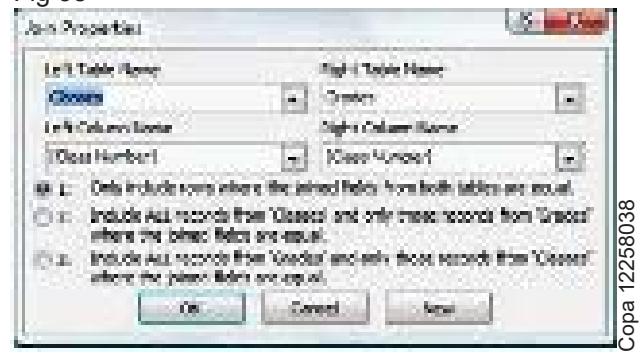
Inner Joins vs. Outer Joins

Excel normally uses inner joins in its queries. These queries return only those rows from both tables in the join that match on the joining field (e.g., customers in the Customers table with corresponding orders in the Orders table.)

If you need to display all customers, with or without orders, as well as any available order information, you need to use an outer join.

In the query tray, double click the join line between two related tables. The Join Properties dialog box will appear:

Fig 38



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Select button 2 or 3 depending on which field's records you want to display completely.

Action Queries

Action queries modify groups of records in one fell swoop. Types of action queries include:

- Update Queries (modify all records in a table that meet specific criteria - ex: change the tax rate for all Ohio customers from 5.75% to 6%)
- Delete Queries (remove records from a table - ex: delete all customers whose last order date is more than 2 years ago)
- Append Queries (add records to an existing table - ex: at the end of the year, add the year's orders to the end of an archive table)

- Make-table Queries (create a new table - ex: extract a subset of records into a new table, for a subordinate who needs Ohio customers only)

Other Specialized Queries

Instructions for creating and running these special query types can be found in the Access help manual by clicking the Help button in the upper right corner of the screen (Internet connection required).

Find Duplicates query: Lets you locate duplicate records in a table by displaying a field containing duplicate values alongside other fields for comparison, to help you tell if the record is really a duplicate.

Find Unmatched query: Lets you compare two tables and identify records in one of the tables that have no corresponding records in the other table.

Crosstab query: This is a special type of Totals query that presents summary information in a compact format that is similar to a spreadsheet.

Union query: Lets you review all of the data that is returned by several similar select queries together, as a combined set.

Concepts of network and internet

Objectives : At the end of this lesson you shall be able to

- define computer network and its advantages and disadvantages
 - name and explain the types of network and their characteristics
 - explain the types of topologies
 - state about the cables used for network system
 - name and state about the various connectors used in network system
 - explain about the hub, modem and internet
 - describe about the internet protocols connection sharing (ICS) using windows.
-

Define computer network

A computer network is an interconnection of various computer systems located at different places. In computer network two or more computers are linked together with a medium and data communication devices for the purpose of communicating data and sharing resources. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes.

Advantages of Computer Networks

The following are some of the advantages of computer networks.

- **File Sharing:** Networks offer a quick and easy way to share files directly. Instead of using a disk or USB key to carry files from one computer or office to another, you can share files directly using a network.
- **Security:** Specific directories can be password protected to limit access to authorized users. Also, files and programs on a network can be designated as "copy inhibit" so you don't have to worry about the illegal copying of programs.
- **Resource Sharing:** All computers in the network can share resources such as printers, fax machines, modems, and scanners.
- **Communication:** Even outside of the internet, those on the network can communicate with each other via electronic mail over the network system. When connected to the internet, network users can communicate with people around the world via the network.
- **Flexible Access:** Networks allow their users to access files from computers throughout the network. This means that a user can begin work on a project on one computer and finish up on another. Multiple users can also collaborate on the same project through the network.

- **Workgroup Computing:** Workgroup software like Microsoft BackOffice enables many users to contribute to a document concurrently. This allows for interactive teamwork.
- **Error reduction and improve consistency:** One can reduce errors and improve consistency by having all staff work from a single source of information, so that standard versions of manuals and directories can be made available, and data can be backed up from a single point on a scheduled basis, ensuring consistency.

Network Application Areas

There is a long list of application areas, which can be benefited by establishing Computer Networks. Few of the potential applications of Computer Networks are:

- 1 Information retrieval systems which search for books, technical reports, papers and articles on particular topics
- 2 News access machines, which can search past news, stories or abstracts with given search criteria.
- 3 Airline reservation, hotel booking, railway-reservation, car-rental, etc.
- 4 A writer's aid: a dictionary, thesaurus, phrase generator, indexed dictionary of quotations, and encyclopaedias.
- 5 Stock market information systems which allow searches for stocks that meet certain criteria, performance comparisons, moving averages, and various forecasting techniques.
- 6 Electronic Fund Transfer (EFT) between banks and via cheque clearing house.
- 7 Games of the types that grow or change with various enthusiasts adding to the complexity or diversity.
- 8 Electronic Mail Messages Systems (EMMS).

- 9 Corporate information systems such as marketing information system, customer information system, product information system, personnel information system, etc.
- 10 Corporate systems of different systems such as Order-Entry System, Centralized Purchasing, Distributed Inventory Control, etc.
- 11 On-line systems for Investment Advice and Management, Tax Minimization, etc.
- 12 Resources of interest to a home user.
- 13 Sports results.
- 14 Theatre, movies, and community events information.
- 15 Shopping information, prices, and advertisements.
- 16 Restaurants; good food guide.
- 17 Household magazine, recipes, book reviews, film reviews.
- 18 Holidays, hotels, travel booking.
- 19 Radio and TV programmes.
- 20 Medical assistance service.
- 21 Insurance information.
- 22 Computer Assisted Instruction (CAI).
- 23 School homework, quizzes, tests.
- 24 Message sending service.
- 25 Directories.
- 26 Consumer reports.
- 27 Employment directories and Job opportunities.
- 28 Tax information and Tax assistance.
- 29 Journey planning assistance viz. Train, bus, plane etc.
- 30 Catalogue of Open University and Virtual University courses.

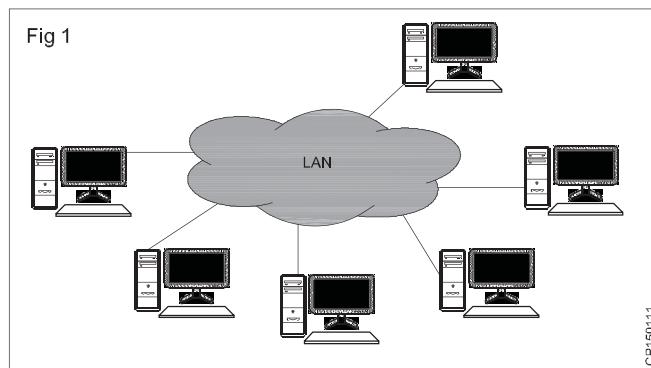
A classification of computer networks can be done to distance as in the table.

Interprocess (or) Distance	Network Type
0 to 1 Km	Local Area Network (LAN)
1 Km to 10 Km	Metropolitan Area Network (MAN)
10 Km to 1000 Km	Wide Area Network (WAN)
Above 1000 Km	Internet

Local Area Network (LAN)

Networks used to interconnect computers in a single room, rooms within a building or buildings on one site are called Local Area Network (LAN). LAN transmits data with a speed of several megabits per second (106 bits per second). The transmission medium is normally coaxial cables.

LAN (Fig 1) links computers, i.e., software and hardware, in the same area for the purpose of sharing information. Usually LAN links computers within a limited geographical area because they must be connected by a cable, which is quite expensive. People working in LAN get more capabilities in data processing, work processing and other information exchange compared to stand-alone computers. Because of this information exchange most of the business and government organisations are using LAN.



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Major Characteristics of LAN

- every computer has the potential to communicate with any other computers of the network
- high degree of interconnection between computers
- easy physical connection of computers in a network
- inexpensive medium of data transmission
- high data transmission rate

Types of Connection

Peer to Peer: Peer to peer is an approach to computer networking where all computers share equivalent responsibility for processing data. Peer-to-peer

networking (also known simply as peer networking) differs from client-server networking, where certain devices have responsibility for providing or "serving" data and other devices consume or otherwise act as "clients" of those servers.

Client server: The term client-server refers to a popular model for computer networking that utilizes client and server devices each designed for specific purposes. The client-server model can be used on the Internet as well as LAN.

Advantages of LAN

- The reliability of network is high because the failure of one computer in the network does not affect the functioning for other computers.
- Addition of new computer to network is easy.
- High rate of data transmission is possible.
- Peripheral devices like magnetic disk and printer can be shared by other computers.

Disadvantages of LAN

If the communication line fails, the entire network system breaks down.

Use of LAN

Followings are the major areas where LAN is normally used

- File transfers and Access
- Word and text processing
- Electronic message handling
- Remote database access
- Personal computing
- Digital voice transmission and storage

Metropolitan Area Network (MAN)

A Data network designed for a town or city. In terms of geographic breadth, MANs are larger than, but smaller than. MANs (Fig 2) are usually characterized by very high-speed connections using optical fiber or other digital media.

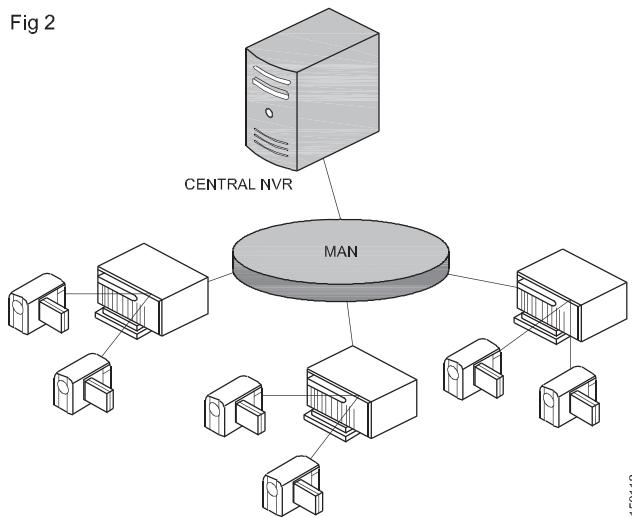
Characteristic of MAN

- 1 The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km range. Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings.
- 2 A MAN (like a WAN) is not generally owned by a single organisation. The MAN, its communications links and equipment are generally owned by either a consortium of users or by a network service provider

who sells the service to the users.

- 3 A MAN often acts as a high speed network to allow sharing of regional resources. It is also frequently used

Fig 2



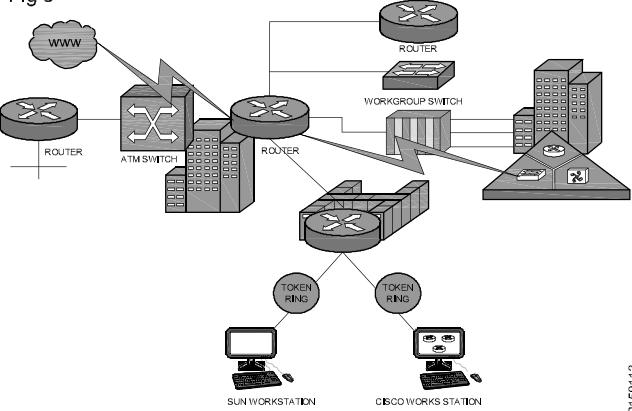
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to provide a shared connection to other networks using a link to a WAN.

Campus Area Network (CAN)

A Campus Area Network or Corporate Area Network (CAN) is a network made up of an interconnection of local area network within a limited geographical area. A

Fig 3



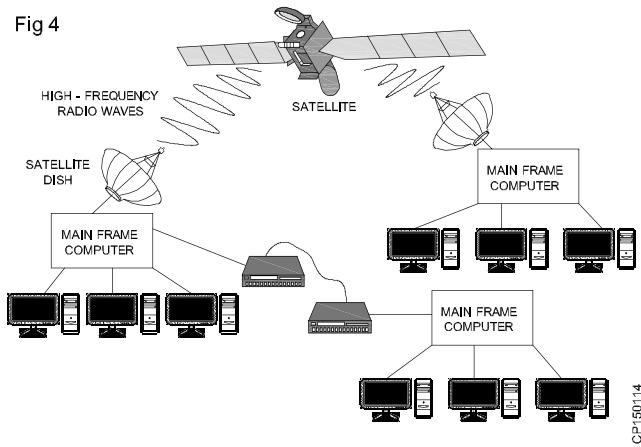
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CAN (Fig 3) is larger than a local area network but smaller than a Wide area Network

Wide Area Network (WAN)

The term Wide Area Network (Fig 4) is used to describe a computer network spanning a regional, national or global area. For example, for a large company the head quarters might be at Delhi and regional branches at Bombay, Madras, Bangalore and Calcutta. Here regional centres are connected to head quarters through WAN. The distance

Fig 4



between computers connected to WAN is larger. Therefore the transmission mediums used are normally telephone lines, microwaves and satellite links.

Characteristics of WAN

Followings are the major characteristics of WAN.

- Communication Facility:** For a big company spanning over different parts of the country the employees can save long distance phone calls and it overcomes the time lag in overseas communications. Computer conferencing is another use of WAN where users communicate with each other through their computer system.
- Remote Data Entry:** Remote data entry is possible in WAN. It means sitting at any location you can enter data, update data and query other information of any computer attached to the WAN but located in other cities.
- Centralised Information:** In modern computerised environment you will find that big organisations go for centralised data storage. This means if the organisation is spread over many cities, they keep their important business data in a single place. As the data are generated at different sites, WAN permits collection of this data from different sites and save at a single site.

Examples of WAN

- Ethernet:** Ethernet developed by Xerox Corporation is a famous example of WAN. This network uses coaxial cables for data transmission. Special integrated circuit chips called controllers are used to connect equipment to the cable.
- Arpanet:** The Arpanet is another example of WAN. It was developed at Advanced Research Projects Agency of U. S. Department. This Network connects more than 40 universities and institutions throughout USA and Europe.

Difference between LAN and WAN

- LAN is restricted to limited geographical area of few kilometers. But WAN covers great distance and op-

erate nationwide or even worldwide.

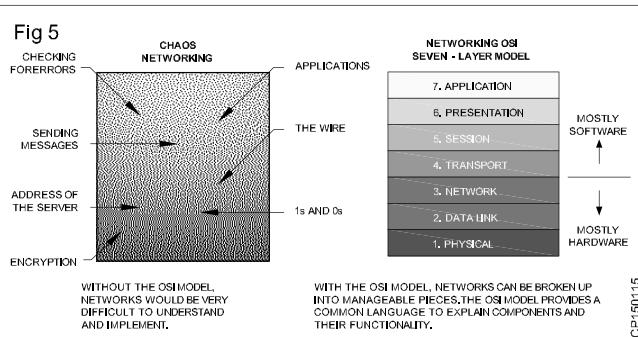
- In LAN, the computer terminals and peripheral devices are connected with wires and coaxial cables. In WAN there is no physical connection. Communication is done through telephone lines and satellite links.
- Cost of data transmission in LAN is less because the transmission medium is owned by a single organisation. In case of WAN the cost of data transmission is very high because the transmission medium used is hired either telephone lines or satellite links.
- The speed of data transmission is much higher in LAN than in WAN. The transmission speed in LAN varies from 0.1 to 100 megabits per second. In case of WAN the speed ranges from 1800 to 9600 bits per second (bps).
- Few data transmission errors occur in LAN compared to WAN. It is because in LAN the distance covered is negligible.

Open Systems Interconnection (OSI)

The Open Systems Interconnection (**OSI**) model is a reference tool for understanding data communications between any two networked systems. It divides the communications processes into seven layers. Each layer both performs specific functions to support the layers above it and offers services to the layers below it. The three lowest layers focus on passing traffic through the network to an end system. The top four layers come into play in the end system to complete the process.

An Overview of the OSI Model (Fig 5)

Application Layer (Layer 7): This layer interfaces directly to and performs common application services for the application processes. The common application services provide semantic conversion between associated application processes. Examples of common applica-



tion services include the virtual file, virtual terminal (for example, Telnet), and "Job transfer and Manipulation protocol" (JTM, standard ISO/IEC 8832)

Presentation Layer (Layer 6): The Presentation layer relieves the Application layer of concern regarding syntactical differences in data representation within the end-user systems. MIME encoding, encryption and similar manipulation of the presentation of data are done at this layer. An example of a presentation service would be

the conversion of an EBCDIC-coded text file to an ASCII-coded file.

Session Layer (Layer 5): The Session layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes check pointing, adjournment, termination, and restart procedures. This layer is responsible for setting up and tearing down TCP/IP sessions.

Transport Layer (Layer 4): The purpose of the Transport layer is to provide transparent transfer of data between end users, thus relieving the upper layers from any concern with providing reliable and cost-effective data transfer. The transport layer controls the reliability of a given link. Some protocols are stateful and connection oriented. This means that the transport layer can keep track of the packets and retransmit those that fail. The best known example of a layer 4 protocol is TCP.

Network Layer (Layer 3): The Network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service requested by the Transport layer. The Network layer performs network routing, flow control, segmentation/desegmentation, and error control functions. The router operates at this layer - sending data throughout the extended network and making the Internet possible, although there are layer 3 (or IP) switches. This is a logical addressing scheme - values are chosen by the network engineer. The addressing scheme is hierarchical.

Data Link Layer (Layer 2): The Data link layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical layer. The addressing scheme is physical which means that the addresses (MAC) are hard-coded into the network cards at the time of manufacture. The addressing scheme is flat.

Physical Layer (Layer 1): The physical layer defines all electrical and physical specifications for devices. This includes the layout of pins, voltages, and cable specifications. Hubs and repeaters are physical-layer devices. The major functions and services performed by the physical layer are:

- Establishment and termination of a connection to a communications medium.
- Participation in the process whereby the communication resources are effectively shared among multiple users. For example, contention resolution and flow control.
- Modulation or conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications

channel. These are signals operating over the physical cabling - copper and fiber optic, for example. SCSI operates at this level.

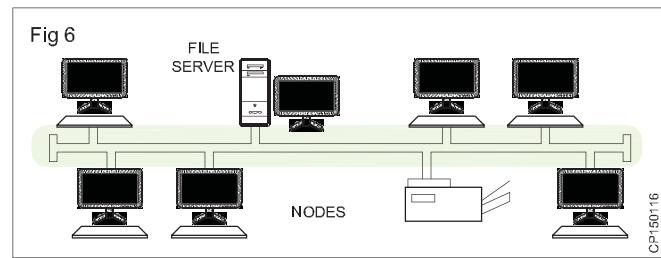
Network Topology

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations.

Main Types of Physical Topologies

- LINEAR BUS
- STAR
- RING
- TREE
- MESH

Linear Bus Topology



A linear bus topology (Fig 6) consists of a main run of cable with a terminator at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable.

Advantages of a Linear Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

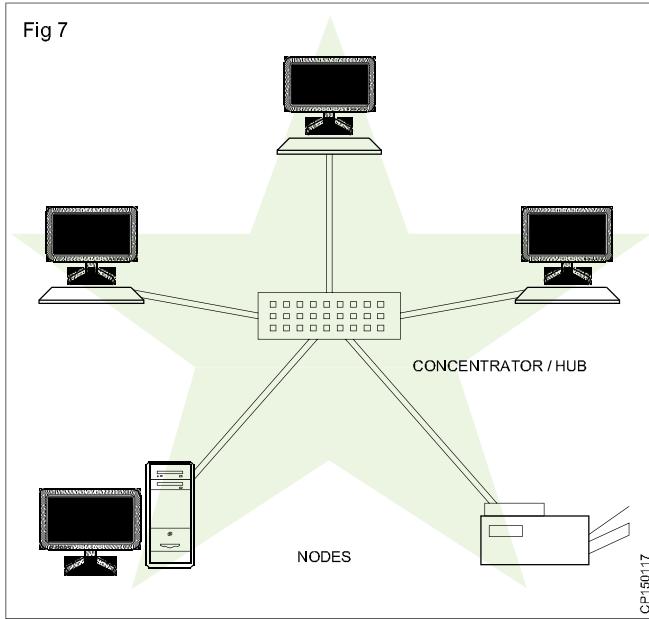
Disadvantages of a Linear Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star Topology

A star topology (Fig 7) is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub, switch, or concentrator

Fig 7



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Data on a star network passes through the hub, switch, or concentrator before continuing to its destination. The hub, switch, or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow.

This configuration is common with twisted pair cable; however, it can also be used with coaxial cable or fiber optic cable.

Advantages of a Star Topology

- Easy to install and wire.
- No disruptions to the network when connecting or removing devices.
- Easy to detect faults and to remove parts.

Disadvantages of a Star Topology

- Requires more cable length than a linear topology.
- If the hub, switch, or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the hubs, etc.

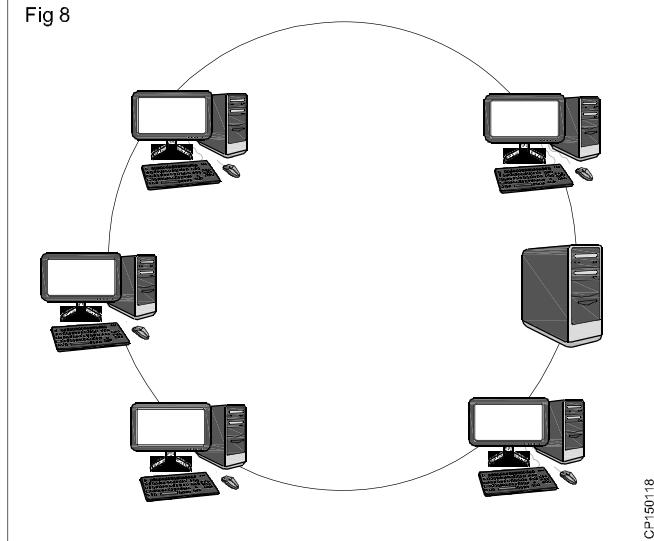
Ring Topology

The ring topology (Fig 8) is one which the network is a loop where data is passed from one workstation to another.

Advantages of Ring Topology

- This is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

Fig 8



CP150118

- There is no need for network server to control the connectivity between workstations.
- Additional components do not affect the performance of network.
- Each computer has equal access to resources.

Disadvantages of Ring Topology

- Each packet of data must pass through all the computers between source and destination.
- If one workstation or port goes down, the entire network gets affected.
- Network is highly dependent on the wire which connects different components.
- MAU's and network cards are expensive as compared to Ethernet cards and hubs.

Tree or Expanded Star

A tree topology (Fig 9) combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable. Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.

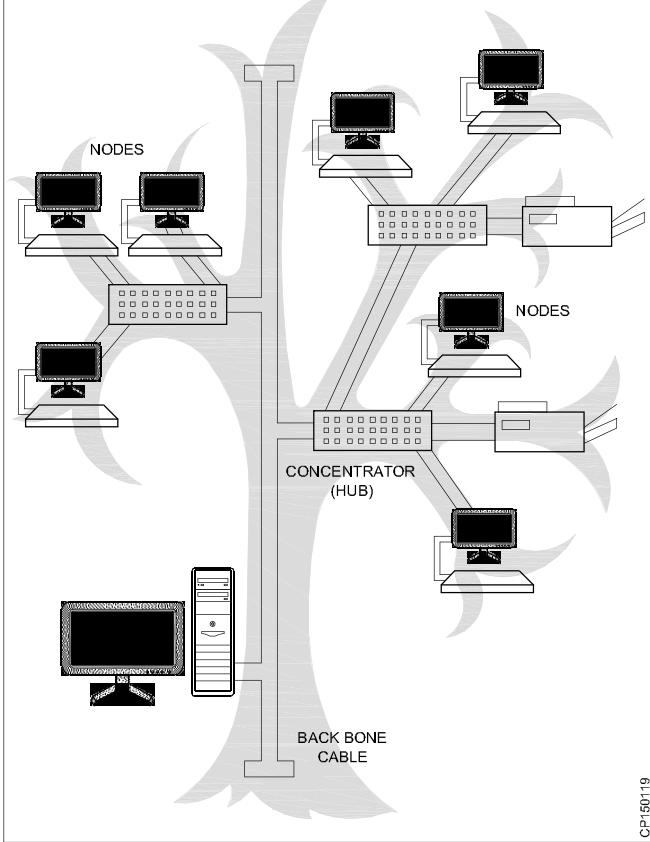
Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.

Disadvantages of a Tree Topology

- Overall length of each segment is limited by the type

Fig 9



of cabling used.

- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

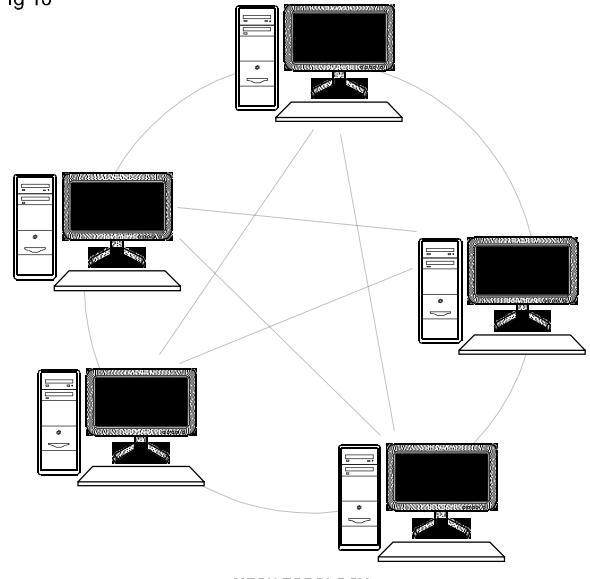
Mesh Topology

A network setup where each of the computers and network devices are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. This topology is not commonly used for most computer networks as it is difficult and expensive to have redundant connection to every computer. However, this topology is commonly used for wireless networks (Fig 10).

Advantages of Mesh topology

- Data can be transmitted from different devices simultaneously. This topology can withstand high traffic.
- Even if one of the components fails there is always an alternative present. So data transfer doesn't get affected.
- Expansion and modification in topology can be done without disrupting other nodes.

Fig 10



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Disadvantages of Mesh topology

- There are high chances of redundancy in many of the network connections.
- Overall cost of this network is way too high as compared to other network topologies.
- Set-up and maintenance of this topology is very difficult. Even administration of the network is tough.

PROTOCOLS

Network Protocol

A **network protocol** defines rules and conventions for communication between network devices. Protocols for computer networking all generally use packet switch techniques to send and receive messages in the form of packets. Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received. Some protocols also support message acknowledgement and data compression designed for reliable and/or high-performance network communication. Hundreds of different computer network protocols have been developed each designed for specific purposes and environments.

Parameters of Protocol

- 1 Physical cable or transmission media.
- 2 Number of bits transmitted on the media.
- 3 When to transmit the data on the network.
- 4 Volume of data to be transmitted.
- 5 Interact with a network with different cable type or topology.
- 6 Ensure that the message has been delivered intact

Network Topology Comparison						
Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
Star Bus	Each computer connects to a central connection device.	All information passes through the central network connection. Each computer must be close to the central device. 100 meters maximum cable length. Up to 24 computers per network.	100 meters maximum cable length. Up to 24 computers per network.	Add a new computer by plugging in a new cable from the computer to the connection device. When one computer goes down, the rest of the network is unaffected. If the connection device goes down, then the network is down.	More expensive of the simple topologies, it requires costly connection device. Usually cheaper than a hybrid network.	Uses twisted pair cable. Requires large amounts of cable. No more than 100 meters from the computer to the connection device.
Bus	Single cable connects everything.	One computer at a time sends information. Information goes along the cable and the computer accesses the information off the cable.	Connect the cable from one computer to the next and so on to the end. A terminator is placed at each end of the network.	To add a computer, you must shut down the network and disconnect the cable from the existing computers. If one computer malfunctions, the entire network goes down.	A cheaper network since there is usually one continuous copper cable.	Single continuous cable connects the devices. Terminator is required at each end of the cable. Uses coaxial or twisted pair cabling.
Ring	Single cable configured in a ring.	Information goes in one direction around the ring and passes along the ring until it reaches the correct computer.	Computers are located close to each other. Setup is easy. There is no connector. The ring has no beginning and no end.	Cable between the computers must be broken to add a new computer, so the network is down until the new device is back online. If there's a break in the cable or an error in the network, information continues to transfer through the rest of the ring until reaching the point of the break. This makes troubleshooting easy.	One of the more expensive topologies due to high cable costs.	Requires more cabling than other topologies. Uses twisted pair.

Network Topology Comparison						
Topology	Information Transfer	Setup	Expansion	Troubleshooting	Cost	Cabling Concerns
H y b r i d Mesh Combines two or more different structures.	Often used across long distances. Information transfer can happen in different ways, depending on the other topologies.	Often created when expanding an existing network. Can use a variety of connection devices.	Connection devices make combining different networks and different topologies easy.	Troubleshooting is most difficult in this topology because of the variety of technologies.	Expensive, large, and usually complicated.	Cabling depends on the types of networks. Can use twisted pair and coaxial cable. Also incorporates fiber optic cabling over long distances.

and in a proper manner.

List of Network Protocols

1 TCP/IP: Transmission Control Protocol / Internet Protocol is an industry standard protocol widely used. It is used for inter operating among different types of computers. Almost all types of networks support TCP/IP. It is the protocol used by the Internet. It uses a 32 - bit addressing scheme.

IP Address

IP defines an addressing scheme that is independent of the underlying physical address (e.g. 48-bit MAC address). IP specifies a unique 32-bit number for each host on a network.

This number is known as the **Internet Protocol Address**, the **IP Address** or the **Internet Address**. These terms are interchangeable. Each packet sent across the internet contains the IP address of the source of the packet and the IP address of its destination.

2 UDP - User Datagram Protocol - is a simple OSI transport layer protocol for client/server network applications based on Internet Protocol (IP). UDP is the main alternative to TCP and one of the oldest network protocols in existence, introduced in 1980. UDP is often used in videoconferencing applications or computer games specially tuned for real-time performance.

3 FTP: File Transfer Protocol (**FTP**) is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet.

FTP is built on a client-server architecture and uses separate control and data connections between the client and the server. FTP users may authenticate themselves using a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that hides (encrypts) the username and password, and encrypts the content, FTP is often secured with SSL/TLS ("FTPS"). **SSH File Transfer Protocol (SFTP)** is sometimes also used instead.

4 SMTP

Simple Mail Transfer Protocol (SMTP) is an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (**IP**) networks.

While electronic mail servers and other mail transfer agents use SMTP to send and receive mail messages, user-level client mail applications typically only use SMTP for sending messages to a mail server for relaying.

For receiving messages, client applications usually use either the **Post Office Protocol (POP)** or the **Internet Message Access Protocol (IMAP)** or a proprietary system (such as Microsoft Exchange or Lotus Notes/ Domino) to access their mail box accounts on a mail server.

5 Telnet

Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal

connection. User data is interspersed in-band with Telnet control information in an 8-bitbyte oriented data connection over the **Transmission Control Protocol (TCP)**.

Telnet provided access to a command-line interface (usually, of an operating system) on a remote host. Most network equipment and operating systems with a TCP/IP stack support a Telnet service for remote configuration (including systems based on Windows NT). Because of security issues with Telnet, its use for this purpose has waned in favour of SSH.

6 HTTP

The **Hypertext Transfer Protocol (HTTP)** is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

Hypertext is a multi-linear set of objects, building a network by using logical links (the so-called hyperlinks) between the nodes (e.g. text or words). HTTP is the protocol to exchange or transfer hypertext.

7 SSH File Transfer Protocol

In computing, the **SSH File Transfer Protocol** (also **Secure File Transfer Protocol**, **Secure FTP**, or **SFTP**) is a network protocol that provides file access, file transfer, and file management functionalities over any reliable data stream.

It was designed by the **Internet Engineering Task Force (IETF)** as an extension of the **Secure Shell Protocol (SSH)** version 2.0 to provide secure file transfer capability, but is also intended to be usable with other protocols.

The IETF of the Internet Draft states that even though this protocol is described in the context of the SSH-2 protocol, it could be used in a number of different applications, such as secure file transfer over **Transport Layer Security (TLS)** and transfer of management information in VPN applications.

This protocol assumes that it is run over a secure channel, such as SSH, that the server has already authenticated the client, and that the identity of the client user is available to the protocol.

8 Post Office Protocol

In computing, the **Post Office Protocol (POP)** is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection. POP and IMAP (Internet Message Access Protocol) are the two most prevalent Internet standard protocols for e-mail retrieval.

Virtually all modern e-mail clients and servers support both. The POP protocol has been developed through several versions, with version 3 (POP3) being the current standard. Most webmail service providers such as Hotmail, Gmail and Yahoo! Mail also provide IMAP and POP3 service.

Networking Components

- **Gateway:** A device sitting at a network node for interfacing with another network that uses different protocols. Works on OSI layers 4 to 7.
- **Router:** A specialized network device that determines the next network point to which it can forward a data packet towards the destination of the packet. Unlike a gateway, it cannot interface different protocols. Works on OSI layer 3.
- **Switch:** A device that allocates traffic from one network segment to certain lines (intended destination(s)) which connect the segment to another network segment. So unlike a hub a switch splits the network traffic and sends it to different destinations rather than to all systems on the network. Works on OSI layer 2.
- **Bridge:** A device that connects multiple network segments along the data link layer. Works on OSI layer 2.
- **Hub:** It connects multiple Ethernet segments together making them act as a single segment. When using a hub, every attached device shares the same broadcast domain and the same collision domain. Therefore, only one computer connected to the hub is able to transmit at a time.

Depending on the network topology, the hub provides a basic level 1 OSI model connection among the network objects (workstations, servers, etc.). It provides bandwidth which is shared among all the objects, compared to switches, which provide a connection between individual nodes.

- **Repeater:** A device to amplify or regenerate digital signals received while sending them from one part of a network into another. Works on OSI layer 1.
- **Modem (MoDem):** A device that modulates an analog "carrier" signal (such as sound), to encode digital information, and that also demodulates such a carrier signal to decode the transmitted information, as a computer communicating with another computer over the telephone network

Types of MODEM

External Modem: This is a modem separated from the system unit in the computer case. It is connected to the serial port of the computer by means of a cable. It is connected to the telephone wall jack by another cable.

Internal Modem: An internal modem is a circuit board (a modem card) that can be added to the system unit of the computer. It takes one of the expansion slots.

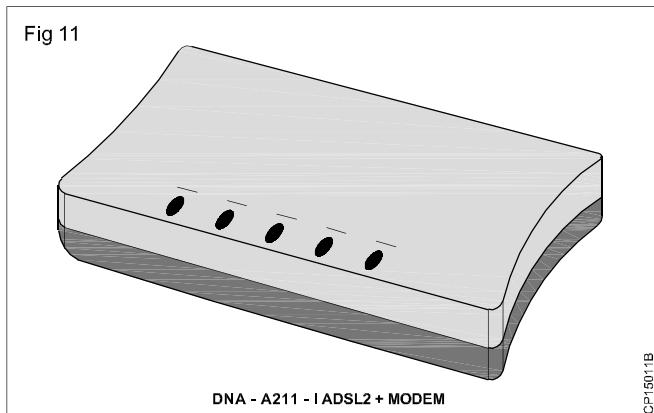
Wired Modem / Standard Modem

Most modem's used today are called standard modems. These modems are usually operated by commands entered from a microcomputer keyboard. Users control the functions (dialling, etc.) of a modem through the keyboard. Modems may use different command languages to control their functions,

Wireless Modems: Wireless modems transmit the data signals through the air instead of by using a cable. They sometimes are called a radiofrequency modem. This type of modem is designed to work with cellular technology, and wireless local area networks. Wireless modems are not yet perfected, but the technology is rapidly improving.

ADSL Modem

Asymmetric Digital Subscriber Line, ADSL (Fig 11) is a type of DSL broadband communications technology used for connecting to the Internet. ADSL allows more data to be sent over existing copper telephone lines POTS, when compared to traditional modem lines. A special filter, called a micro filter, is installed on a subscriber's telephone line to allow both ADSL and regular voice (telephone) services to be used at the same time. ADSL requires a special ADSL modem and subscribers must be in close geographical locations to the provider's central office to receive ADSL service. Typically this distance is within a radius of 2 to 2.5 miles. ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the up-stream rate).



Network Interface Card (NIC)

NIC (Fig. 12) provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card. Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or Wi-Fi wireless standards.



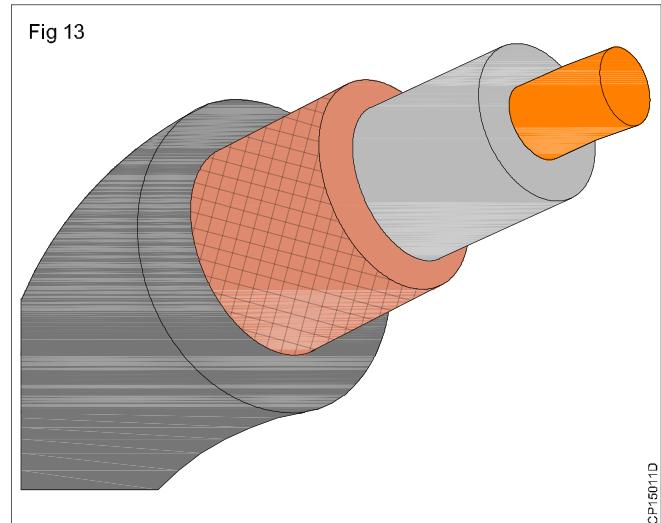
Ethernet NICs plug into the system bus of the PC and include jacks for network cables, while Wi-Fi NICs contain built-in transmitters / receivers (transceivers). In new computers, many NICs are now pre-installed by the manufacturer. All NICs feature a speed rating such as 11 Mbps, 54 Mbps or 100 Mbps that suggest the general performance of the unit.

Network Cables Standards

Cable is the medium through which information usually moves from one network device to another. There are several types of cable which are commonly used with LANs. In some cases, a network will utilize only one type of cable, other networks will use a variety of cable types. The type of cable chosen for a network is related to the network's topology, protocol, and size. Understanding the characteristics of different types of cable and how they relate to other aspects of a network is necessary for the development of a successful network.

Cable standards

A wide range of cabling types are been used to run Ethernet systems. Therefore, different types of cabling standards are being used for the networks involved in connecting devices together using different types of cabling system.



Coaxial cable (Fig 13) is the kind of copper cable used by companies between the community antenna and user homes and businesses. Coaxial cable is sometimes used by telephone companies from their central office to the telephone poles near users. It is also widely installed for use in business and corporation and other types of.

Coaxial cable is called "coaxial" because it includes one physical that carries the signal surrounded (after a layer of insulation) by another concentric physical channel, both running along the same axis. The outer channel serves as a ground. Many of these cables or pairs of coaxial tubes can be placed in a single outer sheathing and, with repeaters, can carry information for a great distance.

10BASE-T Cable Standard: 10Base-T is one of the Ethernet standards for cabling in a network environment. 10BaseT uses a twisted pair cable with a maximum length

of 100 meters. Standard 10BaseT operates at 10 Mbps. It is commonly used in a star topology.

10BASE-FL Cable Standard: 10BaseFL is a fiber optic cable standard designed to run at 10 Mbps. It is similar to 10Base-T, though the media type is fiber. For use up to 2000 meters.

100BASE-TX Cable Standard: 100 Mbps Fast Ethernet over category 5 twisted pair cable. Maximum cable length of 100 meters.

100BASE-FX Cable Standard: 100 Mbps Fast Ethernet standard over fiber cable. Can transmit data up to 2000 meters.

1000BASE-T Cable Standard: Gigabit Ethernet over twisted pair copper wires. Transmit up to 1000 Mbps. 100 meter maximum cable length. Cat5 or better required (Cat6 cabling recommended).

1000BASE-CX Cable Standard: Gigabit Ethernet over a special copper twinax cable. Up to 25 meters in length. Typically used in a wiring closet or data center as a short jumper cable.

1000BASE-SX Cable Standard: Gigabit Ethernet using a short-wavelength laser device over multimode fiber optic cable. 50 μm core (max 300 meters) or 62.5 μm core (max 500 meters). 1000Mbps maximum transfer speed.

1000BASE-LX Cable Standard: Gigabit Ethernet using long-wavelength laser transmitters over fiber optic cable. Up to 3,000 meters. Uses single mode fiber and requires SC connectors for terminating the cable.

10 GBASE-SR Cable Standard: 802.3ae standard. 33 meters for 62.5 μm fiber optic cable, 300 meters for 50 μm cables. 10 Gbps (Gigabit per second) transfer rate.

10 GBASE-LR Standard: 10 Gbps transfer rate. 10 kilometres maximum distance. Fiber optic cable.

10 GBASE-ER Standard: 10 Gbps transfer rate. 40 kilometres maximum cable length. Fiber optic cable.

Media types

A cable is a device which contains a number of signal conductors usually in the form of separate wires. It is the medium through which information usually moves from one system to another through the network. There are several types of cable which are commonly used with the local area network. In some cases, a network utilizes only one type of cable, whereas other network uses a variety of cable types. The type of cable chosen for a network is related to network topology, protocol and size.

Twisted Pair

Twisted pair cable is the most common type of network medium used in LAN today. A transmission media consists of colour coded pairs of two shielded insulated copper wires which are arranged in a spiral pattern. The spiral pattern is an important aspect of twisted - pair cables in order to minimize cross talk or interference between

adjoining wires.

The advantage of using twisted pair cables are

- It is lighter, thinner and more flexible
- Easy to install
- It is inexpensive

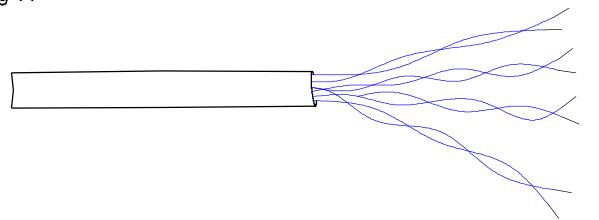
There are two varieties of twisted pair cabling, they are

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**

Unshielded twisted pair (UTP)

Unshielded twisted pair (Fig 14) cabling consists of two unshielded wires twisted around each other that contain no shielding. It is commonly used in the telephone wires and is common for computer networking because of high flexibility of the cables. It is a plastic connector that looks like a large telephone-style connector. The standard connector for unshielded twisted pair cabling is RJ-45 connector.

Fig 14



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UTP has five categories of cable standards defined by the Electronic Industries Association and Telecommunications Industry Association (commonly known as EIA/TIA). The five categories of unshielded twisted pair are:

Categories of Unshielded Twisted Pair

In order to manage the network cabling, you need to be familiar with the standards that may be used on modern networks. The categories of the unshielded twisted pair cable are described below.

Category 1

- It is a form of UTP that contains two pairs of wire.
- CAT 1 is suitable for voice communications but not for data.
- It can carry up to 128 kilobits per second (Kbps) of data.
- It is usually used for telephone wire Data rate - 1 Mbps. This type of wire is not capable of supporting computer network traffic and is not twisted.

Category 2

- It contains four wire pairs and can carry up to 4 Mbps of data.
- CAT 2 is rarely found on modern networks.
- Category 2 or CAT 2 is capable of transmitting data up to 4 Mbps. This type of cable is seldom used.

Category 3

- CAT 3 made up of four twisted - pair wires, each twist is three times per foot. It is certified to transmit data up to 10 Mbps.
- CAT 3 has typically been used for 10 Mbps Ethernet or 4 Mbps Token Ring networks.
- The CAT 3 cabling is gradually replaced with CAT5 to accommodate higher throughput.

Category 4

- CAT 4 is made up of four twisted-pair wires, specialized to transmit data up to 16 Mbps and is rarely used in new installations.
- CAT 4 may be used for 16Mbps Token Ring or 10 Mbps Ethernet networks. It is guaranteed for signals as high as 20 MHz and Provides More protection against crosstalk and attenuation than CAT1, CAT2, orCAT 3.

Category 5

- CAT 5 is the most popular twisted pair Ethernet cabling designed for high signal integrity which is in common use today.
- CAT 5 contains four wire pairs and supports up to 100 Mbps throughout.
- It is the most popular form of UTP for new network installations and upgrades to Fast Ethernet.
- In addition to 100 Mbps Ethernet, CAT 5 wiring can support other fast networking technologies.
- It is popular because it is both affordable and high speed for today's local area networks Cat 5 cables are often used in structured cabling for computer networks such as fast Ethernet.

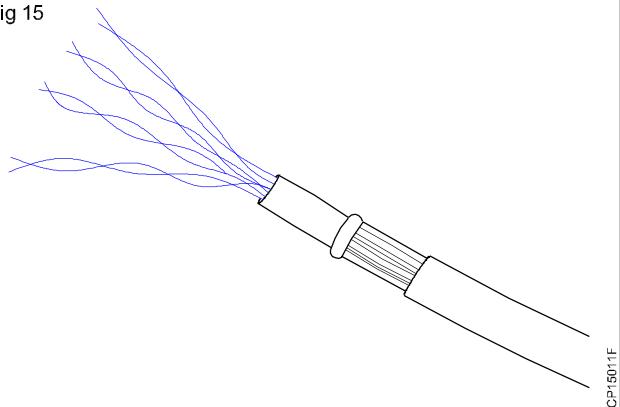
Category 6

- CAT 6 cable was originally designed to support gigabit Ethernet. It is similar to CAT 5 wire, but contains a physical separator between the four Twisted copper wires pairs to further reduce the electromagnetic interference.
- It is a twisted-pair cable that contains four wire pairs, each wrapped in foil insulation. Additional foil insulation covers the bundle of wire pairs, and a fire-resistant plastic sheet covers the second foil layer.
- The foil insulation provides excellent resistance to crosstalk and enables CAT 6 to support at least six times the throughput supported by regular CAT 5.
- When the CAT 6 is used as a patch cable, it is usually terminated in RJ-45 Electrical connectors.

Shield Twisted Pair (Fig 15)

A type of copper telephone wiring in which each of the two copper wires that are twisted together are coated with an insulating coating that functions as a ground for the wires.

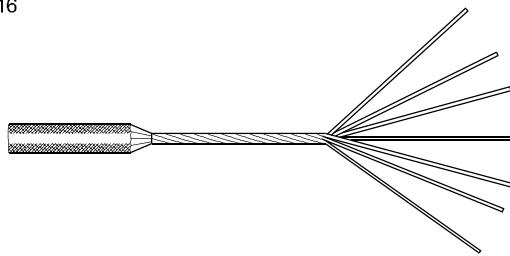
Fig 15



The extra covering in shielded twisted pair wiring protects the transmission line from leaking into or out of the cable. STP cabling often is used in networks, especially fast data rate Ethernets.

Fiber Optic Cable (Fig 16)

Fig 16



A technology that uses glass (or plastic) threads (fibers) to transmit. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages on to light waves.

Fibre optics has several advantages over traditional metal lines:

- Fibre optic cables have a much greater capacity than metal cables. This means that they can carry more data.
- Fibre optic cables are less susceptible than metal cables to interference.
- Fibre optic cables are much thinner and lighter than metal wires.
- Data can be transmitted (the natural form for data) rather than analogically.

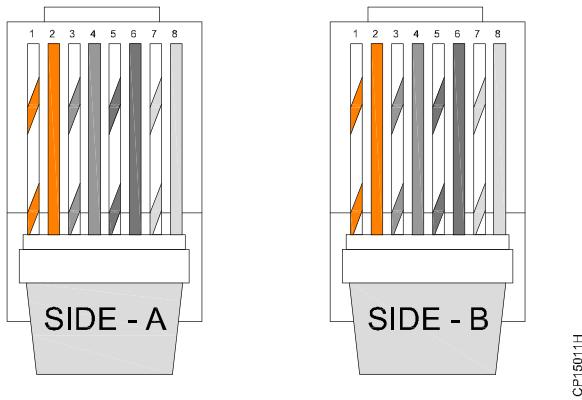
The main disadvantage of fibre optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

In addition, telephone companies are steadily replacing traditional telephone lines with fibre optic cables. In the future, almost all communications will employ fibre optics.

Straight Cable

A straight cable (Fig 17) is to connect different type of devices. This type of cable will be used most of the time and can be used to:

Fig 17



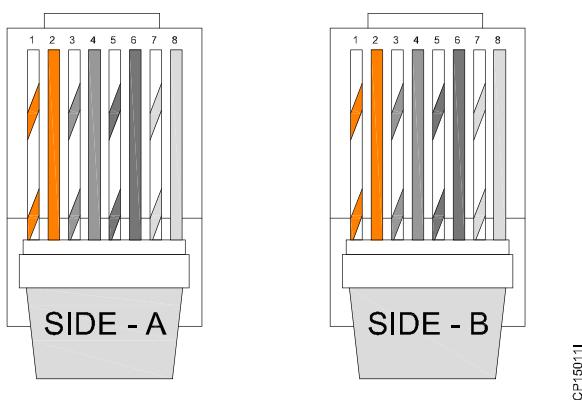
- 1 Connect a computer to a switch/hub's normal port.
- 2 Connect a computer to a cable/DSL modem's LAN port.
- 3 Connect a router's WAN port to a cable/DSL modem's LAN port.
- 4 Connect a router's LAN port to a switch/hub's uplink port. (Normally used for expanding network)
- 5 Connect 2 switches/hubs with one of the switch/hub using an uplink port and the other one using normal port.

If you need to check how straight cable looks like, it's easy. Both sides (side A and side B) of cable have wire arrangement with same colour.

Crossover Cable

A crossover cable (Fig 18), it's usually used to connect same type of devices. A crossover cable can be used to:

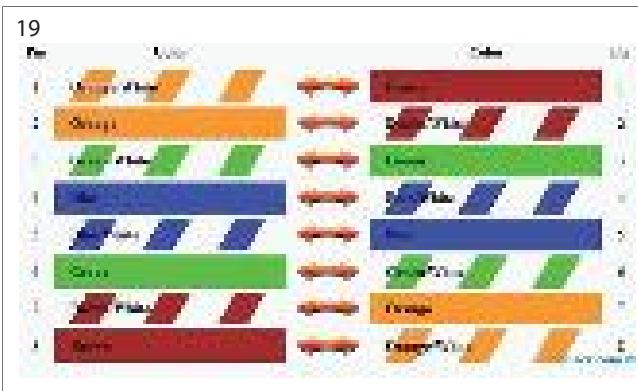
Fig 18



- 1 Connect 2 computers directly.
- 2 Connect a router's LAN port to a switch/hub's normal port. (Normally used for expanding network).
- 3 Connect 2 switches/hubs by using normal port in both switches/hubs.

In you need to check how crossover cable looks like, both side (side A and side B) of cable have wire arrangement with following different colour.

Rollover Cable (Fig 19)



Rollover cable (also known as **Cisco Console Cable** or a **Yost Cable**) is a type of cable that is often used to connect a computer terminal to a router's port. This cable is typically flat (and has a light blue colour) to help distinguish it from other types of network cabling. It gets the name rollover because the pin outs on one end are reversed from the other, as if the wire had been rolled over and you were viewing it from the other side.

Connectors

The media connectors are the physical devices that help to transfer the data between the systems.

RJ11: Registered Jack-11 (Fig 20) a four- or six-wire used primarily to connect telephone equipment. RJ-11 connectors are also used to connect some types of some types of Local area network.



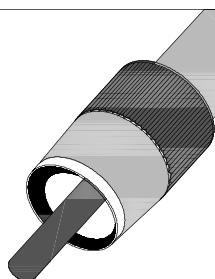
RJ45: RJ45 (Fig 21) connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable.

ST: ST stands for **Straight Tip** (Fig 22) - a quick release bayonet style developed by AT&T. STs were predominant in the late 80s and early 90s.

21



Fig 22



CP-5011M

ST Connectors are among the most commonly used fiber optic connectors in networking applications. They are cylindrical with twist lock coupling, 2.5mm keyed ferrule. ST connectors are used both short distance applications and long line systems.

SC: SC stands for **S**ubscriber **C**onnecto**r** (Fig 23) - a general purpose push/pull style Connector developed by NTT. SC has an advantage in keyed duplexility to support send/receive channels.

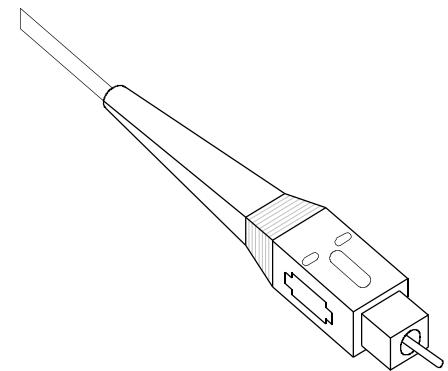
SC Connectors are frequently used for newer Network applications. The SC is a snap-in connector that is widely used in single mode systems for its performance. The SC connector is also available in a Duplex configuration. They offer low cost, simplicity, and durability. SC connectors provide for accurate alignment via their ceramic ferrules.

The square, snap-in connector latches with a simple push-pull motion and is keyed. They feature a 2.5mm Ferrule and molded housing for protection. Typical matched SC connectors are rated for 1000 mating cycles and have an Insertion Loss of 0.25 dB.

LC: LC stands for **L**ucent **C**onnecto**r** (Fig 24). The LC is a small form factor fiber optic connector.

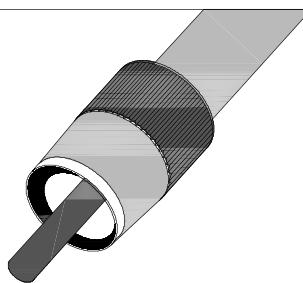
The LC Connector uses a 1.25 mm ferrule, half the size of the ST. Otherwise, it is a standard ceramic Ferrule connector. The LC has good performance and is highly favoured for single mode.

Fig 23



CP-5011N

Fig 22



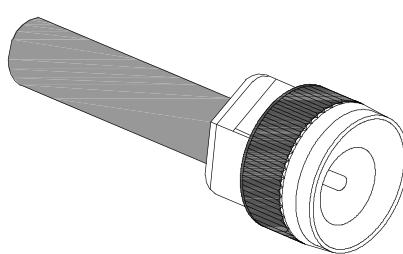
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USB: The USB 2.0 Standard-A type of USB plug is a flattened rectangle which inserts into a "downstream-port" receptacle on the USB host, or a hub, and carries both power and data. This plug is frequently seen on cables that are permanently attached to a device, such as one connecting a keyboard or mouse to the computer via USB connection.

A Standard-B plug-which has a square shape with bevelled exterior corners-typically plugs into an "upstream receptacle" on a device that uses a removable cable, e.g. a printer. A Type B plug delivers power in addition to carrying data. On some devices, the Type B receptacle has no data connections, being used solely for accepting power from the upstream device. This two-connector-type scheme (A/B) prevents a user from accidentally creating an Electrical loop.

BNC: Bayonet Neill Concelman (Fig 25) connector, (sometimes erroneously called a British Naval Connector or Bayonet Nut Connector, a type of connector used with coaxial cable such as the RG-58 A/U cable used with the 10Base2. The basic BNC connector is a male type mounted at each end of a cable.

Fig 25



CP-5011P

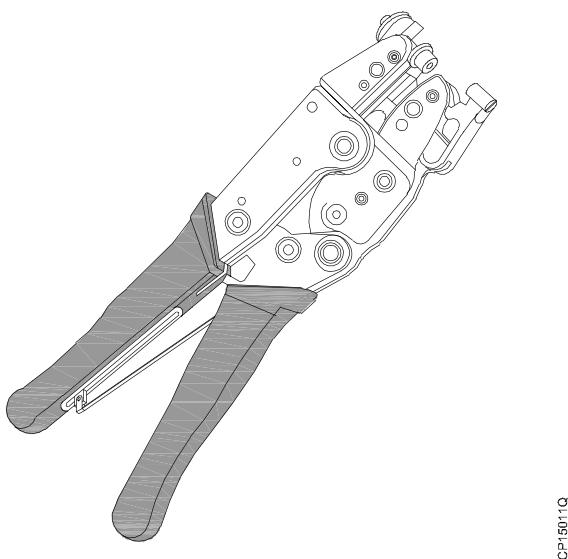
This connector has a center pin connected to the center cable conductor and a metal tube connected to the outer cable shield. A rotating ring outside the tube locks the cable to any female connector.

BNC T-connectors (used with the 10Base-2 system) are female devices for connecting two cables to a NIC. A BNC barrel connector allows connecting two cables together.

BNC connectors can also be used to connect some monitor, which increases the accuracy of the signals sent from the adapter.

Crimping Tool: A crimping tool (Fig 26) is a tool designed to crimp or connect a connector to the end of a cable. For example, network cables and phone cables are created using a crimping tool to connect the RJ45 and RJ11 connectors to the end of the cable. In the picture to the right, is an example of what a crimping tool looks like. This shows a tool capable of crimping both RJ-11 and RJ-45 connectors.

Fig 26



How to Crimp RJ45

1 Strip 1 to 2 inches (2.5 to 5.1 cm) of the outer skin at the end of the cable wire by making a shallow cut in the skin with a utility knife. Run the knife around the cable, and the jacket should slide off easily. There will be 4 pairs of twisted wires exposed, each of them a different color or colour combination.

Orange-white striped and solid orange

Green-white striped and solid green

Blue-white striped and solid blue

Brown-white striped and solid brown

2 Fold each pair of wires backwards to expose the core of the cable.

3 Cut off the core and discard.

4 Straighten the twisted wires using 2 pair of tweezers. Grasp a wire beneath a bend with 1 pair of tweezers, and use the other pair to gently straighten the bend. The straighter your wires, the easier your job will be

5 Arrange the untwisted wires in a row, placing them into the position, running from right to left, in which they will go into the RJ-45 connector:

- Orange with a white stripe
- Orange
- Green with a white stripe
- Blue
- Blue with a white strip
- Green
- Brown with a white stripe
- Brown

6 Trim the untwisted wires to a suitable length by holding the RJ-45 connector next to the wires. The insulation on the cable should be just inside the bottom of the RJ-45 connector. The wires should be trimmed so that they line up evenly with the top of the RJ-45 connector.

- Trim the wires in small increments, checking frequently to ensure a correct fit. It's better to cut the untwisted wires a few times than have to go back and start all over again because you trimmed off too much.

7 Insert the wires into the RJ-45 connector, making sure that they stay aligned and each color goes into its appropriate channel. Make sure that each wire goes all the way to the top of the RJ-45 connector. If you don't make these checks, you will find that your newly crimped RJ-45 connector is useless.

8 Use the crimping tool to crimp the RJ-45 connector to the cable by pressing the jacket and cable into the connector so that the wedge at the bottom of the connector is pressed into the jacket.

Re crimp the cable once more to ensure proper connection.

9 Follow the instructions above to crimp an RJ-45 connector to the opposite end of the cable

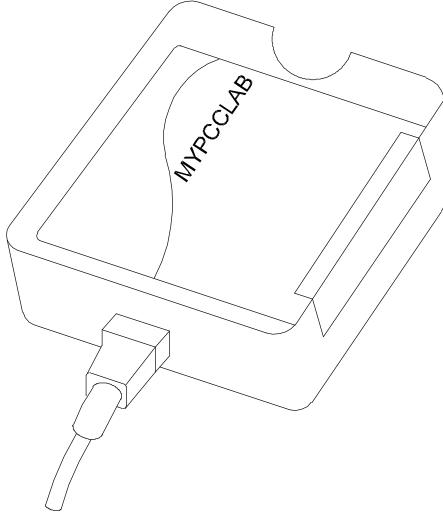
10 Use a cable tester to assure that your cable is working properly when both ends are crimped.

Cable Tester (Fig 27)

When connected to an Ethernet cable, a network cable tester tells if the cable is capable of carrying an Ethernet signal. If the cable carries the signal, this indicates that all the circuits are closed, meaning that electric current can move unimpeded through the wires, and that there are no short circuits, or unwanted connections, in the wire.

Network cable testers vary in complexity and price, but a basic tester consists of a source of electrical current, a measuring device that shows if the cable is good, and a connection between the two, usually the cable itself.

Fig 27



CP15011R

Computer networks use Ethernet cables to allow computers in the network to "talk" to each other. An Ethernet cable has eight wires that are arranged in four pairs. For current to flow correctly, the wire pairs must be connected in the proper order.

A network cable tester can identify if the wires are paired correctly. It can also show if there is a break in the insulation, a situation which allows crosstalk between two wires that should not be connected. The tester can also tell whether the cable has the proper level of resistance.

A network cable tester can be a simple apparatus that merely identifies whether current flows through the cable, or it may be a professional-level, complex device that gives additional information that helps identify the problem.

Professional-level network cable testers may not only tell if an open circuit exists, but may identify where the break is located. Some also identify the gauge of wire used and can generate their own signal to test for interference.

How to Check with the Tester

- 1 Turn on your network cable tester.
- 2 Plug one end of the Ethernet cable you are trying to test into the "IN" Ethernet input on the network cable tester.
- 3 Plug the other end of your Ethernet cable you are trying to test into the "OUT" input on the network cable tester.
- 4 Press the "Test" button. The network cable tester will send a signal across the Ethernet cable. If the signal gets from one end of the cable to the other, a green light will appear on the device, letting you know that the test was successful. If the signal does not get from one end of the cable to the other, a red light will appear on the device, letting you know that the test was not successful and that the cable is bad.

Switch

A **Network Switch** (Fig 28) is a small hardware device that joins multiple computers together within one Local Area Network. Technically, network switches operate at layer two (Data Link Layer) of the OSI.

28



Network switches appear nearly identical to hub, but a switch generally contains more intelligence (and a slightly higher price tag) than a hub. Unlike hubs, network switches are capable of inspecting data packet as they are received, determining the source and destination device of each packet, and forwarding them appropriately.

By delivering messages only to the connected device intended, a network switch conserves bandwidth and offers generally better performance than a hub.

Availability of Switches

- 1 8 Port Switches
- 2 16 port switches
- 3 24 port switches
- 4 32 port switches

Hub: A Hub (Fig 29) is a small, simple, inexpensive device that joins multiple computers together. Many network hubs available today support the Ethernet standard. Other types including USB hubs also exist, but Ethernet is the type traditionally used in home networking.

To network a group of computers using an Ethernet hub,

29

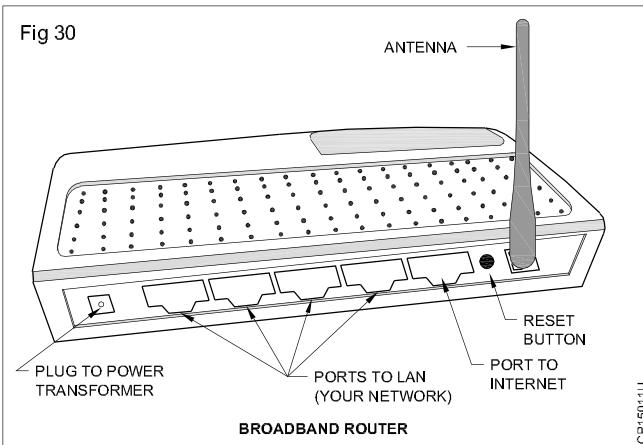


first connect an Ethernet cable into the unit, and then connect the other end of the cable to each computer's NIC. All Ethernet hubs accept the RJ45 connectors of standard Ethernet cables.

Ethernet hubs vary in the speed (network data rate or bandwidth they support. Some years ago, Ethernet hubs offered only 10 Kbps rated speeds. Newer types of hubs offer 100 Mbps Ethernet. Some support both 10 Mbps and 100 Mbps (so-called dual-speed or 10/100 hubs).

Routers

Routers (Fig 30) are physical devices that join multiple wired or wireless networks together. Technically, a wired or wireless router is a Layer 3 gateway, meaning that the wired/wireless router connects networks (as gateways do), and that the router operates at the network layer of the OSI model.



Home networkers often use an Internet Protocol (IP) wired or wireless router, IP being the most common OSI network layer protocol. An IP router such as a DSL or cable modem router joins the home's LAN to the WAN of the Internet.

Bridges

A bridge (Fig 31) device filters data traffic at a network boundary. Bridges reduce the amount of traffic on a LAN by dividing it into two segments.



Bridges operate at the data link layer (Layer 2) of the OSI model. Bridges inspect incoming traffic and decide whether to forward or discard it. An Ethernet bridge, for example, inspects each incoming Ethernet frame - including the source and destination MAC addresses, and sometimes the frame size - in making individual forwarding decisions.

ISP: Internet Service Provider, it refers to a company that provides Internet services, including personal and business access to the internet. For a monthly fee, the service provider usually provides a software package, Username, password and access phone number.

Equipped with a modem you can then log on to the Internet and browse the world wide web and USENET and send and receive email. For broadband access you typically receive the broadband modem hardware or pay a

monthly fee for this equipment that is added to your ISP account billing.

In addition to serving individuals, ISPs also serve large companies, providing a direct connection from the company's networks to the Internet. ISPs themselves are connected to one another through Network Access Point (NAPs). ISPs may also be called IAPs (Internet Access Provider).

State Owned ISP's

- **BSNL** - Servicing all of India except Mumbai and Delhi. Triple-play Broadband Services provided by ADSL and VDSL. Also providing internet services over GPRS, 3G, as well as WiMax
- **MTNL** - Servicing Mumbai and Delhi. Triple-play Broadband Services provided by ADSL under the "Tri-Band" brand. Also providing GPRS and 3G internet services.

Private Owned nationwide ISP's

- Airtel - ADSL, GPRS, 3G & 4G LTE
- Skynet Broadband - Internet Service Provider
- Aircel - GPRS & 3G
- Hathway - Broadband over Cable
- Idea - GPRS & 3G
- MTS India - CDMA/EV-DO
- O-Zone Networks Private Limited - Pan - India Public Wi-Fi hotspot provider
- Reliance Communications - ADSL, GPRS & 3G, Metro-Ethernet, CDMA/EV-DO, Wimax
- Reliance Industries - LTE (to be launched)
- Sify - Broadband over cable
- Tata DoCoMo - GPRS & 3G
- Tata Indicom - ADSL, CDMA/EV-DO, Metro-Ethernet, WiMax
- Vodafone - GPRS & 3G

NSP: Network Service Providers (**NSP**) is a business or organization that sells bandwidth or network access by providing direct Internet backbone access to the Internet and usually access to its **Network Access Point (NAPs)**.

Network service providers may consist of Telecommunications companies, data carriers, wireless communications providers, Internet service provider, and Cable television operators offering high-speed Internet access.

Dial up: Dial-up access is really just like a phone connection, except that the parties at the two ends are computer devices rather than people. Because dial-up access uses normal telephone lines, the quality of the connection is not always good and data rate are limited.

In the past, the maximum data rate with dial-up access was 56 Kbps (56,000 bits per second), but new technologies such as ISDN are providing faster rates.

Broadband: The term broadband refers to a telecommunications signal or device of greater Bandwidth (signal processing), in some sense, than another standard or usual signal or device (and the broader the band, the greater the capacity for traffic).

Wireless (Wi-Fi): Wireless broadband is high-speed Internet service via wireless technology. Wireless broadband is available in Internet cafés, local "hot spots" within many cities, private businesses and many homes.

The advantage of wireless broadband is that the computer receiving the Internet signal need not be tethered by an Ethernet or network cable to the broadband modem or router.

A wireless broadband modem receives the service and transmits it via radio waves to the immediate surrounding area. Any computer equipped with wireless capacity within receiving distance can pick up the signal, making the Internet 'portable.' The most common way to take advantage of wireless broadband is by using a laptop computer.

Mobile Broadband: The term mobile broadband refers to high-speed wireless Internet connections and services designed to be used from arbitrary locations.

Cellular networks normally provide broadband connections suitable for mobile access. The technologies in use today fall into two categories -3G (third generation cell networks) and 4G (fourth generation).

Introduction to TCP/IP

Objectives : At the end of this lesson you shall be able to

- explain TCP/IP, addresses and subnets.

Introduction to TCP/IP : TCP and IP were developed by Department of Defense (DOD) research project to connect a number different networks designed by different vendors into a network of networks (the “Internet”). It was initially unsuccessful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems. Several computers in a small department can use TCP/IP (along with other protocols) on a single LAN. The IP component provides routing from the department to the enterprise network, then to regional networks, and finally to the global internet. On the battlefield a communications network will sustain damage, so the DOD designed TCP/IP to be robust and automatically recover from any node or phone failure. This design allows the construction of very large networks with less central management. However, because of the automatic recovery, network problems can go undiagnosed and uncorrected for long periods of time.

As with all other communications protocol, TCP/IP is composed of layers:

IP is responsible for moving packet of data from node to node. IP forwards each packet based on a four byte destination address (the IP number). The Internet authorities assign ranges of numbers to different organisations. The organisations assign groups of their numbers to departments. IP operates on gateway machines that move data from department to organisation to region and then around the world.

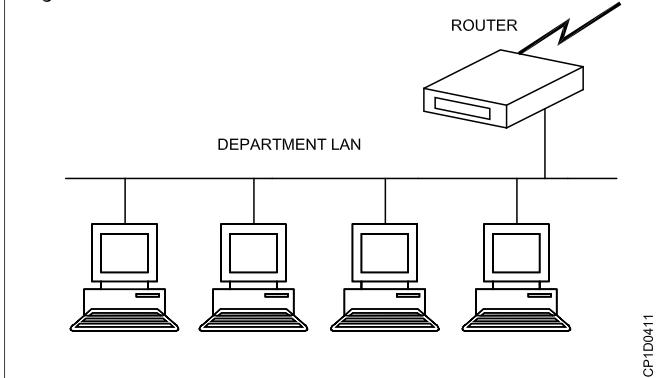
TCP is responsible for verifying the correct delivery of data from client to server. Data can be lost in the intermediate network. TCP adds support to detect errors or lost data and to trigger retransmission until the data is correctly and completely received.

Sockets is a name given to the package of subroutines that provide access to TCP/IP on most systems.

The Internet Protocol was developed to create a Network of Networks (the “Internet”). Individual machines are first connected to a LAN (Ethernet or Token Ring). TCP/IP shares the LAN with other users (a Novell file server, Windows for Workgroups peer systems). One device provides the TCP/IP connection between the LAN and the rest of the world. (Refer Fig 1)

To insure that all types of systems from all vendors can communicate, TCP/IP is absolutely standardised on the LAN. However, larger networks based on long distances and phone lines are more volatile. In US, many large corporations would wish to reuse large internal networks based on IBM’s SNA. In Europe, the national phone

Fig 1



companies traditionally standardize on X.25. However, the sudden explosion of high speed microprocessors, fiber optics and digital phone systems has created a burst of new options: ISDN, frame relay, FDDI, Asynchronous Transfer Mode (ATM). New technologies arise and become obsolete within a few years. With cable TV and phone companies competing to built the National Information Superhighway, no single standard can govern citywide, nationwide, or worldwide communications.

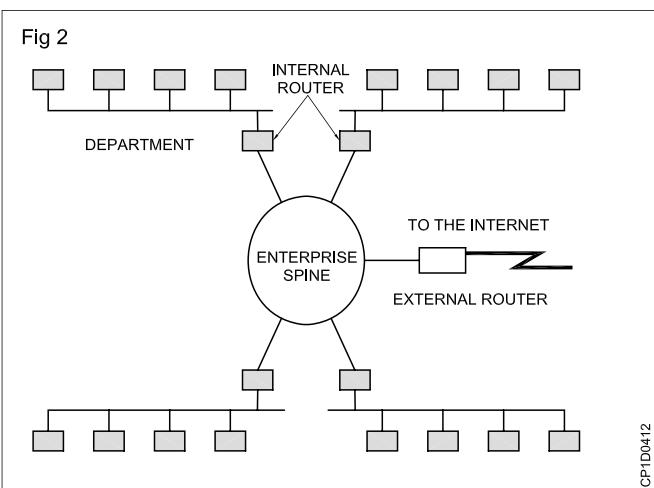
The original design of TCP/IP as a Network of Networks fits nicely within the current technological uncertainty. TCP/IP data can be sent across a LAN or it can be carried within an internal corporate SNA network or it can piggyback on the cable TV service. Furthermore, machines connected to any of these networks can communicate to any other network through gateways supplied by the network vendor.

Addresses : Each technology has its own convention for transmission messages between two machines within the same network. On a LAN, messages are sent between machines by supplying the six byte unique identifier (the “MAC” address). In an SNA network, every machine has Logical Units with their own network address. DECNET, Appletalk and Novell IPX all have a scheme for assigning numbers to each local network and to each workstation attached to the network.

On top of these local or vendor specific network addresses, TCP/IP assigns a unique number to every workstation in the world. This “IP number” is a four byte value that, by convention, is expressed by converting each byte into a decimal number (0 to 255) and separating the bytes with a period. For example, a server IP is like 130.132.59.234

Subnets: Although the individual subscribers do not need to tabulate network numbers or provide explicit routing, it is convenient for most Class B networks to be internally manage as much smaller and simpler version

of the larger network organisations. It is common to subdivide the two bytes available for internal assignment into a one byte department number and a one byte workstation ID. (Refer Fig 2)



The enterprise network is built using commercially available TCP/IP router boxes. Each router has small tables with 255 entries to translate the one byte department number into selection of a destination Ethernet connected to one of the routers.

TCP treats the data as a stream of bytes. It logically assigns a sequence number to each byte. The TCP packet has a header that says, in effect, "This packet starts with byte 379642 and contains 200 bytes of data." The receiver can detect missing or incorrectly sequenced packets. TCP acknowledges data that has been received and retransmits data that has been lost. The TCP design means that error recovery is done end-to-end between the Client and Server machine. There is no formal standard for tracking problems in the middle of the network, though each network has adopted some adhoc tools.

There are three levels of TCP/IP knowledge. Those who administer a regional or national network must design a system of long distance phone lines, dedicated routing devices and very large configuration files. They must know the IP numbers and physical locations of thousands of subscriber networks. They must also have a formal network monitor strategy to detect problems and respond quickly.

Each large company or university that subscribes to the Internet must have an intermediate level of network organisation and expertise. A half dozen routers might be configured to connect several dozen departmental LANs in several buildings. All traffic outside the organisation would typically be routed to a single connection to a regional network provider.

However, the end user can install TCP/IP on a personal computer without any knowledge of either the corporate or regional network. Three pieces of information are required:

- 1 The IP address assigned to this personal computer.
- 2 The part of the IP address (the subnet mask) that distinguishes other machines on the same LAN (messages can be sent to them directly) from machines in other departments or elsewhere in the world (which are sent to a router machine)
- 3 The IP address of the router machine that connects this LAN to the rest of the world.

Transmission media and network components

Objectives : At the end of this lesson you shall be able to

- explain cable media, wireless media and network adapter.

Network media : Media are what the message is transmitted over. Different media have different properties and are most effectively used in different environments for different purposes.

In computer networking, the medium affects nearly every aspect of communication. Most important, it determines how quickly and to whom a computer can talk and how expensive the process is.

Cable media : Cables have a central conductor that consists of a wire or fiber surrounded by a plastic jacket. Three types of cable media are twisted-pair, coaxial and fiber-optic cable. Two types of twisted-pair cable are used in networks: unshielded (UTP) and shielded (STP).

Table summarizes the characteristics of these types of cable media, which are discussed in the following sections.

Factor	UTP	STP	Coaxial	Fiber-optic
Cost	Lowest	Moderate	Moderate	Highest
Installation	Easy	Fairly easy	Fairly easy	Difficult
Bandwidth capacity	1- to 155 Mbps (typically 10 Mbps)	1- to 155Mbps (typically 16 Mbps)	Typically 10 Mbps	2 Gbps (typically 100 Mbps)
Node capacity per segment	2	2	30 (10base 2) 100 (10 base 5)	2
Attenuation	High (range of hundreds of meters)	High (range of hundreds of meters)	Lower (range of a few kilometers)	Lowest (range of tens of kilometers)
EMI	Most vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Less vulnerable than UTP but still vulnerable to EMI and eavesdropping	Not affected by EMI or eavesdropping

Twisted-pair cable : Twisted-pair cable uses one or more pairs of two twisted copper wires to transmit signals. It is commonly used as telecommunications cable.

When copper wires that are close together conduct electric signals, there is a tendency for each wire to produce interference in the other. One wire interfering with another in this way is called crosstalk. To decrease the amount of crosstalk and outside interference, the wires are twisted. Twisting the wires allows the emitted signals from one wire to cancel out the emitted signals from the other and protects them from outside noise.

Twisted pairs are two color-coded, insulated copper wires that are twisted around each other. A twisted-pair cable consists of one or more twisted pairs in a common jacket. Fig 1 shows a twisted-pair cable.

The two types of twisted-pair cable are unshielded and shielded.

Fig 1

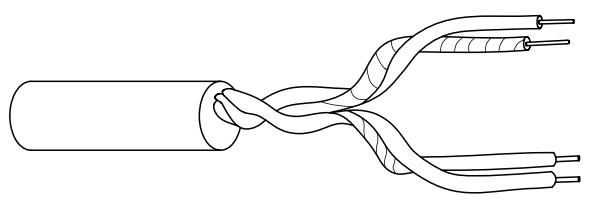


CP1D0211

Unshielded twisted-pair cable : Unshielded twisted-pair (UTP) cable consists of a number of twisted pairs with a simple plastic casing. UTP is commonly used in telephone systems. Fig 2 shows a UTP cable.

The Electrical Industries Association (EIA) divides UTP into different categories by quality grade. The rating for each category refers to conductor size, electrical characteristics and twists per foot. The following categories are defined.

Fig 2

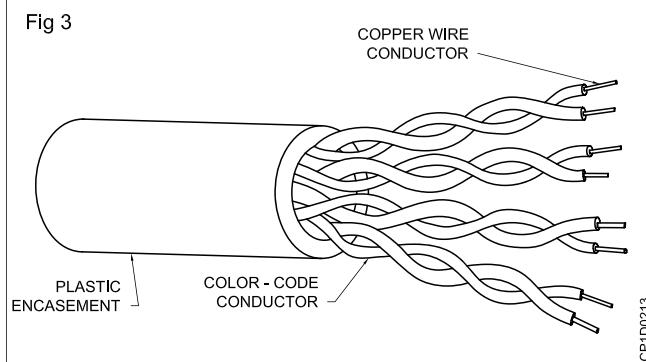


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- Categories 1 and 2 were originally meant for voice communication and can support only low data rates, less than 4 megabits per second (Mbps). These cannot be used for high-speed data communications. Older telephone networks used Category 1 cable.
- Category 3 is suitable for most computer networks. Some innovations can allow data rates much higher, but generally Category 3 offers data rates up to 16 Mbps. This category of cable is the kind currently used in most telephone installations.
- Category 4 offers data rates upto 20 Mbps.
- Category 5 offers enhancements over Category 3, such as support for Fast Ethernet, more insulation and more twists per foot, but Category 5 requires compatible equipment and more stringent installation. In a Category 5 installation, all media, connectors and connecting equipment must support Category 5 or performance will be affected.

Data-grade UTP cable (Categories 3,4 and 5) consists of either four or eight wires. A UTP cable with four wires is called a two-pair. Network topologies that use UTP require atleast two-pair wire. You may want to include an extra pair for future expansion. Fig 3 shows a four-pair cable.

Fig 3



CP1D0213

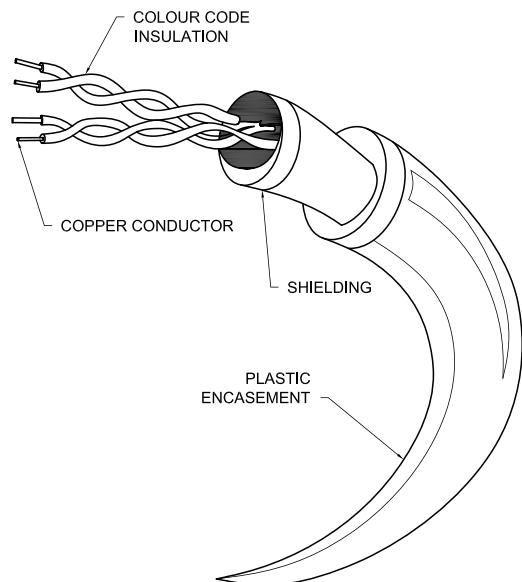
Because UTP cable was originally used in telephone systems, UTP installations are often similar to telephone installations. For a four-pair cable, you need a modular RJ-45 telephone connector. For a two-pair cable, you need a modular RJ-11 telephone connector. These connectors are attached to both ends of a patch cable. One end of the patch cable is then inserted into a computer or other device, and the other end is inserted into a wall jack. The wall jack connects the UTP drop cable (another length of cable) to a punch-down block.

The other side of the punch-down block is wired to a patch panel. The patch panel provides connectivity through patch cables to other user devices and connectivity devices.

UTP's popularity is partly due to the, first usage of the same in telephone systems. In many cases a network can be run over the already existing wires installed for the phone system, at a great savings in installation cost.

Shielded twisted-pair cable : The only difference between shielded twisted pair (STP) and UTP is that STP cable has a shielded usually aluminium/polyester between the outer jacket or casing and the wires. Fig 4 shows STP cable.

Fig 4



CP1D0214

The shield makes STP less vulnerable to EMI because the shield is electrically grounded. If a shield is grounded correctly, it tends to prevent signals from getting into or out of the cable. It is a more reliable cable for LAN environments. STP was the first twisted-pair cable to be used in LANs. Although many LANs now use UTP, STP is still used.

Transmission media specifications from IBM and Apple Computer use STP cable. IBM's Token Ring network uses STP and IBM has its own specifications for different qualities and configurations of STP. A completely different type of STP is the standard for Apple's Apple Talk networks. Networks that conform to each vendor's specifications have their own special requirements, including connector types and limits on cable length.

STP has the following characteristics

Cost : Bulk STP is fairly expensive. STP costs more than UTP and thin coaxial cable but less than thick coaxial or fiber-optic cabling.

Installation : The requirement for special connectors can make STP more difficult to install than UTP. An electrical ground must be created with the connectors. To simplify installation, use standardised and prewired cables.

Because STP is rigid and thick (up to 1.5 inches in diameter), it can be difficult to handle.

Bandwidth capacity : With the outside interference reduced by the shielding, STP can theoretically run at 500 Mbps for a 100 meter cable length. Few installations run at data rates higher than 155 Mbps. Currently, most STP installations have data rates of 16 Mbps.

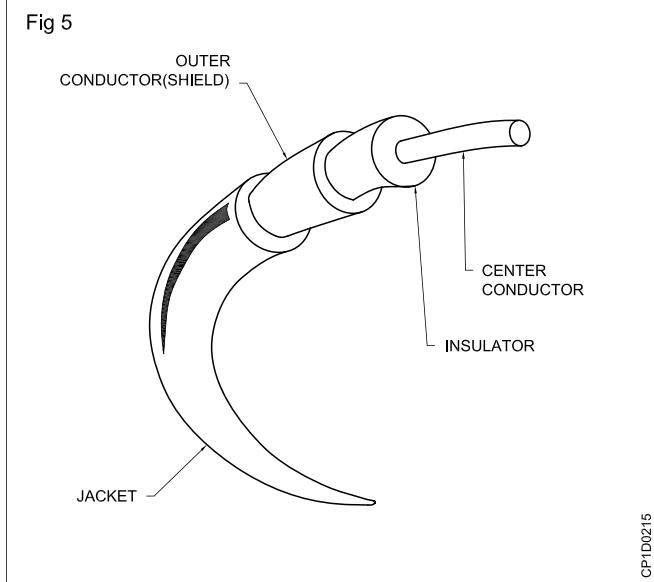
Node capacity : Since only two computers can be connected together by an STP cable, the number of computers in an STP network is not limited by the cable. Rather, it is limited by the hub or hubs that connect the cables together. In a Token Ring network, which is the most common type of STP network, the useful upper limit is around 200 nodes in a single ring, but it depends on the type of data traffic in your network. There is a specified maximum limit of 270, but you will probably never reach this limit.

Attenuation : STP does not outperform UTP by much in terms of attenuation. The most common limit is 100 meters.

EMI : The biggest difference between STP and UTP is the reduction of EMI. The shielding blocks a considerable amount of the interference. However, since it is copper wire, STP still suffers from EMI and is vulnerable to eavesdropping.

Coaxial cable : Coaxial cable commonly called coax has two conductors that share the same axis. A solid copper wire or stranded wire runs down the center of the cable and this wire is surrounded by plastic foam insulation. The form is surrounded by a second conductor, a wire mesh tube, metallic foil or both. The wire mesh protects the wire from EMI. It is often called the shield. A tough plastic jacket forms the cover of the cable, providing protection and insulation. Fig 5 shows a coaxial cable.

Fig 5



Coaxial cable comes in different sizes. It is classified by size (RG) and by the cable's resistance to direct or alternating electric currents (measured in ohms also called impedance)

The following are some coaxial cables commonly used in networking:

50 ohm, RG-8 and RG-11 used for thick ethernet.

50 ohm, RG-58 used for thin ethernet.

75 ohm, RG-59 used for cable TV.

93 ohm, RG-62 used for ARCnet.

PVC and plenum cable : Polyvinyl chloride (PVC) is commonly used in coaxial cabling because it is a flexible, inexpensive plastic well suited for use as insulation and cable jacketing. PVC is often used in the exposed areas of an office.

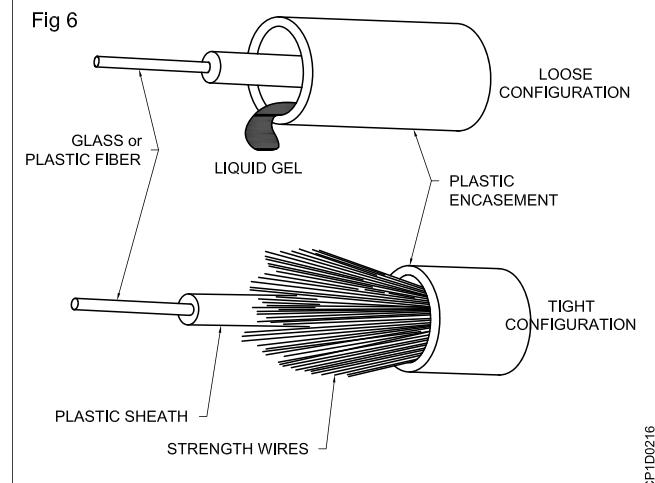
A plenum is the space between the false ceiling of an office and the floor above. The air in the plenum circulates with the air in the rest of the building, and there are strict fire codes about what can be placed in a plenum environment.

Because PVC gives off poisonous gases when burned, you cannot use it in a plenum environment. You must use plenum grade cable instead. Plenum grade cable is certified to be fire resistant to produce a minimum amount of smoke. Plenum cable is also used in vertical runs (walls) without conduit (a tube to hold the cable). Plenum cable is more expensive and less flexible than PVC.

Fiber-optic cable : Fiber-optic cable transmits light signals rather than electrical signals. It is enormously more efficient than the other network transmission media. As soon as it comes down in price (both in terms of the cable and installation costs) fibre optic will be the choice for network cabling.

Each fiber has an inner core of glass or plastic that conducts light. The inner core is surrounded by cladding, a layer of glass that reflects the light back into the core. Each fiber is surrounded by a plastic sheath. The sheath can be either tight or loose. Fig 6 shows examples of these two types of fiber optic cables.

Fig 6

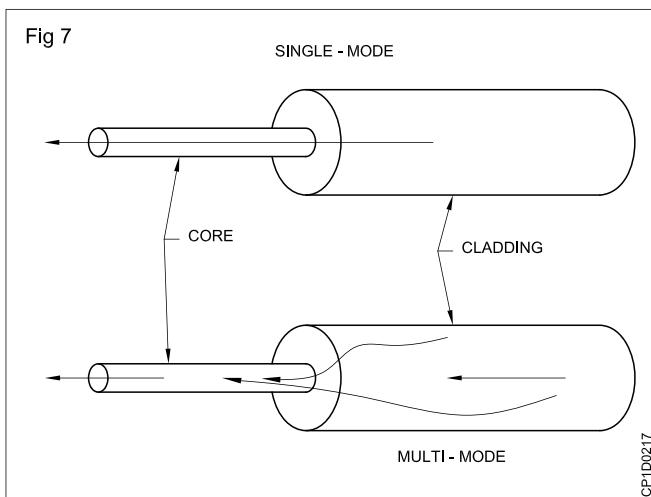


Tight configurations completely surround the fibers with a plastic sheath and sometimes include wires to strengthen the cable (although these wires are not required). Loose configurations leave a space between the sheath and the

outer jacket, which is filled with a gel or other material. The sheath provides the strength necessary to protect against breaking or extreme heat or cold. The gel, strength wires and outer jacket provide extra protection.

A cable may contain a single fiber, but often fibers are bundled together in the center of the cable. Optical fibers are smaller and lighter than copper wire. One optical fiber is approximately the same diameter as a human hair.

Optical fibers may be multimode or single mode. Single mode fibers allow a single light path and are typically used with laser signaling. Single mode fiber can allow greater bandwidth and cable runs than multimode but is more expensive. Multimode fibers use multiple light paths. The physical characteristics of the multimode fiber make all parts of the signal (those from the various paths) arrive at the same time, appearing to the receiver as though they were one pulse. If you want to save money, look into multimode, since it can be used with LEDs (light emitting diodes) which are a more affordable light source than lasers. Fig 7 shows single mode and multi mode fibers.



Optical fibers are differentiated by core/cladding size and mode. The size and purity of the core determine the amount of light that can be transmitted. The following are the common types of fiber-optic cable.

8.3 micron core/125 micron cladding, single mode

62.5 micron core/125 micron cladding, multimode

50 micron core/125 micron cladding, multimode

100 micron core/140 micron cladding, multimode

A typical LAN installation starts at a computer or network device that has a fiber-optic network interface and (NIC). This NIC has an incoming interface and an outgoing interface. The interfaces are directly connected to fiber-optic cables with special fibre-optic connectors. The opposite ends of the cables are attached to a connectivity device or splice center.

Wireless media : Wireless media do not use an electrical or optical conductor. In most cases, the earth's atmosphere is the physical path for the data. Wireless media is therefore useful when distance or obstructions make

bounded media difficult. There are three main types of wireless media: radio wave, micro wave and infrared.

Radio wave transmission systems : Radio waves have frequencies between 10 kilohertz (KHz) and 1 gigahertz (GHz). The range of the electromagnetic spectrum between 10 KHz and 1 GHz is called radio frequency (RF).

Radio wave include the following types.

Short wave

Very high frequency (VHF) television and FM radio

Ultra-high frequency (UHF) radio and television

Radio waves can be broadcast omnidirectionally or directionally. Various kinds of antennas can be used to broadcast radio signals.

Microwave transmission systems : Microwave communication makes use of the lower gigahertz frequencies of the electromagnetic spectrum. These frequencies, which are higher than radio frequencies, produce better throughout and performance. There are two types of microwave data communication systems: terrestrial and satellite.

Terrestrial microwave : Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz range. The signals are highly focused and the physical path must be line-of-sight. Relay towers are used to extend signals. Terrestrial microwave systems are typically used when using cabling is cost prohibitive.

Because terrestrial microwave equipment often uses licensed frequencies, additional costs and time constraints may be imposed by licensing commissions or government agencies (the FCC, in the United States).

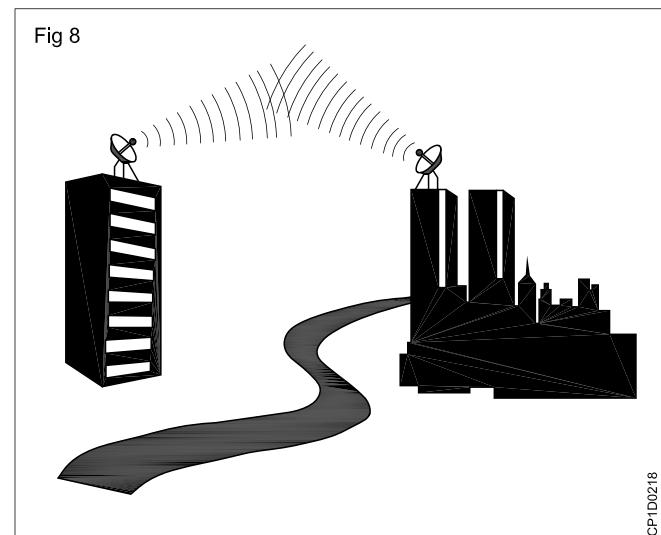


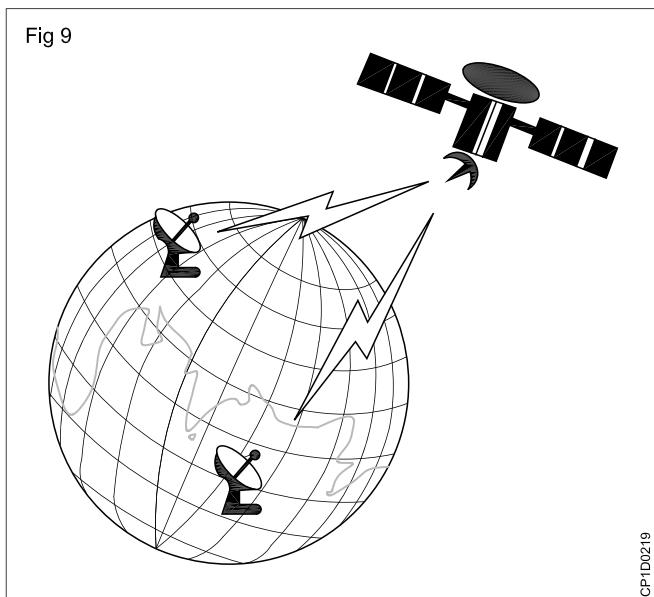
Fig 8 shows a microwave system connecting separate buildings. Smaller terrestrial microwave systems can be used within a building, as well. Microwave LANs operate at low power, using small transmitters that communicate with omnidirectional hubs. Hubs can then be connected to form an entire network.

Satellite : Satellite microwave systems transmit signals between directional parabolic antennas. Like terrestrial microwave systems, they use low gigahertz frequencies and must be in line-of-sight. The main difference with satellite system is that one antenna is on a satellite in geosynchronous orbit about 50,000 kilometers (22,300 miles) above the earth. Because of this, satellite microwave systems can reach the most remote places on earth and communicate with mobile devices.

Here's how it usually works: a LAN sends a signal through cable media to an antenna (commonly known as a satellite dish), which beams the signal to the satellite in orbit above the earth. The orbiting antenna then transmits the signal to the another location on the earth or, if the destination is on the opposite side of the earth, to another satellite, which then transmits to a location on earth.

Fig 9 shows a transmission being learned from a satellite dish on earth to an orbiting satellite and then back to earth.

Fig 9



Because the signal must be transmitted 50,000 kilometers to the satellite and 50,000 kilometers back to earth, satellite microwave transmissions take about as long to cover a few kilometers as they do to span continents. Because the transmission must travel long distances, satellite microwave systems experience delays between the transmission of a signal and its reception. These delays are called propagation delays. Propagation delays range from .5 to 5 seconds.

Infrared transmission systems : Infrared media use infrared light to transmit signals. LEDs or ILDs transmit the signals and photodiodes receive the signals. Infrared media use the tera-hertz range of the electromagnetic spectrum. The remote controls we use for television, VCR and CD players use infrared technology to send and receive signals.

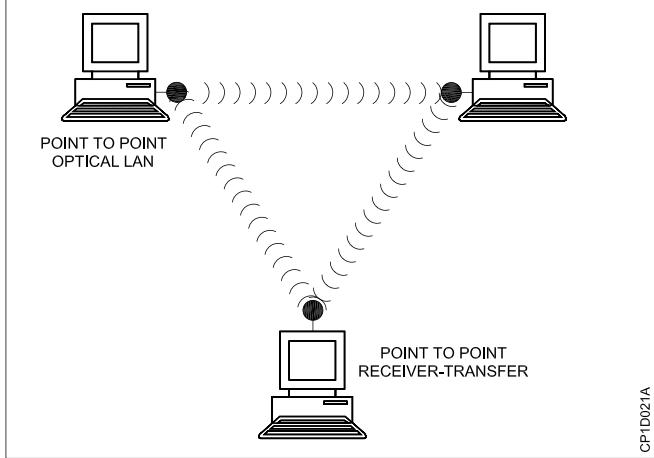
Because infrared signals are in the terahertz (higher-frequency) range, they have good throughout. Infrared signals do have a downside: the signals cannot penetrate walls or other objects and they are diluted by strong light sources.

Infrared media use pure light, normally containing only electromagnetic waves or photons from a small range of the electromagnetic spectrum. Infrared light is transmitted either line-of-sight (point-to-point) or broadcast omnidirectionally, allowing it to reflect off walls and ceilings. Point-to-point transmission allows for better data rates, but devices must remain in their locations. Broadcast, on the other hand, allows for more flexibility but with lower data rates. (Part of the signal strength is lost with each reflection.)

Point-to-point : Infrared beams can be tightly focused and directed at a specific target. Laser transmitters can transmit line-of-sight across several thousand meters.

One advantage of infrared is that an FCC license is not required to use it. Also, using point-to-point infrared media reduces attenuation and makes eavesdropping difficult. Typical point-to-point infrared computer equipment is similar to that used for consumer product with remote controls. Careful alignment of transmitter and receiver is required. Fig 10 shows how a network might use point-to-point infrared transmission.

Fig 10



Broadcast : Broadcast infrared systems spread the signal to cover a wider area and allow reception of the signal by several receivers. One of the major advantage is mobility; the workstations or other devices can be moved more easily than with point-to-point infrared media. Fig 11 shows how a broadcast infrared system might be used.

Because broadcast infrared signals are not as focussed as point-to-point, this type of system cannot offer the same throughout. Broadcast infrared is typically limited to less than 1 Mbps, making it too slow for most network needs.

Network adapters, sometimes called Network Interface Cards (NICs) are peripheral cards that plug into the motherboard of your computer and into a network cable. It is through the network adapter that your computer communicates on the network. Many newer IBM-compatible computers have built-in networking adapters for Ethernet.

Network adapters perform all the functions required to communicate on a network. They convert data from the

form stored in the computer to the form transmitted or received (or transceived) on the cable and provide a physical connection to the network.

Fig 11

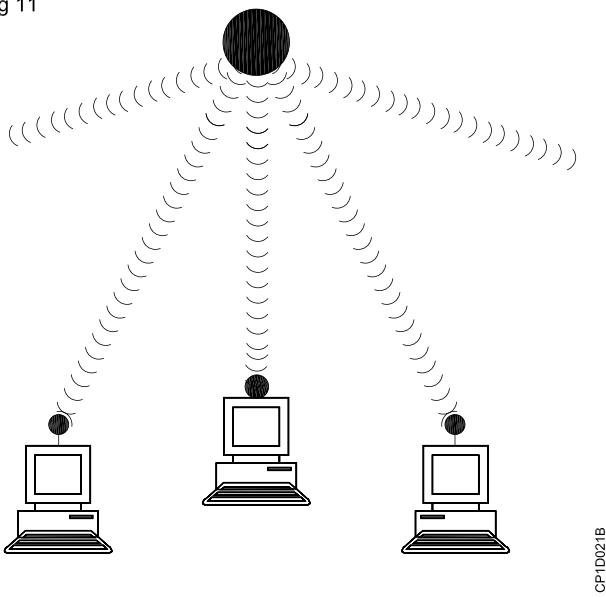
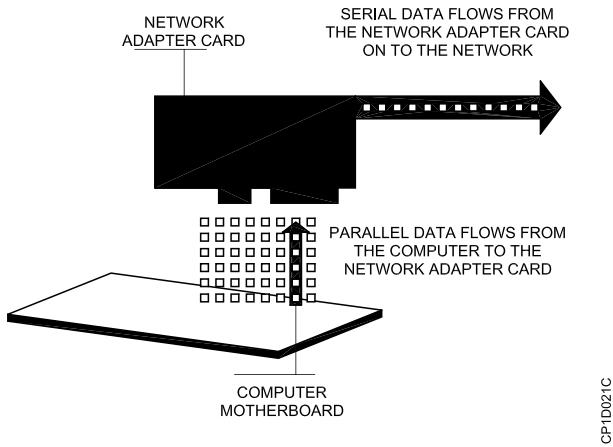


Fig 12 shows how an adapter plugs into a computer and attaches to a network cable.

Fig 12



Adapters in Abstract: Your computer software does not have to be aware of how the network adapter performs its function because the network driver software handles all the specifics for your computer. The applications running on your computer need only address data and hand it to the adapter card.

This is much the way the post office or a parcel delivery service works. You don't care about the details of postal delivery; you simply address your parcel and hand it to the delivery driver. The postal service manages the process of delivering it for you.

This abstraction allows your computer to use a microwave radio transmitter just as easily as a fiber-optic network adapter or an adapter that works over coaxial cable.

Everything in your computer remains the same except for the actual network adapter and the driver software for that adapter.

How network adapters work : Network adapters receive the data to be transmitted from the motherboard of your computer into a small amount of RAM called a buffer. The data in the buffer is moved into a chip that calculates a checksum value for the chunk and adds address information, which includes the address of the destination card and its own address, which indicates where the data is from. Ethernet adapter addresses are permanently assigned when the adapter is made at the factory. This chunk is now referred to as a frame.

For example, in Ethernet, the adapter listens for silence on the network when no other adapters are transmitting. It then begins transmitting the frame one bit at a time, starting with the address information, then the chunk of data and then the checksum.

The network adapter must still convert the serial bits of data to the appropriate media in use on the network. For instance, if the data is being transmitted over optical fiber, the bits are used to light up an infrared LED (light emitting diode) or laser diode, which transmits light pulses down the fiber to the receiving device's APD (avalanche photo diode) or photo-transistor. If the data is being sent over twisted-pair cable, the adapter must convert the bits of data from the 5-volt logic used in computers to the differential logic used for digital twisted-pair transmission.

The circuitry used to perform this media conversion is called a transceiver. Ethernet is the same no matter what type of media you use only the transceiver changes. Transceivers can be external devices attached through the AUI port on an Ethernet adapter, or they can be internal on the card. Some cards (usually called combo cards) have more than one type of transceiver built in so you can use them with your choice of media. AUI interfaces on Ethernet adapters are not transceivers—they are where you attach a transceiver for the different media types.

Because a network signal travels through copper and optical fiber at about 66 percent as fast as the speed of light, there's a chance that one of two adapters far away from each other could still be hearing silence when the other has in fact started transmitting. In this case, they could transmit simultaneously and garble their data. This is referred to as a collision.

While adapters transmit, they listen to the wire to make sure the data on the line matches the data being transmitted. As long as it does, everything is fine. If another adapter has interrupted, the data being, "heard" by the transmitting network adapter will not match the data being transmitted. If this happens, the adapter ceases transmitting and transmits a solid on state instead, which indicates to all computers that it has detected a collision and that they should discard the current frame because it has been corrupted. The network adapter waits a random amount of time and then again attempts to transmit the frame.

Configuring network adapters : Because network adapters have not been around since computers were invented, there is no assigned place for cards to be set to. Most adapter cards require their own interrupt, port address and upper memory range. PCI motherboards automatically assign IRQ and port settings to your PCI card, so you don't need to worry about it.

Unfortunately, network adapters in computers with ISA buses can conflict with other devices, since no two devices

should share the same interrupt or port. No software that comes with your computer will tell you every interrupt and port in use unless your computer is already running Windows NT, so you must be somewhat familiar with the hardware in your computer or use a program that can probe for free resources to find one. Many adapters have test programs that can tell you whether the adapter is working correctly with the settings you've assigned.

Computer name and workgroup - Client server

Objectives : At the end of this lesson you shall be able to

- define computer name
- define workgroup
- explain client-server model, centralised computing and client computing with central file storage
- explain web server.

Computer Name: In network computers are identified by its IP Address, but a name can also be given to identify it easily as remembering IP address is difficult comparing remembering a alphanumeric name.

Client-Server : The term Client-Server can describe hardware, in which case it is referring to network servers and client computers, or it can refer to a way of organising software applications and services on a network. Client-server computing is a powerful way of constructing programs on a network. In order to describe its advantage and how it works, we will first describe two alternatives to client-server computing:

- Centralised computing
- Client computing with central file storage

Centralized computing : Centralized computing originated with mainframe computers and time-sharing. The principle behind centralized computing is that a central computer executes a program, such as a database or a transaction-processing program (for instance, an airline reservations system or a bank records program) and remote terminals merely display data on a screen and convey keyboard data back to the central computer.

In modern networks, personal computers can perform the role of dumb terminals. With Windows software, the PC can appear to the central computer as many terminals, each virtual terminal accessing different data or performing a separate transaction on the mainframe.

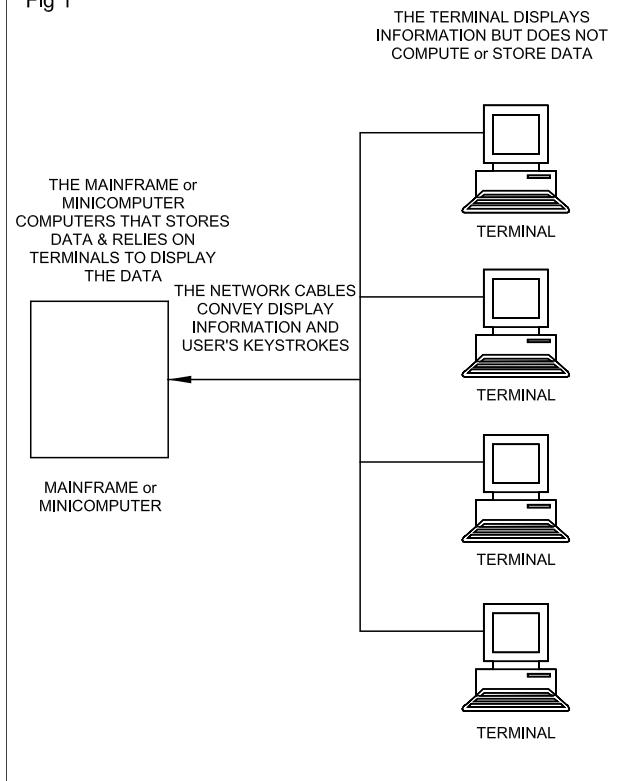
In centralized computing it is the central computer that does all the work. The data resides on the central computer and the program executes on the central computer. The personal computer or dumb terminal only display screen data and accepts keystrokes for the central computer to process. Centralized computing does not fully use the capabilities of today's powerful network clients. Fig 1 illustrates centralized computing.

Client computing with Central file storage : At the opposite end of the spectrum from centralized computing is client computing with central file storage (see Fig 2). In this way of organizing an application, the client computer does all the work. A central file server stores, but that is all.

Workgroup: In a network computers can be grouped together by using workgroup feature. Computers in a particular workgroup will show together when you open a workgroup. Though a computer of one workgroup can access other workgroup computers also.

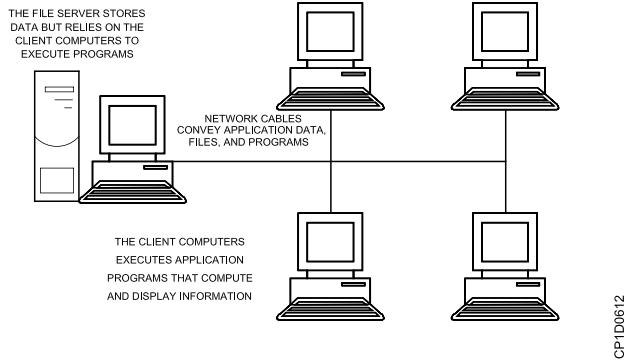
Client computers cooperate to ensure that central files are not corrupted by attempts by several computers to access them at the same time. When a client computer needs to perform an operation, the file is transferred to the client computer to perform the operation. Two examples of this type of application are networked database programs that do not use a SQL. (Structured Query Language) server and any network-aware application that does not communicate with a special program executing on the server, such as network scheduling programs and groupware.

Fig 1



CP1D0611

Fig 2

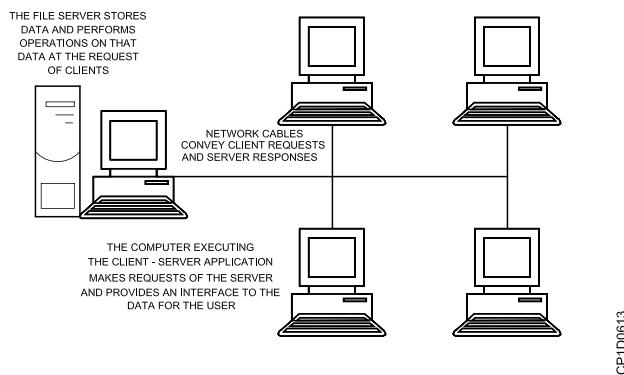


While it is fully exploits the capabilities of client computers and provides a richer and more customizable environment for the user, this type of program can place heavy demands on the network if the data files in which program works with are large. It also takes time to transmit data from the server to the client, process the data, and transfer it back to the server so other network programs can access the data.

The Client-Server Model : The client-server model combines the advantages of both the centralized computing model and the client model of computing. It does this by performing the operations that are best executed by a central computer on the file server and performing those operations that are best done close to the user on the client computer (see Fig 3). The client-server model works best when many people need access to large amounts of data. Simply stated, a client-server system is any system in which the client computer makes a request over a network to a server computer that then satisfies the request.

The Client : When you use a client-server system, what you see is the client, or front end. It presents the interface to manipulate or search for data. The request you make by manipulating windows, menu, check boxes and so on, is translated into a compact form that the client transmits over the network for the server to perform.

Fig 3



One example of a front end is Microsoft Access when it is used with a SQL back end. (You can also use Access without a SQL back end.) Access displays tables in windows or in forms you can browse. It allows you to modify and search the tables in an easy-to-use graphical environment. All the actual data manipulation, however, occurs on the SQL server. Access translates all the database operations into SQL for the server to perform. The results of the operations are transmitted back to Access to display in an intuitive, graphical form.

SQL is not limited to database programs such as Microsoft Access. User programs such as Microsoft Excel can use SQL to query the back-end data-base server for values to use in spreadsheet calculations. Program tools allow custom programs to store and retrieve data in server-based databases. Query tools provide direct access to the SQL data.

The Server : The server is where data operations in a client-server system occur. The central computer can service many client requests quickly and efficiently, which is the traditional advantage of centralized computing. The central computer can also provide enhanced security by performing only authorized operations on the data.

Back-end database software is optimized to perform searches and sorts and the back-end computer is often more powerful than the front-end computer.

Web server : A web server is a program using the client/server model and the World Wide Web's Hyper Text Transfer Protocol (HTTP) serves the files that form web pages to web users.

Every computer on the internet that contains a web site must have a web server program. The most popular web servers are: The Microsoft's Internet Information Server (IIS) which comes with the Microsoft's Windows NT Server; Netscape Fast Track and Enterprises Servers and Apache, a web server for Unix-based operating systems. Other web servers include Novell's Web Server for users of its Netware Operating System and IBM's family of Lotus Domino Servers. Primarily for IBM's OS/390 and AS/400 customers.

Web servers often come as a part of a larger package of Internet related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files and building and publishing web pages. Consideration in choosing a web server include how well it works with the operating system and other servers, its ability to handle server side programming and publishing, search engine and site building tools that may come with it.

DHCP

Objectives : At the end of this lesson you shall be able to

- define DHCP
 - explain DHCP.
-

DHCP: Dynamic Host Control Protocol allows server computers to distribute dynamic IP address when the client establish connection to server. The server maintains a IP address pool and it offer some IP which is not already allotted to some other client. When client disconnects from server its IP then becomes free again and can be given to other client.

It is dynamic as same client can get different IP in different times. It is beneficial as requirement of IP address is less as all the clients are not always connected to server and its saves the time to allocate IP to each client manually.

Dynamic Host Configuration Protocol (DHCP) is a standard protocol defined by RFC 1541 (which is

superseded by RFC 2131) that allows a server to dynamically distribute IP addressing and configuration information to clients. Normally the DHCP server provides the client with at least this basic information:

- IP Address
- Subnet Mask
- Default Gateway

Other information can be provided as well, such as Domain Name Service (DNS) server addresses and Windows Internet Name Service (WINS) server addresses. The system administrator configures the DHCP server with the options that are parsed out to the client.

Concept of proxy server

Objectives : At the end of this lesson you shall be able to

- explain the meaning of proxy server
- explain common connection point
- explain packet filtering, domain filtering and control user access by service
- explain logging and web publishing.

What is a proxy server? To be a “proxy” means to act on behalf of another. This is exactly what a proxy server does; it acts on behalf of its proxy clients to interact with other servers. You could say that a proxy server is a “mediator” for computer communications.

Placing a proxy server on your network gives you several advantages, including security enhancements, caching enhancements and greater control over your network users. The advantages of using Microsoft Proxy Server (MPS) is listed below:

- Common connection point
- Caching
- Packet filtering
- Domain filtering
- Control user access by service
- Logging
- Web publishing

Common connection point : MPS was designed to connect two networks, rather like a gateway. Typically, MPS connects an internal network and the Internet. This configuration gives the internal computers a common connection point to the Internet-through MPS.

When used to provide a common connection, MPS lets clients share a single connection to the Internet. Instead of giving each user on a Local Area Network (LAN) a separate modem, phone line and dial-up account to the Internet, MPS can function as a gateway to the Internet using a single connection. Instead of using separate standard phone line connections, users can share a single higher-speed connection through the proxy server. The net effect is usually an overall cost savings and reduction in administrative overhead. One connection is usually cheaper and easier to maintain than several separate connections.

Caching : Since you can use MPS as a common connection point to the Internet, you can also use it to cache frequently accessed resources. MPS allocates a portion of the server's hard disk space to store frequently accessed objects.

Caching can either be passive or active. Passive caching just stores objects as they are requested so the cache is updated only when users request information. Active caching directs the server to refresh objects in the cache automatically.

You can selectively control MPS caching so that you can limit the size of cached objects, change the expiration limits (control the freshness of objects) and determine whether MPS always caches or always excludes from cache certain content.

Caching only works with the Web Proxy Service in MPS. You will learn more about the Web Proxy Service later in this chapter.

Packet Filtering : To protect internal users from the outside world (in other words to protect the network from outsiders), MPS provides packet-filtering services. A packet filter prevents unauthorized access from the outside by limiting the available connection points coming into the network. To that end, packet filters stop various types of protocols from entering the network.

MPS supports both static and dynamic packet filters. A static filter keeps all traffic of a certain description or type from passing through MPS. A dynamic packet filter automatically determines which type of traffic is allowed in or out. With a static filter the administrator defines the port, the protocol and maybe the IP address. With a dynamic filter the administrator just defines the service to be allowed or filtered.

Domain Filtering : MPS also lets you limit the access of your internal clients to the Internet. You can configure filters for a single computer, a group of computers or a domain name. Many companies prefer to have this type of control over their users because they can block access to Internet sites that they believe reduce employee productivity or contain offensive material. Some popular examples of domain filtering are blocking access to Internet game servers or Web sites that contain pornographic material.

You can configure domain filters for a specific IP address, IP address and subnet mask or domain name. IP address filters prevent users from contacting a single computer. Using the IP address and subnet mask as a filter limits access to an entire group (a subnet) of computers. Domain name filters can apply to an entire Web site or to subsections of that site.

Control user access by Protocol or Service : You can also selectively enable and disable ports, services and protocols through MPS. MPS lets you control access to Internet services at the user level. You can also enable or restrict access to protocols on a user or group basis. Many protocols are predefined in the default MPS configuration.

If the protocol or service you would like to enable or disable is not defined in the MPS property sheets, you can create a new sheet. You can define a protocol by TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) port number or range. This gives you the ability to control access by port.

Logging : Because all traffic between networks passes through MPS, MPS has the unique opportunity to log and track communication. You can track the information your internal clients get from other networks or the Internet and monitor inbound communication. You can use this information to help you secure your internal network from attack and unauthorized access. Plus, you can monitor where your users spend their time on the Internet and what information they are downloading.

Web publishing : MPS can also act as a Web server. MPS can service requests from cache on behalf of a Web server, pass requests to the Web server on the local system or pass requests to another Web server on the internal network. The terms "reverse proxying" and "reverse hosting" describe the Web Publishing services that MPS provides.

As a reverse proxy, MPS listens to incoming Web requests for a single Web server on the local network. The incoming requests are simply forwarded to another Web server. Web hosting requires more work on the part of MPS. As a reverse host, MPS can send requests to one of many Web servers. In this case, MPS responds as if the entire site were contained locally, even though the actual data may be coming from several different Web servers.

The main difference between reverse proxying and reverse hosting is that in performing reverse proxying, MPS forwards all requests to the Web server. In performing reverse hosting, MPS selectively forwards requests to multiple Web servers on the internal network. In reverse hosting, the Microsoft Proxy Server routes an external request for a resource (that specifies an Internet domain name) to one or more internal Web servers. For instance, requests for <http://www.hudlogic.com/bios> might be routed to an internal server named "business" (<http://business>), while requests for <http://www.hudlogic.com/pictures> could be sent to a different Web server named "server1" (<http://server1>).

Services : Microsoft Proxy Server 2.0 supports Hypertext Transfer Protocol (HTTP) version 1.1, Windows Sockets version 1.1, SOCKS version 4.3a and Secure Sockets Layer (SSL) 3.0. The MPS services that provide this support are the Web Proxy service, WinSock Proxy service and the SOCKS Proxy service, respectively.

Web Proxy Service : The Web Proxy service provides support for HTTP (a.k.a. Web publishing), FTP, Gopher and secure (SSL) communications. The Web Proxy service works with any CERN-compliant Web browser, such as Internet Explorer or Netscape Navigator. Because the Web Proxy supports only these widely adopted Internet standard communication methods, it isn't operating system dependent. Clients running Unix, Macintosh or Windows operating systems can communicate with the Web Proxy service as long as they're configured with a CERN-compliant Web browser.

Any operating system using a CERN-compliant Web browser can communicate through the Web Proxy server, regardless of its underlying operating system.

WinSock Proxy Service : The WinSock Proxy service supports Microsoft Windows operating systems using Windows Sockets. This support is available for both Transmission Control Protocol/internet Protocol (TCP/IP) and Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocols. The WinSock Proxy service applies mainly to Windows clients including Windows 3.x, Windows 95 and Windows NT.

Windows Sockets is an interprocess communication mechanism derived from the Berkeley Sockets interface (originally designed for Unix systems). The Sockets interface was extended to support Windows-based clients running Microsoft implementations of TCP/IP. The name given to this Sockets interface for Windows was WinSock (for Windows Sockets).

The WinSock Proxy Service doesn't support 16-bit IPX/SPX clients such as the Windows 3.x 16-bit Netware clients.

SOCKS Proxy Service : The SOCKS Proxy service supports SOCKS version 4.3a client applications such as FTP, Gopher and Telnet. Operating systems like Macintosh and Unix can run SOCKS 4.3a and access the SOCKS Proxy service when communicating through the Microsoft Proxy Server. One limitation of the SOCKS proxy service on MPS is that it does not support UDP-based protocols.

UDP-based protocols aren't supported through the SOCKS Proxy service, but the WinSock Proxy service does support UDP for Windows clients.

Video conferencing

Objectives: At the end of this lesson you shall be able to

- define video conferencing
- list the advantages of video conferencing
- list the disadvantages of video conferencing.

Video Conferencing

Definition: Videoconferencing is the conduct of a conference by a set of telecommunication technologies which allow two or more remotely located teams to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Video conferencing is a very useful technique to cut down various costs as well as travel time when meetings and conferences are concerned. Video conferencing connects individuals in real time through audio and video communication over broadband networks. It enables visual meetings and collaboration on digital documents and shared presentations. New technologies allow participants to connect remotely over a network through multiple devices like laptops, desktops, smartphones and tablets.

Advantages

- 1 Significant Travel Savings
- 2 Not only is video conferencing a direct replacement for many in-person business trips, but because there is virtually no cost to add additional key employees to a virtual meeting, it is a cost effective solution.
- 3 Improved Communication
- 4 Audio conferencing and e-mail may be used for communication but there is a lack of visual connection

and eye contact in these. Video conferencing allows users to successfully convey, creating essential social bonds and shared understandings.

- 5 Increased Productivity
- 6 Important meetings are shorter and more effective. But it is a well-known fact that many meetings take longer than the necessary time of the participants. Video conferencing users can save a minimum of two hours a week with the technology. The interactivity of group collaboration and document sharing greatly increases productivity.
- 7 Conferencing Quality
- 8 The present day state-of-the-art technology delivers excellent, reliable audio and video quality, making conferencing very effective and interesting too.

Disadvantages

- 1 Absence of Physical Presence
- 2 Initial installation costs
- 3 Not yet popular with a large size of users.

Network security

Objectives: At the end of this lesson you shall be able to

- **define network security**
- **explain network security concepts.**

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator.

Network security concepts

Network security refers to any activities designed to protect your network. Specifically, these activities protect the usability, reliability, integrity, and safety of your network and data. Effective network security targets a variety of threats and stops them from entering or spreading on your network.

Network security starts with authenticating, commonly with a username and a password. Since this requires just one detail authenticating the user name -i.e. the password- this is sometimes termed one-factor authentication. With two-factor authentication, something the user needs a 'dongle', an ATM card, or a mobile phone, and with three-factor authentication, something the user needs a fingerprint or retinal scan.

Once authenticated, a firewall decides what services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component may fail to check potentially harmful content such as computer worms or Trojans being transmitted over the network.

Anti-virus software or an intrusion prevention system (IPS) helps detect and inhibit the action of such malware.

Encrypting the communication between two hosts using a network helps maintain privacy.

Surveillance and early-warning tools sometimes referred to as Honeypots can be employed.

Honeypot is a trap set to detect, deflect, or, in some manner, counteract attempts at unauthorized use of information systems. Generally, a honeypot consists of a computer, data, or a network site that appears to be part of a network, but is actually isolated and monitored, and which seems to contain information or a resource of value to attackers. This is similar to the police baiting a criminal and then conducting undercover surveillance.

The Foundations of Security

Security relies on the following elements:

- **Authentication**

Authentication addresses the question: who are you? It is the process of uniquely identifying the clients of your applications and services. These might be end users, other services, processes, or computers. In security parlance, authenticated clients are referred to as principals.

- **Authorization**

Authorization addresses the question: what can you do? It is the process that governs the resources and operations that the authenticated client is permitted to access. Resources include files, databases, tables, rows, and so on, together with system-level resources such as registry keys and configuration data. Operations include performing transactions such as purchasing a product, transferring money from one account to another, or increasing a customer's credit rating.

- **Auditing**

Effective auditing and logging is the key to non-repudiation. Non-repudiation guarantees that a user cannot deny performing an operation or initiating a transaction. For example, in an e-commerce system, non-repudiation mechanisms are required to make sure that a consumer cannot deny ordering 100 copies of a particular book.

- **Confidentiality**

Confidentiality, also referred to as privacy, is the process of making sure that data remains private and confidential, and that it cannot be viewed by unauthorized users or eavesdroppers who monitor the flow of traffic across a network. Encryption is frequently used to enforce confidentiality. Access control lists (ACLs) are another means of enforcing confidentiality.

- **Integrity**

Integrity is the guarantee that data is protected from accidental or deliberate (malicious) modification. Like privacy, integrity is a key concern, particularly for data passed across networks. Integrity for data in transit is typically provided by using hashing techniques and message authentication codes.

- **Availability**

From a security perspective, availability means that systems remain available for legitimate users. The goal for many attackers with denial of service attacks is to crash an application or to make sure that it is sufficiently overwhelmed so that other users cannot access the application. Threats, Vulnerabilities, and Attacks Defined

A threat is any potential occurrence, malicious or otherwise, that could harm an asset. In other words, a threat is any bad thing that can happen to your assets.

A vulnerability is a weakness that makes a threat possible. This may be because of poor design, configuration mistakes, or inappropriate and insecure coding techniques. Weak input validation is an example of an application layer vulnerability, which can result in input attacks.

An attack is an action that exploits a vulnerability or enacts a threat. Examples of attacks include sending malicious input to an application or flooding a network in an attempt to deny service.

How Do You Build a Secure Web Application?

It is not possible to design and build a secure Web application until you know your threats. An increasingly important knowledge needed is about threat modeling. The purpose of threat modeling is to analyze your application's architecture and design and identify potentially vulnerable areas that may allow a user, perhaps mistakenly, or an attacker with malicious intent, to compromise your system's security.

After you know your threats, design with security in mind by applying proven security principles. You must follow secure coding techniques to develop secure, robust, and hack-resilient solutions. The design and development of application layer software must be supported by a secure network, host, and application configuration on the servers where the application software is to be deployed.

E-mail

Objectives : At the end of this lesson you shall be able to

- state the hotmail services offered
- explain MSN outlook express and its tools
- explain popular search engines
- state the FAQs about hotmail.

Hotmail: MSN Hotmail is the world's largest provider of free Web-based e-mail. Hotmail is based on the premise that e-mail access should be easy and possible from any computer connected to the World Wide Web.

By adhering to the universal HyperText Transfer Protocol (HTTP) standard, Hotmail eliminates the disparities that exist between different e-mail programs. Sending and receiving e-mail from Hotmail is as easy as going to the Hotmail web site at <http://www.hotmail.com>, or by clicking on the Hotmail link at <http://www.msn.com>, signing in, and sending an e-mail message.

Hotmail is the web-based e-mail provider, which means you can send and receive messages from any computer connected to the Internet. You can use Hotmail from home, work, school, an Internet cafe, a friend's house or any other computer in the world with an Internet connection. Your messages are stored in a central location, so your Inbox will always be up to date. This is great for people who use more than one computer, travel frequently, or don't even own a computer.

Advantages of Hotmail

Get a permanent e-mail address: When you create a Hotmail account, you choose a permanent e-mail address that will never change as long as you continue to use Hotmail. This is great for people who: Want to switch Internet Service Providers. Your Hotmail address will be the same no matter how you access the Internet, so you don't have to worry about retrieving messages from your old address or notifying friends, family and associates of a new e-mail address. You are free to select any Internet Service Provider that suits your needs.

When you leave town for travel, you may no longer have access to your ISP's e-mail account. But with Hotmail, your friends will always know where to reach you.

Your e-mail is private and secure: When you sign up for Hotmail, you choose your personal ID and password. The only way you can access your account is by using the password you selected. This means that only you will have access to your Hotmail account, even if you use a computer at a public terminal or a friend's house. Because the messages in your Hotmail account are stored securely at a central location, you don't have to worry about losing important information if something happens to your computer. Hotmail is strongly committed to keeping your personal information confidential.

Hotmail is fast and easy to use: Hotmail is recognized world wide as the best Web-based e-mail service. It is also stated that 'while others provide similar services, none can match Hotmail's general ease of use'. If everything is fine, it takes less than a minute to get started on Hotmail and its pages are so worked out to load quickly knowing that the users time is valuable.

Get an additional e-mail account for FREE: Hotmail offers everyone the opportunity to get a free e-mail account. Hotmail can offer e-mail accounts for free because it places banner advertising on some of its pages. Some Internet Service Providers charge a monthly fee for additional e-mail accounts. Hotmail lets an unlimited number of people use a single Internet Service Provider account and have a free, personal e-mail account.

Keep your personal e-mail separate from your work e-mail: People who use e-mail for work will find it convenient to keep their personal messages separate from their work messages. You can use Hotmail for your personal correspondence and your company's e-mail system only for business messages. Additionally, you don't have to store personal e-mail on your company's servers. All messages in your Hotmail account are securely stored in a central location that you access via the Internet with the password you select.

Outlook Express

Microsoft Outlook Express puts the world of online communication on your desktop. Whether you want to exchange e-mail with colleagues and friends or join newsgroups to trade ideas and information. Some of the tools offered by outlook express are;

Manage multiple mail and news accounts: If you have several mail or news accounts, you can use them all from one window. You can also create multiple users, or identities, for the same computer. Each identity gets its own mail folders and Address Book. The ability to create multiple accounts and identities makes it easy for you to keep work separate from personal mail and also between individual users.

Browse through messages quickly & easily: Using the message list and preview pane, you can view a list of messages and read individual messages at the same time. The Folders list contains mail folders, news servers, and newsgroups, and you can easily switch between them. You can also create new folders to organize and sort messages, and then set up message rules so that

incoming mail that meets your criteria automatically goes to a specific folder. You can also create your own views to customize the way you look at your mail.

Keep your mail on a server so you can view it from more than one computer: If your ISP uses an IMAP mail server for incoming mail, you can read, store, and organize your messages in folders on the server without downloading the messages to your computer. That way, you can view messages from any computer that can connect to that server.

Use the Address Book to store and retrieve e-mail addresses: You can save names and addresses in your Address Book automatically by simply replying to a message or by importing them from other programs, by typing them in, by adding them from e-mail messages you receive, or by searching popular Internet directory services (white pages). The Address Book supports Lightweight Directory Access Protocol (LDAP) for accessing Internet directory services.

Add a personal signature or stationery to your messages: You can insert essential information into outgoing messages as part of your personal signature, and you can create multiple signatures to use for different purposes. For more detailed information, you can include a business card. To make your messages look more attractive, you can add stationery patterns and backgrounds, and you can change the color and style of the text.

Send and receive secure messages: You can digitally sign and encrypt messages by using digital IDs. Digitally signing your message assures recipients that the message is really from you. Encryption ensures that only intended recipients can read a message.

Find newsgroups that interest you: Looking for a newsgroup that matches your interests? You can search for newsgroups that contain keywords or browse through all of the newsgroups available from your Usenet provider. When you find a newsgroup you want to view regularly, add it to your Subscribed list so you can find it again easily.

View newsgroup conversations efficiently: You can view a newsgroup message and all of the responses without reading an entire message list. When you view the list of messages, you can expand and collapse conversations to make it easier to find what interests you. You can also use views to display only the messages you want to read.

Download newsgroup messages for offline reading: To use your online time efficiently, you can download messages or entire newsgroups, so you don't have to be connected to your ISP to read messages. You can also download message headers only for offline viewing and then mark the headers of the messages you want to read; then the next time you are connected, Outlook Express downloads the message text. You can also compose messages offline and send them the next time you reconnect.

Some important (Top 8) recommendations for staying safe and secure when you're online are listed below;

- Change your password often. The quick act of changing your password can ensure your e-mail remains private. In addition, passwords that use both letters and numbers are harder to break.
- Don't share your password. Most e-mail administrators will not ask for your password. Do not be duped by malicious e-mails asking you for your password. This is a well-known, although not-too-common trick designed to fool you into sharing your password. As a rule, never share it with anyone.
- Never open attachments from unknown sources. They may contain what are known as "letterbombs" or "viruses," which can damage your PC.
- Always remember to sign out when you are done. It's quick, easy and may save your account from unwanted trespassers. If you are using a public terminal, at an internet cafe for example, it is advised that you close the browser you were using when you are ready to end your Internet session.
- Don't reply to unsolicited messages ("spam") mail, or other harassing or offensive mail. By responding, you only confirm that you are a person with an active e-mail address who can be plagued with constant unwanted e-mail solicitations. Instead, forward the unsolicited message to the customer service department of the source's e-mail (usually of a form similar to abuse@[implicateddomain].com). To help control spam, Hotmail provides members with "filters" for incoming mail. These can easily be set up to send certain messages (such as those that include certain words) directly to your online trash can.
- Make sure that you are using the most up-to-date Internet software (e.g. browsers such as Microsoft Internet Explorer or Netscape Navigator). More recent versions often offer enhanced security protection.
- Always use a secure network. Most corporate networks and Internet service providers are protected by administrators who watch for potential security problems and act to protect users from "hackers" (malicious users) who may try to steal personal information that is transferred through the network. Although the risk is small, use caution when on any unfamiliar network.
- Use stations maintained by sources you trust, or ask if the Internet terminal you are using is protected against security break-ins.

A SMALL LIST OF Search Engines

Yahoo.com (<http://www.Yahoo.com>)

Search.com (<http://search.com>)

EasySearcher (<http://www.easysearcher.com>)

AltaVista (<http://www.altavista.com>)

Excite (<http://www.excite.com>)

Google (<http://www.google.com>)
Hotbot (<http://www.hotbot.com>)
Infoseek (<http://www.infoseek.com>)
Lycos (<http://www.lycos.com>)
WebCrawler (<http://www.webcrawler.com>)
www.all4one.com (This useful tool queries four search engines at once)
www.av.com (Very powerful search engine which gives plenty of results)
www.askjeeves.com (Instead of entering words to search for, just type in your question)
www.rediff.com (Search for anything)
www.bigfoot.com (Looking for someone's email address ? Try here)
www.sawaal.com (All your questions answered)
www.hotbot.com (Useful search engine which helps to find pictures, video or music)
www.indiainfo.com (Info lets you search the web easily)
www.yahoo.com (Search engine which is also the most popular)
mp3.lycos.com (The place to start if you're after music files in the mp3 format)
www.metacrawler.com (Metacrawler puts your search through a host different engines)
www.mirago.co.uk (A search engine with an excellent selection of shopping links)
www.webferret.com (One of the easiest way to search the web)
www.indiatimes.com (The portal's search engine)
www.webcrawler.com (Let the webcrawler spider to do the searching for you)
www.indonet.net (Excellent Indian search engine with loads of useful search categories)
www.satyamonline.com (On ISP's site and has good search options)

COMPILED LIST OF INTERESTING FAQ's about HOTMAIL

1 How much e-mail storage space do I get with Hotmail?

Hotmail offers 2MB of storage space. If you do not keep your account below this limit, Hotmail may remove some messages, which cannot be recovered.

If you need additional storage space, there are a few options. You can use the latest version of Microsoft Internet Explorer v5 or above, which includes Outlook Express, which offers you the ability to store e-mails locally. You can send a blank e-mail message to hmoex@hotmail.com for more information on how to use the beta (pre-release) process to store Hotmail messages on your local PC, using Outlook Express.

Also, MSN has introduced Preview 2 of MSN Explorer as an integrated client for MSN services, such as MSN Hotmail. This client allows you to also store Hotmail locally on your machine. This too reduces the amount of storage that you need on hotmail.

2 Can I get Hotmail in different languages?

MSN Hotmail can now be viewed in a variety of languages.

You can make the language of a Hotmail session match the language of the Sign In page used to begin that session. You have your choice of the following languages: English, French, German, Italian, Japanese, Portuguese (Brazilian), and Spanish, and more to come.

3 Can I use Hotmail as a business address?

No. You may not use your Hotmail address as your primary business address. If, however, you work for a company with which you have an e-mail address and you want to use your Hotmail account to send and receive e-mail while away from your computer at work, you are encouraged to do so.

Example of Prohibited Use:

You are an individual who runs a business. You and your employees want to use Hotmail accounts rather than registering and administering your account through a paid ISP.

Example of Allowed Use:

You are a businessperson who travels. You have an account with your company (**yourname@yourcompany.com**). You use your Hotmail account to read and send solicited messages while you are traveling.

Hotmail prohibits account sharing. Since Hotmail is accessible from everywhere in the world, each individual is able to sign up for his or her own personal account. You are encouraged to sign up for an account of your own, to which only you have access. Sharing an account compromises the privacy and security of your e-mail. Each Hotmail user must have his or her individual e-mail account.

4 Is my e-mail really private and secure? (SSL)?

Secure connections (often called SSL, or Secure Sockets Layer) is the industry standard in Web security. It is used primarily for transmitting sensitive information over the Internet. When you have a secure connection between your browser and a Web site, no one else can easily access the data that you send across the connection. Hotmail uses SSL to encrypt your sign-in name, and password, when you log in to give you a high level of security.

It is Hotmail's policy to respect the privacy of its users. Therefore, Hotmail will not monitor, edit, or disclose the contents of a user's private communications unless required to do so by law or in the good faith belief that such action is necessary to:

- conform to the edicts of the law or comply with legal process served on Hotmail;
- protect and defend the rights or property of Hotmail; or
- act under exigent circumstances to protect the personal safety of its users or the public.

5 Can Hotmail protect its users from e-mail viruses?

MSN Hotmail is pleased to offer users McAfee VirusScan for free. Whenever you receive attachments in your Hotmail account, it will automatically scan them with McAfee's popular VirusScan before downloading.

MSN Hotmail recently added the ability to have all attachments you want to send scanned before they can be attached to your outgoing e-mail. So before you upload file to send to another user, it will also be scanned for viruses before you send it, reducing the spread of viruses to Hotmail users and the other recipients of your e-mail.

Remember, to ensure safety, Hotmail recommends that you never open attachments from unknown sources.

6 How do I send images and use e-mail stationery to make e-mail I send more colorful and fun?

(Emoticons/Stationery/RTF)

MSN Hotmail offers users stationery to send fun, colorful messages to family and friends! Always capture the right mood for your messages by selecting one of the many different stationery templates. Use the Stationery Chooser button on the Compose page to view the available stationery choices.

You can also accent your messages by using Rich Text Formatting. The Rich Text Formatting option, also allows you to add emoticons to your e-mail. This new feature allows you to add selected symbols or emoticons to your message. These icons help you convey emotion or add flair within a message.

7 What does it mean when my account is marked "inactive"?

Currently, if you do not sign in to your Hotmail account for 60 days, or if you do not sign-in within the first 10 days, your account will be marked "inactive." Stored e-mail and addresses will be deleted, and inbound mail will be refused. Your Passport will still function, and your Hotmail e-mail name will be reserved. To re-activate your account, simply go to <http://www.hotmail.com> and enter your Sign-In name and password. You will then be able to once again send and receive e-mail using hotmail. If your account stays "inactive" for over a period of 90 days, it may be permanently deleted.

8 Can I send and receive attachments on Hotmail?

Yes, you can send and receive as many files as you want to a message - up to 1MB (1024K) of attachments.

Attachments sent to your Hotmail account can be downloaded to your personal computer by clicking them. GIF and JPEG images and HTML files are automatically displayed in the browser window.

Chatting, video chatting and using social network sites

Objectives : At the end of this lesson you shall be able to

- explain chating process
- explain video chating process
- explain social network services.

Chatting Process

A web chat is a system that allows users to communicate in real time using easily accessible web interfaces. It is a type of internet online chat distinguished by its simplicity and accessibility to users who do not wish to take the time to install and learn to use specialized chat software. This trait allows users instantaneous access and only a web browser is required to chat. Users will always get the latest version of a chat service because no software installation or updates are required.

Video Chat

In video chat video of both caller and receiver can be seen on screen of both user along with audio. So it gives an impression of face to face interaction though the caller and receiver can be thousands of mile apart.

Social Networking services

A social networking service is a platform to build social networks or social relations among people who, share interests, activities, backgrounds or real-life connections. A social network service consists of a representation of each user (often a profile), his social links, and a variety of additional services. Social networking is web-based services that allow individuals to create a public profile, to create a list of users with whom to share connection, and view and cross the connections within the system. Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Social network sites are varied and they incorporate new information and communication tools such as, mobile connectivity, photo/video/sharing and blogging. Online community services

are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, pictures, posts, activities, events, interests with people in their network.

The main types of social networking services are those that contain category places (such as former school year or classmates), means to connect with friends (usually with self-description pages), and a recommendation system linked to trust. Popular methods now combine many of these, with American-based services such as Facebook, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr and Twitter widely used worldwide; Nexopia in Canada; Badoo, Bebo, Vkontakte (Russia), Delphi (also called Delphi Forums), Draugiem.lv (mostly in Latvia), Hi5 (Europe), Hyves (mostly in The Netherlands), iWiW (mostly in Hungary), Nasza-Klasa, Soup (mostly in Poland), Glocals in Switzerland, Skyrock, The Sphere, StudiVZ (mostly in Germany), Tagged, Tuenti (mostly in Spain), and XING in parts of Europe; Hi5 and Orkut in South America and Central America; Mxit in Africa; and Cyworld, Mixi, Orkut, renren, weibo and Wretch in Asia and the Pacific Islands.

There have been attempts to standardize these services to avoid the need to duplicate entries of friends and interests (see the FOAF standard and the Open Source Initiative). According to experts, the largest social networking users are Asian-Pacific regions with 615,9 million people. A 2013 survey found that 73% U.S adults use social networking sites.

Explaining threats to computers connected to Internet & process of protecting computers from it.

Objectives : At the end of this lesson you shall be able to

- **explain threats to computers connected to Internet**
- **process of Protecting computers from Internet.**

A web threat is any threat that uses the World Wide Web to facilitate cybercrime. Web threats use multiple types of malware and fraud, all of which utilize HTTP or HTTPS protocols, but may also employ other protocols and components, such as links in email or IM, or malware attachments or on servers that access the Web. They benefit cybercriminals by stealing information for subsequent sale and help absorb infected PCs into botnets.

Web threats pose a broad range of risks, including financial damages, identity theft, loss of confidential information/data, theft of network resources, damaged brand/personal reputation, and erosion of consumer confidence in e-commerce and online banking.

It is a type of threat related to information technology (IT). The IT risk, i.e. risk affecting has gained and increasing impact on society due to the spread of IT processes.

Web threats can be divided into two primary categories, based on delivery method - push and pull. Push-based threats use spam, phishing, or other fraudulent means to lure a user to a malicious (often spoofed) website which then collects information and/or injects malware. Push attacks use phishing, DNS poisoning (or pharming), and other means to appear to originate from a trusted source.

Precisely-targeted push-based web threats are often referred to as spear phishing to reflect the focus of their data gathering attack. Spear phishing typically targets specific individuals and groups for financial gain. In other push-based web threats, malware authors use social engineering such as enticing subject lines that reference holidays, popular personalities, sports, pornography, world events and other hot topics to persuade recipients to open the email and follow links to malicious websites or open attachments with malware that accesses the Web.

Pull-based web threats are often referred to as "drive-by" threats by experts (and more commonly as "drive-by downloads" by journalists and the general public), since they can affect any website visitor. Cybercriminals infect legitimate websites, which unknowingly transmit malware to visitors or alter search results to take users to malicious websites. Upon loading the page, the user's browser passively runs a malware downloader in a hidden HTML frame (IFRAME) without any user interaction.

Internet security

Internet security is a tree branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet. The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing. Different methods have been used to protect the transfer of data, including encryption.

Types of security

Network layer security

TCP/IP which stands for Transmission Control Protocol (TCP) and Internet Protocol (IP) aka Internet protocol suite can be made secure with the help of cryptographic methods and protocols. These protocols include Secure Sockets Layer (SSL), succeeded by Transport Layer Security (TLS) for web traffic, Pretty Good Privacy (PGP) for email, and IPsec for the network layer security.

Internet Protocol Security (IPsec)

This protocol is designed to protect communication in a secure manner using TCP/IP aka Internet protocol suite. It is a set of security extensions developed by the Internet Task force IETF, and it provides security and authentication at the IP layer by transforming data using encryption. Two main types of transformation that form the basis of IPsec: the Authentication Header (AH) and ESP. These two protocols provide data integrity, data origin authentication, and anti-replay service. These protocols can be used alone or in combination to provide the desired set of security services for the Internet Protocol (IP) layer.

The basic components of the IPsec security architecture are described in terms of the following functionalities:

- Security protocols for AH and ESP
- Security association for policy management and traffic processing
- Manual and automatic key management for the internet key exchange (IKE)
- Algorithms for authentication and encryption

The set of security services provided at the IP layer includes access control, data origin integrity, protection against replays, and confidentiality. The algorithm allows these sets to work independently without affecting other parts of the implementation. The IPsec implementation is operated in a host or security gateway environment giving protection to IP traffic.

Security token

Some online sites offer customers the ability to use a six-digit code which randomly changes every 30-60 seconds on a security token. The keys on the security token have built in mathematical computations and manipulate numbers based on the current time built into the device. This means that every thirty seconds there is only a certain array of numbers possible which would be correct to validate access to the online account. The website that the user is logging into would be made aware of that devices' serial number and would know the computation and correct time built into the device to verify that the number given is indeed one of the handful of six-digit numbers that works in that given 30-60 second cycle. After 30-60 seconds the device will present a new random six-digit number which can log into the website.

Electronic mail security (E-mail)

Background

Email messages are composed, delivered, and stored in a multiple step process, which starts with the message's composition. When the user finishes composing the message and sends it, the message is transformed into a standard format: an RFC 2822 formatted message. Afterwards, the message can be transmitted. Using a network connection, the mail client, referred to as a mail user agent (MUA), connects to a mail transfer agent (MTA) operating on the mail server. The mail client then provides the sender's identity to the server. Next, using the mail server commands, the client sends the recipient list to the mail server. The client then supplies the message. Once the mail server receives and processes the message, several events occur: recipient server identification, connection establishment, and message transmission. Using Domain Name System (DNS) services, the sender's mail server determines the mail server(s) for the recipient(s). Then, the server opens up a connection(s) to the recipient mail server(s) and sends the message employing a process similar to that used by the originating client, delivering the message to the recipient(s).

Pretty Good Privacy (PGP)

Pretty Good Privacy provides confidentiality by encrypting messages to be transmitted or data files to be stored using an encryption algorithm such Triple DES or CAST-128. Email messages can be protected by using cryptography in various ways, such as the following:

- Signing an email message to ensure its integrity and confirm the identity of its sender.
- Encrypting the body of an email message to ensure its confidentiality.

- Encrypting the communications between mail servers to protect the confidentiality of both message body and message header.

The first two methods, message signing and message body encryption, are often used together; however, encrypting the transmissions between mail servers is typically used only when two organizations want to protect emails regularly sent between each other. For example, the organizations could establish a virtual private network (VPN) to encrypt the communications between their mail servers over the Internet. Unlike methods that can only encrypt a message body, a VPN can encrypt entire messages, including email header information such as senders, recipients, and subjects. In some cases, organizations may need to protect header information. However, a VPN solution alone cannot provide a message signing mechanism, nor can it provide protection for email messages along the entire route from sender to recipient.

Multipurpose Internet Mail Extensions (MIME)

MIME transforms non-ASCII data at the sender's site to Network Virtual Terminal (NVT) ASCII data and delivers it to client's Simple Mail Transfer Protocol (SMTP) to be sent through the Internet. The server SMTP at the receiver's side receives the NVTASCII data and delivers it to MIME to be transformed back to the original non-ASCII data.

Message Authentication Code

A Message authentication code (MAC) is a cryptography method that uses a secret key to encrypt a message. This method outputs a MAC value that can be decrypted by the receiver, using the same secret key used by the sender. The Message Authentication Code protects both a message's data integrity as well as its authenticity.

Firewalls

A firewall (computing) controls access between networks. It generally consists of gateways and filters which vary from one firewall to another. Firewalls also screen network traffic and are able to block traffic that is dangerous. Firewalls act as the intermediate server between SMTP and Hypertext Transfer Protocol (HTTP) connections.

Role of firewalls in web security

Firewalls impose restrictions on incoming and outgoing Network packets to and from private networks. Incoming or outgoing traffic must pass through the firewall; only authorized traffic is allowed to pass through it. Firewalls create checkpoints between an internal private network and the public Internet, also known as choke points(borrowed from the identical military term of a combat limiting geographical feature). Firewalls can create choke points based on IP source and TCP port number. They can also serve as the platform for IPsec. Using tunnel mode capability, firewall can be used to implement VPNs. Firewalls can also limit network

exposure by hiding the internal network system and information from the public Internet. Also, WE HAVE A LOT OF BIG WAYE to deal with it.

Types of firewalls

Packet filter

A packet filter is a first generation firewall that processes network traffic on a packet-by-packet basis. Its main job is to filter traffic from a remote IP host, so a router is needed to connect the internal network to the Internet. The router is known as a screening router, which screens packets leaving and entering the network.

Stateful packet inspection

In a stateful firewall the circuit-level gateway is a proxy server that operates at the network level of an Open Systems Interconnection (OSI) model and statically defines what traffic will be allowed. Circuit proxies will forward Network packets (formatted unit of data) containing a given port number, if the port is permitted by the algorithm. The main advantage of a proxy server is its ability to provide Network Address Translation (NAT), which can hide the user's IP address from the Internet, effectively protecting all internal information from the Internet.

Application-level gateway

An application-level firewall is a third generation firewall where a proxy server operates at the very top of the OSI model, the IP suite application level. A network packet is forwarded only if a connection is established using a known protocol. Application-level gateways are notable for analyzing entire messages rather than individual packets of data when the data are being sent or received.

Malicious software

Malware

A computer user can be tricked or forced into downloading software onto a computer that is of malicious intent. Such programs are known as malware and come in many forms, such as viruses, Trojan horses, spyware, and worms. Malicious software is sometimes used to form botnets.

Viruses

Computer Viruses are programs that can replicate their structures or effects by infecting other files or structures on a computer. The common use of a virus is to take over a computer to steal data.

Worms

Computer worms are programs that can replicate themselves throughout a computer network, performing malicious tasks throughout.

Trojan horse

A Trojan horse commonly known as a Trojan is a general term for malicious software that pretends to be harmless, so that a user willingly allows it to be downloaded onto the computer.

Ransomware and Scareware

Botnet

A botnet is a network of zombie computers that have been taken over by a robot or bot that performs large-scale malicious acts for the creator of the botnet.

Spyware

The term spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

Denial-of-service attack

A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of the concerted efforts to prevent an Internet site or service from functioning efficiently or at all, temporarily or indefinitely.

Browser choice

Web browser statistics tend to affect the amount a Web browser is exploited. For example, Internet Explorer 6, which used to own a majority of the Web browser market share, is considered extremely insecure because vulnerabilities were exploited due to its former popularity. Since browser choice is more evenly distributed (Internet Explorer at 28.5%, Firefox at 18.4%, Google Chrome at 40.8%, and so on) and vulnerabilities are exploited in many different browsers.

Application vulnerabilities

Applications used to access Internet resources may contain security vulnerabilities such as memory safety bugs or flawed authentication checks. The most severe of these bugs can give network attackers full control over the computer. Most security applications and suites are incapable of adequate defense against these kinds of attacks.

Internet security products

Antivirus

Antivirus programs and Internet security programs can protect a programmable device from malware by detecting and eliminating viruses; Before 2000 a user would pay for antivirus software, 10 years later however, computer users can choose from a host of free security applications on the Internet.

Security Suites

So called "security suites" were first offered for sale in 2003 (McAfee) and contain a suite of firewalls, anti-virus, anti-spyware and more. They may now offer theft protection, portable storage device safety check, private internet browsing, cloud anti-spam, a file shredder or make security-related decisions (answering popup windows) and several were free of charge as of at least 2012.

Outlook Express & Google+

Objectives : At the end of this lesson you shall be able to

- explain outlook express
 - explain Google+
-

Microsoft Outlook

Microsoft Outlook is a personal information manager from Microsoft, available as a part of the Microsoft Officesuite. Although often used mainly as an email application, it also includes a calendar, task manager, contact manager, note taking, journal, and web browsing. It can be used as a stand-alone application, or can work with Microsoft Exchange Server and Microsoft SharePoint Server for multiple users in an organization, such as shared mailboxes and calendars, Exchange public folders, SharePoint lists, and meeting schedules. There are third-party add-on applications that integrate Outlook with devices such as BlackBerry mobile phones and with other software such as Office and Skype internet communication. Developers can also create their own custom software that works with Outlook and Office components using Microsoft Visual Studio. In addition, Windows Mobile devices can synchronize almost all Outlook data to Outlook Mobile.

Google+

Google+ (pronounced and sometimes written as Google Plus) is a social networking and identity service that is owned and operated by Google Inc. Google has described Google+ as a "social layer" that enhances many of its online properties, and that it is not simply a social networking website, but also an authorship tool that associates web-content directly with its owner/author. It is the second-largest social networking site in the world after Facebook. 540 million monthly active users are part of the Identity service site, by interacting socially with Google+'s enhanced properties, like Gmail, +1 button, and YouTube comments. In October 2013, Google counted 540 million active users who used at least one Google+ service, of which 300 million users are active in "the stream".

Creation

Google launched the Google+ service as an invitation-only "field test" on June 28, 2011, but soon suspended early invites due to an "insane demand" for new accounts. On August 6, each Google+ member had 150 invitations to give out until September 20, 2011, when Google+ opened to everyone 18 years of age or older without the need for an invitation. It was opened for a younger age group (13 years or older in US and most countries, 14 or older in South Korea and Spain, 16 or older in the Netherlands) on January 26, 2012. Google+ is available as a website and on mobile devices.

Before the launch, Google referred to Google+ as Google Circles, a name alluding to its emphasis on organising friendship information. Google+ is considered the company's fourth foray into social networking, following Google Buzz (launched 2010, retired in 2011), Google Friend Connect (launched 2008, retired by March 1, 2012) and Orkut (launched in 2004, as of 2013 operated entirely by subsidiary Google Brazil). Sources such as The New York Times have declared it Google's biggest attempt to rival the social network Facebook, which has over 1 billion users.

Web designing

Objectives : At the end of this lesson you shall be able to

- explain web sites and web pages
 - explain static and dynamic web pages
 - explain HTML, DHTML and XML
 - explain the concept of web hosting, web server, application server and database server.
-

Introduction

The World Wide Web (WWW) was created in 1990 by CERN physicist Tim Berners-Lee. On 30 April 1993, CERN announced that the World Wide Web would be free to use for anyone. Before the introduction of HTML and HTTP, other protocols such as File Transfer Protocol and the Gopher Protocol were used to retrieve individual files from a server. These protocols offer a simple directory structure which the user navigates and chooses files to download. Documents were most often presented as plain text files without formatting, or were encoded in word processors formats.

Websites

A website, also written as Web site, web site, or simply site, is a set of related web page containing content (media) such as written language, Image, video, sound, etc. A website is hosted on at least one web server, accessible via a network such as the internet or a private local area network through an Internet address known as a uniform resource locator. All publicly accessible websites collectively constitute the world wide web.

A webpage is a document, typically written in plain text interspersed with formatting instructions of Hypertext Mark-up Language (HTML) XHTML. A webpage may incorporate elements from other websites with suitable HTML anchor.

Web pages are accessed and transported with the Hypertext Transfer Protocol (HTTP), which may optionally employ encryption secure, HTTPS to provide security and privacy for the user of the webpage content. The user's application, often a web browser, renders the page content according to its HTML Mark-up instructions onto a Computer monitor.

The pages of a website can usually be accessed from a simple Uniform Resource Locator (URL) called the web address. The URLs of the pages organize them into a hierarchy, although hyperlink between them conveys the reader's perceived sitemap and guides the reader's navigation of the site which generally includes a Home page with most of the links to the site's web content, and a supplementary about page, contact page and link page.

Some websites require a subscription to access some or all of their content. Examples of subscription websites include many business sites, parts of news websites, Academic journal websites, gaming websites, file-sharing websites, Internet forum, web-based Email, Social networking websites, websites providing real-time Stock market data, and websites providing various other services (e.g., websites offering storing and/or sharing of images, files and so forth).

A website may be

- Personal website
- Commercial website
- E-Government
- Non-profit organization website.

Static Website

A static website is one that has web pages stored on the server in the format that is sent to a client web browser. It is primarily coded in Hypertext Markup Language (HTML).

Simple forms or marketing examples of websites, such as classic website, a five-page website or a brochure website are often static websites, because they present pre-defined, static information to the user. This may include information about a company and its products and services through text, photos, animations, audio/video and interactive menus and navigation.

This type of website usually displays the same information to all visitors. Similar to handing out a printed brochure to customers or clients, a static website will generally provide consistent, standard information for an extended period of time. Although the website owner may make updates periodically, it is a manual process to edit the text, photos and other content and may require basic website design skills and software.

Advantages

- Static Websites are easier to develop
- Can be developed quickly
- They are indexed easily by search engines as all the web pages actually exist on the server, which is not the case with dynamic websites.

Disadvantages

- Static websites cannot do complex tasks required by many online services.
- Updating a whole site can be cumbersome and time consuming.
- An isolation of Data and Design is not provided in static websites.

Dynamic Website

A dynamic website is one that changes or customizes itself frequently and automatically, based on certain criteria.

Dynamic websites can have two types of dynamic activity: Code and Content. Dynamic code is invisible or behind the scenes and dynamic content is visible or fully displayed

Advantages

- Can do more complex task required by online services.
- They are easier to update.
- Isolation of data and design allows programmers and content writers to work independently.

Disadvantages

- Can take more time to build.
- Can be difficult to build.
- Dynamic websites are not indexed by search engines easily, since they do not have actual web pages present on the web server. With continuous improvements in search engine technology, this problem is now very much eliminated and you can find that many dynamic websites are very well indexed by search engines now a days.

A few such classifications are:

- Affiliate: enabled portal that renders not only its custom CMS but also syndicated content from other content providers for an agreed fee. There are usually three relationship tiers. Affiliate Agencies (e.g., Commission Junction), Advertisers (e.g., eBay) and consumer (e.g., Yahoo!).
- Archive site: used to preserve valuable electronic contents that are on verge of extinction. For examples: Internet Archive, which since 1996 has preserved billions of old and new web pages; and Google Groups, which in early 2005 had preserved over 845,000,000 messages posted to Usenet news/discussion groups.
- Blog Site: sites generally used to post online diaries, comments or views that may include discussion forums (e.g., blogger, Xanga).

- Content Site: these sites create and sell of original content to end-user. (e.g., Slate, About.com).
- Corporate website: used to provide information regarding business, organization, or service.
- Commerce site (or eCommerce site): these sites are designed for purchasing or selling goods, such as Amazon.com, CSN Stores, and Overstock.com.
- Community site: sites where persons with similar interests communicate to each other through chatting and messaging or through soci message boards, such as MySpace or Facebook.
- City Site: A site that shows information about a certain city or town and events that takes place in that town. Usually created by the city council. For example, Richmond.com is the geodomain for Richmond, Virginia.
- Information site: contains content that is intended to inform visitors, but not necessarily for commercial purposes, such as: RateMyProfessors.com, Free Internet Lexicon and Encyclopaedia. Most government, educational and non-profit institutions have an informational site.
- Mirror site: A complete reproduction of a website.
- News site: similar to an information site, but dedicated to dispensing news and commentary.
- Personal homepage: run by an individual or a small group such as a family that contains information or any content that the individual wishes to include. These are usually uploaded using a web hosting service such as Geocities.
- Phish Site: a website created to fraudulently acquire sensitive information, such as passwords and credit card details, by disguising as a trustworthy person or business (such as Social Security Administration, PayPal) in an electronic communication.
- Political site: A site on which people may voice political views.
- Rating site: A site on which people can praise or disparage what is featured.
- Review site: A site on which people can post reviews for products or services.
- School site: a site on which teachers, students, or administrators can post information about current events at or involving their school.
- Video sharing: A site that enables user to upload videos, such as YouTube and Google Video.
- Search engine site: a site that provides general information and is intended as a gateway for retrieving other sites. Google, Yahoo and MSN are the most widely known search engines.
- Shock site: includes images or other material that is intended to be offensive to most viewers (e.g. rotten.com).

- Warez: a site designed to host and let users download copyrighted materials illegally.
- Web portal: a site is vehicle that provides a gateway to other resources on the Internet or an intranet.

Web Pages

A web page or webpage is a Document or information resource that is suitable for the world wide Web and can be accessed through a web browser and displayed on a computer display or mobile device. This information is usually in HTML or XHTML format, and may provide navigation bar to other web pages via Hyper text Hyper link. Web pages frequently subsume other resources such as Cascading Style Sheet, Client-side-scripting and Images into their final presentation.

Web pages may be retrieved from a local computer or from a remote Web server. The web server may restrict access only to a private network, e.g. a corporate Intranet or it may publish pages on the World Wide Web. Web pages are requested and served from web. Web server using Hypertext Transfer Protocol (HTTP).

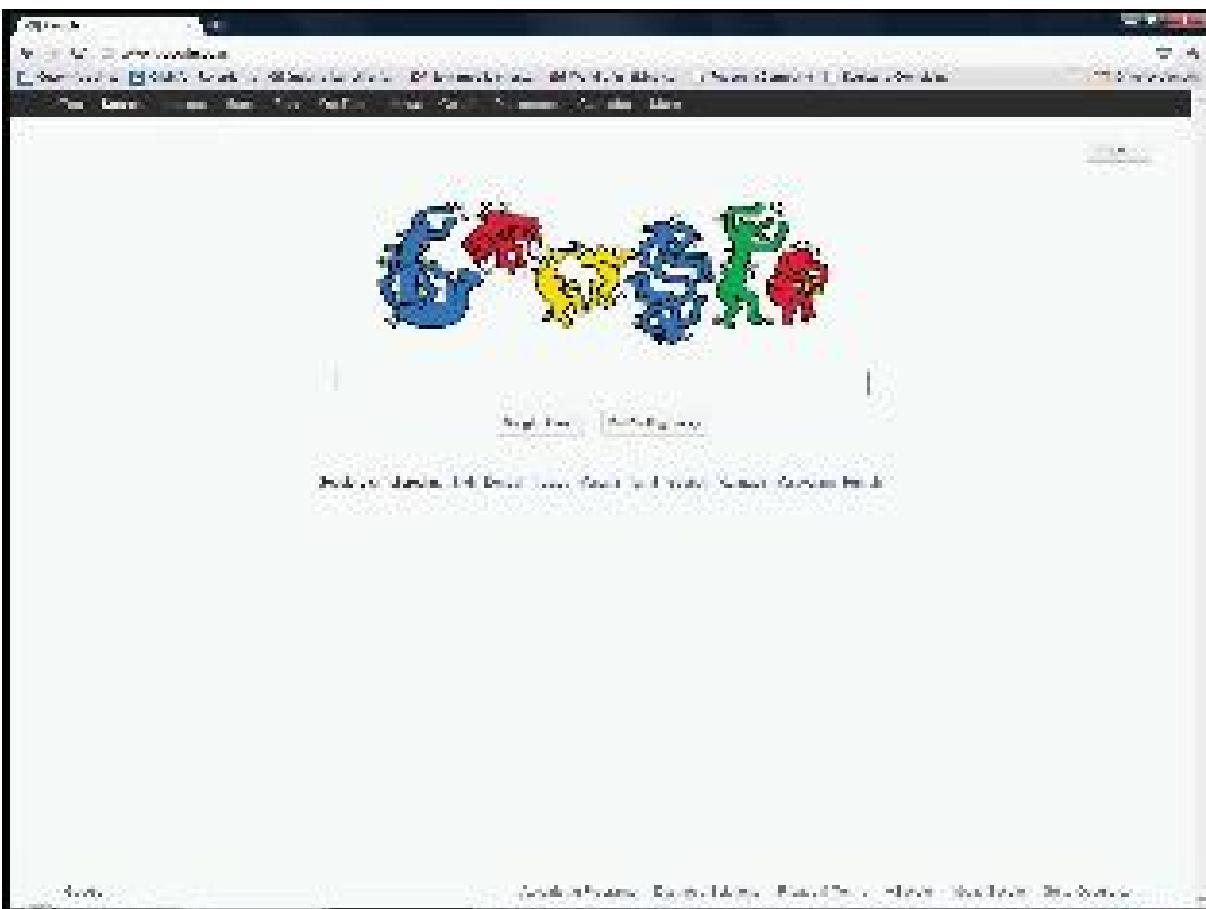
Web pages may consist of files of static text and other Web content stored within the Web server's file system(Static Web page), or may be constructed by Server-side scripting when they are requested (Dynamic web page). Client-side scripting can make web pages more responsive to user input once on the client browser.

Web Browser

A Web browser can have a Graphical User Interface, like Internet Explorer, Mozilla Firefox, Google Chrome and Opera (web browser), or can be Command Line Interface, like Lynx (web browser) (Fig 1) or Links (web browser). Web users with disabilities often use assistive technologies and adaptive strategies to Web accessibility web pages. Users may be colour blind, may or may not want to use a mouse perhaps due to repetitive stress injury or motor-neurone problems, may be deaf and require audio to be captioned, may be blind and using a Screen reader or display, may need screen magnification, etc. Disabled and able-bodied users may disable the download and viewing of images and other media, to save time, network bandwidth or merely to simplify their browsing experience.

Users of mobile devices often have restricted displays and bandwidth. Anyone may prefer not to use the fonts, font sizes, styles and colour schemes selected by the web page designer and may apply their own CSS styling to the page. The World Wide Web Consortium (W3C) and Web Accessibility Initiative (WAI) recommend that all web pages should be designed with all of these options in mind.

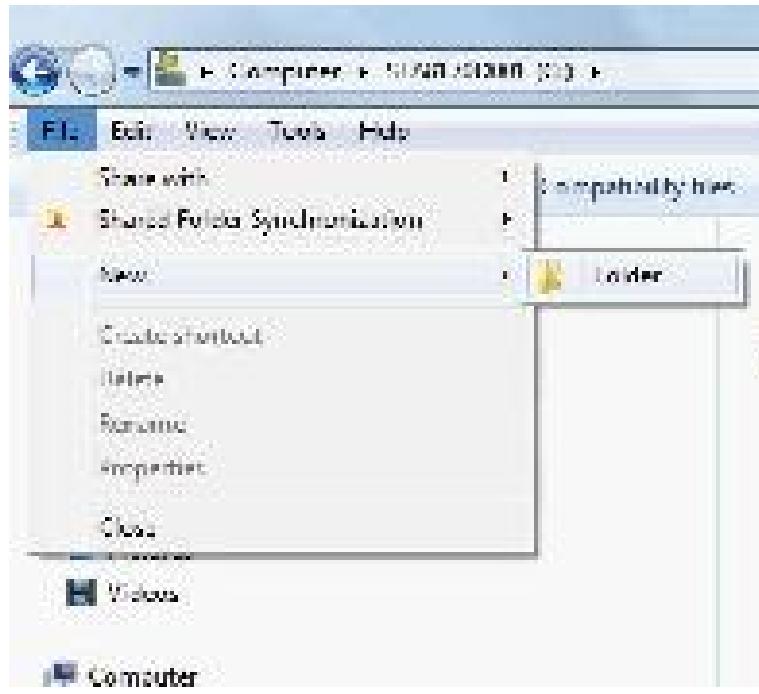
Fig 1



Downloading a Software from Internet

- 1 Create a Temporary Files folder by opening My Computer, double click on your hard drive (typically the C: drive), then select File/New/Folder as on Fig 2.

Fig 2



- 2 Type "Temporary File" and name it as on Fig 3.
- 3 Type "My SQL 5. 1 free download " from freeware software website on internet.

Note: As an example Choose "<http://dev.mysql.com/downloads/>" select "My SQL Community server" in download from the opened site as on Fig 4

Fig 3

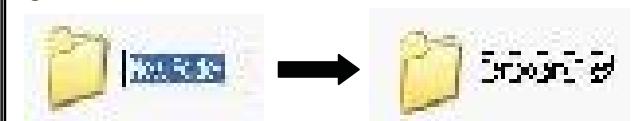


Fig 4



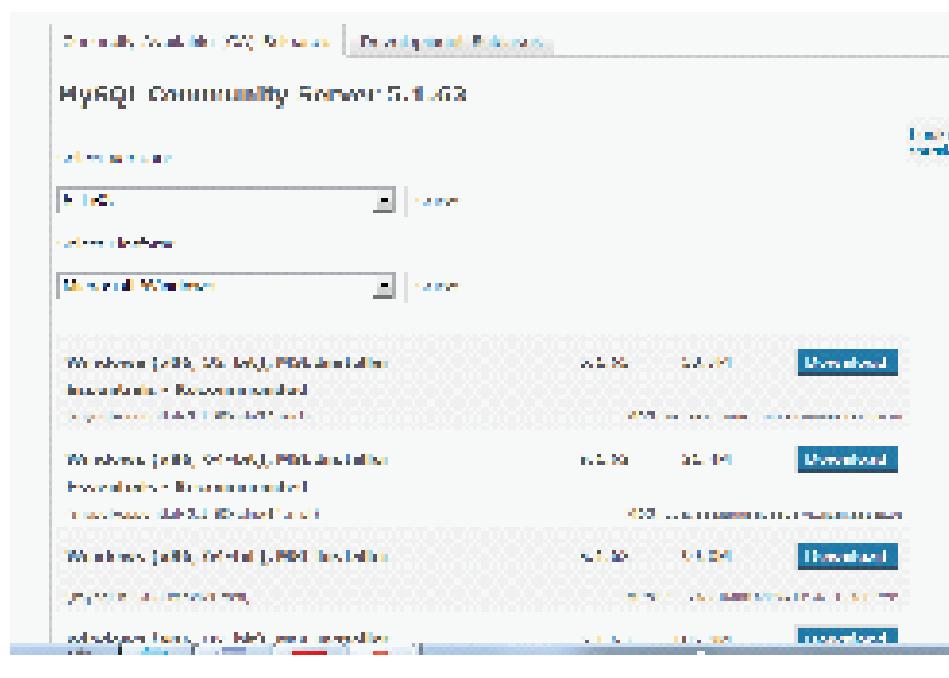
4 Click "MySQL Community Server 5.1 " from looking for previous version option as on Fig 5

Fig 5

A screenshot of the 'Download MySQL Community Server' page. The page title is 'Download MySQL Community Server'. It features two main sections: 'MySQL Community Edition' and 'MySQL Cluster Community Edition'. Under 'MySQL Community Edition', there is a note about the end-of-life date for version 5.1. Below this, there are two download options: 'Windows (x86, 32-bit), MSI Installer Essentials - Recommended' and 'Windows (x86, 32-bit), ZIP Archive'. There is also a link to 'Windows (x86, 32-bit), ZIP Archive (older versions)'. At the bottom of the page, there is a section titled 'Find your preferred MySQL Community Edition' with a list of links for different MySQL editions.

5 Choose "Windows (x86, 32-bit), MSI Installer Essentials - Recommended" and click download (Fig.6).

Fig 6



Note: Save the "My SQL 5.1.63" in the created Folder name " Temporary Folder"

- 6 Burn the Downloaded "My SQL 5.1.63" in a CD ROM for Installation.

WEB LANGUAGES

Web languages are called as Markup languages are designed for the processing, definition and presentation of text. The language specifies code for formatting, both the layout and style, within a text file. The code used to specify the formatting are called tags

Four Types of Markup languages

- 1 BML
- 2 HTML
- 3 DHTML
- 4 XML

BML (Better markup language)

BML is essentially a simple macro language. Macros are called blocks in BML. Blocks are defined in look files, and are invoked in BML files. Blocks accept parameters and are divided into several types, according to how parameters are transmitted and how the definition of the block is able to make use of them.

HTML (Hyper text markup Language)

HTML or HyperText Markup Language is the language of the web. All web pages are written in HTML. HTML defines the way that images, multimedia, and text are displayed in web browsers. It includes elements to connect the

documents (hypertext) and make web documents interactive (such as with forms).

HTML is a defined standard markup language. That standard was developed by the World Wide Web Consortium (W3C). It is based upon SGML (Standard Generalized Markup Language). It is a language that uses tags to define the structure of your text. Elements and tags are defined by the < and > characters.

DHTML

Dynamic HTML is not really a new specification of HTML, but rather a new way of looking at and controlling the standard HTML codes and commands.

When thinking of dynamic HTML, we need to remember the qualities of standard HTML, especially that once a page is loaded from the server, it will not change until another request comes to the server. Dynamic HTML give more control over the HTML elements and allows them to change at any time, without returning to the Web server.

There are four parts to DHTML:

- Document Object Model (DOM) (definition)
- Scripts
- Cascading Style Sheets (CSS)
- XHTML

DOM

The DOM is allows to access any part of Web page to change it with DHTML. Every part of a Web page is specified by the DOM and using its consistent naming conventions can access them and change their properties.

Scripts

Scripts written in either JavaScript or ActiveX are the two most common scripting languages used to activate DHTML. You use a scripting language to control the objects specified in the DOM.

Cascading Style Sheets

CSS is used in DHTML to control the look and feel of the Web page. Style sheets define the colors and fonts of text, the background colors and images, and the placement of objects on the page. Using scripting and the DOM, we can change the style of various elements.

XHTML

XHTML or HTML 4.x is used to create the page itself and build the elements for the CSS and the DOM to work on. There is nothing special about XHTML for DHTML - but having valid XHTML is even more important, as there are more things working from it than just the browser.

Features of DHTML

There are four primary features of DHTML:

- 1 Changing the tags and properties
- 2 Real-time positioning
- 3 Dynamic fonts (Netscape Communicator)
- 4 Data binding (Internet Explorer)

Changing the tags and properties

This is one of the most common uses of DHTML. It allows to change the qualities of an HTML tag depending on an event outside of the browser (such as a mouse click, time, or date, and so on). we can use this to preload information onto a page, and not display it unless the reader clicks on a specific link.

Real-time positioning

Objects, images, and text moving around the Web page. This can allow we to play interactive games with the readers or animate portions of the screen.

Dynamic Fonts

This is a Netscape only feature. Netscape developed this to get around the problem designers had with not knowing what fonts would be on a reader's system. With dynamic fonts, the fonts are encoded and downloaded with the page, so that the page always looks how the designer intended it to.

Data binding

This is an IE only feature. Microsoft developed this to allow easier access to databases from Web sites. It is very similar to using a CGI to access a database, but uses an ActiveX control to function.

XML

Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is defined in the XML 1.0 Specification produced by the W3C, and several other related specifications, all gratis open standards. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services

Creating an HTML document

Before start writing code to write a web page, it is a good practice to plan ahead the appearance of the web page. An HTML document has two elements:

- 1 Document Content
- 2 Tags

Document content is the information on a web page that the user will see. That information could be text or graphics.

Tags are the HTML codes that control how the document content will appear. The tags, in other words, will determine whether the text will be bold, black or blue, or of font type Time New Roman or Arial.

Start Notepad

To start Notepad go to:

Start

All Programs

Accessories

Notepad

Edit Your HTML with Notepad (Fig 7)

Type your HTML code into your Notepad:

Save Your HTML

Fig 7



```
Untitled - Notepad
File Edit Format View Help
<!DOCTYPE html>
<html>
<body>
<h1>My First Heading</h1>
<p>My first paragraph.</p>
</body>
</html>
```

Select Save as.. in Notepad's file menu.

When you save an HTML file, you can use either the .htm or the .html file extension.

Save the file in a folder that is easy to remember

Run the HTML in Your Browser

Start your web browser and open your html file from the File, Open menu, or just browse the folder and double-click your HTML file.

The result should look much like this: (Fig 8)

Fig 8



Structure of Markup Language

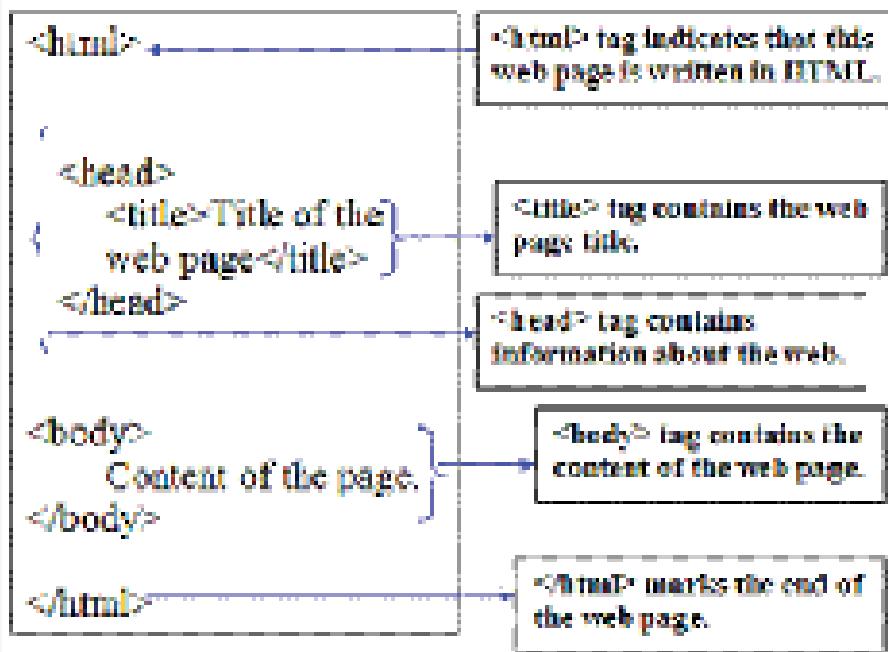
An HTML document has two* main parts:

- 1 head. The head element contains title and meta data of a web document.
- 2 body. The body element contains the information that you want to display on a web page.

To make your web pages compatible with HTML 4, you need to add a document type declaration (DTD) before the HTML element. Many web authoring software add DTD and basic tags automatically when you create a new web page.

In a web page, the first tag (specifically, <html>) indicates the markup language that is being used for the document. The <head> tag contains information about the web page. Lastly, the content appears in the <body> tag. (Fig 9)

Fig 9



The <!DOCTYPE> Declaration

There are many different documents on the web. A browser can only display a document correctly, if it knows what kind of document it is.

There are also many different versions of HTML, and a browser can only display an HTML page 100% correctly if it knows the exact HTML version used in the page. This is what <!DOCTYPE> is used for.

<!DOCTYPE> is not an HTML tag. It is an information (a declaration) to the browser about what version the HTML is written in.

The HTML <head> Element

The <head> element is a container for all the head elements. Elements inside <head> can include scripts, instruct the browser where to find style sheets, provide meta information, and more.

The following tags can be added to the head section: <title>, <base>, <link>, <meta>, <script>, and <style>.

The HTML <title> Element

The <title> tag defines the title of the document.

The title element is required in all HTML/XHTML documents.

The title element:

- Defines a title in the browser toolbar.

- Provides a title for the page when it is added to favorites.
- Displays a title for the page in search-engine results.

HTML Element Syntax

- An HTML element starts with a start tag / opening tag
- An HTML element ends with an end tag / closing tag
- The element content is everything between the start and the end tag
- Some HTML elements have empty content
- Empty elements are closed in the start tag
- Most HTML elements can have attributes

HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

Examples

```

<html>
<body>
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
<h4>This is heading 4</h4>
<h5>This is heading 5</h5>
<h6>This is heading 6</h6>
</body>
</html>

```

Result

This is heading 1

This is heading 2

This is heading 3

This is heading 4

This is heading 5

This is heading 6

HTML Paragraphs

HTML paragraphs are defined with the `<p>` tag.

```
<html>
<body>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
<p>This is a paragraph.</p>
</body>
</html>
```

Examples

This is a paragraph.

This is a paragraph.

This is a paragraph.

HTML Links

HTML links are defined with the `<a>` tag.

```
<html>
<body>
<a href="http://www.facebook.com">
This is a link</a>
</body>
</html>
```

Result

This is a link

By clicking the link it shows the facebook login page

HTML Images

HTML images are defined with the `` tag.

```
<html>
<body>

</body>
</html>
```

Result (Fig 10)

Fig 10



HTML Attributes

- HTML elements can have attributes
- Attributes provide additional information about an element
- Attributes are always specified in the start tag
- Attributes come in name/value pairs like: `name="value"`

Attribute Example

HTML links are defined with the `<a>` tag. The link address is specified in the `href` attribute:

```
<html>
<body>
<a href="http://www.yahoo.com">
This is a link</a>
</body>
</html>
```

Result

This is the link

By clicking the link yahoo home page appears (Fig 11).

Formatting

Create Line Breaks - The `
` Element:

Whenever the `
` element, anything following it starts on the next line. This tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Fig 11



Example:

```
Hello<br/>
You come most carefully upon your hour.<br/>
Thanks<br/>
Mahnaz
```

Result

```
Hello
You come most carefully upon your hour.
Thanks
Mahnaz
```

To Become

Centring Content - The <center> Element:

You can use <center> tag to put any content in the center of the page or any table cell.

Example:

```
<p>This is not in the center.</p>
<center>
<p>This is in the center.</p>
</center>
```

This will produce following result:

```
This is not in the center.
This is in the center.
```

Soft Hyphens:

Occasionally, you will want to allow a browser to hyphenate long words to better justify a paragraph. For example, consider the following code and its resulting output.

```
<p style="text-align: justify;"> The morbid fear of
the number 13, or triskaidekaphobia, has plagued
some important historic figures like Mahamiya and
Nanao.</p>
```

This will produce following result:

```
Example for soft hyphen - The morbid fear of the
number 13, or triskaidekaphobia, has plagued some
important historic figures like Mahamiya and Nanao.
```

Preserve Formatting - The <pre> Element:

Sometimes you want your text to follow the exact format of how it is written in the HTML document. In those cases, you can use the preformatted tag (<pre>).

Any text between the opening <pre> tag and the closing </pre> tag will preserve the formatting of the source document.

```
<pre>
function testFunction( strText ){
alert (strText)
}
</pre>
```

This will produce following result:

```
function testFunction( strText ){
alert (strText)
}
```

Horizontal Rules - The `<hr />` Element

Horizontal rules are used to visually break up sections of a document. The `<hr>` tag creates a line from the current position in the document to the right margin and breaks the line accordingly.

For example you may want to give a line between two paragraphs as follows:

```
<p>This is paragraph one and should be on top</p>
<hr />
```

```
<p>This is paragraph two and should be at bottom</p>
```

This will produce following result:

This is paragraph one and should be on top

This is paragraph two and should be at bottom

Again `<hr />` tag is an example of an empty element, where you do not need opening and closing tags, as there is nothing to go in between them.

Note: The `<hr />` element has a space between the characters hr and the forward slash. If you omit this space, older browsers will have trouble rendering the line break, while if you miss the forward slash character and just use `<hr>` it is not valid XHTML

Presentational Tags:

If you use a word processor, you are familiar with the ability to make text bold, italicized, or underlined; these are just three of the ten options available to indicate how text can appear in HTML and XHTML.

Bold Text - The `` Element:

Anything that appears in a `...` element is displayed in bold, like the word bold here:

```
<p>The following word uses a <b>bold</b>
typeface.</p>
```

This will produce following result:

The following word uses a bold typeface.

Italic Text - The `<i>` Element:

Anything that appears in a `<i>...</i>` element is displayed in italicized, like the word italicized here:

```
<p>The following word uses a <i>italicized</i>
typeface.</p>
```

This will produce following result:

The following word uses a italicized typeface.

Underlined Text - The `<u>` Element:

Anything that appears in a `<u>...</u>` element is displayed with underline, like the word underlined here:

```
<p>The following word uses a <u>underlined</u>
typeface.</p>
```

This will produce following result:

The following word uses a underlined typeface.

Strike Text - The `<strike>` Element:

Anything that appears in a `<strike>...</strike>` element is displayed with strikethrough, which is a thin line through the text:

```
<p>The following word uses a
<strike>strikethrough</strike> typeface.</p>
```

This will produce following result:

The following word uses a strikethrough typeface.

Monospaced font - The `<tt>` Element:

The content of a `<tt>` element is written in monospaced font. Most fonts are known as variable-width fonts because different letters are of different widths (for example, the letter m is wider than the letter i). In a monospaced font, however, each letter is the same width.

```
<p>The following word uses a
<tt>monospaced</tt> typeface.</p>
```

This will produce following result:

The following word uses a monospaced typeface.

Superscript Text - The `<sup>` Element:

The content of a `<sup>` element is written in superscript; the font size used is the same size as the characters surrounding it but is displayed half a character's height above the other characters.

```
<p>The following word uses a
<sup>superscript</sup> typeface.</p>
```

This will produce following result:

The following word uses a superscript typeface.

Subscript Text - The `<sub>` Element:

The content of a `<sub>` element is written in subscript; the font size used is the same as the characters surrounding it, but is displayed half a character's height beneath the other characters.

```
<p>The following word uses a
<sub>subscript</sub> typeface.</p>
```

This will produce following result:

The following word uses a subscript typeface.

Larger Text - The **<big>** Element:

The content of the **<big>** element is displayed one font size larger than the rest of the text surrounding it.

```
<p>The following word uses a <big>big</big>  
typeface.</p>
```

This will produce following result:

The following word uses a big typeface.

Smaller Text - The **<small>** Element:

The content of the **<small>** element is displayed one font size smaller than the rest of the text surrounding it.

```
<p>The following word uses a <small>small</  
small> typeface.</p>
```

This will produce following result:

The following word uses a small typeface.

Styling HTML with CSS

CSS was introduced together with HTML 4, to provide a better way to style HTML elements.

CSS can be added to HTML in the following ways:

- Inline - using the **style** attribute in HTML elements
- Internal - using the **<style>** element in the **<head>** section
- External - using an external CSS file

```
<html>  
<body style="background-color:PowderBlue;">  
<h1>Look! Styles and colors</h1>  
<p style="font-family:verdana;color:red;">  
This text is in Verdana and red</p>  
<p style="font-family:times;color:green;">  
This text is in Times and green</p>  
<p style="font-size:30px;">This text is 30 pixels high</p>  
</body>  
</html>
```

Result:

Look! Styles and colors

This text is in Verdana and red

This text is in Times and green

This text is 30 pixels high

HTML Hyperlinks (Links)

A hyperlink (or link) is a word, group of words, or image that you can click on to jump to a new document or a new section within the current document.

When you move the cursor over a link in a Web page, the arrow will turn into a little hand.

Links are specified in HTML using the **<a>** tag.

The **<a>** tag can be used in two ways:

- 1 To create a link to another document, by using the **href** attribute
- 2 To create a bookmark inside a document, by using the **name** attribute

The HTML code for a link is simple. It looks like this:

```
<a href="url">Link text</a>
```

The **href** attribute specifies the destination of a link.

```
<a href="http://www.yahoo.com/">Visit yahoo</a>
```

which will display like this: Visit yahoo.com

Clicking on this hyperlink will send the user to Yahoo homepage.

The "Link text" doesn't have to be text. It can be an image or any other HTML element.

HTML Links - The target Attribute

The target attribute specifies where to open the linked document.

The example below will open the linked document in a new browser window or a new tab:

Example

```
<a href="http://www.yahoo.com/" target="_blank">Visit  
yahoo !</a>  
<html>  
<body>  
<a href="http://www.yahoo.com" target="_blank">Visit  
yahoo.com!</a>  
<p>If you set the target attribute to "_blank", the link will  
open in a new browser window/tab.</p>  
</body>  
</html>
```

Result

Visit yahoo.com!

If you set the target attribute to "_blank", the link will open in a new browser window/tab.

HTML Images - The Tag and the Src Attribute

In HTML, images are defined with the tag.

The tag is empty, which means that it contains attributes only, and has no closing tag.

To display an image on a page, you need to use the src attribute. Src stands for "source". The value of the src attribute is the URL of the image you want to display.

Syntax for defining an image:

```

```

The URL points to the location where the image is stored. An image named "bamboo.gif", located in the "images" directory on "www.w3schools.com" has the URL: <http://www.backgrounlabs.com/index.php?search=bamboo>.

The browser displays the image where the tag occurs in the document. If you put an image tag between two paragraphs, the browser shows the first paragraph, then the image, and then the second paragraph.

HTML Images - The Alt Attribute

The required alt attribute specifies an alternate text for an image, if the image cannot be displayed.

The value of the alt attribute is an author-defined text:

```

```

The alt attribute provides alternative information for an image if a user for some reason cannot view it (because of slow connection, an error in the src attribute, or if the user uses a screen reader).

HTML Images - Set Height and Width of an Image

The height and width attributes are used to specify the height and width of an image.

The attribute values are specified in pixels by default:

```

```

Note: It is a good practice to specify both the height and width attributes for an image. If these attributes are set, the space required for the image is reserved when the page is loaded. However, without these attributes, the browser does not know the size of the image. The effect will be that the page layout will change during loading (while the images load).

If an HTML file contains ten images - eleven files are required to display the page right. Loading images takes time, so my best advice is: Use images carefully.

When a web page is loaded, it is the browser, at that moment, that actually gets the image from a web server and inserts it into the page. (Fig 12) Therefore, make sure that the images actually stay in the same spot in relation to the web page, otherwise your visitors will get a broken link icon. The broken link icon is shown if the browser cannot find the image.

Fig 12



```

<html>
<body>
<h2>Friendship Card</h2>

</body>
</html>

```

HTML Tables

Tables are defined with the `<table>` tag.

A table is divided into rows (with the `<tr>` tag), and each row is divided into data cells (with the `<td>` tag). `td` stands for "table data," and holds the content of a data cell. A `<td>` tag can contain text, links, images, lists, forms, other tables, etc.

Table Example

```

<table border="1">
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in a browser:

row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Tables and the Border Attribute

If you do not specify a border attribute, the table will be displayed without borders. Sometimes this can be useful, but most of the time, we want the borders to show.

To display a table with borders, specify the border attribute:

```

<table border="1">
<tr>
<td>Row 1, cell 1</td>
<td>Row 1, cell 2</td>
</tr>
</table>

```

HTML Table Headers

Header information in a table are defined with the `<th>` tag.

All major browsers display the text in the `<th>` element as bold and centered.

```

<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>

```

How the HTML code above looks in your browser:

Header 1	Header 2
row 1, cell 1	row 1, cell 2
row 2, cell 1	row 2, cell 2

HTML Unordered Lists

An unordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with bullets (typically small black circles).

```

<ul>
<li>Coffee</li>
<li>Milk</li>
</ul>

```

How the HTML code above looks in a browser:

- Coffee
- Milk

HTML Ordered Lists

An ordered list starts with the `` tag. Each list item starts with the `` tag.

The list items are marked with numbers.

```

<ol>
<li>Coffee</li>
<li>Milk</li>
</ol>

```

How the HTML code above looks in a browser:

- 1 Coffee
- 2 Milk

HTML Definition Lists

A definition list is a list of items, with a description of each item.

The `<dl>` tag defines a definition list.

The `<dl>` tag is used in conjunction with `<dt>` (defines the item in the list) and `<dd>` (describes the item in the list):

```
<dl>
<dt>Coffee</dt>
<dd>- black hot drink</dd>
<dt>Milk</dt>
<dd>- white cold drink</dd>
</dl>
```

How the HTML code above looks in a browser:

Coffee - black hot drink
Milk- white cold drink

Note : Inside a list item you can put text, line breaks, images, links, other lists, etc.

HTML List Tags

Tag	Description
<code></code>	Defines an ordered list
<code></code>	Defines an unordered list
<code></code>	Defines a list item
<code><dl></code>	Defines a definition list
<code><dt></code>	Defines an item in a definition list
<code><dd></code>	Defines a description of an item in a definition list

HTML elements can be grouped together with `<div>` and ``

HTML Block Elements

Most HTML elements are defined as block level elements or as inline elements.

Block level elements normally start (and end) with a new line when displayed in a browser.

Examples: `<h1>`, `<p>`, ``, `<table>`

HTML Inline Elements

Inline elements are normally displayed without starting a new line.

Examples: ``, `<td>`, `<a>`, ``

The HTML `<div>` Element

The HTML `<div>` element is a block level element that can be used as a container for grouping other HTML elements.

The `<div>` element has no special meaning. Except that, because it is a block level element, the browser will display a line break before and after it.

When used together with CSS, the `<div>` element can be used to set style attributes to large blocks of content.

Another common use of the `<div>` element, is for document layout. It replaces the "old way" of defining layout using tables. Using tables is not the correct use of the `<table>` element. The purpose of the `<table>` element is to display tabular data.

The HTML `` Element

The HTML `` element is an inline element that can be used as a container for text.

The `` element has no special meaning.

When used together with CSS, the `` element can be used to set style attributes to parts of the text.

HTML Grouping Tags

Tag	Description
<code><div></code>	Defines a div
<code></code>	Defines a span

HTML Layout

Website Layouts

Most websites have put their content in multiple columns (formatted like a magazine or newspaper).

Multiple columns are created by using `<div>` or `<table>` elements. CSS are used to position elements, or to create backgrounds or colorful look for the pages.

HTML Layouts - Using `<div>` Elements

The `div` element is a block level element used for grouping HTML elements.

The following example uses five `div` elements to create a multiple column layout, creating the same result as in the previous example:

Example

```
<div>
<!DOCTYPE html>
<html>
<body>
<div id="container" style="width:500px">
<div id="header" style="background-color:#FFA500;">
<h1 style="margin-bottom:0;">Main Title of Web Page</h1></div>
<div id="menu" style="float:left; width:100px; height:200px; background-color:#FFD700; margin-right:10px;">
<b>Menu</b><br />
</div>
<div id="content" style="float:left; width:300px; height:200px; background-color:#FFFFE0;">
<h2>Content Area</h2>
</div>
</div>
<script>
document.getElementById("header").style.backgroundColor = "#FFA500";
document.getElementById("menu").style.backgroundColor = "#FFD700";
document.getElementById("content").style.backgroundColor = "#FFFFE0";
</script>

```

```

<div id="content" style="background-color:#EEEEEE;height:200px;width:400px;float:left;">
Content goes here</div>
<div id="footer" style="background-color:#FFA500;clear:both;text-align:center;">

```

```

</div>
</div>
</body>
</html>

```

Result (Fig 13)

Fig 13



HTML Forms

HTML forms are used to pass data to a server.

A form can contain input elements like text fields, checkboxes, radio-buttons, submit buttons and more. A form can also contain select lists, textarea, fieldset, legend, and label elements.

The <form> tag is used to create an HTML form:

<form>

input elements.

</form>

HTML Forms - The Input Element

The most important form element is the input element.

The input element is used to select user information.

An input element can vary in many ways, depending on the type attribute. An input element can be of type text field, checkbox, password, radio button, submit button, and more.

The most used input types are described below.

Text Fields

<input type="text" /> defines a one-line input field that a user can enter text into:

<form>

First name: <input type="text" name="firstname" />

Last name: <input type="text" name="lastname" />
</form>

How the HTML code above looks in a browser:

First name:

Last name:

Note: The form itself is not visible. Also note that the default width of a text field is 20 characters.

Password Field

<input type="password" /> defines a password field:

<form>

Password: <input type="password" name="pwd" />

</form>

How the HTML code above looks in a browser:

Password:

Note: The characters in a password field are masked (shown as asterisks or circles)

Radio Buttons

<input type="radio" /> defines a radio button. Radio buttons let a user select ONLY ONE of a limited number of choices:

```
<form>
<input type="radio" name="sex" value="male" /> Male<br/>
<input type="radio" name="sex" value="female" /> Female
</form>
```

How the HTML code above looks in a browser:

- Male
- Female

Checkboxes

<input type="checkbox" /> defines a checkbox. Checkboxes let a user select ONE or MORE options of a limited number of choices.

```
<form>
<input type="checkbox" name="vehicle" value="Bike" />
I have a bike<br />
<input type="checkbox" name="vehicle" value="Car" />
I have a car
</form>
```

How the HTML code above looks in a browser:

- I have a bike
- I have a car

Submit Button

<input type="submit" /> defines a submit button.

A submit button is used to send form data to a server. The data is sent to the page specified in the form's action attribute. The file defined in the action attribute usually does something with the received input:

```
<form name="input" action="html_form_action.asp"
method="get">
```

Username: <input type="text" name="user" />

```
<input type="submit" value="Submit" />
</form>
```

How the HTML code above looks in a browser:

Username: Submit

If you type some characters in the text field above, and click the "Submit" button, the browser will send your input to a page called "html_form_action.asp". The page will show you the received input.

HTML Iframes

Syntax for adding an iframe:

```
<iframe src="URL"></iframe>
```

The URL points to the location of the separate page.

Iframe - Set Height and Width

The height and width attributes are used to specify the height and width of the iframe.

The attribute values are specified in pixels by default, but they can also be in percent (like "80%").

Example

```
<!DOCTYPE html>
<html>
<body>
<iframe src="demo_iframe.htm" width="200"
height="200"></iframe>
</body>
</html>
```

It will appear as shown in Fig 14.

Iframe - Remove the Border

The frameborder attribute specifies whether or not to display a border around the iframe.

Set the attribute value to "0" to remove the border:

Example

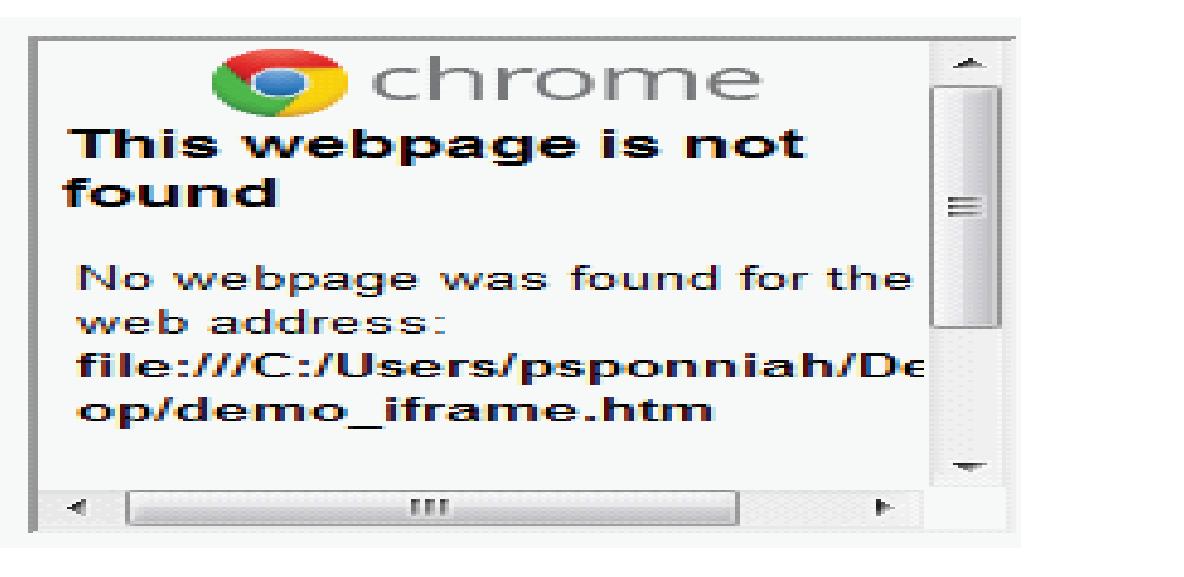
```
<iframe src="demo_iframe.htm" frameborder="0"></
iframe>
```

Use iframe as a Target for a Link

An iframe can be used as the target frame for a link.

The target attribute of a link must refer to the name attribute of the iframe:

Fig 14



Example

```
<iframe src="demo_iframe.htm" name="iframe_a"></iframe>  
<p><a href = "http://www.yahoo.com" target="iframe_a">yahoo.com</a></p>
```

HTML iframe Tag

Tag	Description
<iframe>	Defines an inline sub window (frame)

HTML Colour

Color Values

HTML colors are defined using a hexadecimal notation (HEX) for the combination of Red, Green, and Blue color values (RGB).

The lowest value that can be given to one of the light sources is 0 (in HEX: 00). The highest value is 255 (in HEX: FF).

HEX values are specified as 3 pairs of two-digit numbers, starting with a # sign.

Color Values (Fig 15)

Fig 15

Color	Color HEX	Color RGB
Black	#000000	rgb(0,0,0)
Red	#FF0000	rgb(255,0,0)
Green	#00FF00	rgb(0,255,0)
Blue	#0000FF	rgb(0,0,255)
Yellow	#FFFF00	rgb(255,255,0)
Cyan	#00FFFF	rgb(0,255,255)
Magenta	#FF00FF	rgb(255,0,255)
Grey	#C0C0C0	rgb(192,192,192)
White	#FFFFFF	rgb(255,255,255)

```
<!DOCTYPE html>
```

```
<html>
```

```
<body>
```

```
<p style="background-color:#FFFF00">
```

Color set by using hex value

```
</p>
```

```
<p style="background-color:rgb(255,255,0)">
```

Color set by using rgb value

```
</p>
```

```

<p style="background-color:yellow">
Color set by using color name
</p>
</body>
</html>

```

Result

Color set by using hex value
 Color set by using rgb value
 Color set by using color name

DHTML

The HTML script Element

The <script> tag is used to define a client-side script, such as a JavaScript.

The script element either contains scripting statements or it points to an external script file through the src attribute.

The required type attribute specifies the MIME type of the script.

Common uses for JavaScript are image manipulation, form validation, and dynamic changes of content.

The script below writes Hello World! to the HTML output:

Example

```

<script type="text/javascript">
document.write("Hello World!")
</script>

```

The HTML noscript Element

The <noscript> tag is used to provide an alternate content for users that have disabled scripts in their browser or have a browser that doesn't support client-side scripting.

The noscript element can contain all the elements that you can find inside the body element of a normal HTML page.

The content inside the noscript element will only be displayed if scripts are not supported, or are disabled in the user's browser:

Example

```

<!DOCTYPE html>
<html>
<body>
<script type="text/javascript">
document.write("Hello World!")
</script>

```

<noscript>Sorry, your browser does not support JavaScript!</noscript>

<p>A browser without support for JavaScript will show the text in the noscript element.</p>

</body>

</html>

Result

Hello World!

A browser without support for JavaScript will show the text in the noscript element.

HTML Script Tags

Tag	Description
<script>	Defines a client-side script
<noscript>	Defines an alternate content for users that do not support client-side scripts

HTML Entities

Some characters are reserved in HTML.

It is not possible to use the less than (<) or greater than (>) signs in your text, because the browser will mix them with tags.

To actually display reserved characters, we must use character entities in the HTML source code.

A character entity looks like this:

&entity_name;

OR

&#entity_number;

Non-breaking Space

A common character entity used in HTML is the non-breaking space ().

Browsers will always truncate spaces in HTML pages. If you write 10 spaces in your text, the browser will remove 9 of them, before displaying the page. To add spaces to your text, you can use the character entity.

HTML Useful Character Entities

Note: Entity names are case sensitive!

HTML Uniform Resource Locators

A **URL** is another word for a web address.

Result	Description	Entity Name	Entity Number
	non-breaking space	 	
<	less than	<	<
>	greater than	>	>
&	ampersand	&	&
¢	cent	¢	¢
£	pound	£	£
¥	yen	¥	¥
•	euro	€	€
§	section	§	§
©	copyright	©	©
®	registered trademark	®	®
™	trademark	™	™

A URL can be composed of words, such as "w3schools.com", or an Internet Protocol (IP) address: 192.68.20.50. Most people enter the name of the website when surfing, because names are easier to remember than numbers.

Scheme	Short for...	Which pages will the scheme be used for...
http	HyperText Transfer Protocol	Common web pages starts with http://. Not encrypted
https	Secure HyperText Transfer Protocol	Secure web pages. All information exchanged are encrypted
ftp	File Transfer Protocol	For downloading or uploading files to a website. Useful for domain maintenance
file		A file on your computer

URL Encoding

URLs can only be sent over the Internet using the ASCII character-set.

Since URLs often contain characters outside the ASCII set, the URL has to be converted into a valid ASCII format.

URL encoding replaces non ASCII characters with a "%" followed by two hexadecimal digits.

URLs cannot contain spaces. URL encoding normally replaces a space with a + sign.

URL - Uniform Resource Locator

When you click on a link in an HTML page, an underlying <a> tag points to an address on the world wide web.

A Uniform Resource Locator (URL) is used to address a document (or other data) on the world wide web.

Explanation:

- **Scheme** - defines the **type** of Internet service. The most common type is http
- **Host** - defines the **domain host** (the default host for http is www)
- **Domain** - defines the Internet **domain name**, like w3schools.com
- **Port** - defines the **port number** at the host (the default port number for http is 80)
- **Path** - defines a **path** at the server (If omitted, the document must be stored at the root directory of the web site)
- **Filename** - defines the name of a document/resource

Common URL Schemes

The table below lists some common schemes:

XML Structure

The XML structure including the document parts, the prologue, and provides a simple XML example document.

Document Parts

- Prolog
- Document Element (root element)

The Prologue

The prologue, equivalent to the header in HTML, may include the following:

- An XML declaration (optional) such as:

```
<?xml version="1.0"?>
```
- A DTD or reference to one (optional). An example reference to an external DTD file:

```
<!DOCTYPE LANGLIST SYSTEM "langlist.dtd">
```
- Processing instructions - An example processing instruction that causes style to be determined by a style sheet:

```
<?xml-stylesheet type="text/css" href="xmlstyle.css"?>
```

An XML Example

Therefore a complete well formed XML document may look like:

```
<?xml version="1.0"?>

<LAND>
  <FOREST>
    <TREE>Oak</TREE>
    <TREE>Pine</TREE>
    <TREE>Maple</TREE>
  </FOREST>
  <MEADOW>
    <GRASS>Bluegrass</GRASS>
    <GRASS>Fescue</GRASS>
    <GRASS>Rye</GRASS>
  </MEADOW>
</LAND>
```

The LAND element, above, is the root element.

Result

Oak Pine Maple Bluegrass Fescue Rye

Web Elements

A web page, as an information set, can contain numerous types of information, which is able to be seen, heard or interact by the End-user

Web Hosting

A web hosting service is a type of Internet hosting service that allows individuals and organizations to make their Website accessible via the World Wide Web. Web hosts are companies that provide space on a Server (computing) owned or leased for use by clients, as well as providing Internet connectivity, typically in a data centre. Web hosts can also provide data centre space and connectivity to the Internet for other servers located in their data centre, called Collocation.

TYPES OF Web Hosting

There are four types of Web hosting

- 1 Free hosting
- 2 Dedicated hosting
- 3 Shared (Virtual) hosting
- 4 Collocated Hosting

Free hosting

Free web hosting is best suited for small sites with low traffic, like personal sites. It is not recommended for high traffic or for real business. Technical support is often limited, and technical options are few.

Dedicated Hosting

With dedicated hosting, your web site is hosted on a dedicated server. Dedicated hosting is the most expensive option. This option is best suited for large web sites with high traffic, and web sites that use special software. Dedicated hosting to be very powerful and secure, with almost unlimited software solutions.

Shared (Virtual) Hosting

Shared hosting is very cost effective.

With shared hosting, your web site gets its own domain name, and is hosted on a powerful server along with maybe 100 other web sites. Shared solutions often offer multiple software solutions like e-mail, database, and different editing options. Technical support tends to be good.

Collocated Hosting

Collocation means "co-location". Collocated hosting lets place own web server on the premises (locations) of a service provider. This is pretty much the same as running own server in your own office, only that it is located at a place better designed for it. Most likely an ISP will have dedicated resources like high-security against fire and vandalism, regulated backup power, dedicated Internet connections and more.

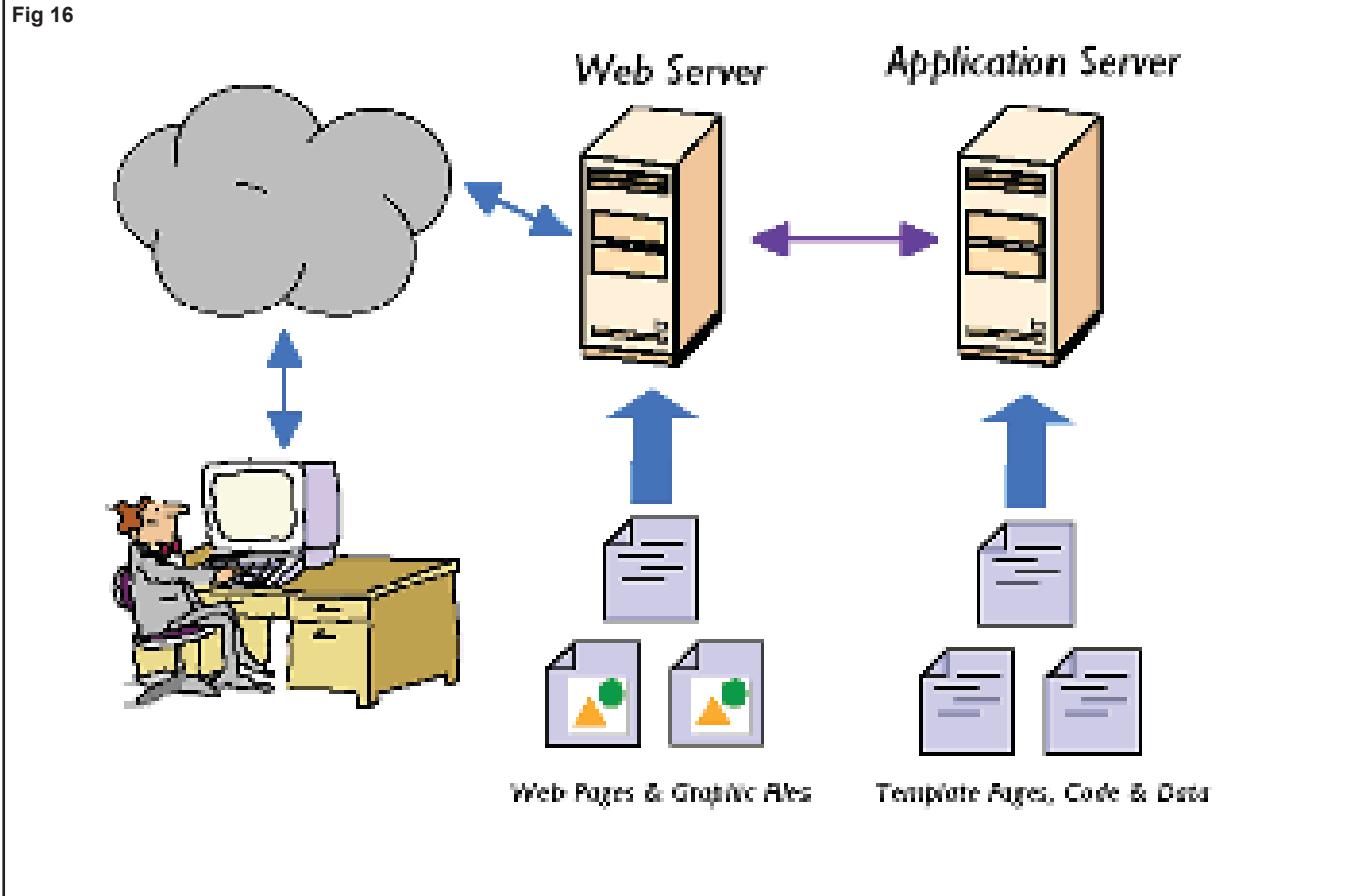
Web Server

A Web server is a program that, using the client server model and the World Wide Web's Hypertext Transfer Protocol (HTTP), serves the files that form Web pages to Web users (whose computers contain HTTP clients that forward their requests). Every computer on the Internet that contains a Web site must have a Web server program. Two leading Web servers are Apache, the most widely-installed Web server, and Microsoft's Internet Information Server (IIS). Other Web servers include Novell's Web Server for users of its Netware operating system and IBM's family of Lotus Domino servers, primarily for IBM's OS390 and AS-400 customers.

Web servers often come as part of a larger package of Internet- and intranet-related programs for serving e-mail, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server include how well it works with the operating system and other servers, its ability to handle server-side programming, security characteristics, and publishing, search engine, and site building tools that may come with it.

Application Server

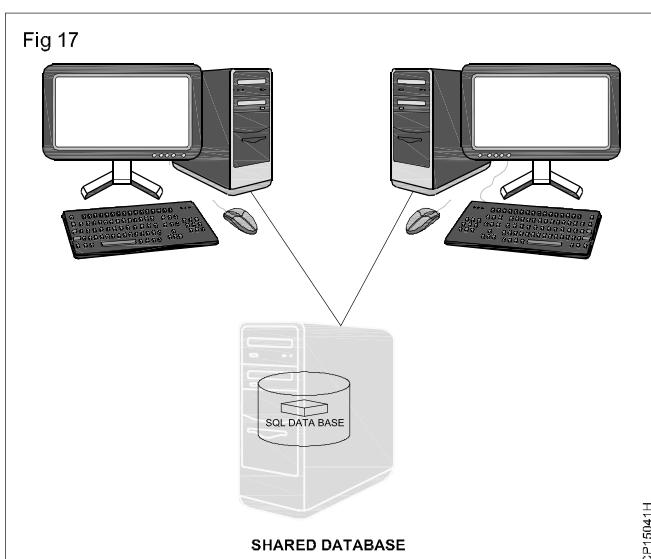
Also called an appserver, and application server (Fig 16) is a program that handles all application operations between users and an organization's backend business applications or database. An application server is typically used for complex transaction-based applications. To support high-end needs, an application server has to have built-in redundant, monitor for high-availability, high-performance distributed application services and support for complex database access.



Database Server

Database server (Fig 17) is the term used to refer to the back-end system of a database application using client-

server architecture. The back-end, sometimes called a database server, performs tasks such as data analysis, storage, data manipulation, archiving, and other non-user specific tasks.



Introduction to CMS and web authoring tools

Objectives: At the end of this lesson you shall be able to

- explain the meaning of content management System.
 - list some of the popular CMSes.
 - explain the use and main features of kompozer web authoring tool.
-

Definition of CMS:

CMS Stands for "Content Management System." A CMS is a software tool that allows you to create, edit, and publish content.

Description of CMS:

The goal of a CMS is to provide an intuitive user interface for building and modifying webpage content. Each CMS also provides a web publishing tool that allows one or more users to publish updates live on the Web. The editing component is called the content management application (CMA), while the publishing tool is called the content delivery application (CDA). These two components are integrated together in a CMS to streamline the web development process.

In terms of web publishing, content can be simple text, photos, music, video, documents, or just about anything you can think of. While early CMS software was used to manage documents and local computer files, most CMS systems are now designed exclusively to manage content on the Web. A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage.

Content management systems are available as installable applications and web-based user interfaces. The use of a web interface simplifies the website updating process. Additionally, most web-based CMSes are updated automatically, ensuring all users have the latest tools to manage their content.

A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage. Since the CMS manages all your content, you don't have to.

There are several web-based CMS tools available today. The following are some of the most popular ones:

- WordPress - free web software designed for creating template-based websites or blogs
- Blogger - Google's blogging tool designed specifically for maintaining a blog
- Joomla - a flexible web publishing tool that supports custom databases and extensions
- Drupal - an open source platform often used for developing community-based sites

- Weebly - a web-based platform for building simple personal and business websites
- Wix - a collection of web publishing tools for creating a highly customizable website

Introduction to WYSIWYG web authoring tools

WYSIWYG stands for "What You See Is What You Get". In such editors you edit not directly the source code of your documents, but its presentation as it will appear in the final document. So instead of writing blocks of code manually (as you e.g. would do it in Word or Notepad), you manipulate with design components using an editor window. This means that you view something very similar to the final result while the document or image is being created.

There are many easy-to-use WYSIWYG programs having all the tools needed to create a complex and fully functional websites, even by beginners. These sites even have options to work with HTML code be it design or editing. It is easier to create a Web site with an HTML editor, as software developers continue to add tools that let you develop advanced features with style. Many WYSIWYG web authoring tools offer advanced features to integrate Dynamic HTML or many other features into a site with an elegant and consistent design.

Introduction to Kompozer

KompoZer is a complete Web Authoring System that combines web file management and easy-to-use WYSIWYG web page editing capabilities found in Microsoft FrontPage, Adobe DreamWeaver and other high end programs. With kompozer you can create web pages and manage a website with no technical expertise or knowledge of HTML.

A useful feature of Kompozer is that you can use it to publish your web pages to a web hosting server. You just need to know your FTP account username and password as well as the site URL and Kompozer will log in and place your web pages on the server.

KompoZer's File Menu contains menu items for all major operations possible while using it. KompoZer's tool bar user interface consists of:

- Composition Toolbar
- Format Toolbar
- Tab Browser Toolbar
- Edit Mode Toolbar
- Status Toolbar

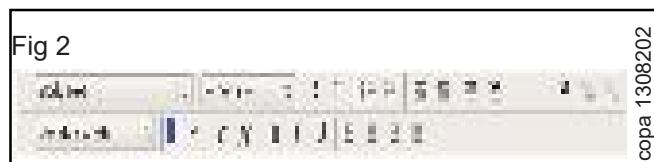
Composition Toolbar

The Composition Toolbar consists of buttons for the most used major operations. Below is the a snapshot of the default Composition Toolbar with text below each button indicating the respective button's function. (Refer Fig.1)



Format Toolbar(Refer Fig.2)

The Format Toolbar is a very useful tool while editing web pages with KompoZer. With the Format Toolbar you can apply paragraph format, choose a font, change foreground or background colour, increase or decrease size, and emphasize a block of text. You can also create ordered or unordered lists and justify a block of text to left, right or centre. To know which button does what just hover your mouse over the button and a tool tip will appear indicating the function of the button.



Tab Browser Toolbar(Refer Fig.3)

KompoZer allows you to simultaneously edit multiple web documents using different tabs for each opened document. Having multiple tabs gives a cleaner look to your desktop as it is not cluttered when multiple windows are used for each document. As a visual indicator a "red floppy icon" icon appears for pages which have been edited but not saved yet.



Edit Mode Toolbar(Refer Fig.4)

The Edit Mode Toolbar indicates the viewing mode which is presently active for the current document. Available viewing modes are the Normal view, HTML Tags view, HTML source view and the Preview mode. You can easily change your viewing mode by simply clicking any of the other three with the mouse.



Status Toolbar(Refer Fig.5)

KompoZer's status bar shows the position of the cursor with respect to the HTML tag hierarchy. You can easily edit/assign the properties of any particular tag in the status bar just by right clicking and choosing the desired option. Simple left-click of the mouse on a tag in status bar selects the text surrounded by that tag.

