Core Module-1

(120 hours)

Able to use basic hand tools effectively

(3 hours)

In this section, we will discuss:

- Introduction to hand tools.
- Usage of different tools
- Soldering techniques
- Cables and connectors
- Safety hazards on hand toools

Introduction to different types of tools

What is tools?

- An item or implement used for a specific purpose. A tool can be a physical object such as mechanical tools including saws and hammers or a technical object such as a web authoring tool or software program. Furthermore, a concept can also be considered a tool.

Image Source: Hand Tools & Its Safety – NSTI Dehradun (wordpress.com)

Types of tools

Basic types of tools

Tools categories in three types as below

1. Mechnical Tools
2. Measurement Tools
3. Power Tools

Mechnical Tools

Cutting Tools

- Knives
- Saw
- Scissors
- Blades etc.

Image source: https://sites.google.com/view/master-training

Mechnical Tools

Grabbinng and clamping Tools

- C- Clamps
- Pliers
- Bench vise
- Tweezers

Image source: https://sites.google.com/view/master-training

Mechnical Tools

Hammers and Mallets

- Ball point Hammer
- Nail Hammer
- Track hammer
- Mallet

Image source: https://sites.google.com/view/master-training

Mechnical Tools

Screw Drivers, Fasteners and spanners

- Hand held tools used to fasten objects using screws. There are different types of screw drivers like Phillips Screw Driver etc. Allen Key Set is a set of tools that can fasten / unfasten special set of screws.
- Spanners are tools that provides grip and mechanical advantage in applying torque/force to turn objects.

Image source: https://sites.google.com/view/master-training

Measurement Tools

Multimeter

- A multimeter or a multi tester, also known as a VOM (volt ohm milli-ammeter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter can measure voltage, current, and resistance.

Image source: https://sites.google.com/view/master-training

Measurement Tools

Digital Oscilloscope

- A digital storage oscilloscope (often abbreviated DSO) is an oscilloscope which stores and analyses the signal digitally rather than using analog techniques It is now the most common type of oscilloscope in use because of the advanced trigger, storage, display and measurement features which it typically provides

Image source: https://sites.google.com/view/master-training

Power Tools

Power Drill

- A power drill is an electrical motor that rotates a replaceable drill bit to make a hole in wood, plastic, or metal. Alternately, a screwdriver tip can be installed to turn screws. Corded or cordless drills can handle a wide variety of tasks, including drilling holes and driving screws in and out.

Image source: https://sites.google.com/view/master-training

Power Tools

Hot Glue Gun

- Hot glue guns use continuous heating elements to melt the adhesive The gun would heat the glue, and you could use the hot glue to adhere pieces of fabric together (or to make other craft projects).
- Hot melt also has the advantage of not losing any thickness when drying.

Image source: https://sites.google.com/view/master-training

Crimping Tools and Types

Crimping tools

- Crimp tools are a varied collection of devices used to join materials or components by pressing them together and creating a seal or crimp

Image source: https://sites.google.com/view/master-training

Crimping Tools and Types

Types of Crimping tools

- Bootlace Crimp Tool
- RJ45 Crimp tool
- RJ9 Crimp tool

Image source: https://www.computerhope.com/jargon/c/crimp.htm

Safety hazards on basic hand tools

Hand Tool Safety Rules

Some basic hand tools safety hazards

- Hammer Safety
- Power Drill Safety
- Power Saw Safety
- Hand Files & Rasp Safety
- Chisel Safety
- Toolboxes, Tool Chests & Cabinets

Image Source: https://nstidehradun.wordpress.com/2019/11/29/hand-tools-and-its-safety/

Soldering techniques

What is Soldering

- Soldering is a joining process used to join different types of metals together by melting solder.

Image Source:
https://svtronics.com/blog/wpcontent/uploads/2021/06/AdobeStock_130497973.jpg

Soldering techniques

Materials Required for soldering

- Soldering Iron
- Rosin core solder
- Soldering iron stand
- Sponge
- Solder braid
- Prototype board

Image Source:https://www.sciencebuddies.org/science-fair projects/references/how-to-solder

Soldering techniques

How to solder

- Solder needs a clean surface on which to adhere
- To solder, heat the connection with the tip of the soldering iron for a few seconds, then apply the solder.
- Keep the soldering tip on the connection as the solder is applied
- Don't move the connection while the solder is cooling.
- Don't overheat the connection, as this might damage the electrical component you are soldering.

Image Source:https://www.sciencebuddies.org/science-fair projects/references/how-to-solder

Cables and Connectors

Cables

- Cable is the medium through which information usually moves from one network device to another.

- USB Cables
- HDMI cables
- Ethernet Cable
- Cat 6 cable
- VGA cable
- Fiber optic cable

Image Source:https://contentgrid.homedepot-static.com/hdus/en_US/DTCCOMNEW/Articles/types-of-cables-and-connectors-for-networking-section-2-A.jpg

Cables and Connectors

Connectors

- A connector is the unique end of a plug, jack, or the edge of a card that connects to a port

- AV ports
- RF connectors

Image Source:https://5.imimg.com/data5/RO/XO/MY-3767981/rf-connectors-500x500.jpg

Able to Disassemble and assemble PC

(3 hours)

In this section, we will discuss:

- Steps to asseble PC
- Steps to deassemble PC

Computer assembly

Steps for assemble PC

As we know, computer assembly is a systematic process. First, arrange the computer parts. The sequence for assembly and working of the computer listed below is as:

1. Open the case.
2. Install the power supply.
3. Attach the components to the motherboard.
4. Install the motherboard.
5. Install internal drives.
6. Connect all internal cables.
7. Install motherboard power connections
8. Connect external cables to the computer.
9. Boot the computer for the first time.

Image Source: https://cdn2.vectorstock.com/i/1000x1000/30/51/assembling-pc-personal-computer-hardware-vector-13773051.jpg

Computer assembly

Required Material

- Computer case, with power supply installed
- Motherboard
- CPU
- Heat sink/fan assembly
- Thermal compound
- RAM module(s)
- Motherboard standoffs and screws
- Anti-static wrist strap and anti-static mat
- Tool kit

Image Source: https://cdn3.vectorstock.com/i/1000x1000/30/67/assembling-pc-personal-computer-hardware-vector-13773067.jpg

Computer assembly

Step 1 : Open the case

- The first step in assembling a computer is to open the computer case.
- There are different methods for opening cases.
- The computer comes with various types of cabinets. The method for opening the case is different based on the manufacturer.
- To open the case, first remove the screws of the left side cover and slide the side cover.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 2 : Install Power Supply

- Insert the power supply into the case.
- Align the holes in the power supply with the holes in the case.
- Secure the power supply to the case using the proper screws

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 3 : Assemble motherboard

- The motherboard has to be prepared before its installation. To prepare the motherboard, you first need to install the CPU, then the heat sink on the CPU and CPU fan.

Image Source: https://i.ytimg.com/vi/H3yTF6wqTbg/maxresdefault.jpg

Computer assembly

Step 3 : Assemble motherboard

- Heat sink and fan assembly

Image Source:
https://content.instructables.com/ORIG/F97/Y4PB/KKCKYS94/F97Y4PBKKCKYS94.jpg?auto=webp&fit=bounds&frame=1&auto=webp&frame=1&height=300

Computer assembly

Step 3 : Assemble motherboard

- RAM Installation

Image Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcREsFBYn_au89zChyMMDNg4OMhdNcJs4GXYtg&usqp=CAU

Computer assembly

Step 4 : Install motherboard

- Lay the motherboard over the standoffs to mount it on the holes.
- Align the screw holes of the motherboard with the standoffs.
- Then screw the board using a standard screwdriver.
- Tighten all the motherboard screws.
- Connect the 4-pin ATX power connector from the power supply to the motherboard.

- Image Source : https://icdn.digitaltrends.com/image/digitaltrends/installmotherboard01.jpg

Computer assembly

Step 5 : Install Internal Drives

- **Hard Drive**
- Position the HDD so that it aligns with the 3.5-inch drive bay.
- Insert the HDD into the drive bay so that the screw holes in the drive line up with the screw holes in the case
- Secure the HDD to the case using proper screws.

- Image Source : https://www.deskdecode.com/wp-content/uploads/2020/05/installing-hard-drive-min.jpg

Computer assembly

Step 5 : Install Internal Drives

- **Optical Drive**
- Position the optical drive so that it aligns with the 5.25 inch drive bay.
- Insert the optical drive into the drive bay so that the optical drive screw holes align with the screw holes in the case (see Figure 1.11).
- Secure the optical drive to the case using the proper screws.
- Connect the power cable coming from the SMPS to the power socket of optical drive.
- Connect SATA data cable from optical drive socket to the motherboard socket.

Image Source: https://docs.oracle.com/cd/E19127-01/ultra27.ws/820-6776/images/126223new.gif

Computer assembly

Step 6 : Connect all internal cables

Power cables are used to distribute electricity from the power supply to the motherboard and other components. Data cables transmit data between the motherboard and storage devices, such as hard drives.

Image Source: https://docs.oracle.com/cd/E19127-01/ultra27.ws/820-6776/images/126223new.gif

Computer assembly

Step 7 : Install motherboard power connections

- Align the 20-pin ATX power connector with the socket on the motherboard.
- Gently press down on the connector until the clip clicks into place.
- Align the 4-pin AUX power connector with the socket on the motherboard.
- Gently press down on the connector until the clip clicks into place.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 8 : Connect External cables to computers

- Connect Monitor
- Connect one end of the cable to the monitor port on the back of the computer case and the other end to the monitor. In case of VGA cable as shown in Figure 12.22 tighten the screws on the monitor cable to secure it.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 8 : Connect External cables to computers

- Connect Keyboard and mouse

As shown in image make proper connection with keyboard and mouse

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 8 : Connect External cables to computers

Checklist the following before starting the computer

- VGA cable of monitor is connected to the cabinet or not.
- Power cable of monitor and cabinet has been plugged into the UPS power output socket. Make sure monitor is connected to the power supply or not.
- Keyboard and mouse both are connected to their proper ports

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer assembly

Step 9 : Starting the Computer

- To start the computer, it is necessary to follow the correct sequence to start up. Now push the power button on the CPU to start the computer

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Steps for Disassemble PC

Disassembly is the process of breaking down a device into separate parts. Disassembly of any device is required to determine a problem, to replace a part, or take the parts and use them in another device

1. Unplugging
2. Open the case
3. Disconnect all connectors
4. Remove the Fan
5. Remove the Power Supply
6. Remove HDD and Optical Drive
7. Remove RAM
8. Remove Motherboard

Image Source: https://www.researchgate.net/profile/Sagar-Kamarthi/publication/45061936/figure/fig1/AS:669091685728257@1536535297037/Disassembly-of-Personal-Computer.png

Computer Disassembly

Required Material

- One working PC
- An anti-static wrist strap
- An anti-static mat
- Anti-static bags of various sizes
- Technician’s toolkit
- A plastic cup or box to organise screws, nuts, and bolts

Image Source: https://www.researchgate.net/profile/Sagar-Kamarthi/publication/45061936/figure/fig1/AS:669091685728257@1536535297037/Disassembly-of-Personal-Computer.png

Computer Disassembly

Step 1 : Unplugging

- Unplug the power cord from the PC and from the wall socket to prevent any injuries and damage of the PC from electrostatic discharge (ESD).
- Unplug all the peripherals attached to the computer, such as the keyboard, mouse, monitor, headphones, and any external drives.
- Wear a grounding strap to discharge any static electricity.

Image Source: https://awesomerajaaida.files.wordpress.com/2015/02/lab-3-how-to-install-a-hard-drive.jpg

Computer Disassembly

Step 2 : open the case

- To open the case, first remove the screws of the left side cover and slide the side cover.
- Pull the latch to release the side panel. Then lift the side cover out from the chassis.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Step 3 : Disconnect all Connectors

- Disconnect all the connectors connected to the motherboard. These include SATA power cable and data cable of HDD as well as SATA cable of optical drive.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Step 4 : Remove the Fan

- Remove the fan now. Most computers have two fans — the system fan and CPU fan. The system fan is located at the back side of the computer to blow air into the computer. The CPU fan is located on top of the CPU heat sink. The fans and its connectors are labelled with their names.

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Step 5 : Remove Power supply

- Disconnect the power cable of the hard disk and optical drive which connects to the SMPS
- Remove the screws that secure the power supply unit to the chassis
- Carefully lift the power supply out of the chassis

Image Source: https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Step 6 : Remove RAM

RAM allows for the transfer of information to and from the CPU. Computer runs fast with more RAM. Most computers have four RAM slots, and two RAM chips. To remove the RAM, push down on both tabs holding the RAM in place, which are located at both ends of the RAM. It will cause the module to pop up for easy removal.

Image Source: https://docs.oracle.com/cd/E19127-01/ultra27.ws/820-6776/images/23967.gif

Computer Disassembly

Step 7 : Remove Expansion Cards

- The modern motherboards are integrated with the audio, video and network cards. However, if your computer has the expansion card as shown in Figure , insert into the expansions slot to increase the functionality. The expansion card is screwed with a single screw on top of expansion card slot.

Image Source https://ncert.nic.in/vocational/pdf/keit104.pdf

Computer Disassembly

Step 8 : Remove Mother board

- Every part of the computer is attached to the motherboard. The CPU, RAM, and expansion cards are directly attached to the motherboard.
- To remove the motherboard, disconnect all the cables from the motherboard. It has seven screws holding it to the frame. Remove these screws and then lift the motherboard out of the frame.

Image Source https://i.ytimg.com/vi/i3afSFfCmH4/maxresdefault.jpg

Able to install and maintain software’s for a PC

(1 hours)

In this section, we will discuss:

- Distinguish between System Software and Application Software
- Differentiate between Linux and Windows OS
- Windows 32 bit, and 64 bit System
- FDISK, Format, Scandisk, FAT System, NTFS and Directories, Fragmentation and defragmentation disk

Distinguish between System Software and Application Software

System Software

- What is System Software?
- Types of System Software
- Features of System Software

Image Source_:https://eportfolio.utm.my/user/choy-wan-ling/chapter-5-system-software

System Software

What is System Software

- System Software is a set of programs that control and manage the operations of computer hardware.
- It also helps application programs to execute
  correctly.

Example: Operating system, programming language, Communication software, etc.

Image Source_:https://eportfolio.utm.my/user/choy-wan-ling/chapter-5-system-software

System Software

Types of System Software

- Operating system
- Device Driver
- Language processors

System Software

Features of System Software

- System Software is closer to the system
- Generally written in a low-level language
- The system software is difficult to design and understand
- Fast in speed
- Less interactive
- Smaller in size
- Hard to manipulate

Image Source : https://eportfolio.utm.my/user/choy-wan-ling/chapter-5-system-software

Distinguish between System Software and Application Software

Application Software

- What is Application Software?
- Types of Application Software
- Features of Application Software

https://www.technoganpat.in/2018/08/difference-between-systems-software-and-application

Application Software

what is Application Software ?

- Application Software is a program that does real work for the user. It is mostly created to perform a specific task for a user.
- Application Software acts as a mediator between the end-user and System Software. It is also known as an application package.
- This type of software is written using a high-level language like C, Java, VB. Net, etc.

Example: Word-processing, Spreadsheet, Database, etc.

Image source: https://images.saymedia-content.com/.image/ar_16:9%2Cc_fill%2Ccs_srgb%2Cq_auto:eco%2Cw_1200/MTc2NDU0MjY4MDgwNDMzMTE0/three-categories-of-application-software.png

Application Software

Types of Application Software ?

- General Purpose Software
  E.g. MS word, Ms-Excel, Power Point
- Customized Software
  E.g. railway reservation system, airline reservation system
- Utilities software
  E.g. Antivirus, disk fragmented, memory tester, disk repair

Application Software

Feature of Application Software ?

- An important feature of Application Software:
- Perform more specialized tasks like word processing, spreadsheets, email, photo editing, etc.
- It needs more storage space as it is bigger in size
- Easy to design and more interactive for the user
- Generally written in a high-level language

Image source: https://www.goodcore.co.uk/blog/wp-content/uploads/2019/08/types-of-software.png

Distinguish between System Software and Application Software

System Software	Application Software
It is designed to manage the resources of the computer system, like memory and process management, etc	It is designed to full fill the requirements of the user for performing specific tasks.
Written in a low-level language	Written in a high-level language
Less interactive for the users	More interactive for the users
System software plays vital role for the effective functioning of a system	Application software is not so important for the functioning of the system, as it is task specific.

Operating System

Operating system

- What is operating System
- Types of Operating System

https://www.howtogeek.com/wp-content/uploads/2018/08/img_5b68e80f77e33.png?width=1198&trim=1,1&bg-color=000&pad=1,1

Operating System

What is Operating system

- An operating system is a program that controls the execution of application programs and acts as an interface between the user of a computer and the computer hardware.

- A more common definition is that the operating system is the one program running at all times on the computer (usually called the kernel), with all else being application programs.

https://www.howtogeek.com/wp-content/uploads/2018/08/img_5b68e80f77e33.png?width=1198&trim=1,1&bg-color=000&pad=1,1

Operating System

Types of Operating system

Differentiate between Linux and Windows OS

Linux	Windows OS
Linux Is a open source operating system	While windows is licenced operating system
Linux is free of cost	While windows is paid and costly
Monolithic kernel used	Micro kernel used
Linux is more efficient compared to windows	Less efficient compared to linux
Provide more security than windows	While it provide less security than linux

Differentiate between 32 bit and 64 bit OS

32 bit OS	64 bit OS
32 bit system can access 2^32 memory address.	64 bit system can access 2^64 memory address.
Can Handle upto 4GB RAM data	Can Handle more than 4GB RAM data
A 32-bit processor system could properly run a 32-bit OS, but it cannot run the 64-bit OS at its full capability.	A 64-bit processor system can run either a 32-bit or 64-bit version of an installed operating system (OS).
The 64-bit programs and applications won't work.	The 32-bit programs and applications will work with no hassle.
It needs a 32-bit operating system.	This one can run on both 32-bit and the 64-bit operating system.

https://static.javatpoint.com/operating-system/images/32-bit-vs-64-bit-operating-system.png

FDISK, Format, Scandisk commands

Disk Part command in windows 10 – fdisk command

- The diskpart command interpreter helps you manage your computer's drives (disks, partitions, volumes, or virtual hard disks).

- Disk Part, replacing its predecessor - fdisk, is a command-line utility that provides the ability to manage disks, partitions or volumes in your computer running all versions of the operating system since Windows 2000, also including the latest Windows 10.

Administrator: Command Prompt - diskpart

```
Microsoft Windows [Version 10.0.19044.1466]
(c) Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>list volume
'list' is not recognized as an internal or external command,
operable program or batch file.

C:\WINDOWS\system32>diskpart

Microsoft DiskPart version 10.0.19041.964

Copyright (C) Microsoft Corporation.
On computer: LAPTOP-I6QLFUK2

DISKPART> list volume

  Volume ###  Ltr  Label        Fs     Type        Size     Status     Info
  ----------  ---  -----------  -----  ----------  -------  ---------  --------
  Volume 0     C   Acer         NTFS   Partition    275 GB  Healthy    Boot
  Volume 1     D   DATA         NTFS   Partition    199 GB  Healthy
  Volume 2         ESP          FAT32  Partition    100 MB  Healthy    System
  Volume 3         Recovery     NTFS   Partition   1024 MB  Healthy    Hidden

DISKPART> fdisk

Microsoft DiskPart version 10.0.19041.964

ACTIVE      - Mark the selected partition as active.
ADD         - Add a mirror to a simple volume.
ASSIGN      - Assign a drive letter or mount point to the selected volume.
```

FDISK, Format, Scandisk commands

Using Disk management create partition

- Disk Management is not as powerful as MiniTool Partition Wizard Free Edition, but as a Windows built-in partition manager, it can complete most simple and basic partition managements like create partition, delete partition, format partition, etc.

FDISK, Format, Scandisk commands

Scandisk Command

- Scandisk can improve the performance of your hard drive and help maintain the Windows file system.

Command Prompt, follow these steps:

- Boot your computer.
- Go to Start.->Run.->cmd in the box:
- You can now type chkdsk to open the utility in a read-only mode. Press Enter.
- To repair errors

Administrator: Command Prompt - chkdsk

```
C:\WINDOWS\system32>chkdsk
The type of the file system is NTFS.
Volume label is Acer.

WARNING!  /F parameter not specified.
Running CHKDSK in read-only mode.

Stage 1: Examining basic file system structure ...
Progress: 795486 of 1516288 done; Stage: 52%; Total: 18%; ETA:   0:01:55
```

FDISK, Format, Scandisk commands

Format Command

The format command is used to erase information from a

computer diskette or fixed drive.

Format

C:\WINDOWS\system32>format E:

E: is the drive letter

Administrator: Command Prompt

```
C:\WINDOWS\system32>format E:/
Invalid parameter - /

C:\WINDOWS\system32>format E:
Insert new disk for drive E:
and press ENTER when ready...
The type of the file system is FAT32.
Verifying 7.2 GB
Initializing the File Allocation Table (FAT)...
Volume label (11 characters, ENTER for none)?
Format complete.
       7.2 GB total disk space.
       7.2 GB are available.

       4,096 bytes in each allocation unit.
   1,886,527 allocation units available on disk.

          32 bits in each FAT entry.

Volume Serial Number is C0BA-0DAA

C:\WINDOWS\system32>
```

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

What is directories

A **directory** is a location for storing files on your computer. Directories are found in a hierarchical file system such as Linux, DOS, and Unix

Pictured is an example of output from the Windows/DOS tree command. It shows all the local and subdirectories.

Reference: https://www.computerhope.com/jargon/d/director.htm

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

FAT File System

- A disk formatted with FAT is allocated in clusters, whose size are determined by the size of the volume. When a file is created, an entry is created in the directory and the first cluster number containing data is established.

- It is only used with FAT12 and FAT16, and imposes on the root directory a fixed maximum size which is pre-allocated at creation of this volume.

Image Source: http://www.c-jump.com/CIS24/Slides/FAT/lecture.html

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

FAT File System

- FAT32 stores the root directory in the Data Region, along with files and other directories, allowing it to grow without such a constraint.

Image Source: http://www.c-jump.com/CIS24/Slides/FAT/lecture.html

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

NTFS

- NT file system (NTFS), which is also sometimes called the New Technology File System, is a process that the Windows NT operating system uses for storing, organizing, and finding files on a hard disk efficiently.

NTFS File System

Image Source:https://www.kencorner.com/wp-content/uploads/2018/03/NTFSFileSystem.png

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

Fragmentation and Defragmentation

- **Disk fragmentation** occurs when a file is broken up into pieces to fit on the disk. Because files are constantly being written, deleted and resized, fragmentation is a natural occurrence.
- When a file is spread out over several locations, it takes longer to read and write.

Image Source: https://windowsreport.com/windows-10-defrag-tools

FAT System, NTFS and Directories, Fragmentation and defragmentation disk

Fragmentation and Defragmentation

- the process of defragmentation rejoins the fragmented parts of a file. It loads the file fragments and then saves them in consecutive parts of the storage.

- The process of defragmenting can be time consuming, but it is one of the easiest ways to increase the performance of your computer. The frequency at which a PC should be defragmented will directly depend on the amount of usage area.

Able to manage files effectively in Windows and Linux environment

(6 hours)

In this section, we will discuss:

- Functions of Key board and Mouse
- Applications MS Paint/Note pad
- Different text formats
- Different image file formats
- Advantages of compressing files
- Distinguish between backup and cloning

Functions of Key board and Mouse

What is a Computer Keyboard?

- A keyboard is a peripheral device that enables a user to input text into a computer or any other electronic machinery.
- It is a peripheral device that is the most basic way for the user to communicate with a computer.

Image Source:
https://www.ign.com/articles/best-keyboard

Functions of Key board and Mouse

Categories of Keys on a Keyboard

- Typing(alphanumeric) keys
- Control keys
- Function keys
- Navigation keys
- Numeric keypad
- Other Keys(Shift, Caps Lock, Tab, Enter, spacebar, Backspace)

Image Source:
https://www.javatpoint.com/keyboard

Functions of Key board and Mouse

What are the Uses of Keyboard in Computer?

- Input Date
- Type Numbers
- Text Chatting
- Type Special Character
- Types computer short cut Keys

Image Source:
https://www.computerhope.com/issues/ch001689.htm

Introduction to Internet, Browsing, and Emailing

Types of Keyboards

- Gaming Keyboard
- Mechanical Keyboard
- Ergonomic Keyboard
- Multimedia Keyboard
- Hand Keyboard
- Flexible Keyboards

Image Source:
https://www.computerhope.com/jargon/k/keyboard.htm

Introduction to Internet, Browsing, and Emailing

Types of Keyboards

- Wireless Keyboard
- Laptop Keyboard
- Laser virtual Keyboard

Image Source:
https://www.computerhope.com/jargon/k/keyboard.htm

Introduction to Internet, Browsing, and Emailing

Five Functions of Keyboard

- Built-in functions
- Boot sequence functions
- Operation keystrokes
- Shortcut commands
- Specialty keys

Image Source:
https://www.advance-africa.com/images/xwindows1.png.pagespeed.ic.bg4V5WeD6K.jpg

Introduction to Internet, Browsing, and Emailing

Other Functions of Keyboard

- Print Screen
- Scroll Lock
- Pause
- Brightness UP & Down
- Volume UP & Down

Image Source:
https://www.digitalcitizen.life/7-ways-change-volume-windows-both-pcs-tablets/

Functions of Key board and Mouse

How does Keyboard Works in Computer?

- A keyboard contains many mechanical switches or push-buttons called "keys".
- When one of these are pushed, an electrical circuit is closed, and the keyboard sends a signal to the computer that tells it what letter, number or symbol it would like to be shown on the screen.

Image Source:
https://www.engineersgarage.com/insight-how-computer-keyboard-works/

Introduction to Internet, Browsing, and Emailing

Keyboard Advantages and Disadvantages

Advantages

- User Friendly
- Security
- Visual Representation
- Water Proof
- Typing Errors

Image Source: https://www.esis.com.au/computer-products/keyboards-pointing-devices/keyboards-mice-etc-industrial/waterproof-keyboards-plastic/

Introduction to Internet, Browsing, and Emailing

Keyboard Advantages and Disadvantages

Disadvantages

- Cost
- Maintenance
- Cleanliness
- Text/Numeric Input
- Health Risks

Health risks

- Keyboard and mouse usage can cause serious injury.
- From my experience, they are often not be the lone cause.
- Others are
  - Stress
  - Bad posture

Image Source:
https://slidetodoc.com/lis-508-lecture-4-looking-at-a-computer/

Functions of Key board and Mouse

What is Computer Mouse?

- A mouse is a pointing input device that controls the movement of the cursor or pointer on a display screen.
- It controls the movement of the cursor on the computer screen and allows users to move and select folders, text, files, and icons on a computer.

Image Source: https://www.uow.edu.au/student/learning-co-op/technology-and-software/mouse-buttons/

Functions of Key board and Mouse

What are the uses of a Mouse?

- Move the mouse pointer
- Select
- Open or execute a program
- Drag-and-drop
- Hovering

Image Source: https://www.barhamprimary.co.uk/page/?title=Computer+Mouse+and+Keyboard+Skills&pid=135

Functions of Key board and Mouse

What are the uses of a Mouse?

- Scroll Up & Down
- Perform other functions
- Playing Game
- Combination Activities

Image Source:
http://lazplanet.blogspot.com/2017/05/make-simple-image-zoomer-in-5-minutes.html

Functions of Key board and Mouse

Computer Mouse Parts with their Functions

- Buttons
- Ball/laser/LED
- Mouse Wheel
- Printed Circuit Board
- Cable/Wireless Receiver
- Battery
- Microprocessor

Image Source:
https://www.nidirect.gov.uk/articles/keyboard-and-mouse-basics

Functions of Key board and Mouse

Types of Mouse

- Optical Mouse
- Gaming Mouse
- Wireless Mouse
- Laser Mouse
- Trackball Mouse
- Ergonomic Mouse

Image Source:
https://scoopten.com/what-is-computer-mouse-types/

Functions of Key board and Mouse

Types of Mouse

- 3D Mouse
- Mechanical Mouse
- Roller Bar Mouse
- Finger Mouse
- Pen Mouse (Stylus)

Image Source:
https://scoopten.com/what-is-computer-mouse-types/

Functions of Key board and Mouse

How does Mouse Works in Computer?

- Able to work on almost any surface, the mouse has a small, red light-emitting diode (LED) that bounces light off that surface onto a (CMOS) sensor.
- The computer moves the cursor on the screen based on the coordinates received from the mouse.

Image Source:
https://www.quora.com/What-are-the-different-types-of-mouse

Functions of Key board and Mouse

Mouse Advantages and Disadvantages

Advantages

- It is easier to use and handle a mouse as compared to the keyboard.
- Mouse requires less space.
- Mouse can be used to draw graphics.
- Mouse is light to carry. Therefore it is portable.
- They can be easily connected to any devices with USB port.

Image Source: https://slideplayer.com/slide/7606416/25/images/9/Mouse+Advantages+Disadvantages.jpg

Functions of Key board and Mouse

Mouse Advantages and Disadvantages

Disadvantages

- The wired mouse is delicate in nature and must be used carefully as it can be damaged easily
- If the batteries are low they tend to lose their accuracy and speed.
- Wireless mouse can sometimes face connectivity issues.
- Mouse cannot enter text data into the computer.

Image Source: https://www.shutterstock.com/image-photo/inside-laptop-mouse-damaged-1905599818

Applications MS Paint/Notepad

What is MS Paint?

- MS Paint is a simple program that allows users to create basic graphic art on a computer.
- Images created within MS Paint are typically saved as GIF, Windows bitmap, PNG, TIFF or JPEG files.

Applications MS Paint/Notepad

Tools of MS Paint

- Free-Form Select and Select Tool
- Eraser/Colour Eraser
- Pick Colour
- Pencil
- Airbrush
- Fill With Colour

Image Source: https://www.electronicsandcommunications.com/2020/08/microsoft-paint-tutorial-for-beginners.html

Applications MS Paint/Notepad

Tools of MS Paint

- Magnifier
- Brush
- Text
- Curve Tool
- Shapes(Line,Rectangle,Ellipse,Polygon)

Image Source: https://www.electronicsandcommunications.com/2020/08/microsoft-paint-tutorial-for-beginners.html

Applications MS Paint/Notepad

What is Notepad?

- Notepad is a generic text editor included with all versions of Microsoft Windows that allows you to create, open, and read plaintext files.

Applications MS Paint/Notepad

How to use Notepad?

- Create, open, and save text files with Notepad
- simple text edits
- Turn Word Wrap on or off
- Change the font of the text document
- Print text files

Image Source: https://www.howtogeek.com/258545/how-to-use-notepad-to-create-a-dated-log-or-journal-file/

Different text formats

What is the text-based formats?

- Text based also refers to documents that contain only text, such as program source code, batch and shell scripts as well as HTML and XML files.
- Text-based documents are readable in any text editor and most word processors.

Image Source: https://www.bleepingcomputer.com/news/microsoft/windows-10-notepad-is-getting-better-utf-8-encoding-support/

Different text formats

File format extensions for text files

- .doc and .docx - Microsoft Word file
- .odt - OpenOffice Writer document file
- .pdf - PDF file
- .rtf - Rich Text Format
- .tex - A LaTeX document file
- .txt - Plain text file
- .wpd - WordPerfect document

Image Source:
https://filesconverter.com/text-formats

Different image formats

What is the image-based formats?

- Image Format describes how data related to the image will be stored.
- Data can be stored in compressed, Uncompressed or vector format.

Image Source:
https://dlpng.com/png/6589946

Different text formats

File format extensions for image files

- .ai - Adobe Illustrator file
- .bmp - Bitmap image
- .gif - GIF image
- .ico - Icon file
- .jpeg or .jpg - JPEG image

Image Source:
https://99designs.com/blog/tips/image-file-types/

Different text formats

File format extensions for image files

- .png - PNG image
- .ps - PostScript file
- .psd - PSD image
- .svg - Scalable Vector Graphics file
- .tif or .tiff - TIFF image

Image Source:
https://www.firevista.com/list-of-all-image-formats/

Advantages of compressing files

What Is a Compressed File?

- A compressed file is any file containing one or more files or directory that is smaller than their original file size.

Image Source: https://www.howtogeek.com/178146/htg-explains-everything-you-need-to-know-about-zipped-files/

Advantages of compressing files

Why Compress Files?

- A compressed file takes up less storage space
- Several files and folders are combined into one package that is easy to manage

Image Source:
https://www.khanacademy.org/computing/computers-and-internet/

Advantages of compressing files

How Does Compression Work?

- Data compression is a means of altering or encoding structured data to take up less disk space when stored on a computer-based system.

Types of Compression

- Lossless Compression
- Lossy Compression

Image Source:
https://developer.apple.com/documentation/compression

Advantages of compressing files

Common Compression and Extraction Methods

- zip
- rar
- gz
- 7z

Image Source:
https://www.maketecheasier.com/7-zip-vs-winrar-vs-winzip/

Advantages of compressing files

Advantages & Disadvantages of Using File Compression

Advantages

- Increased computing efficiency
- Quicker transfers
- Improved file integrity
- Email/webpage accessibility

Image Source: https://www.rfwireless-world.com/Terminology/Advantages-and-Disadvantages-of-Data-Compression.html

Advantages of compressing files

Advantages & Disadvantages of Using File Compression

Disadvantages

- Memory Issue
- Speed
- File Size
- Viruses and Malware
- File Transfer

Image Source: https://image.slidesharecdn.com/final-302-181124182547/95/file-compression-zip-file-15-638.jpg?cb=1543084052

Advantages of compressing files

Difference between the Zip and Rar format

- ZIP and RAR are widely used file formats for data compression and archive.
- ZIP supports lossless data compression. Whereas, RAR supports data compression, error recovery and file spanning.

.RAR

.ZIP

Image Source:
https://tech-blogs.com/the-little-known-difference-between-rar-and-zip/

Distinguish between backup and cloning

What is Backup?

- Backup is the process of creating a copy of the data on your system that you use for recovery in case your original data is lost or corrupted.
- You can also use backup to recover copies of older files if you have deleted them from your system.

Image Source:
https://us.norton.com/content/norton-msm/us/en-us/home/internetsecurity/how-to/the-importance-of-data-back-up.html/?lg=en&ct=US&cs=true

Distinguish between backup and cloning

Why should I back up my data?

- Data loss prevention
- Natural disaster
- Hard drive Fails
- Lost devices
- Tax reporting and audits
- Cyberthreats

Image Source:
https://www.g2.com/articles/what-is-backup

Distinguish between backup and cloning

Types of Backups

- Full backup
- Differential backup
- Incremental backup

Image Source: https://spanning.com/blog/types-of-backup-understanding-full-differential-incremental-backup/

Distinguish between backup and cloning

Advantages and disadvantages of backup

Advantages

- Quick Access to Files
- Protection Against Power Failures
- Added Anti-Virus Protection
- Safeguard Against Failed Hard Drive
- Recovery if Operating System Fails

TYPE	BENEFITS	DRAWBACKS
Full	▪ Provides full copy of data set ▪ Offers arguably best protection	▪ Time-consuming ▪ Requires lots of storage space
Incremental	▪ Less time and storage space than full backup	▪ Time-consuming to restore ▪ Need all the backups in backup chain to restore
Differential	▪ Shorter restore time than incremental	▪ Can grow to much bigger size than incremental
Synthetic full	▪ Reduced restore time ▪ Less bandwidth usage	▪ Newer, so not as well-known
Incremental-forever	▪ Availability of data ▪ Automated restoration process	▪ Newer, so not as well-known ▪ Need all the backups in backup chain to restore

Image Source:
https://www.techtarget.com/searchdatabackup/feature/Full-incremental-or-differential-How-to-choose-the-correct-backup-type

Distinguish between backup and cloning

Advantages and disadvantages of backup

Disadvantages

- Hardware failure
- Hidden costs
- Failed recoveries

Image Source: https://www.webwerks.in/blogs/advantages-and-disadvantages-cloud-backup-services

Distinguish between backup and cloning

What is Cloning?

- Cloning is also used to describe the act of making the exact copy of a directory file or disk inclusive of any subdirectories or files within the disk or directory.

Image Source:
https://www.ubackup.com/clone/clone-old-computer-to-a-new-one-4348.html

Distinguish between backup and cloning

Simple steps with cloning software

- Install all desired programs and files to a master computer
- Use software create an image of the master computer's hard disk.
- Clone the image to the other computers.

Image Source:
https://www.ubackup.com/windows-10/clone-hard-drive-windows-10-0528.html

Distinguish between backup and cloning

Advantages and disadvantages of Cloning

Advantages

- A faulty computer can be wiped clean of data and restored from the untouched master image
- Don't have to waste the installing individual applications to new computers.
- A comprehensive backup of operating systems and installed softwares

Image Source:
https://www.ubackup.com/features/disk-clone.html

Distinguish between backup and cloning

Advantages and disadvantages of Cloning

Disadvantages

- Need to have a high number of the same hardware for the same image
- Must have dedicated IT staff when dealing with more than just a few computers

It can be used by the terrorists for criminal activities.

It can be used by the cloner for fraud calls.

It can be used for illegal money transfer.

Image Source:
https://www.slideshare.net/jagjitsingh2010/cloning-4

Distinguish between backup and cloning

Backup Vs Clone

- A backup disk creates an image file. You can use this to recover data if there’s an emergency.
- Cloning copies data from one hard disk to another, if you want to change the drive.

Image Source:
https://recoverit.wondershare.com/harddrive-backup/backup-vs-clone.html

Able to work with Linux environment by using Linux commands.

(6 hours)

In this section, we will discuss:

- Introduction to Linux operating system
- Familiarization with GUI environment
- Syntax of shell commands
- Shell Scripting

Introduction to Linux operating system

What is an Operating System?

- Operating System is defined as a collection of programs that coordinates the operations of computer hardware and software.
- It acts as a bridge for the interface between man and machine.

Image Source:
https://www.guru99.com/introduction-linux.html

Introduction to Linux operating system

Types of Operating System (OS)

- Batch Operating System
- Multitasking/Time Sharing OS
- Multiprocessing OS
- Real Time OS
- Distributed OS
- Network OS

Image Source:
https://www.tutorialandexample.com/types-of-operating-system/

Introduction to Linux operating system

Functions of Operating System

- Process management
- Memory management
- File management
- Device Management
- I/O System Management
- Secondary-Storage Management

Image Source:
https://www.tutorialandexample.com/functions-of-the-operating-system/

Introduction to Linux operating system

Functions of Operating System

- Security
- Command interpretation
- Networking
- Job accounting
- Communication management

Image Source: https://kullabs.com/class-miscellaneous/teacher-training/digital-literacy/introduction-and-function-of-operating-system

Introduction to Linux operating system

Advantages of Operating System

Advantages

- User Friendly
- Security
- Sharing Resources
- Hardware Accessibility
- Multitasking

Image Source: https://www.hitechwhizz.com/2021/02/5-advantages-and-disadvantages-limitations-benefits-of-operating-system.html

Introduction to Linux operating system

Disadvantages of Operating System

Disadvantages

- Cost
- Reliability
- Complexity
- Fragmentation
- Virus Attacks

Image Source: https://www.hitechwhizz.com/2021/02/5-advantages-and-disadvantages-limitations-benefits-of-operating-system.html

Introduction to Linux operating system

What is Linux Operating System?

- Linux is a community of open-source Unix like operating systems that are based on the Linux Kernel.
- Linux is a Unix-like, open source and community-developed operating system (OS) for computers, servers, mainframes, mobile devices and embedded devices.

Image Source:
https://www.guru99.com/introduction-linux.html

Introduction to Linux operating system

Who created Linux?

- Linux, computer operating system created in the early 1990s by Finnish software engineer Linus Torvalds and the Free Software Foundation.

Image Source: https://souclou.com/linus-torvalds-creator-of-linux-kernel-explained-why-linux-desktop-was-not-a-thing/

Introduction to Linux operating system

History of Linux

- In 1991, the Linux history started with the starting of a particular project by the Finland student Linus Torvalds for creating a new free OS kernel.

Image Source:
https://www.elprocus.com/linux-operating-system/

Introduction to Linux operating system

Components of Linux System

- Kernel
- System Library
- System Utility

Image Source:
https://www.tutorialspoint.com/operating_system/os_linux.htm

Introduction to Linux operating system

Basic features of Linux

- Portable
- Open Source
- Multi-user
- Multiprogramming
- Hierarchical File System
- Shell
- Security

Image Source:
https://steemit.com/features/@arshi731/features-of-linux

Introduction to Linux operating system

Architectures of Linux Operating System

- The Kernel
- System Library
- Hardware layer
- System
- Shell utility.

Image Source:
https://www.javatpoint.com/architecture-of-linux

Introduction to Linux operating system

The Linux Kernel

- Linux kernel is a free, open-source, monolithic, modular, Unix-like operating system kernel.
- It is the main component of the Linux operating system (OS) and is the core interface between the computer's hardware and its processes.

Image Source:
https://www.javatpoint.com/architecture-of-linux

Introduction to Linux operating system

User-interface of Linux

- A user interface (UI) refers to the part of an operating system, program, or device that allows a user to enter and receive information.

Image Source:
https://ubuntu.com/blog/whats-new-in-ubuntu-desktop-20-04-lts

Introduction to Linux operating system

Distribution of Linux

- Ubuntu
- Linux Mint
- Debian
- Red Hat
- Fedora

Image Source:
https://oracle-patches.com/en/os/choosing-the-right-linux-distribution-step-by-step-instruction

Introduction to Linux operating system

Best Command-Line Editors in Linux

- Vim
- Emacs
- Nano
- Micro

Image Source:
https://www.javatpoint.com/linux-nano-editor

Introduction to Linux operating system

Types of Users in Linux

- Root user
- Regular user
- Service Account

Image Source:
https://linoxide.com/list-users-linux-command-line/

Introduction to Linux operating system

Comparison of Linux with another Operating System

- Linux is Open Source and is free to use. Windows is not open source and is not free to use.
- Linux file system is case sensitive. Windows file system is case insensitive

LINUX	UBUNTU
A family of free and open source software operating system built around the Linux Kernel	A free and open source operating system and Linux distribution based on Debian
Core operating system	An operating system, which is a distribution of Linux
Linus Torvalds was the initial developer; Linux community can support the development of the OS	Developed by Canonical Ltd, and the Ubuntu community can support its development
Initially released in 1991	Initially released in 2004
Used for personal computers, game consoles, embedded systems, desktops and servers	Used for personal computers, servers, cloud computing and IoT

Image Source:
https://pediaa.com/difference-between-linux-and-ubuntu/

Introduction to Linux operating system

Advantages and disadvantages of Linux operating system

Advantages

- Open source
- No anti-virus software needed
- Text editors
- Powerful command prompt
- No reboot needed

Image Source:
https://www.guru99.com/introduction-linux.html

Introduction to Linux operating system

Advantages and disadvantages of Linux operating system

- Low system specifications
- Good at multitasking
- Less disk space needed
- File formats

Image Source:
https://www.techradar.com/how-to/how-to-speed-up-ubuntu-2004

Introduction to Linux operating system

Advantages and disadvantages of Linux operating system

Disadvantages

- Hardware drivers
- Learning curve
- Software alternative
- No Games

Image Source:
https://www.techrepublic.com/article/evaluating-linux-reality-vs-hype/

Familiarization with GUI environment

What is Graphical User Interface (GUI)?

- A graphical user interface (GUI) is an interface through which a user interacts with electronic devices such as computers and smartphones through the use of icons, menus and other visual indicators or representations (graphics).

Image Source:
https://etipsguruji.com/gui/

Familiarization with GUI environment

Top 10 Linux Desktop Environments

- GNOME
- KDE Plasma
- Unity
- MATE
- Cinnamon

Image Source:
https://technastic.com/5-best-linux-desktop-environments/

Familiarization with GUI environment

Top 10 Linux Desktop Environments

- Budgie
- LXQT
- XFCE
- Deepin
- LXDE

Image Source:
https://commons.wikimedia.org/wiki/File:Desktop_Ubuntu_20.04.png

Familiarization with GUI environment

CLI vs GUI

- CLI, or Command Line Interface, is a text-based interface used to interact with software and operating system by typing commands into the interface and receive a response in the same way
- GUI, or Graphical User Interface, is a visual-based interface which features the use of graphic images, including windows, icons, and menus.

GUI	CLI
A type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators	An interface for the user to issue commands in the form of successive lines of text or command lines to perform the tasks
Graphical User Interface	Command Line Interface
Even a beginner can easily handle	User should have good knowledge of commands
Requires more memory as it contains a lot of graphical components	Does not require more memory
Slower	Fast
There are customizable options to change the appearance	It is not possible to change the apperance
More flexible	Not much flexible

Image Source:
https://pediaa.com/difference-between-gui-and-cli/

Syntax of shell commands

Linux directory structure

- / - Root
- /bin - Binaries and other executable programs.
- /etc - System configuration files.
- /home - Home directories.
- /opt - Optional or third party software.

Image Source:
https://www.geeksforgeeks.org/linux-directory-structure/

Syntax of shell commands

Linux directory structure

- /tmp - Temporary space, typically cleared on reboot.
- /usr - User related programs.
- /var - Variable data, most notably log files.

Image Source:
https://www.geeksforgeeks.org/linux-directory-structure/

Syntax of shell commands

Types of Files in Linux

- Regular files (-)
- Directory files (d)
- Special files

-rw-------	:	Regular File
drwxr-xr-x	:	Directory File
lrwxrwxrwx	:	Link File
Crw-rw----	:	Character Device File
Srw-rw-rw-	:	Socket File
prw-------	:	Named Pipe File
brw-rw----	:	Block Device File

Image Source:
https://www.2daygeek.com/find-identify-file-types-in-linux/

Syntax of shell commands

What are Shell Commands?

- In Linux, commands are ways or instructions through which you can instruct your system to do some action.
- Commands are executed in the command line.

Image Source:
https://www.geeksforgeeks.org/basic-linux-commands-day-day-life/

Syntax of shell commands

What is Shell?

- The shell is the command interpreter on the Linux systems.
- It the program that interacts with the users in the terminal emulation window.

Image Source:
https://www.educba.com/bash-shell-in-linux/

Syntax of shell commands

What are the types of shell commands?

- The C Shell
- The Bourne Shell
- The Korn Shell
- GNU Bourne-Again Shell .

Image Source:
https://www.tutorialandexample.com/linux-bash/

Syntax of shell commands

What is Command Line Interface (CLI)?

- The Command Line Interface (CLI), is a non-graphical, text-based interface to the computer system, where the user types in a command and the computer then successfully executes it.
- The Terminal is the platform or the IDE that provides the command line interface (CLI) environment to the user.

```
Usage: gs.{sh|bat} [global-options] command [options] [parameters]

Description:
Options:
      --help                 Show the help information for this command
      --cli-version=<n>      Use another CLI version (set '1' for legacy CLI).
                               Overrides XAP_CLI_VERSION environment variable
      --username=<username> Username for secured environments
      --password=<password> Password for secured environments
      --timeout=<timeout>    Change the default timeout (60 sec) for the specified
                               operation
      --server=<server>      Name or IP address of the Manager server to connect to
Commands:
  version      Platform version
  help         Help information for this command
  demo         Run Spark in standalone mode (Master, Worker and Zeppelin) and
                 deploy a Space in high availability mode (2 primaries with
                 backup each).
  blueprint    List of available commands for blueprints
  pu           List of available commands for Processing Unit operations
  space        List of available commands for Space operations
  maven        List of available commands for Maven-related operations
  completion   Generate completion script for bash/zsh shells.
  host         List of available commands for local host operations
  container    List of available commands for container operations
  info         Show the configured Manager information
  request      List of available commands for Request operations
  cls, clear   Clears interactive shell terminal
  exit, quit   Exits interactive shell (shortcut: CTRL-D)
```

Image Source:
https://docs.gigaspaces.com/latest/admin/tools-cli.html

Syntax of shell commands

Basic Shell Commands in Linux

- It is a command language interpreter that executes commands read from input devices such as keyboards or from files.
- The shell gets started when the user logs in or starts the terminal.

1.is	1.clear	1.diff	1.kill and killall	1.apt, pacman, yum, rpm
2.pwd	2.echo	2.cmp	2.df	2.sudo
3.cd	3.less	3.comm	3.mount	3.cal
4.mkdir	4.man	4.sort	4.chmod	4.alias
5.mv	5.unman	5.export	5.chown	5.dd
6.cp	6.whoami	6.zip	6.ifconfig	6.whereis
7.rm	7.tar	7.unzip	7.traceroute	7.whatis
8.touch	8.grep	8.ssh	8.wget	8.top
9.in	9.head	9.service	9.ufw	9. useradd
10.cat	10. tail	10. ps	10. iptables	10. passwd

Image Source:
https://www.journaldev.com/34067/linux-commands

Syntax of shell commands

Displaying the file contents on the terminal

- cat
- more
- less
- head
- Tail

```
tuts@FOSSLinux:~$ cat longfile | head -4
This is a long file
FOSSLinux is the home of Linux
We learn Linux everyday
How-Tos
tuts@FOSSLinux:~$ cat longfile | tail -4
Guides
News
And More!
Come, Join Us
```

Image Source: https://study.com/academy/lesson/linux-commands-for-managing-files-directories.html

Syntax of shell commands

File and Directory Manipulation Commands

- mkdir
- cp
- mv
- rm
- touch

Image Source: https://study.com/academy/lesson/linux-commands-for-managing-files-directories.html

Syntax of shell commands

Extract, sort, and filter data

Commands

- grep
- grep with Regular Expressions
- sort
- wc
- cut

```
[user1@server ~]$ sort test_file
Albert, 19
Daya,   23
Jon,    35
Lussy,  27
Maria,  25
Sanjay, 30
Sarvan, 32
Vikarm, 12
Vinita, 21
[user1@server ~]$ sort -k2 test_file
Vikarm, 12
Albert, 19
Vinita, 21
Daya,   23
Maria,  25
Lussy,  27
Sanjay, 30
Sarvan, 32
Jon,    35
[user1@server ~]$ _
```

Image Source: https://www.computernetworkingnotes.com/linux-tutorials/how-to-use-the-sort-command-in-linux.html

Syntax of shell commands

Basic Terminal Navigation Commands

- pwd
- ls -l
- clear
- cd path/name
- cp -r source destination
- up/down arrows

Image Source: https://study.com/academy/lesson/linux-commands-for-managing-files-directories.html

Syntax of shell commands

File Permissions Commands

- chown
- chgrp
- chmod

Image Source:
https://study.com/academy/lesson/modifying-file-permissions-access-control-in-linux.html

Syntax of shell commands

What is the use of shell command?

- It is a command language interpreter that executes commands read from input devices such as keyboards or from files.
- The shell gets started when the user logs in or starts the terminal.

```
TOUCH(1)                          User Commands                          TOUCH(1)

NAME
       touch - change file timestamps

SYNOPSIS
       touch [OPTION]... FILE...

DESCRIPTION
       Update  the  access  and modification times of each FILE to the current
       time.

       A FILE argument that does not exist is created empty, unless -c  or  -h
       is supplied.

       A  FILE  argument  string of - is handled specially and causes touch to
       change the times of the file associated with standard output.

       Mandatory arguments to long options are  mandatory  for  short  options
       too.

       -a     change only the access time

 Manual page touch(1) line 1 (press h for help or q to quit)
```

Image Source:
https://www.poweradmin.com/blog/essential-shell-commands-for-linux/

Shell Scripting

Shell scripting

- Shell Scripting is an open-source computer program designed to be run by the Unix/Linux shell.
- Shell Scripting is a program to write a series of commands for the shell to execute.

Image Source:
https://mindmajix.com/shell-scripting-tutorial

Shell Scripting

Types of Shell

- The Bourne Shell
- The C shell

Image Source: https://www.slideshare.net/sschaturvedi2015/shell-and-its-types-in-linux-248788008

Shell Scripting

Editors

- VI Editor
- Nano Editor

Image Source:
https://www.maketecheasier.com/linux-nano-text-editor-beginner-guide/

Shell Scripting

VI Editor

- It is the default text editor that comes with most Linux systems.
- It is a Terminal-based text editor that users need to learn, essentially when more user-friendly text editors are not available on the system.

sudo apt install vim

Modes & Controls	
Command Mode	ESC (commands preceded by :)
Insertion Mode	Entered on insertion or change
Starting VI (command line)	
vi <*filename*>	Edit *filename*
vi -r <*filename*>	Edit last version of *filename* after crash
vi + *n* <*filename*>	Edit *filename* at line *n*
vi + <*filename*>	Edit *filename* at end of file
vi +/*str* <*filename*>	Edit *filename* at first occurance of *str*
In insertion mode the following should be preceded by ESC:	
:w	Save
:x	Save & Exit
:q	Exit if no changes made
:q!	Exit & discard any changes

Image Source: https://www.smashingmagazine.com/2010/05/vi-editor-linux-terminal-cheat-sheet-pdf/

Shell Scripting

Nano Editor

- GNU nano is a simple terminal-based text editor
- Nano can be used in a terminal window or at the system console..

sudo apt install nano

Image Source:
https://www.maketecheasier.com/linux-nano-text-editor-beginner-guide/

Shell Scripting

Why do we need shell scripts?

- Using a shell script is most useful for repetitive tasks that may be time consuming to execute by typing one line at a time.

Image Source:
https://www.educba.com/uses-of-shell-scripting/

Shell Scripting

What is Bash?

- BASH is an acronym for Bourne Again Shell
- Bash or Shell is a command line tool that is used in open science to efficiently manipulate files and directories.

Image Source: https://devopslearning.medium.com/100-days-of-devops-day-51-introduction-to-bash-scripting-9501ce7a32a4

Shell Scripting

Features of Bash

- Shell commands
- I/O Redirection
- Interactive
- Manuals/help
- Scripting
- Functions
- Extras

Image Source:
https://linuxaria.com/howto/7-hidden-features-of-bash

Shell Scripting

Bash Scripting

- A Bash Shell Script is a plain text file containing a set of various commands that we usually type in the command line.
- It is used to automate repetitive tasks on Linux filesystem.

Image Source:
https://dzone.com/articles/functions-in-shell-script/

Shell Scripting

Shell Variables

- A variable is a temporary storage area in memory that is either set by the user, shell, system, or any program that loads another program.

There are two categories of variables:

- environment variables
- shell variables

```bash
#! /bin/bash

# Bash System-defined Variables

echo $HOME # Home Directory

echo $PWD # current working directory

echo $BASH # Bash shell name

echo $BASH_VERSION # Bash shell Version

echo $LOGNAME # Name of the Login User

echo $OSTYPE # Type of OS
```

Image Source:
https://www.javatpoint.com/bash-variables

Shell Scripting

Bash Operators

- Integer Comparisons
- String Comparisons
- Logical Operators
- File Test Operators

Bash Shell Test Operators

Integer Comparisons	Function
-gt	Greater than
-lt	Less than
-ge	Greater than or equal to
-le	Less than or equal to
-eq	Equal to
-ne	Not equal to
String Comparisons	**Functions**
-z	Test for empty string
=	Test for equality of strings
!=	Test for inequality of strings
Logical Operators	**Function**
-a	Logical AND
-o	Logical OR
!	Logical NOT
File Test Operators	**Function**
-f	File exists and is a regular file
-s	File is not empty
-r	File is readable
-w	File can be written to and modified
-x	File is executable
-d	Filename is a directory name

Image Source:
https://www.geeksforgeeks.org/linux-directory-structure/

Shell Scripting

Read User Input

- ‘read’ command is used to take input from user in bash
- It takes input from the user and assigns it to the variable

read <variable_name>

```
#!/bin/bash

# using read command without any variable

echo "Enter name : "

read

echo "Name : $REPLY"
```

Image Source:
https://www.javatpoint.com/bash-read-user-input

Shell Scripting

Bash Conditional statements

- if statement
- if-else statement
- Else If ladder
- Nested if
- switch statement

```
#!/bin/bash
echo "enter your age"
read age
if [ "$age" -ge 18 ]; then
      echo "you are eligible to vote"
else
      echo "you are younger !!"
```

Image Source:
https://www.javatpoint.com/if-then-else-shell-scripting

Shell Scripting

Bash Looping

- while statement
- for statement
- until statement

```
GNU nano 4.8                    dummy.sh
#!/bin/bash

for i in {1..5}; do
        echo "hello world"
done
```

Image Source:
https://linuxhint.com/nested-loop-bash-script-examples/

Shell Scripting

Bash Functions

- Functions in bash scripting are a great option to reuse code.
- A Bash function can be defined as a set of commands which can be called several times within bash script

```
GNU nano 2.2.6                                File: function.sh

#!/bin/bash
var1='P'
var2='Q'
my_function () {
local var1='R'
var2='S'
echo "Inside Function"
echo "var1 is $var1."
echo "var2 is $var2."
}
echo "Before Calling the Function"
echo "var1 is $var1."
echo "var2 is $var2."
my_function
echo "After Calling the Function"
echo "var1 is $var1."
echo "var2 is $var2."
```

Image Source:
https://ro.linuxteaching.com/article/bash_call_function

Familiarization of open office tools

(5 hours)

In this section, we will discuss:

- OpenOffice tools for creating documents
- OpenOffice tools for creating spreadsheet
- OpenOffice tools for creating presentation

OpenOffice tools for creating documents

What is open office

- OpenOffice is the leading open-source office software suite for word processing, spreadsheets, presentations, graphics, databases and more.
- Developed by Sun Microsystems Ltd.

Image Source: https://media.smallbiztrends.com/2016/12/open-office.png

OpenOffice tools for creating documents

Advantages of open office

- No licensing fees
- Cross-platform
- Extensive language support
- Consistent user interface
- Integration
- Granularity
- File compatibility

Image: https://www.howtogeek.com/wp-content/uploads/2014/04/apache-openoffice.png?trim=1,1&bg-color=000&pad=1,1

OpenOffice tools for creating documents

Features

- Styles and formatting
- Interoperability
- Programmability

Image: https://www.howtogeek.com/wp-content/uploads/2014/04/apache-openoffice.png?trim=1,1&bg-color=000&pad=1,1

OpenOffice tools for creating documents

What are the minimum requirements

- Microsoft Windows 98, ME, 2000 (Service Pack 2 or higher), XP or 2003
- GNU/Linux Kernel version 2.2.13 and glibc 2.2.0 or newer
- Mac OS X 10.3.x (10.3.5 recommended), Mac OS X 10.4.x, plus X11
- Solaris version 8 or higher

Image Source: https://media.smallbiztrends.com/2016/12/open-office.png

OpenOffice tools for creating documents

Parts of the main window

- Title Bar
- Control Buttons
- Menu Bar
- Tool Bar
- Status Bar

Image: https://img.brainkart.com/imagebk34/RuTbyaO.jpg

OpenOffice tools for creating documents

Working with documents

- Starting a new document
- Entering the Text
- Saving the Document
- Saving with password
- Closing a Document

Image: https://wiki.openoffice.org/w/images/thumb/9/9d/Saveas.png/500px-Saveas.png

OpenOffice tools for creating documents

Working with documents

- Closing Unsaved Document
- Opening an existing document
- Editing a document
- Deleting and renaming files
- Deleting a file
- Moving within a document

Image: https://wiki.openoffice.org/w/images/thumb/9/9d/Saveas.png/500px-Saveas.png

Working with documents

Starting a new document

You can also start a new document in one of the following ways:

- Use File > New and choose the type of document
- Press Control+N on the keyboard.
- Use File > Wizards for some types of documents.

Image: https://www.wikihow.com/images/thumb/3/3f/Use-OpenOffice.org-Writer-Step-2Bullet2.jpg/aid571139-v4-728px-Use-OpenOffice.org-Writer-Step-2Bullet2.jpg.webp

Working with documents

Entering the Text

- Once a new document is open, the text can be typed in blank area of the screen.
- As the text is typed they appear on the screen and the flashing vertical bar.

Image: https://www.inkubit.com/wp-content/uploads/2020/08/word-und-openoffice-im-vergleich-bild-2-1024x639.png

Working with documents

Saving the Document

- Click File -> Save , (or) File -> Save As (or) Ctrl + S
- Select location to store your document
- Type your document name in the File Name box
- click “Save” button

Image: https://img.brainkart.com/imagebk34/ecA1qn9.jpg

Working with documents

Saving with password

- click on “Save with Password” check box and then click “Save” button
- Enter a password and retype the same password
- Click “Confirm Password”
- click “OK” button

Image: https://img.brainkart.com/imagebk34/Ra2dcPS.jpg

Working with documents

Closing a Document

- After your document is saved
- File -> Close command (or) Press Ctrl + W.

https://img.brainkart.com/imagebk34/CjylYx2.jpg

Working with documents

Closing Unsaved Document

- When you close an unsaved file using the close control button, Writer shows a warning message

https://img.brainkart.com/imagebk34/CjylYx2.jpg

Working with documents

Opening an existing document

- To open an existing document, Click on the File -> Open or Ctrl + O, the Open dialog box appears, enter the name of the file in the File Name text box and click on OPEN button

https://wiki.openoffice.org/w/images/thumb/e/ed/WindowsOpen.png/500px-WindowsOpen.png

Working with documents

Deleting and renaming and moving files

- You can rename or delete files within the OpenOffice.org dialogs. It is not possible to copy and paste files within the dialogs.

https://opentextbc.ca/computerstudies/wp-content/uploads/sites/322/2020/11/Move-to-Screeshot.png

Page Preview, Setting the printer and Printing a document

Preview the document to be printed

- Click File -> Page Preview
- To close the preview click the Close Preview button

https://img.brainkart.com/imagebk34/4MkXDN8.jpg

Page Preview, Setting the printer and Printing a document

Setting the Printer and Printing

- Click File -> Print or Ctrl + P
- Click General Tab
- Select the required printer
- Specify Number of Copies using spin arrows.
- Click Print button.

https://img.brainkart.com/imagebk34/4MkXDN8.jpg

Open Office tools for creating spreadsheet

Introduction to spreadsheet

- Spreadsheet is use for calculate, graph, and analyze the information.

https://img.brainkart.com/imagebk34/gqWsgKo.jpg

Open Office tools for creating spreadsheet

Features of OpenOffice Calc

- Connecting with Excel
- AutoSum
- List AutoFill
- AutoFill
- Charts
- Databases
- Functions

https://www.openoffice.org/es/producto/pix/calc-big.png

Structure of a Spreadsheet

Creating a new worksheet

- Start -> All Programs ->OpenOffice -> OpenOffice Calc (or)
- Double-click on “OpenOffice” icon the desktop
- File -> New -> Spreadsheet

https://www.wikihow.com/images/thumb/7/7d/Learn-Spreadsheet-Basics-with-OpenOffice.org-Calc-Step-1.jpg/v4-460px-Learn-Spreadsheet-Basics-with-OpenOffice.org-Calc-Step-1.jpg.webp

Structure of a Spreadsheet

Parts of the OpenOffice Calc Window

- Title Bar
- Control Buttons
- Menu Bar
- Tools Bar
- Scroll bar
- Status bar

https://img.brainkart.com/imagebk34/RuTbyaO.jpg

Parts of the OpenOffice Calc Window

Title Bar

- The title bar is displayed at the top most part of the window, which displays the name of the document and the name of the application.

https://wiki.openoffice.org/w/images/5/51/Calc3-mainwindow.png

Parts of the OpenOffice Calc Window

Control Buttons

- In the right corner of title bar: minimize, maximize/restore and (3) close control buttons are available.

https://img.brainkart.com/imagebk34/PPypAbe.jpg

Parts of the OpenOffice Calc Window

Menu Bar

- The menu bar is just below the title bar which comprises of various menus consisting of various options.

https://img.brainkart.com/imagebk34/O5uOC27.jpg

Parts of the OpenOffice Calc Window

Tool Bar

https://img.brainkart.com/imagebk34/z1DLVq1.jpg

Under the menu bar, there are two toolbars available by default. They are:

- **Standard Toolbar**
- Formatting Toolbar

Parts of the OpenOffice Calc Window

Tool Bar

https://img.brainkart.com/imagebk34/RR6C4Ld.jpg

Under the menu bar, there are two toolbars available by default. They are:

- Standard Toolbar
- **Formatting Toolbar**

Parts of the OpenOffice Calc Window

Status Bar

- The status bar is at the bottom of the window which shows the current status of the document such as number of pages, current page number, default language etc.

https://img.brainkart.com/imagebk37/8hBvqK7.jpg

Structure of a Spreadsheet

Row, Column, Cell and Cell Pointer

- The worksheet has number of rows and columns.
- each column is labelled as A, B, C, D and rows are numbered from 1, 2, 3
- OpenOffice Calc version 4.1.5 contains 1024 columns and 10,48,576 rows.
- Intersection of each row and column makes a box which is called as “Cell”

https://img.brainkart.com/imagebk34/qbZdacA.jpg

Structure of a Spreadsheet

Worksheet tabs

- At the bottom of the grid of cells are the sheet tabs.
- When you open a new worksheet, sheet1 is the default active sheet.
- If you click on another sheet, it will become active and its color will turn white.
- To select multiple sheet select sheet and press Ctrl+Click.

https://img.brainkart.com/imagebk34/raYfVHv.jpg

Structure of a Spreadsheet

Worksheet tabs

On the left of the sheet tab, four navigation buttons are used to move between worksheets.

- Move to the First sheet
- Move to the previous sheet
- Move to Next sheet
- Move to the Last sheet

https://img.brainkart.com/imagebk34/IPuulWG.jpg

Working with Spreadsheet

Working with Data

- **“Tab key”** is used to move the cell pointer towards the right side .
- **“Shift+Tab”** is used to move backward.
- **“Enter”** key is also used to move the cell pointer.
- Four **“direction keys”** are used to move the cell pointer anywhere in the worksheet.

https://upload.wikimedia.org/wikipedia/commons/9/93/OpenOffice_Calc_4.0.png

Working with Data

Entering Data

1. Entering Number
2. Entering Text
3. Entering Date and Time

https://www.lifewire.com/thmb/rqQ0zO6Ii7DJKNdyWSJkxfFuv3k=/1600x870/filters:no_upscale():max_bytes(150000):strip_icc()/36-openoffice-calc-basic-spreadsheet-tutorial-599f0be867e9479f8773977cfbcc979e.jpg

Working with Spreadsheet

Copy, Cut and Paste – Spreadsheet

Copy and paste Data

- Select the cell or cells you want to copy
- Select Edit -> Copy or Click “Copy” icon from the standard toolbar or Press Ctrl +C
- Move the cell pointer to the cell in which you want to paste.
- Select Edit -> Paste or Click “Paste” icon or Press Ctrl + V

https://www.shorttutorials.com/openoffice-spreadsheet/images/paste.jpg

Working with Spreadsheet

Copy, Cut and Paste – Spreadsheet

Cut and Paste Data

- Select the cell or cells you want to cut
- Select Edit -> Cut or Click “Cut” icon from the standard toolbar or Press Ctrl + X
- Move the cell pointer to the cell in which you want to paste.
- Select Edit -> Paste or Click “Paste” icon or Press Ctrl + V

https://www.shorttutorials.com/openoffice-spreadsheet/images/paste.jpg

Working with Spreadsheet

Copy, Cut and Paste – Spreadsheet

Copy a formula from one cell and paste it in multiple cells

- Copy the formula from H2 using Ctrl + C
- Select all cells (i.e., H3 to H11) in which you want to paste this addition formula.
- Paste the copied formula using Ctrl + V or Edit -> Paste (or) Click “Paste” icon.

	A	B	C	D	E	F	G	H
1	Reg. No	Name	Tam	Eng	CS	Com	Acc	Tot
2	12001	Jayashree J	147	136	105	163	162	713
3	12002	Kowsalya T	156	148	149	147	179	779
4	12003	Muskan S	149	165	123	168	179	784
5	12004	Ashia Stephy R	168	144	146	192	167	817
6	12005	Vennila T P	199	198	150	200	200	947
7	12006	Deepika M	187	141	98	130	178	734
8	12007	Tharani J	165	102	100	192	192	751
9	12008	Thulasi A	143	169	88	176	173	749
10	12009	Ayisha B	120	138	109	182	167	716
11	12010	Jenifer A	145	135	95	180	185	740
12								

https://img.brainkart.com/imagebk34/ceZsIOh.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Columns

- Select the column where a new column should be inserted
- Right-click on the selected column name that you selected. A pop-up menu appears.
- click the “Insert Columns” option from the menu.

https://img.brainkart.com/imagebk34/NDHDYwR.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Columns

- A new column can also be inserted using Insert -> Column’s command.

https://img.brainkart.com/imagebk34/NDHDYwR.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Rows

- Select the row where a new row to be inserted.
- Right-click on the row number, a pop-up menu appears
- click “Insert Rows” option from the menu.

https://img.brainkart.com/imagebk34/26kerh2.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Rows

- A new row can also be inserted using Insert -> Rows

https://img.brainkart.com/imagebk34/g0pJCCq.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Cells

- To insert a new cell between two existing cells, just right-click on any existing cell
- From the pop-up menu, select “Insert” option
- The “Insert Cells” dialog box appear with four options

i. Shift cells down
ii. Shift cells right
iii. Entire row
iv. Entire Column

https://img.brainkart.com/imagebk34/d0pFgWE.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Cells

- To insert a new cell between two existing cells, just right-click on any existing cell
- From the pop-up menu, select “Insert” option
- The “Insert Cells” dialog box appear with four options

i. Shift cells down
ii. Shift cells right
iii. Entire row
iv. Entire Column

https://img.brainkart.com/imagebk34/d0pFgWE.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting multiple columns or rows

Multiple columns or rows can be inserted at once rather than inserting one at a time.

- Select multiple rows or columns for insertion.

https://img.brainkart.com/imagebk34/NDHDYwR.jpg

Inserting Columns, Rows and Cells – Spreadsheet

Inserting Columns, Rows and Cells using “Insert Cells” Toolbar

- Click View -> Toolbars -> Insert Cell

https://img.brainkart.com/imagebk34/kLsTJ3z.jpg

Working with Spreadsheet

Deleting columns and rows - Spreadsheet

- Delete single column or row.
- Delete multiple columns or rows.

https://img.brainkart.com/imagebk34/Hab10Nr.jpg

Save, Close and Open the Worksheet

Saving Worksheet

- File -> Save (or) Ctrl + S (or) Click “Save”
- If the file has not been saved previously, the Save As dialog box will appear.
- Give “File Name”.
- Click “Save” button.

https://img.brainkart.com/imagebk34/kJIIW7N.jpg

Save, Close and Open the Worksheet

Closing a Worksheet

- File -> Close command (or) Press Ctrl + W.

https://img.brainkart.com/imagebk34/kJIIW7N.jpg

Save, Close and Open the Worksheet

Opening an existing worksheet

- File → Open command (or) “Open” icon (or) Ctrl + O

https://img.brainkart.com/imagebk34/weTQMdS.jpg

Creating Formulae – Spreadsheet

Creating Formulae

- Operators
- Construction of formula

K7 | f(x) Σ = =Branch1.K7+Branch2.K7+Branch3.K7

	A	K	L	M	N
2	Flowering Abundantly, Ltd.				
3	Combined Sales YTD				
4					
5		Oct	Nov	Dec	YTD
6	Revenue:				
7	Greenery Sales	167,890	169,388	285,693	4,279,995
8	Fertilizer Sales	126,488	39,065	21,164	2,383,984
9	Earth Sales	120,069	34,107	15,676	879,163
10	Sub-Total	414,447	242,560	322,533	7,543,142
11					
12	Cost of Sales:				
13	Wholesaler Purchases	140,912	82,470	109,661	2,564,668
14	Sales Tax	45,589	26,682	35,479	829,746
15	Sub-Total	186,501	109,152	145,140	3,394,414
16					
17	Total Revenue:	227,946	133,408	177,393	4,148,728
18					
19	Expenses:				

Branch1 | Branch2 | Branch3 | Combined

https://wiki.openoffice.org/w/images/1/1a/CG3Ch3F14d.png

Creating Formulae

Operators

i. **Arithmetic Operators**
ii. Relational Operators
iii. Reference Operators
iv. Text Operator

Operator	Name	Value in Column B	Value in Column C	Formula in Column D	Result in Column D Operator
+	Addition	98	25	= B3 + C3	123
-	Subtraction	125	25	= B3 – C3	100
*	Multiplication	25	5	= B3 * C3	125
/	Division	90	10	= B3 / C3	9
^	Exponent	25	2	= B3 ^ C3	625
%	Percent	600		= B3 * 35%	72
Percentage (%) operator shows percentage of the content.					

https://img.brainkart.com/imagebk34/9csFCzE.jpg

Creating Formulae

Operators

i. Arithmetic Operators
ii. Relational Operators
iii. Reference Operators
iv. Text Operator

Operator	Name	Value in Column B	Value in Column C	Formula in Column D	Result in Column D
>	Greater than	98	100	=B3>C3	FALSE
>=	Greater than or equal to	85	72	=B3>=C3	TRUE
<	Less than	54	24	=B3<C3	FALSE
<=	Less than or equal to	55	55	=B3<=C3	TRUE
=	Equal to	12	12	=B3=C3	TRUE
<>	Not equal to	54	45	=B3<>C3	TRUE

https://img.brainkart.com/imagebk34/e7frlNi.jpg

Creating Formulae

Operators

i. Arithmetic Operators
ii. Relational Operators
iii. Reference Operators
iv. Text Operator

https://img.brainkart.com/imagebk34/ZrOVphS.jpg

Creating Formulae

Operators

i. Arithmetic Operators
ii. Relational Operators
iii. Reference Operators
iv. Text Operator

https://img.brainkart.com/imagebk34/4z7Lh1I.jpg

Creating Formulae

Construction of formula

- Formula should begin with an = sign.
- = cell reference1 <operator> cell reference2 <operator> …….

	A	B	C	D	E	F	G	H
1	Reg. No	Name	Tam	Eng	CS	Com	Acc	Tot
2	12001	Jayashree J	147	136	105	163	162	713
3	12002	Kowsalya T	156	148	149	147	179	
4	12003	Muskan S	149	165	123	168	179	
5	12004	Ashia Stephy R	168	144	146	192	167	
6	12005	Vennila T P	199	198	150	200	200	
7	12006	Deepika M	187	141	98	130	178	
8	12007	Tharani J	165	102	100	192	192	
9	12008	Thulasi A	143	169	88	176	173	
10	12009	Ayisha B	120	138	109	182	167	
11	12010	Jenifer A	145	135	95	180	185	

https://img.brainkart.com/imagebk34/dlB1grO.jpg

Functions - Spreadsheet

Inserting Functions into Worksheet

https://img.brainkart.com/imagebk34/ramRQqZ.jpg

Direct Insert method

- SUM (range 1; range 2; range 3…… range n)

Functions - Spreadsheet

Inserting Functions into Worksheet

https://img.brainkart.com/imagebk34/ajcHnGW.jpg

Using Function Wizard method

- Insert -> Function (or) Ctrl + F2

Formatting Worksheet – Spreadsheet

Text Formatting

Making the cell contents as bold, italics, underlined, changing font style, size, colour etc

https://img.brainkart.com/imagebk34/hDWGpop.jpg

Formatting Worksheet – Spreadsheet

Text Formatting

Number formatting options are used to visually change the format of a numeric content

https://img.brainkart.com/imagebk34/rNkLlHz.jpg

Formatting Worksheet – Spreadsheet

Text Formatting

Number formatting options are used to visually change the format of a numeric content

https://img.brainkart.com/imagebk34/rNkLlHz.jpg

Working with Chart – Spreadsheet

Chart Wizard

https://img.brainkart.com/imagebk34/9RUqLW8.jpg

Steps

- Chart type
- Data Range
- Data Series
- Chart Elements.

Chart Wizard

Chart type

This step use to select Chart type under the "Choose a chart type" list box

- Select Chart type
- Select chart style.
- Click, "Next" button.

https://img.brainkart.com/imagebk34/pjrCQ35.jpg

Chart Wizard

Data Range

This step Specify the range of data for which the chart should be created

- Click “Select data range”.
- There are two checkboxes used to set the first row or first column or both, as X and Y axis labels to the chart.
- Click "Next" button to move to the third step.

https://img.brainkart.com/imagebk34/j21BZTL.jpg

Chart Wizard

Data Series

https://img.brainkart.com/imagebk34/DMIDX2P.jpg

In this step, the user can fine tune the data to be included in the chart.

- To add some more columns click “Add” button.
- To remove columns click “Remove” button.
- Click “Next” button to move the last step.

Chart Wizard

Chart Element

This step is used to insert or change titles and legend.

- In “Title” box, type the title for the chart.
- To add a subtitle type it in the “Subtitle” box.
- User can add or modify the labels of X and Y axis.
- To create a chart, click “Finish” button.

https://img.brainkart.com/imagebk34/DMIDX2P.jpg

Working with Chart – Spreadsheet

Editing Chart elements

After inserting a chart any element of the chart can be modified. To modify the element

a. Double click on the element
b. Right click on the selected element
c. Select Format from the popup menu.

https://img.brainkart.com/imagebk34/O3mltu2.jpg

Structure of Presentation

Opening a new presentation

- To open impress click Start button and select All Programs -> Open Office -> OpenOffice Impress.

https://img.brainkart.com/imagebk34/hmXOjMx.jpg

Structure of Presentation

Creating a new presentation

You can create a presentation by any one of the following methods.

i. By selecting an Empty presentation
ii. By selecting from template
iii. By selecting from Open existing presentation

https://img.brainkart.com/imagebk34/RCxsLNt.jpg

Creating a new presentation

Using Empty presentation

- Select Empty presentation under Type.
- Click Next, Choose a design under Select a slide design
- Click Next, click an item to see a preview of the transition.
- Select how the presentation will be Speed drop-down menu.
- Click Create, A new presentation is created

https://img.brainkart.com/imagebk34/7U1S8sf.jpg

Creating a new presentation

Using Template

If you choose the option from template, it uses a template design already created as the basis for a new presentation. The wizard changes to show a list of available templates. Choose the template that you want.

https://img.brainkart.com/imagebk34/ynIHqs9.jpg

Creating a new presentation

Using Open existing presentation

- If you choose the option Open existing presentation, it helps in continuing the work on a previously created presentation.
- You have to open a presentation already prepared by clicking Open button. The wizard changes to show a list of existing presentations, from which you can choose the one that you want.

https://img.brainkart.com/imagebk34/Uu8FTVW.jpg

Structure of presentation

Parts of the main Impress window

The main Impress window has three parts:

i. Slides pane
ii. Workspace
iii. Task pane.

Additionally, several toolbars can be displayed or hidden during the creation of a presentation.

https://wiki.openoffice.org/w/images/thumb/d/dd/IG1-1.png/500px-IG1-1.png

Parts of the main Impress window

Slides pane

- The Slides pane contains thumbnail pictures of the slides in your presentation, in the order of our insertion of slides.

- https://img.brainkart.com/imagebk34/OsL0cuW.jpg

Parts of the main Impress window

Tasks pane

https://wiki.openoffice.org/w/images/thumb/d/dd/IG1-1.png/500px-IG1-1.png

- The Tasks pane has five sections:

i. Master Pages
ii. Layout
iii. Table Design
iv. Custom Animation
v. Slide Transition

Structure of presentation

Window elements of Impress

The window elements of Impress includes: Title Bar, Menu Bar, Tool Bar, Ruler Bar which are similar to the elements in Open Office writer.

- View Buttons
- Status Bar
- Navigator

https://img.brainkart.com/imagebk34/Nw6cNac.jpg

Working with Presentation

Workspace

The Workspace has five tabs:

i. Normal
ii. Outline
iii. Notes
iv. Handout
v. Slide Sorter

These five tabs are called View Buttons

The actual Workspace section is below the View Buttons

https://img.brainkart.com/imagebk34/Nw6cNac.jpg

Working with Presentation

Formatting a presentation

i. Creating the first slide
ii. Inserting additional slides
iii. Deleting a Slide
iv. Rearranging slides

https://wiki.openoffice.org/w/images/thumb/8/85/ImpressMainWindow.png/500px-ImpressMainWindow.png

Formatting a presentation

Creating the first slide

- The first slide is normally a title slide Decide the layout as per its purpose of presentation.
- You can select a layout in the Layout section of the Tasks pane by clicking on it.

https://img.brainkart.com/imagebk34/n7wbHaV.jpg

Formatting a presentation

Inserting additional slides

- Insert a new slide. This can be done in a variety of ways.

i. Insert -> Slide.
ii. Right-click on the present slide, and select Slide -> New Slide
iii. Click the Slide icon in the Presentation toolbar

- Select the layout slide that best fits your needs.
- Modify the elements of the slide.

https://img.brainkart.com/imagebk34/pkBR8GI.jpg

Formatting a presentation

Deleting a Slide

You can delete a slide at any time using the following procedure.

- Select the slide you want to delete
- Click Edit
- Delete slide
- Or else, right click the slide and choose Delete slide

https://img.brainkart.com/imagebk34/SEhh9AL.jpg

Formatting a presentation

Rearranging slides

- Select the slide that you want to rearrange.
- Drag that slide to the desired position by holding the mouse using left click.
- Release the mouse once you drag the slide to the desired place.

https://img.brainkart.com/imagebk34/sq6L4Tj.jpg

Working with presentation

Running the slide show

To run the slide show, do one of the following:

- Click Slide Show -> Slide Show on the main menu bar
- Click the Slide Show button
- Press F5 or F9
- To exit the slide show, press the Esc key

https://img.brainkart.com/imagebk34/LLqz6RR.jpg

Working with presentation

Saving a Presentation

To save the presentation, do one of the following:

- Click File -> Save
- Give file name
- Click Save

https://img.brainkart.com/imagebk34/WCWQSaR.jpg

Creating Graphic Objects – Presentation

Inserting images - presentation

- To insert Image place the cursor in the place where you want the image to be inserted. Then, Click Insert -> select Picture From file.

https://img.brainkart.com/imagebk34/5C5ra5E.jpg

Creating Graphic Objects – Presentation

Inserting audio and video

- The audio and movie files can be inserted by clicking Insert Movie and Sounds Option from the Insert menu.
- Select the audio or movie file form the specified location and open.

https://img.brainkart.com/imagebk34/5C5ra5E.jpg

Familiarization with PC Management

(3 hours)

In this section, we will discuss:

- Disk management
- Task scheduler
- Even viewer
- Device manager
- Shared folders
- Services and applications
- Virus and Antivirus
- Using different types of firewalls -pocket firewalls, State-full firewalls, Application layer firewalls and Proxy firewalls

Familiarization with Disk management

Introduction

- Disk Management is a Microsoft Windows utility first introduced in Windows XP as a replacement for the fdisk command. It enables users to view and manage the disk drives installed in their computer and the partitions associated with those drives.

Image Source:https://www.computerhope.com/issues/pictures/win10-disk-management.jpg

Familiarization with Disk management

How to Open Disk Management

Way1: The easiest way to open Disk Management in Windows 10 is from computer Desktop.

- Right click on Start Menu (or press Windows+X hotkey) and then select "Disk Management".

Image Source: https://www.diskpart.com/windows-10/images/windows-10-disk-management/open-disk-management-windows-10.jpg

Familiarization with Disk management

How to Open Disk Management

Way2: Use Windows+R hotkey to open Run window. Then type "Diskmgmt.msc" and click "OK" or hit "Enter" key.

https://www.diskpart.com/windows-10/images/windows-10-disk-management/open-disk-management-from-run.jpg

Familiarization with Disk management

How to Open Disk Management

Way 3: Directly type "disk management" in the Search box and choose "Create and format hard disk partitions" from the results.

https://www.diskpart.com/windows-10/images/windows-10-disk-management/search-disk-management.jpg

Familiarization with Disk management

How to Use Disk Management

Disk Management has two main sections—a top and a bottom:

- The top section contains a list of all the partitions, formatted or not, that Windows recognizes.
- The bottom section contains a graphical representation of the physical drives installed in the computer.

https://www.isunshare.com/images/article/windows-8/access-disk-management-in-windows-8/find-disk-management.png

Familiarization with Disk management

How to Partition a Hard Drive

- Open Disk Management the tool included in all versions of Windows that lets you partition drives, among a number of other things.

https://www.lifewire.com/thmb/0UXXUZDix55KTmmwa4fGJYgxmtE=/1227x884/filters:no_upscale():max_bytes(150000):strip_icc()/009_how-to-partition-a-hard-drive-2626081-5c82c5dc46e0fb0001cbf4cc.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- When Disk Management opens, you should see an Initialize Disk window with the message "You must initialize a disk before Logical Disk Manager can access it.
- Choose a partition style for the new hard drive
- Locate the hard drive where you want to partition.

https://www.lifewire.com/thmb/CDl9e9ow0Ra_ULfQ83rnJpWb9sQ=/1007x672/filters:no_upscale():max_bytes(150000):strip_icc()/001_how-to-partition-a-hard-drive-2626081-5c82ad7c4cedfd000190b160.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Once you've found the space tap-and-hold or right-click anywhere on it, and choose New Simple Volume.

https://www.lifewire.com/thmb/ATQst9QBPgZEWXtUMWrYBmTB2gI=/1126x697/filters:no_upscale():max_bytes(150000):strip_icc()/002_how-to-partition-a-hard-drive-2626081-5c82c62d46e0fb00010f10b6.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Choose Next > on the New Simple Volume Wizard window

https://www.lifewire.com/thmb/9zHKG3FGCmO-8EWWoPh1VUagwdg=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/003_how-to-partition-a-hard-drive-2626081-5c82adb846e0fb0001a0be31.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Choose Next > on the Specify Volume Size step to confirm the size of the drive you're creating.

https://www.lifewire.com/thmb/4xtocdwN00p2tsp4W0rKb7JyyQs=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/004_how-to-partition-a-hard-drive-2626081-5c82add546e0fb0001a0be33.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Select Next > on the Assign Drive Letter or Path step.

https://www.lifewire.com/thmb/m5ghUv2ipi2RYEJ4mSQoAifE2Us=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/005_how-to-partition-a-hard-drive-2626081-5c82adf64cedfd000190b164.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Choose Do not format this volume on the Format Partition step, and then select Next >.

https://www.lifewire.com/thmb/2C8NQOgm8E61SFgnXYQ0kYFadlU=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/006_how-to-partition-a-hard-drive-2626081-5c82ae1c46e0fb000113662e.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Verify your choices on the Completing the New Simple Volume Wizard screen
- Choose Finish and Windows will partition the drive.

https://www.lifewire.com/thmb/E7Jh6NzEHjBl23UqxyZjhe0UHJQ=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/007_how-to-partition-a-hard-drive-2626081-5c82ae48c9e77c0001a3e4f4.jpg

Familiarization with Disk management

How to Partition a Hard Drive

- Next, Windows will try to open the new drive automatically.
- you'll see this message instead: **"You need to format the disk in drive F: before you can use it.** Do you want to format it?“
- Select Cancel

https://www.lifewire.com/thmb/kyLqh1cebh2m014peEIavGBvS40=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/008_how-to-partition-a-hard-drive-2626081-5c82ae75c9e77c0001a6761a.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- Open Disk Management, the hard drive manager included with all versions of Windows.

https://www.lifewire.com/thmb/BAfcDsXhVa_FevvK8x6qelrTVFU=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/001_how-to-format-a-hard-drive-2626077-5c3e8296c9e77c0001323453.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- After Disk Management opens, which might take several seconds, look for the drive you want to format from the list at the top. There's a lot of information in Disk Management, so if you can't see everything, maximize the window.

https://www.lifewire.com/thmb/ZbPAraYUOebfV10OtPmq_TdKvno=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/002_how-to-format-a-hard-drive-2626077-5c3e82adc9e77c00012a04ab.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- If you don't see the drive listed on the top or an Initialize Disk window appears, it probably means that the hard drive is new and has not yet been partitioned. Partitioning is something that must be done before a hard drive is formatted.

https://www.lifewire.com/thmb/CnaftQSECOW9KiWCp7RXrnc16Ew=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/003_how-to-format-a-hard-drive-2626077-5c3e82c6c9e77c00019f8939.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- The first of several formatting details which we'll cover over the next several steps is the volume label, which is essentially a name given to the hard drive.
- In the Volume label textbox, enter whatever name you'd like to give to the drive.

https://www.lifewire.com/thmb/ULWAd0M1yuZoE5D760-eSQNA5Is=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/004_how-to-format-a-hard-drive-2626077-5c3e82e2c9e77c00016ee2c0.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- Next up is the file system choice. In the File system textbox, choose NTFS.

https://www.lifewire.com/thmb/FXk--js9sw3JIIMXp-3BwFAdor4=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/005_how-to-format-a-hard-drive-2626077-5c3e8301c9e77c00012a16e7.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- In the Allocation unit size textbox, choose Default. The best allocation size based on the size of the hard drive will be chosen.

https://www.lifewire.com/thmb/LLEq6hLThS5AjOLYd_bZW7qNtKY=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/006_how-to-format-a-hard-drive-2626077-5c3e831cc9e77c0001a9258c.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- Next Click on “Perform a quick format checkbox”.

https://www.lifewire.com/thmb/Y_A6WN76uQO48YbmuinItp5fOFc=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/007_how-to-format-a-hard-drive-2626077-5c3e833a46e0fb0001aa2acc.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- The final format option is the Enable file and folder compression setting that is unchecked by default, which we recommend sticking with.

https://www.lifewire.com/thmb/9jJpxH6DWXVuIkfUpJ92Or9hyhk=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/008_how-to-format-a-hard-drive-2626077-5c3e835dc9e77c0001325f39.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- Review the settings you've made in the last several steps and then click OK.

Familiarization with Disk management

How to Format A Hard Drive in Windows

- Windows is usually pretty good about warning you before you might do something damaging, and a hard drive format is no exception.

https://www.lifewire.com/thmb/JVNJP4Vd-JCpYjgdOHCkCIfHtSs=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/010_how-to-format-a-hard-drive-2626077-5c3e846dc9e77c0001329a59.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- The hard drive format has begun! You can check the progress by watching the Formatting

https://www.lifewire.com/thmb/BptGPHyWzUy_bgo4qjV0kEnN84Y=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/011_how-to-format-a-hard-drive-2626077-5c3e848b46e0fb0001526cb5.jpg

Familiarization with Disk management

How to Format A Hard Drive in Windows

- That's it! Your hard drive has been formatted and it's ready for use in Windows.

https://www.lifewire.com/thmb/hQxcswELoqi-45n_usnJnbjniv4=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/013_how-to-format-a-hard-drive-2626077-5c3e84c4c9e77c00019ff4b4.jpg

Task scheduler

How to create an automated task using Task Scheduler on Windows

1. Windows Scheduler helps you automate your work.

- Task Scheduler works by keeping tabs of the time and events on your computer and executes the task as soon as the condition is met.

https://www.windowscentral.com/sites/wpcentral.com/files/styles/xlarge/public/field/image/2019/01/create-task-automation-task-scheduler-windows-10.jpg

Task scheduler

How to create a basic task using Task Scheduler

2. Select the Task Scheduler app from start window.

- Right click on Task Scheduler Library in the left navigation tree, and select New Folder.

https://www.lifewire.com/thmb/RNr_fUghjXvgPXXBHN09JdEOcCA=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A1-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-78bd399f1e1143e6a7ed82e03e00b340.jpg

Task scheduler

How to create a basic task using Task Scheduler

3. Give the folder a name like "My Tasks" and select OK.

https://www.lifewire.com/thmb/kNhis6PP_2niv800XyA9en31jTQ=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A3-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-e35ab416d0c64fdda282e0692d84b1a2.jpg

Task scheduler

How to create a basic task using Task Scheduler

4. Select the new folder you've created. In the Actions navigation bar on the right, select Create Basic Task. This will open the Create Basic Task Wizard. Type a name for the task in the Name field. Select Next to continue.

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Task scheduler

How to create a basic task using Task Scheduler

5. The next step of the wizard is to choose a trigger for your task. You can choose one of the time intervals, or one of the system events. In this example, we'll select Daily. Select Next to continue.

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Task scheduler

How to create a basic task using Task Scheduler

6. The next step is to fine tune the interval trigger. In this case we'll set the trigger to happen at 8 AM every day, starting today. Set the recurrence to every 1 day. Select Next to continue

https://www.lifewire.com/thmb/l3vbtXCxQnvw7CF_fo2iSKmKsMY=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A6-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-57456959f53c4477a0bdeb1e3392d041.jpg

Task scheduler

How to create a basic task using Task Scheduler

7. The next step is to set up the Action for the task. In this case, select Start a Program and then select Next.

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Task scheduler

How to create a basic task using Task Scheduler

8. Select the Browse button and browse to Chrome which should be located at "C:\Program Files (x86) \Google\Chrome\Application\". The file name is chrome.exe. Once you browse to the file, select it and select Open. Select Next to continue

https://www.lifewire.com/thmb/FYhWIuRaosRiGaad8ra-IBVw7CI=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A8-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-315d4492766344d78d151a7c16628b6d.jpg

Task scheduler

How to create an advanced task using Task Scheduler

9. On the Finish tab of the Wizard, you'll see the Trigger status and Action you've created. Select Finish to close the Basic Task wizard.
10. You'll see your new task in the main pane in the Task Scheduler window. You can right click the task and select Run

https://www.lifewire.com/thmb/PSVOXzQ1-CLIpEFu3T9s09jGxBg=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A9-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-af9aa5e1784c4c2aa018ea76bbaf4193.jpg

Task scheduler

How to create a basic task using Task Scheduler

- Go to Task Scheduler window, select Create Task in the right navigation pane.
- On the General tab, type a name for your task in the Name field.
- On the Triggers tab, select New, select Monthly, select all months in the Months dropdown and set the Days dropdown to 30 for the end of the month. Make sure Enabled is selected. Select OK.

https://www.lifewire.com/thmb/FnMJ5Ebj5rcHcw-_dTgR_ylfOWg=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/A3-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-7b1371ad86014c54bb89c4e41ae7adba.jpg

Task scheduler

How to create a basic task using Task Scheduler

- On the Actions tab, select New. Select Start a program in the Action dropdown. Select the Browse button and browse to the Word executable at "C:\Program Files\Microsoft Office\root\Office16\". The file name is winword.exe. Once you browse to the file, select it and select Open. Select OK.

https://www.lifewire.com/thmb/pBtrLJyv4M17FdT3or9hYBYcHHI=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/B4-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-ac753d42c0104558b56221eb19fa503f.jpg

Task scheduler

How to create a basic task using Task Scheduler

- On the Conditions tab, configure your task to run.
- On the Settings tab, configure your task.
- Once you're done setting up all of the task tabs, select OK to finish. You'll see the task appear in the main Task Scheduler window.

https://www.lifewire.com/thmb/1Hd1QceJxjuMNA_BqO8SdbspUQE=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/B6-CreateanAutomatedTaskwithWindows10TaskScheduler-annotated-4dcf01a5683043a4a801234548c83806.jpg

Task scheduler

How to run, edit, and delete a task using Task Scheduler

- Open Start, Search Task Scheduler, click to open the experience.
- Expand the Task Scheduler Library.
- Select the folder with your tasks.
- To run a task right-click it and select the Run option.
- To edit a task, right-click it and select the Properties options.
- To delete a task, right-click it and select the Delete option.

https://i0.wp.com/techdirectarchive.com/wp-content/uploads/2020/04/screenshot-2020-04-02-at-16.30.42.png?resize=478%2C316&ssl=1

Even viewer

Definition

- The Windows Event Viewer is an administrative tool found in all versions of Windows. It allows you to view events, errors, and additional important information about what's happening under the hood in your operating system.

https://www.computerhope.com/jargon/e/eventviewer-win10.jpg

Opening the Event Viewer

Open it by search

- Type event in the search box on taskbar and choose View event logs in the result.

https://www.isunshare.com/images/article/windows-10/6-ways-to-open-event-viewer-in-windows-10/type-event-and-tap-view-event-logs.png

Opening the Event Viewer

Turn on Event Viewer via Run

- Press Windows+R to open the Run dialog, enter eventvwr (or eventvwr.msc) and hit OK

https://www.isunshare.com/images/article/windows-10/6-ways-to-open-event-viewer-in-windows-10/enter-eventvwr-and-hit-ok.png

Opening the Event Viewer

Turn on Event Viewer via Run

- Open Command Prompt, type eventvwr and press Enter

https://www.isunshare.com/images/article/windows-10/6-ways-to-open-event-viewer-in-windows-10/type-eventvwr-and-press-enter.png

Opening the Event Viewer

Open Event Viewer in Control Panel

- Access Control Panel, enter event in the top-right search box and click View event logs in the result.

https://www.isunshare.com/images/article/windows-10/6-ways-to-open-event-viewer-in-windows-10/open-event-viewer-in-control-panel.png

Opening the Event Viewer

Open it in This PC

- Open This PC, type event viewer in the search box on the top-right corner, and then double-click Event Viewer in the list.

https://www.isunshare.com/images/article/windows-10/6-ways-to-open-event-viewer-in-windows-10/open-event-viewer-in-this-pc.png

Device manager

What Is Device Manager

- Device Manager is used to manage the hardware devices installed in a computer like hard disk drives, keyboards, sound cards, USB devices, and more.

https://www.lifewire.com/thmb/_uKM1QCadzk06CvvYR2AK03d7FY=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/device-manager-101f5f25854b46b9811278cc4608632f.png

Device manager

How to Access Device Manager

- Device Manager can be accessed in several different ways in all versions of Windows, most commonly from the Control Panel, the Command Prompt, or Computer Management.
- Device Manager can also be opened through the command-line or Run dialog box with a special command.

https://www.lifewire.com/thmb/c4VGe_uuVYKcTF-nRFXX1x_MMm8=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/device-manager-windows-10-start-menu-d6c9d5b991144df488027d2e439f3858.png

Device manager

How to Use Device Manager

- Device Manager lists devices in separate categories so that it's easier to find what you're looking for. You can expand each section to see which devices are listed inside. Once you find the right hardware device, double-click it to see more information like its current status, driver details, or in some cases its power management options.

https://www.lifewire.com/thmb/GXa_TZB89Phc5hH7OafO2Uhoo28=/650x0/filters:no_upscale():max_bytes(150000):strip_icc():format(webp)/device-manager-code-22-7a1e74f0662240f18ee19c5efa22b01a.png

Shared folders

Share files or folders over a network

- Right-click or press a file, select Give access to > Specific people.
- Select a file, select the Share tab at the top of File Explorer, then in the Share with section select Specific people.

https://support.content.office.net/en-us/media/4436f313-6596-0ace-52dc-d04d96fa0257.png

Shared folders

Stop sharing files or folders

- Right-click or press a file or folder, then select Give access to > Remove access.
- Select a file or folder, select the Share tab at the top of File Explorer, and then in the Share with section select Remove access.

https://support.content.office.net/en-us/media/75a38268-1dcd-7258-5dbf-45c0776a7a08.png

Services and applications

Definition of services

- A Windows service is an application that usually serves a core operating system function running in the background and has no user interface.

https://2.bp.blogspot.com/-BLD7zBOXjas/VNHsTZHZSOI/AAAAAAAAGjk/dAI8wBhiZ5U/s1600/openoffice-service2.PNG

Services and applications

Definition of application

- A program that is written to run under the Microsoft Windows operating system, also called a "Windows app." All 32-bit Windows applications run in the 32-bit and 64-bit versions of Windows. All 64-bit applications require 64-bit Windows, which is the standard on new Windows computers and tablets.

https://2.bp.blogspot.com/-BLD7zBOXjas/VNHsTZHZSOI/AAAAAAAAGjk/dAI8wBhiZ5U/s1600/openoffice-service2.PNG

Virus and its type and Antivirus

Definition of VIRUS

- A computer virus is a program which can harm our device and files and infect them for no further use. When a virus program is executed, it replicates itself by modifying other computer programs and instead enters its own coding.

https://miro.medium.com/max/624/1*0fBUSoM_Oigllf786MPoGA.png

Virus and its type and Antivirus

Types of Computer Virus

- Boot Sector Virus.
- Direct Action Virus.
- Resident Virus.
- Multipartite Virus.
- Overwrite Virus
- Polymorphic Virus

https://cdn.ttgtmedia.com/rms/onlineimages/security-computer_virus-f_mobile.png

Virus and its type and Antivirus

Types of Computer Virus

- File Infector Virus
- Space filler Virus
- Macro Virus

https://cdn.ttgtmedia.com/rms/onlineimages/security-computer_virus-f_mobile.png

Virus and its type and Antivirus

What Causes Computer Viruses

The delivery of a computer virus can happen in several ways.

- One common method is via a phishing email.
- Another technique is hosting malware on a server that promises to provide a legitimate program.
- It can be delivered using macros or by injecting malicious code into legitimate software files.

https://intersys.co.uk//wp-content/uploads/2018/11/Computer_Malware.jpg

Virus and its type and Antivirus

What Is a Computer Worm

- A computer worm is malware, just like a virus, but a worm takes a copy of itself and propagates it to other users. Worms can also deliver a payload and exhaust resources.

https://blog.emsisoft.com/wp-content/uploads/2017/07/malware-worms-blog-banner.png

Virus and its type and Antivirus

What Does a Computer Virus Do

- The way a computer virus acts depends on how it’s coded. It could be something as simple as a prank that doesn’t cause any damage, or it could be sophisticated, leading to criminal activity and fraud.
- Many viruses only affect a local device, but others spread across a network environment to find other vulnerable hosts.

https://enterprise.comodo.com/images/what-does-a-malware-virus-do.png

Virus and its type and Antivirus

Symptoms of Computer Virus

- Malware authors write code that is undetectable until the payload is delivered. However, like any software program, bugs could present issues while the virus runs.

https://image.slidesharecdn.com/computerviruses-140131070746-phpapp02/95/computer-viruses-7-638.jpg?cb=1391152119

Virus and its type and Antivirus

Examples of Computer Virus

- The web contains millions of computer viruses, but only a few have gained popularity and infect record numbers of machines. Some examples of widespread computer viruses include:
- Morris Worm
- Nimda
- ILOVEYOU

https://hightouchtechnologies.com/wp-content/uploads/images/services/security-solutions/computer-viruses.png

Virus and its type and Antivirus

Examples of Computer Virus

- SQL Slammer
- Stuxnet
- CryptoLocker
- Conficker
- Tinba
- Welchia
- Shlayer

https://hightouchtechnologies.com/wp-content/uploads/images/services/security-solutions/computer-viruses.png

Virus and its type and Antivirus

How to Prevent Computer Viruses

- Install antivirus software
- Don’t open executable email attachments.
- Keep your operating system updated
- Avoid questionable websites
- Don’t use pirated software

https://cdn.redshift.autodesk.com/2014/04/How_To_Prevent_Malware_Secure_Network_2021.jpg

Virus and its type and Antivirus

What is an Anti-Virus

- Antivirus is a program that helps to secure various systems by scanning, detecting and removing viruses, malware, computer worms, and so on.

https://observer.com/wp-content/uploads/sites/2/2021/02/best-antivirus.jpg?quality=80

Virus and its type and Antivirus

Different types of software

- Cloud-Based Software
- Standalone Software
- Security Software Suites

https://images.slideplayer.com/19/5901606/slides/slide_6.jpg

Virus and its type and Antivirus

What Does AntiVirus Software Do

- Scan specific files or directories for any malware or known malicious patterns
- Allow you to schedule scans to automatically run for you
- Allow you to initiate a scan of a particular file or your entire computer, or of a CD or flash drive at any time.

http://www.hackingtutorials.org/wp-content/uploads/2016/04/how-does-antivirus-software-work-artwork.jpg

Virus and its type and Antivirus

What Does AntiVirus Software Do

- Remove any malicious code detected – sometimes you will be notified of an infection and asked if you want to clean the file, other programs will automatically do this behind the scenes.
- Show you the ‘health’ of your computer.

http://www.hackingtutorials.org/wp-content/uploads/2016/04/how-does-antivirus-software-work-artwork.jpg

Virus and its type and Antivirus

What are the Benefits of Antivirus Software

- Antivirus solutions protect more than just laptops, office computers, smartphones and tablets.
- They protect precious memories, music and photo libraries, and important documents from destruction by malware.

https://i1.wp.com/www.rrstech.in/wp-content/uploads/2020/02/Quick-heal-total-security-provider-nangloi-delhi.jpg

Virus and its type and Antivirus

How Does Antivirus Software Work

- Many antivirus software programs still download malware definitions straight to your device and scan your files in search of matches.
- But since, as we mentioned, most malware regularly morphs in appearance to avoid detection, Webroot works differently.

https://i.ytimg.com/vi/1_rXO2Es5B8/maxresdefault.jpg

Using different types of firewalls

What Is Firewall

- A firewall is a network security device that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules.

https://static.javatpoint.com/tutorial/firewall/images/what-is-firewall-1.png

Using different types of firewalls

Types of Firewalls

- There are multiple types of firewalls based on their traffic filtering methods, structure, and functionality.

https://static.javatpoint.com/tutorial/firewall/images/types-of-firewall.png

Using different types of firewalls

How Does a Firewall Work

- There are multiple types of firewalls based on their traffic filtering methods, structure, and functionality.

https://drsoft.com/static/30c698446206093634f26a342b29ee72/a8378/how-a-firewall-works.png

Using different types of firewalls

Advantages of Using Firewalls

- Firewalls play an important role in the companies for security management.
- It provides enhanced security and privacy from vulnerable services.
- It prevents unauthorized users from accessing a private network that is connected to the internet.

https://www.referenceforbusiness.com/photos/firewalls-578.jpg

Using different types of firewalls

Advantages of Using Firewalls

- Firewalls provide faster response time and can handle more traffic loads.
- A firewall allows you to easily handle and update the security protocols from a single authorized device.
- It safeguards your network from phishing attacks.

https://www.referenceforbusiness.com/photos/firewalls-578.jpg

Using different types of firewalls

How to Use Firewall Protection

Here are some tips to help you improve your firewall security:

a. Constantly update your firewalls as soon as possible
b. Use antivirus protection
c. Limit accessible ports and host
d. Have active network

https://securitytoday.com/-/media/SEC/Security-Products/Images/2015/02/Firewall_Protection.jpg

Hardware Maintenance

In this section, we will discuss:

- Explain and apply common prevention methods
- Explain Service Flow Sequence (SFS) and Trouble Shooting Chart (TSC) of PC
- Safetyprecautions in handling PC
- Sub assemblies and components
- Important points to be considered while purchasingand replacing components
- Concept of Preventive and corrective maintenance.
- Tools required
- Active & Passive Maintenance
- Maintenance scheduling
- Need of diagnostics program. Features, limitations. Examples of commonly used diagnostic programs.
- Monitor, Monochrome and color, Types of Monitor
- Components of Graphics Card
- LCD and CRT Monitors
- Flat screens vs CRT display systems
- Displays memory quality and performance

Explain and apply common prevention methods

Monitors

- Keep it clean-use periodic cleaning, dusting.
- Use simple cleaning solutions, not aerosol sprays, solvents, or commercial cleansers. DON'T use windows sprays on a monitor screen.
- Do not leave monitors on unattended for extended periods of time.

Explain and apply common prevention methods

Monitors Continue...

- Don't attempt to work inside the cabinet unless you are properly trained to do so.
- Don't tamper with the monitor.
- DON'T use windows sprays on a monitor screen.

Explain and apply common prevention methods

Hard Disk Drives

- Avoid rough handling.
- Never move a hard disk when it is still spinning.
- Never expose the internal housing to open air.
- Perform regular data backups.

Image Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQSR9tj7A-DQSYAk9jASl1zJ3NahmQItsoGyg&usqp=CAU

Explain and apply common prevention methods

Floppy Disk Drives

- Do not expose the disks to magnets
- Never touch the exposed surface of a floppy disk.
- Do not allow smoking near a computer.

Image Source: https://en.wikipedia.org/wiki/Floppy_disk

Explain and apply common prevention methods

Keyboards and Pointing Devices

- Use a hand-held vacuum cleaner to remove dust from the small crevasses.
- Never use spray cleaners.
- Clean a mouse or trackball by removing the ball and cleaning the *x* and *y* rollers.
- When using a light pen, never touch the ends with your finger.

Image Source: https://www.medicalexpo.com/prod/pac-technology/product-106764-79,3349.html

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Explain and apply common prevention methods

Printers

- Printers are more mechanical than other peripherals and therefore require more attention.
- Because they use paper, ink, or carbon, printers generate pollutants

that can build up and cause problems.

- Here are a few steps for cleaning the most popular types of printers:

Image Source: https://www.forbes.com/sites/anthonykarcz/2019/08/01/the-best-printers-of-2019/#48bac15514a4

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Explain and apply common prevention methods

Printers
Dot-Matrix Printers

- Adjust the print-head spacing.
- Clean the printer's roller surfaces.
- Clean the surface of the platen.
- Clean the gear train of the paper-handling motor.
- Apply a light coating of oil to the rails.

Image Source:https://www.amazon.in/Epson-FX-2175II-Dot-Matrix-Printer/dp/B005VQWSEE

Explain and apply common prevention methods

Printers
Ink-Jet Printers

- Adjust the print-head spacing.
- Check the tension on the print-head-positioning belt.
- Clean the printer and its mechanism.
- Clean the printer's roller surfaces.
- Clean the gear train of the paper-handling motor.
- Move the carriage assembly to distribute the oil.

Image Source: https://m.media-amazon.com/images/I/61-0Tco3ZgL._SL1432_.jpg

Explain and apply common prevention methods

Printers Laser Printers

- Vacuum to remove dust buildup and excess toner from the interior. Remove the toner cartridge before vacuuming.
- Clean the laser printer's rollers using a damp cloth or denatured alcohol.
- Clean the gear train of the paper- handling motor using a foam swab.
- Apply light oil to the gears using a foam swab.

Image Source: https://m.media-amazon.com/images/I/71oZh2MUEBL._AC_SL1500_.jpg

Explain and apply common prevention methods

Summary

- The best preventive maintenance is to keep a computer clean.
- Never use solvent-based cleaners on a computer
- Never use liquids on the electrical components inside a computer.
- Create and implement a regular maintenance program for each computer under your care.

Image Source: https://www.medicalexpo.com/prod/pac-technology/product-106764-

Explain Service Flow Sequence (SFS) and Trouble Shooting Chart (TSC) of PC

SFS

- Any problem that has anything to do with your HD can be diagnosed using

this Flowchart

Image Source: https://www.medicalexpo.com/prod/pac-technology/product-106764-

Safetyprecautions in handling PC

Finding a Place to Work

- The first thing you need to think about when planning your new homebuilt computer has nothing to do with parts, performance, or configuration.
- You need to find a place to work.

Image Source: https://slideplayer.com/slide/3539407/

Safetyprecautions in handling PC

Staking Out your Work Area

- Professionals and die-hard home computer builders usually have work benches that are dedicated to nothing but computer work.
- You need a sturdy table or workbench
- The table should be clean and non- metallic.
- Avoid places that are damp, subject to temperature extremes, dirty, or dusty.

Image Source: https://slideplayer.com/slide/3539407/

Safetyprecautions in handling PC

COMPUTER SAFETY TIPS
Backups

- The most important precaution against any risk of data loss is a full, up-to-date backup.
- Tape backup drives are the wisest form of insurance for your computer
- Good tape drives are very inexpensive
- full backups weekly and partial backups daily is best

Image Source: https://slideplayer.com/slide/3539407/

Safetyprecautions in handling PC

COMPUTER SAFETY TIPS
Telephone line danger

- One potential threat to your computer which most often goes unnoticed is your modem connection.
- Surges and power fluctuations can hit your system through your phone line and cause serious damage.
- Make sure your power strip or battery backup has telephone line protection.

Image Source: https://slideplayer.com/slide/3539407/

Safetyprecautions in handling PC

COMPUTER SAFETY TIPS
Battery backups

- A single power outage is not as damaging to your computer as the extreme surges and drops in power that occur during a blackout, brownout, or just your ordinary lightning storm.
- Your computer is very sensitive to power fluctuations - protect yourself against this.
- Uninterrupted Power Supplies (UPS) are available at most any computer store or

Office supply store.

Image Source: https://slideplayer.com/slide/3539407/

Safetyprecautions in handling PC

COMPUTER SAFETY TIPS
Turn off your computer

- Monsoon season is the exception to the rule.
- Whenever a storm or brownout is expected, your safest strategy is to turn off all computers and monitors.
- These precautions can save you a great deal of frustration and loss.

Image Source: https://slideplayer.com/slide/3539407/

sub assemblies and components

sub-assemblies and components

- Subassemblies are electronic parts of the computer that are a portion or part of a functional area.
- A subassembly can contain pcbs or just electronic parts.
- Two or more components combined into a unit will form a subassembly.

Image Source: https://www.industrybuying.com/articles/5-essential-components-to-consider-en-buying-a-pc/

sub assemblies and components

sub-assemblies and components

Image Source: https://www.industrybuying.com/articles/5-essential-components-to-consider-en-buying-a-pc/

Some of the items you will find in subassemblies of computers are as follows

- Memory stacks of a memory unit.
- Dc-to-dc converters in modules.
- Dc switching regulators of a power supply.

sub assemblies and components

sub-assemblies and components

Basic PC Components:

- Motherboard
- Processor
- Memory (RAM)
- Case/chassis
- Power supply
- Hard drive

Image Source:https://www.computerhope.com/jargon/m/mothboar.htm

sub assemblies and components

sub-assemblies and components

Basic PC Components:

- ROM
- Keyboard
- Mouse
- Video card
- Monitor
- Sound card

Image Source: https://www.amazon.in/ZAZZ-Basic-Wired-USB-Keyboard/dp/B07CNDCMPW

Important points to be considered while purchasingand replacing components.

Three most important factors

The three most important factors to consider when purchasing computer hardware and software are:

- Quality
- Price
- Service after the sale

Important points to be considered while purchasingand replacing components.

Quality

You can determine quality by asking yourself the following questions:

- How well does this product meet my specific needs?
- Does it have the features and functions I require?
- How well is it made?
- How long will it last?

Important points to be considered while purchasing and replacing components.

Price

- Everyone has a budget, but that doesn’t mean buying cheap is necessarily the way to go.
- if you purchase a product that breaks easily or doesn’t fully meet your needs
- you’ll end up needing to replace it, thereby busting your budget.

Important points to be considered while purchasingand replacing components.

Service after the sale

Here are a few aspects you'd be wise to look into before purchasing:

- Return policy
- Warranty
- Service agreement

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Preventive Maintenance

Preventive Maintenance (PM)

- Preventive maintenance can be defined as an equipment maintenance strategy based on replacing, or restoring, an asset at a fixed interval regardless of its condition.
- Scheduled restoration tasks and replacement tasks are examples of preventive maintenance tasks.

PC Preventive Maintenance Schedule

Frequency	Component	Maintenance Description
Daily	System	Run a virus scan of the memory and hard disk.
	Hard Disk	Create a backup if you have updated important data or program files.
Monthly	Case	External cleaning.
	Hard Disk	Recover lost clusters and de-fragment.
	Keyboard	Clean and check for stuck keys.
	Mouse	Clean and check for wear.
	Monitor	Clean, degauss, and adjust.
	Printer	Clean and dust.
	System	Perform a diagnostics quick test.
	System	Install OS and software patches and updates.
On Failure	Floppy Disk	Clean floppy drive head.
	CDROM	Clean the pickup lens.
Yearly	Case	Open and dust.
	Mainboard	Check chips for chip lift and reseat if necessary.
	CMOS	Test the backup battery.
	Adapter Cards	Clean contacts with contact cleaner and reseat.
As Required	CMOS	Record and backup CMOS setup configuration.
	System	Keep written record of hardware and software configuration of PC system.

Image Source: https://adibahnd2csa.wordpress.com/2013/05/30/154/

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Preventive Maintenance

Time Based Maintenance(TBM)

- Time-Based Maintenance refers to replacing or renewing an item to restore its reliability at a fixed time, interval or usage regardless of its condition.

Failure Finding Maintenance(FFM)

- Failure Finding Maintenance tasks are aimed at detecting hidden failures typically associated with protective functions.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
Scan for hard disk read errors	Weekly	Yes
Clean mouse and keyboard	Monthly	No
Check for full hard disk volumes and remove unnecessary files	Monthly	No
Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5 -pc-maintenance

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Preventive Maintenance

Risk Based Maintenance(RBM)

- Risk Based Maintenance (RBM) is when you use a risk assessment methodology to assign your scarce maintenance resources to those assets that carry the most risk in case of a failure (remembering that risk = likelihood x consequence).

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Preventive Maintenance

Condition Based Maintenance(CBM)

- It may be possible to take action to prevent it from failing completely and/or to avoid the consequences of failure. Condition Based Maintenance as a strategy therefore looks for physical evidence that a failure is occurring or is about to occur.

Image Source: https://1912milligrams.wordpress.com/2012/05/20/pc-preventive-maintenance/

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Preventive Maintenance

Predictive Maintenance(PM)

- Predictive Maintenance (PDM) this was essentially as a synonym for Condition Based Maintenance.

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Corrective Maintenance

Corrective Maintenance (CM)

- A Run to Failure or Corrective Maintenance strategy only restores the function of an item after it has been allowed to fail

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Corrective Maintenance

Deferred Corrective Maintenance(DCM)

- when a corrective maintenance work request is raised it is essential that you prioritize it properly to make sure that where possible you defer the work request and give your team the time to properly plan and schedule the work.
- Emergency Maintenance(EM)

Concept of Preventive and corrective maintenance.

TYPES OF MAINTENANCE

Corrective Maintenance

Emergency Maintenance(EM)

- Emergency Maintenance is corrective maintenance that is so urgent that it breaks into your Frozen Weekly Schedule
- Emergency Maintenance is the one and only maintenance type that we really want to avoid as much as possible.

Image Source: https://www.synopc.com/our-services

Tools required

7 Must-Have Hand Tools

- Flat-Tip Screwdrivers
- Philips-Head Screwdrivers
- Torx Screwdrivers and Nut Drivers
- Wire Cutters

Image Source: https://waneyhcsb.wordpress.com/2012/05/17/pc-tool-kits-and-their-functions/

Tools required

7 Must-Have Hand Tools

- Needle-Nose Pliers
- Wire Strippers
- Crimpers

Active & Passive Maintenance

Active Maintenance

The following is a sample weekly disk-maintenance checklist:

- Back up any data or important files.
- Delete all temporary files.
- Empty the Recycle Bin.
- Check for and install antivirus software updates.
- Finally, run a disk-defragmenting program.

Image Source: https://rheniumsolutions.co.ke/preventive-maintenance-2/

Active & Passive Maintenance

Active Maintenance

The following are some monthly maintenance procedures you should perform:

- Create an operating system startup disk.
- Check for and install any BIOS updates.
- Check for and install any updated drivers for the video, sound, modem, and other devices.
- Check for and install any operating system updates.
- Clean the system
- Check that the cooling fans are operating properly.

Image Source: https://rheniumsolutions.co.ke/preventive-maintenance-2/

Active & Passive Maintenance

Passive Maintenance

Passive preventive maintenance involves taking care of the system by providing the best possible environment—both physical and electrical—for the system.

- General System Care and Handling
- The Operating Environment
- Temperature, Humidity, and Altitude

Passive préventive maintenance

•It involves taking care of the system from physical environment and electrical problems.

•Physical conditions such as temperature, thermal stress, dust and smoke contamination and shock and vibration.

•Electrical issues such as ESD (Electro Static Discharge), power line noise and RFI (Radio frequency interference)

Physical contributors to system failure

1. Dust and pollutants

The power supply fan carries air borne particles through your system and they collect inside the system.

Prevention of dust and dirt

Use dust covers when not in use.

Use curtains on windows

Use air conditioners for computer room.

Avoid shoes into computer room.

Avoid smoking near a PC.

Use vacuum cleaner to clean the surrounding area of the PC frequently.

Image Source:https://slideplayer.com/slide/12793023/

Maintenance scheduling

Maintenance scheduling

There are no universal maintenance schedules that work on every computer. Each schedule must be individualized to meet the needs of the work environment.

Do This Daily

- Back up data.
- Check computer ventilation to ensure that it is clear.
- Remove any paper, books, or boxes that might impede the flow of air into or out of the computer.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
Scan for hard disk read errors	Weekly	Yes
Clean mouse and keyboard	Monthly	No
Check for full hard disk volumes and remove unnecessary files	Monthly	No
Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

Maintenance scheduling

Maintenance scheduling

Do This Weekly

- Clean the outside of the case.
- Clean the screen.
- Run CHKDSK or ScanDisk on all hard disk drives.
- Run a current antivirus program and check all drives.
- Inspect all peripheral devices.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
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Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

Maintenance scheduling

Maintenance scheduling

Do This Monthly

- Clean the inside of the system.
- Clean the inside of any printers.
- Vacuum the keyboard.
- Clean the mouse ball and *x* and *y* wheels.
- Defragment all hard disk drives.
- Delete any unnecessary temporary files.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
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Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

Maintenance scheduling

Maintenance scheduling

Do This Every Six Months

- Perform an extensive preventive maintenance check
- Apply an antistatic solution to the entire computer.
- Check and reseat all cables.
- Run the printer's self-test programs.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
Scan for hard disk read errors	Weekly	Yes
Clean mouse and keyboard	Monthly	No
Check for full hard disk volumes and remove unnecessary files	Monthly	No
Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

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Maintenance scheduling

Maintenance scheduling

Do This Annually

- Reformat the hard disk drive and reinstall all software. Don't forget to back up data first
- Check all floppy disk drives.
- Consider an upgrade to your computer. Check to see that your components can handle your workload.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
Scan for hard disk read errors	Weekly	Yes
Clean mouse and keyboard	Monthly	No
Check for full hard disk volumes and remove unnecessary files	Monthly	No
Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

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Maintenance scheduling

Maintenance scheduling

Summary

- The best maintenance practice is to keep a computer clean.
- Never use solvent-based cleaners on a computer.
- Never use liquids on the electrical components inside a computer.
- Create and implement a regular maintenance program for each computer under your care.

Maintenance Checklist

Activity	Frequency	Auto?
Scan hard disk file systems for errors	Daily	Yes
Scan for viruses	Daily	Yes
Back up data	Daily	No
Clean monitor screen	Weekly	No
Defragment hard disks	Weekly	Yes
Scan for hard disk read errors	Weekly	Yes
Clean mouse and keyboard	Monthly	No
Check for full hard disk volumes and remove unnecessary files	Monthly	No
Update virus definition files	Monthly	Sometimes
Check power protection devices to ensure they are still protecting the system	Quarterly	No

Image Source: https://www.slideshare.net/RheighHenleyCalderon/5-pc-maintenance

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Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

- Computer diagnostics tools are pieces of software that give you the knowledge you need to be able to potentially repair your own computer.
- Some of these tools come built in to your operating system while others come from 3rd party software developers.

Image Source:https ://www.syvir.com/pc_diagnostic.aspx

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

The best diagnostic tools to detect the problem in your Windows PC and fix it right away.

Process Explorer

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

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Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

Windows Sysinternal Suite

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

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Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

Wifi Analyzer

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

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Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

Performance Monitor

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

Reliability Monitor

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

Resource Monitor

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

ESET SysInpector

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

CPU-Z

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Need of diagnostics program Features, limitations. Examples of commonly used diagnostic programs.

Need of diagnostics program

System Explorer

Image Source:https://thegeekpage.com/hardware-diagnostic-tools/

Types of monitor, Monochrome and color

What is a Monitor ?

- A monitor is an electronic output device that is also known as a video display terminal (VDT) or a video display unit (VDU).

Types of monitor, Monochrome and color

Types of Monitor

- Cathode Ray Tube (CRT) Monitors
- Flat Panel Monitors
  - Liquid Crystal Display: LCD
  - Gas Plasma Display
  - Touch Screen Monitors
  - LED Monitors
  - OLED Monitors

Image Source:https://static.javatpoint.com/computer/images/types-of-monitors1.png

Types of monitor, Monochrome and color

Types of Monitor(Cond.)

- Flat Panel Monitors
  - DLP Monitors
  - TFT Monitor
  - Plasma Screen Monitor

Image Source: https://static.javatpoint.com/computer/images/types-of-monitors2.png

Types of monitor, Monochrome and color

Monochrome Monitor

- Also known as monochromatic monitors
- Used extensively during the middle to latter part of the 20th century
- Monochrome monitor is somewhat like that of a black and white television set

Types of monitor, Monochrome and color

CRT Monitor

- CRT Monitor display by using a combination of phosphors
- The phosphors are different colors

- Beam Penetration Method
- Shadow-Mask Method

Types of monitor, Monochrome and color

Beam Penetration Method

- It used with random-scan monitors
- CRT screen is coated with two layers of phosphor
- This method produces four colors only, red, green, orange and yellow

Types of monitor, Monochrome and color

Shadow-Mask Method

- It is commonly used in the Raster-Scan System
- It is used in the majority of color TV sets and monitors
- Shadow mask grid is pierced with small round holes in a triangular pattern.

CGA, EGA, VGA, SVGA, Digital Analogue

CGA **(Color Graphics Adapter)**

- The CGA standard, introduced in 1981
- CGA card came video memory different modes
  - **Text mode**
  - **Color Mode**
  - **Monochrome Graphics Mode**

CGA, EGA, VGA, SVGA, Digital Analogue

EGA**(Enhanced Graphics Adapter)**

- Enhanced Graphics Adapter was introduced by IBM in 1984
- EGA increased resolution to 640×350 pixels in 16 colors
- 256KB of video memory to allow full implementation of all EGA modes

  - **High-resolution mode**
  - **CGA mode**
  - **MDA mode**

CGA, EGA, VGA, SVGA, Digital Analogue

VGA**(Video Graphics Array)**

- VGA graphics started to come on the motherboard as a single chip
- VGA's 640×480 remains a sort of lowest common denominator for all graphics cards
- The VGA specification dictated 256KB of video RAM, 16- and 256-color modes

CGA, EGA, VGA, SVGA, Digital Analogue

SVGA**(Super Video Graphics Array)**

- Super VGA was first defined in 1989
- It was invented by the Video Electronics Standards Association (VESA)
- SVGA evolved to 1024×768 with 256 colors and even higher resolutions and colors as time went on

Main components & connectors on Display

Components of Graphics Card

- GPU or **Graphics Processing Unit** is the main component and heart of the graphics card
- It is also known as Graphics Processor and does all the processing in your graphics card

Main components & connectors on Display

Components of Graphics Card

- **VRAM**
- **VRM(Voltage Regulator Module)**
- **Cooler**
- **PCB**
- **PCI Express x16 connector**
    - **8 Pin**
    - **6 Pin**
- **SLI / Cross Fire Slot**

LCD and CRT Monitors

CRT Monitors

- It is an evacuated glass
- An electron gun at the rear of the tube produce a beam of electrons
- Inner side screen is coated with phosphor substance which gives light when it is stroked
- The control grid voltage determines how many electrons are actually in the electron beam.

LCD and CRT Monitors

CRT Monitors

•The voltage applied to vertical and horizontal deflection plates is control vertical and horizontal deflection, respectively.

•There are two techniques used for producing images on the CRT screen:

1.Vector scan/Random scan
2.Raster scan display

LCD and CRT Monitors

LCD Monitors

- The American inventor J. Fergason created the first working liquid crystal display in 1970.
- Even though liquid crystals were discovered a long time ago, at first, they were applied for different purposes. Molecules of liquid crystals under the influence of electricity

LCD and CRT Monitors

LCD Monitors

- LCD screens are an array of small segments called pixels, which can be manipulated for information displaying.
- Such displays have several layers, where two panels, made of glass material free of sodium and called substrate.
- The liquid crystal panel is illuminated by a light source

LCD and CRT Monitors

LCD Monitors

- When an electric field appears, the molecules are partially aligned along it

- By producing screens using LCD monitor technology, the backlight of the monitor is used to output a color image so that light is generated at the back of the LCD monitors.

- By combining the three primary colors for each pixel of the screen, you can reproduce any color

CRT vs LCD display systems

BASIS FOR COMPARISON	CRT	LCD
Stands For	CRT stands for “Cathode Ray Tube“	LCD stands for “Liquid Crystal Display“.
Major components	Vacuum glass tube, phosphor screen, electron gun, deflection plates.	Glass plates, nematic liquid crystal, internal light source.
Size	CRT is weighted, bulky, and large in size.	LCD is light, compact, and thin in size.
Weight	Heavier	Lighter
Power Consumption	It consumes High power.	It consumes low power.
Power Consumption	It consumes High power.	It consumes low power.
Image Flickering	Image Flickering is there in CRT.	No Image Flickering is there on LCD.
Color	CRT is like Black.	LCD is like White.
Image Retention	Image Retention is not there in CRT.	Image Retention is there on LCD.
Cost	It is less expensive.	It is more expensive.
Image Forming	Electron Gun is used to form images.	Liquid crystals are used to form images.

Displays memory quality and performance

VRAM

- VRAM (video RAM) is a reference to any type of random access memory (RAM) used to store image data for a computer display.
- All types of VRAM are special arrangements of dynamic RAM (DRAM)

Displays memory quality and performance

Types of VRAM

- **Multibank Dynamic RAM (MDRAM)**
- **Rambus Dynamic RAM (RDRAM)**
- **Synchronous Graphics RAM (SGRAM)**
- **Window RAM (WRAM)**

Able to perform basic troubleshoot of PC

(3 hours)

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In this section, we will discuss:

- Proper troubleshooting Techniques for motherboards, I/O Devices.

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Proper troubleshooting Techniques for motherboards, I/O Devices

How to Diagnose Motherboard or Processor Problems?

- The motherboard and processor are two of the most important hardware components inside the computer.
- The various pieces of hardware inside the PC communicate with one another through the circuits on the motherboard, while the CPU stores and executes programming instructions.
- The motherboard and CPU can both be expensive to replace, however, but diagnosing hardware failure on your own can reduce the potential repair costs for your business.

Image Source: https://www.fieldengineer.com/skills/pc-support-technician-devices-db57ecc1262d

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Proper troubleshooting Techniques for motherboards, I/O Devices

How to Diagnose Motherboard or Processor Problems?

- Turn Off the Computer
- Touch a Bare Metal Surface
- Turn on the Computer
- Navigate to Motherboard Manufacturer's Website
- Uninstall Hardware
- Loosen the HeatSink and Processor Fan
- Touch the Processor
- Lift Out the CPU
- Lock the CPU in Place

Image Source: https://www.pearsonitcertification.com/articles/article.aspx?p=2731934&seqNum=28

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Proper troubleshooting Techniques for motherboards, I/O Devices

How to Diagnose Motherboard or Processor Problems?

- Reconnect the Power
- Check for Damage on Motherboard
- Remove the CLRTC Jumper
- Reconnect the Keyboard
- Load Fail-Safe Defaults
- Restart the Computer

Image Source: https://www.pearsonitcertification.com/articles/article.aspx?p=2731934&seqNum=28

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Proper troubleshooting Techniques for motherboards, I/O Devices

Motherboard Troubleshooting

- Check the power supply to see if the fan is turning. If the CPU or motherboard has a fan, see if it is turning. Check voltages going from the power supply to the motherboard.
- Check the BIOS/UEFI settings for accuracy
- Check for overheating. Power down the computer and allow the computer to cool. Power on the computer with the cover off.
- Check the motherboard for distended capacitors. These are small components that might appear to be bulging. If sighted, replace the motherboard as soon as possible.

Image Source: https://www.easypcmod.com/know-motherboard-bad-fix-troubleshooting-guide-282

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Proper troubleshooting Techniques for motherboards, I/O Devices

Motherboard Troubleshooting

- Reseat the CPU, adapters, and memory chips.
- Remove unnecessary adapters and devices and boot the computer.
- Plug the computer into a different power outlet and circuit, if possible.
- Check to determine whether the motherboard is shorting out on the frame.
- Check the CMOS battery
- With a motherboard that has diagnostic LEDs, check the output for any error code.

Image Source: https://www.easypcmod.com/know-motherboard-bad-fix-troubleshooting-guide-282

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Proper troubleshooting Techniques for motherboards, I/O Devices

Troubleshooting I/O Devices

- Solution 1: Make certain that all cables are connected correctly
- Solution 2: Start the computer in a clean boot state
- Solution 3: Change the transfer mode for the drive in IDE Channel Properties
- Solution 4: Check the status of the device in Device Manager
- Solution 5: Contact the hardware manufacturer

Generally, when troubleshooting an I/O devices, follow these steps:

- For new installation, suspect the drivers are not installed correctly, plug in or set in the expansion slot correctly
- For problems after an installation, ask the user what has just changed in the system
- Analyze the situation and try to isolate the problem.
- Check simple things first
- Try using Device Manager to uninstall the device. Then reboot and installs the drivers again
- Exchange the device for a known good once or install the suspect device in a working system
- After problems is fixed, document the symptoms, source of the problem, and the solutions.

Image Source: https://slideplayer.com/slide/253942/

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Understand basic computer network technology

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In this section, we will discuss:

- Introduction to networks
- Type of area networks - LAN, VLAN, CAN, MAN, WAN
- Internet and Intranet etc.
- Uses and benefits of Network
- Server-client based network,
- peer to peer networks
- Network Interface Card
- Transmission Media and Topologies Media Type
- Crimping tools and Color standards for Straight crimping and Crosscrimping

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Introduction to Networks

What is a Computer Network?

- A computer network is a set of computers connected together for the purpose of sharing resources.
- The term network originated during the mid of the 1960s in the Department of Defense in the United States.
- A network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data.

ImageSource: https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

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Introduction to Networks

Characteristics of a Computer Network

- Share resources from one computer to another.
- Create files and store them in one computer, access those files from the other computer(s) connected over the network.

ImageSource: https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

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Introduction to Networks

Characteristics of a Computer Network(continued)

- Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.

ImageSource: https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

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Introduction to Networks

Characteristics of a Computer Network(continued)

Devices required for computer Networking:

- Network Cables
- Distributors
- Routers
- Internal Network Cards
- External Network Cards

ImageSource: https://tyrocity.com/topic/computer-networks/

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Introduction to Networks

Basics Components Of Computer Network

- Servers
- Clients
- Transmission Media
- Network Interface card
- Modem
- Hub
- Switch
- Cables and connectors
- Router
- LAN cable

ImageSource: https://beginnersbook.com/2019/03/computer-network-components/

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Introduction to Networks

Features of a Computer Network

- Performance
- Data Sharing
- Backup
- Software and hardware compatibility
- Reliability
- Security
- Scalability

ImageSource: https://beginnersbook.com/2019/03/computer-network-features/

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Introduction to Networks

Advantages of Computer Networks

- Workgroups
- Shared databases
- Distributed Systems
- Communications
- Device Sharing
- Software sharing
- Security

Ref: https://d8it4huxumps7.cloudfront.net/bites/wp-content/banners/2021/9/6139a6825ca07_advantages_and_disadvantages_of_computer_network.png?d=700x400

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Introduction to Networks

Disadvantages of Computer Networks

- Buying the computer cable and servers can be very expensive.
- Viruses can spread to other computers throughout a computer network.
- People can hack your computer.
- It encourages people to become dependent on computers.
- It comes with the risk of security issues.

ImageSource:https://www.pixuffle.net/disadvantages-of-computer-network/

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Area Networks

Type of Area Networks

- LAN
- MAN
- WAN
- VLAN
- WLAN
- VPN
- CAN
- SAN
- SHAN
- PAN

ImageSource:https://www.quora.com/What-are-the-different-types-of-networking

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Type of Area Networks

LAN(Local Area Network)

- Group of interconnected computers within a small area. (room, building, campus)
- Two or more pc's can from a LAN to share files, folders, printers, applications and other devices
- Coaxial or CAT 5 cables are normally used for connections.

ImageSource:https://www.javatpoint.com/types-of-computer-network

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Type of Area Networks

LAN(Local Area Network)(continued)

- Due to short distances, errors and noise are minimum.
- Local Area Network provides higher security.
- Data transfer rate is 10 to 100 mbps.

Example: A computer lab in a school

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

MAN(Metropolitan Area Network)

- Design to extend over a large area.
- Connecting number of LAN's to form larger network, so that resources can be shared.
- Government agencies use MAN to connect to the citizens and private industries

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

MAN(Metropolitan Area Network)(continued)

- In MAN, various LANs are connected to each other through a telephone exchange line.
- Networks can be up to 5 to 50 km.
- Data transfer rate is low compared to LAN.

Example: Organization with different branches located in the city.

ImageSource:https://www.javatpoint.com/types-of-computer-network

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Type of Area Networks

WAN(Wide Area Network)

- A Wide Area Network is a network that extends over a large geographical area such as states or countries.
- Contains multiple LAN's and MAN's.
- A Wide Area Network is quite bigger network than the LAN.

ImageSource:https://www.javatpoint.com/types-of-computer-network

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Type of Area Networks

WAN(Wide Area Network)(continued)

- Distinguished in terms of geographical range.
- Data transfer rate depends upon the ISP provider and varies over the location.

Example:Internet

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

WLAN(Wireless Local Area Network)

- A WLAN makes use of a Wireless Access Point (WAP) device, which serves as the point of connectivity for wireless clients on the network.
- A LAN that uses high frequency radio waves for communication.
- Provides short range connectivity with high speed data transmission

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

VLAN(Virtual Local Area Network)

- Virtual Local Area Networks (VLANs) divide a single existing physical network into multiple logical networks.
- Thereby, each VLAN forms its own broadcast domain.

ImageSource:https://www.geeksforgeeks.org/virtual-lan-vlan/

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Type of Area Networks

VLAN(Virtual Local Area Network)(continued)

- Communication between two different VLANs is only possible through a router that has been connected to both VLANs.
- VLANs behave as if they had been constructed using switches that are independent of each other.

ImageSource: http://www.codesandtutorials.com/networking/basics/computer_network-types.php

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Type of Area Networks

VPN(Virtual Private Network)

- A Virtual Private Network is a type of network that makes use of existing private or public network infrastructure (e.g the Internet) to provide a secure network connection.
- This is often achieved by creating an encrypted tunnel for secured end-to-end connectivity.

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

VPN(Virtual Private Network)(continued)

- A Virtual Private Network uses data encryption techniques to provide security for files that are sent or received over the network.
- This is often used by organizations that have highly sensitive data to transfer.

ImageSource: https://en.wikipedia.org/wiki/Virtual_private_network

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Type of Area Networks

CAN(Campus Area Network)

- A campus area network (CAN) is a network of multiple interconnected local area networks (LAN) in a limited geographical area.
- CAN is smaller than WAN (Wide Area Network)
- CAN is also known as a controller area network.

Example:Network in university

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

SAN(Storage Area Network)

A Storage Area Network (SAN) is a specialized, high-speed network that provides block-level network access to storage. Connects servers to data storage devices via fiber-optic cables.

ImageSource: http://www.codesandtutorials.com/networking/basics/computer_network-types.php

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Type of Area Networks

SAN(Storage Area Network)(continued)

- SANs are typically composed of hosts, switches, storage elements, and storage devices that are interconnected using a variety of technologies, topologies, and protocols.

Example: Used for daily backup of organization or a mirror copy

ImageSource:https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

SHAN(Smart Home Area Network)

- A home area network (HAN) is a network contained within a user's home that connects a person's digital devices, from multiple computers and their peripheral devices to telephones, VCRs, televisions, video games, home security systems, smart appliances, fax machines and other digital devices that are wired into the network.
- The SHAN network generally used in homes and office space.

ImageSource: https://networkencyclopedia.com/home-area-network-han/

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Type of Area Networks

PAN(Personal Area Network)

- Personal Area Network is a network arranged within an individual person, typically within a range of 10 meters.
- Personal Area Network is used for connecting the computer devices of personal use is known as Personal Area Network.

ImageSource: https://www.networkstraining.com/different-types-of-networks/

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Type of Area Networks

PAN(Personal Area Network)(continued)

- Personal computer devices that are used to develop the personal area network are the laptop, mobile phones, media player and play stations.
- Personal Area Network covers an area of 30 feet.

ImageSource: https://www.javatpoint.com/types-of-computer-network

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Internet and Intranet etc

Internet

- The Internet consists of a network of computers that anyone can access.
- Many intranets together make up the internet.
- It is a public network therefore anyone can access the internet.
- There is no limit to the number of users who can use the internet at any given time

ImageSource:
https://spectrum.ieee.org/tech-talk/aerospace/satellites/facebook-may-have-secret-plans-to-launch-a-intern

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Internet and Intranet etc

Internet(continued)

- There is no limit to the number of users who can use the internet at any given time

ImageSource: https://alphatronicsinitsolutions.com/internet-solutions/

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Internet and Intranet etc

Intranet(continued)

- An intranet is a smaller network of computers that allows access to a particular group of users.
- One can access the intranet from the internet. However, there are restrictions on the number of users.
- Only a specific few users can access the intranet.

ImageSource: https://www.javatpoint.com/intranet

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Internet and Intranet etc

Intranet(continued)

- There are limitations on the volume of traffic at any given time.
- It is a private network therefore anyone can’t access intranet.
- Intranet contains a specific kind of information only.

ImageSource: https://www.shutterstock.com/search/intranet

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Internet and Intranet etc

Difference between Internet and Intranet

- The Internet is a wide network of computers that is available to all whereas Intranet is a network of computers designed for a certain group of users.
- Internet is a public network and Intranet is a private network.
- Number of internet users are very high but the number of users of Intranet is limited.

ImageSource: https://techdifferences.com/difference-between-internet-and-intranet.html

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Internet and Intranet etc

Difference between Internet and Intranet(continued)

- Internet contains various source of information while Intranet only contains group-specific information.
- Anyone can access the internet while Intranet is accessible only by the organization employees or admin who have login details.

Internet	Intranet
The term '**Internet**' comes from the phrase ***Inter***national ***Net***work.	The term '**Intranet**' comes from the phrase ***Int***ernal ***R***estricted ***A***ccess ***Net***work.
The internet is used to share data **globally**.	Intranets are used to share data **locally** and **privately**.
The internet is used to provide **information** that is relevant to a **wide range** of people.	Intranets are used to provide **information** which is relevant to a **single company** or **organisation**.
The internet can be **accessed** from **anywhere** as long as you have an internet connection.	Intranets can only be **accessed** from within the **company** or **organisation** that owns it.

ImageSource: https://www.ictlounge.com/html/internet_intranet.htm

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Internet and Intranet etc

Extranet

- An extranet is a communication network based on the internet protocol such as Transmission Control protocol and internet protocol.
- It is used for information sharing.
- The access to the extranet is restricted to only those users who have login credentials.

ImageSource: https://www.quora.com/What-is-the-difference-between-the-internet-intranet-and-extranet

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Internet and Intranet etc

Extranet(continued)

- An extranet is the lowest level of internetworking.
- An extranet cannot have a single LAN, atleast it must have one connection to the external network.

ImageSource: ttps://www.quora.com/What-is-the-difference-between-the-internet-intranet-and-extranet

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Uses and benefits of Network

- Increased speed and reduced cost
- File Sharing from one system to another.
- Remote access
- Hardware sharing like a printer, scanner, storage

ImageSource: https://ouritpro.net/2016/11/07/the-importance-of-computer-networks/

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Uses and benefits of Network

- Communication i.e. instant messaging, video calls, mail communication etc.
- Online business
- Ease of administration
- Information security

ImageSource: https://www.ccsipro.com/blog/uses-of-computer-network/

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Server-client based Network

- A Computer networking model where one or more powerful computers (servers) provide the different computer network services and all other user of computer network (clients) access those services to perform user's tasks is known as client/server computer networking model.

ImageSource: https://www.educative.io/edpresso/what-are-p2p-and-clientserver-networks

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Server-client based Network

- In such networks, there exists a central controller called server. A server is a specialized computer that controls the network resources and provides services to other computers in the network.
- All other computers in the network are called clients.
- A client computer receives the requested services from a server.

ImageSource:http://ecomputernotes.com/computernetworkingnotes/computer-network/explain-clientserver-network-model

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Server-client based Network

- A server performs all the major operations like security and network management.
- All the clients communicate with each other via centralized server
- If client 1 wants to send data to client 2, it first sends request to server to seek permission for it. The server then sends a signal to client 1 allowing it to initiate the communication.

ImageSource: https://www.educative.io/edpresso/what-are-p2p-and-clientserver-networks

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Server-client based Network

- A server is also responsible for managing all the network resources such as files, directories, applications & shared devices like printer etc.
- If any of the clients wants to access these services, it first seeks permission from the server by sending a request.

ImageSource: https://en.wikipedia.org/wiki/Client%E2%80%93server_model

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Server-client based Network

Advantages of Client Server Networks

- Centralized backup is possible.
- Use of dedicated server improves the performance of whole system.
- Security is better in these networks as all the shared resources are centrally administered.
- Use of dedicated servers also increases the speed of sharing resources.

ImageSource: https://sites.google.com/site/clientserverarchitecture/advantages-of-client-server-architecture

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Server-client based Network

Disadvantages of Client Server Networks

- It requires specialized servers with large memory and secondary storage. This leads to increase in the cost.
- The cost of network operating system that manages the various clients is also high.
- It requires dedicated network administrator.

ImageSource: https://sites.google.com/site/clientserverarchitecture/advantages-of-client-server-architecture

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Peer to peer Networks

- In the peer to peer computer network model we simply use the same Workgroup for all the computers and a unique name for each computer in a computer network.
- There is no master or controller or central server in this computer network and computers join hands to share files, printers and Internet access.
- Peer to peer relationship is suitable for small networks having less than 10 computers on a single LAN.

ImageSource:https://www.educative.io/edpresso/what-are-p2p-and-clientserver-networks

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Peer to peer Networks

- It is practical for workgroups of a dozen or less computers making it common environments, where each PC acts as an independent workstation and maintaining its own security that stores data on its own disk but which can share it with all other PCs on the network.
- Software for peer-to-peer network is included with most modern desktop operating systems such as Windows and Mac OS.

ImageSource: https://www.educative.io/edpresso/what-are-p2p-and-clientserver-networks

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Peer to peer Networks

Advantages of Peer to Peer Networks

- Such networks are easy to set up and maintain as each computer manages itself.
- It eliminates extra cost required in setting up the server.
- Since each device is master of its own, they an: not dependent on other computers for their operations.

ImageSource: http://mdalikhoja.blogspot.com/2006/04/advantages-of-peer-to-peer-networks.html

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Peer to peer Network

Disadvantages of Peer to Peer Networks

- In peer-to-peer network, the absence of centralized server make it difficult to backup data as data is located on different workstations.
- Security is weak as each system manages itself only.
- There is no central point of data storage for file archiving.

ImageSource: http://peermaasumsahin.eoftheismind.wordpress.com/2013/02/18/advantages-and-disadvantages-of-p2p/

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Peer to peer Networks

Difference between Client-server and Peer to Peer Networks

- Both peer-to-peer and client-server networks connect computers so that they can share resources from one computer to others such as files, videos, and pictures.

Client/Server	Peer-To-Peer
Server has the control ability while clients don't	All computers have equal ability
Higher cabling cost	Cheaper cabling cost
It is used in small and large networks	Normally used in small networks with less than 10 computers
Easy to manage	Hard to manage
Install software only in the server while the clients share the software	Install software to every computer
One powerful computer acting as server	No server is needed

ImageSource: http://it-asean.blogspot.com/2014/10/understanding-differences-between.html

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Network Interface Card

What is a Network Interface Card?

- A network interface card (NIC) is a hardware component without which a computer cannot be connected over a network.
- It is also called Ethernet Card,interface controller,Lan Adapter or Network Adapter.

ImageSource:
https://www.tttech-aco.com/products/aerospace-space/development-test-vv/development-end-systems/tte-netw

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Network Interface Card

What is a Network Interface Card?(continued)

- It is a circuit board installed in a computer that provides a dedicated network connection to the computer.
- Every NIC has a 48-bit unique serial number called a MAC address which is stored in ROM carried on the card.
- NIC allows both wired and wireless communications

ImageSource:https://techterms.com/definition/nic

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Network Interface Card

Components of NIC

- An external Memory is used to store the data temporarily and uses the stored data whenever required while processing the communication.
- Connectors are used to make the physical link between cables and plugin with the board, this type of connection is especially seen in Ethernet type of NIC cables.

ImageSource:https://medium.com/computing-technology-with-it-fundamentals/expansion-cards-and-their-slots-on-the-board-19afb07aaeae1

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Network Interface Card

Components of NIC(continued)

- A Processor converts the data message into a signal format for communication to take place easily.
- Different types of standard Buses are plugged into Buses Connector slots, based on the compatibility of the operation process buses are chosen.

ImageSource: https://sites.google.com/site/ktsnetworktechnology/home/basic-part-of-a-network

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Network Interface Card

Components of NIC(continued)

- Jumpers or Dual in package switches are used to control the communication operation, which is either by turning on or turning off the switch.
- A router is an NIC device that is used to connect wirelessly to the internet.

ImageSource: https://www.youtube.com/watch?v=SfEXvbQbi0E

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Network Interface Card

Components of NIC(continued)

- MAC address which is a unique identity address is given to network interface card where ethernet packets are communicated with the computer.
- MAC address is also known as a physical network address.

ImageSource:https://www.elprocus.com/network-interface-card-nic/

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Network Interface Card

Types of NIC Cards

- Wired
- Wireless
- USB

ImageSource: https://www.javatpoint.com/computer-network-components

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Network Interface Card

Types of NIC Cards(continued)

Wired

- These NIC have input jacks made of cables(Ethernet Cable).
- The motherboard has a slot for the network cards where they are inserted.
- The most widely used LAN technology is Ethernet.

ImageSource:https://www.tutorialspoint.com/what-is-network-interface-card-nic

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Network Interface Card

Types of NIC Cards(continued)

Wired

- Ethernet-based NIC is available in hardware shops.
- The speed of Ethernet-based NIC can be 10/100/1000 Mbps.

ImageSource:https://www.tutorialspoint.com/what-is-network-interface-card-nic

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Network Interface Card

Types of NIC Cards(continued)

- Wireless network cards are inserted into the motherboard but no network cables are required to connect the computer to the internet.
- These NICs are designed for Wi-Fi connections.

Wireless

ImageSource: https://afteracademy.com/blog/what-is-a-network-interface-card

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Network Interface Card

Types of NIC Cards(continued)

- These are NICs that provide network connection over the device plugged in the USB port. USB

ImageSource: https://afteracademy.com/blog/what-is-a-network-interface-card

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Network Interface Card

Advantages of NIC

- The communication speed using the Internet is high usually in Gigabytes
- Highly reliable connection
- Many peripheral devices can be connected using many ports of NIC cards.
- Bulk data can be shared among many users.

ImageSource: https://study.com/academy/lesson/network-interface-card-nic-types-function-definition.html

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Network Interface Card

Disadvantages of NIC

- Inconvenient in case of wired cable NIC, as it is not portable like a wireless router
- The configuration should be proper for better communication.
- Data is unsecured.

ImageSource:https://www.omnisecu.com/basic-networking/what-is-nic-card-network-interface-card.php

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Transmission Media and Topologies

Media Type

What is Transmission Media?

- A communication channel that is used to carry the data from the transmitter to the receiver through the electromagnetic signals.
- The main function of this is to carry the data in the bits form through the Local Area Network (LAN). In data communication, it works like a physical path between the sender & the receiver.

ImageSource: http://alissazainal.blogspot.com/2018/01/table_11.html

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Transmission Media and Topologies

Media Type

Types of Transmission Media

- Physical transmission media/Guided media/Wired
- Wireless transmission media/Unguided media/Wireless

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ImageSource: https://mangoguys.wordpress.com/2013/12/03/wireless-transmission-media/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Crimping Tools

- A crimping tool is a device used to conjoin two pieces of metal by deforming one or both of them in a way that causes them to hold each other. The result of the tool's work is called a crimp.

ImageSource:https://www.computerhope.com/jargon/c/crimp.htm

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Crimping Tools(continued)

- For instance, network cables and phone cables are created using a crimping tool (shown below) to join the RJ-45 and RJ-11 connectors to both ends of either phone or Cat 5 cable.

ImageSource: https://mangoguys.wordpress.com/2013/12/03/wireless-transmission-media/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Color

- A straight-thru is used as a patch cord in Ethernet connections.
- A crossover is used to connect two Ethernet devices without a hub or for connecting two hubs.
- A crossover has one end with the Orange set of wires switched with the Green set.

ImageSource: https://incentre.net/ethernet-cable-color-coding-diagram/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

T-568A Straight-Through Ethernet Cable

- The TIA/EIA 568-A standard which was ratified in 1995, was replaced by the TIA/EIA 568-B standard in 2002 and has been updated since.
- Both standards define the T-568A and T-568B pin-outs for using Unshielded Twisted Pair cable and RJ-45 connectors for Ethernet connectivity.

ImageSource: https://incentre.net/ethernet-cable-color-coding-diagram/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

T-568A Straight-Through Ethernet Cable(continued)

- The standards and pinout specification appear to be related and interchangeable, but are not the same and should not be used interchangeably.

ImageSource: https://www.networkkings.org/color-coding-of-straight-and-crossover-cable/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

T-568B Straight-Through Ethernet Cable

- Both the T-568A and the T-568B standard Straight-Through cables are used most often as patch cords for your Ethernet connections.

ImageSource:https://incentre.net/ethernet-cable-color-coding-diagram/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

T-568B Straight-Through Ethernet Cable(continued)

- If user require a cable to connect two Ethernet devices directly together without a hub or when you connect two hubs together, you will need to use a Crossover cable alternative.

568A CABLE END

568B CABLE END

ImageSource:https://www.make-it.ca/technical-notes/how-to-crimp-rj45-connector/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

RJ-45 Crossover Ethernet Cable

- A good way of remembering how to wire a Crossover Ethernet cable is to wire one end using the T-568A standard and the other end using the T-568B standard.

ImageSource: https://www.networkkings.org/color-coding-of-straight-and-crossover-cable/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

RJ-45 Crossover Ethernet Cable

- Another way of remembering the color coding is to simply switch the Green set of wires in place with the Orange set of wires.
- Specifically, switch the solid Green (G) with the solid Orange, and switch the green/white with the orange/white.

ImageSource: https://incentre.net/ethernet-cable-color-coding-diagram/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions

- Pull the cable off the reel to the desired length and cut. If you are pulling cables through holes, its easier to attach the RJ-45 plugs after the cable is pulled.

ImageSource:https://cabling.4cornerit.com/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions(continued)

- The total length of wire segments between a PC and a hub or between two PC's cannot exceed 100 Meters (328 feet) for 100BASE-TX and 300 Meters for 10BASE-T

ImageSource:https://cabling.4cornerit.com/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions(continued)

- Start on one end and strip the cable jacket off (about 1″) using a stripper or a knife. Be extra careful not to nick the wires, otherwise you will need to start over.

ImageSource:https://www.dx.com/p/rj45-connector-cable-plier-network-crimper

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions(continued)

- Spread, untwist the pairs, and arrange the wires in the order of the desired cable end. Flatten the end between your thumb and forefinger. Trim the ends of the wires so they are even with one another, leaving only 1/2″ in wire length.

ImageSource:https://www.vcelink.com/blogs/focus/how-to-crimp-rj45-connectors

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions(continued)

- If it is longer than 1/2″ it will be out-of-spec and susceptible to crosstalk. Flatten and insure there are no spaces between wires.
- Hold the RJ-45 plug with the clip facing down or away from you. Push the wires firmly into the plug.

ImageSource: https://cabling.4cornerit.com/

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions(continued)

- Inspect each wire is flat even at the front of the plug. Check the order of the wires. Double check again. Check that the jacket is fitted right against the stop of the plug.Carefully hold the wire and firmly crimp the RJ-45 with the crimper.

ImageSource: https://medium.com/@julydd/how-to-make-your-own-ethernet-cables-513d56470698

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Crimping tools and Color standards for Straight crimping and Crosscrimping

Ethernet Cable Instructions

- Check the color orientation, check that the crimped connection is not about to come apart, and check to see if the wires are flat against the front of the plug. If even one of these are incorrect, you will have to start over. Test the Ethernet cable.

ImageSource:https://instrumentationtools.com/make-rj45-cable/

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Transmission Media and Topologies Media types

(15 hours)

In this section, we will discuss:

- Concept of Server, client
- Node
- Segment
- Backbone
- Host
- Analog and Digital transmission
- Base band and Broadband transmission
- STP cable, UTP cable, Coaxial cable, Fiber cable and Connectors
- Physical and logical topologies, Bus, Star, Ring and Mesh topologies
- Concept of Asynchronous & Synchronous Transmission

Concept of Server, client

Client-Server Model

- It is a distributed application framework dividing tasks between servers and clients
- Clients initiate requests for services and servers provide that function or service.

Image Source: https://www.omnisci.com/technical-glossary/client-server

Concept of Server, client

Categories of Client-Server Computing

- There are four main categories of client-server computing:
- One-Tier architecture
- Two-Tier architecture
- Three-Tier architecture
- N-Tier architecture

Image Source: https://www.omnisci.com/technical-glossary/client-server

Concept of Server, client

Difference Between Client and Server

- Client computing is classified as:
- Thick client
- Thin client
- Hybrid client

Image Source: https://www.omnisci.com/technical-glossary/client-server

Concept of Server, client

Difference Between Client and Server

- A server is a device or computer program that provides functionality for other devices or programs.
- Some common examples of servers include:
- Application Server
- Computing Server
- Database Server
- Web Server

Image Source: https://www.omnisci.com/technical-glossary/client-server

Concept of Server, client

Difference Between Server-Side Programming and Client-Side Programming

- Server-side programming refers to a program that runs on the server and focuses on the generation of dynamic content.
- Client-side programming refers to a program that runs on the client machine and focuses on the user interface and other processes such as reading and/or writing cookies.

Image Source: https://www.omnisci.com/technical-glossary/client-server

Concept of Server, client

Client-Server vs Peer-to-Peer

- Peer-to-peer (P2P) is a decentralized communications model
- In client-server computing, a centralized communications model, the server is the central node that communicates with other client nodes.

Image Source: https://www.omnisci.com/technical-glossary/client-server

Node

What is a computer network and where do network nodes fit in?

- A computer network is a system of computers and computing devices that are connected via communication links.
- A network node is a connection point in a communications network.

Image Source: https://www.elprocus.com/what-are-network-nodes-in-computer-network-and-their-types/

Node

What does a network node do?

- A network node sits at a point in the network where it sends, receives, stores or creates information.
- It transmits data to communicate with other nodes in the network.

Image Source: https://www.elprocus.com/what-are-network-nodes-in-computer-network-and-their-types/

Node

Types of network nodes

- By network Type
- Data communications
- Internet network
- LANs and wide area networks
- Telecommunications network
- Cable system

Image Source: https://www.elprocus.com/what-are-network-nodes-in-computer-network-and-their-types/

Node

Types of network nodes

- By network topologies:
- Bus topology
- Ring topology
- Star topology
- Mesh topology

Image Source: https://www.techtarget.com/searchnetworking/definition/node#:~:text=A%20network%20node%20sits%20at,as%20modems%2C%20PCs%20and%20printers.

Segment

What is network segment?

- A network segment is a portion of a computer network.

Image Source: https://www.reddit.com/r/ccnp/comments/cu85ui/what_is_the_definition_of_a_network_segment/

Backbone

What is a backbone network?

- A Backbone Network is a Network containing a high capacity connectivity infrastructure that backbone to the different part of the network.

Image Source: https://www.geeksforgeeks.org/types-and-uses-of-backbone-networks/

Host

What is web hosting?

- Web hosting is an online service that allows you to publish your website files onto the internet.

Image Source: https://www.educba.com/what-is-web-hosting/

Host

How does web hosting work?

- Your web host is responsible for making sure your server is up and running.
- Prevents any security breaches and store all your files, assets and databases onto the server.

Image Source: https://www.educba.com/what-is-web-hosting/

Host

Types of web hosting

- Shared Hosting
- WordPress Hosting
- VPS Hosting
- Dedicated Hosting
- Cloud Hosting

Image Source: https://www.educba.com/what-is-web-hosting/

Host

How much does website hosting cost?

- Website hosting cost will vary by provider.
- Free web hosting
- Paid web hosting

Image Source: https://www.educba.com/what-is-web-hosting/

Host

Where do domains come into the picture with website hosting?

- The domain is the means through which the browser locates the right server and downloads the website files.

Image Source: https://www.educba.com/what-is-web-hosting/

Analog Transmission

Concept

- An analog wave form (or signal) is characterized by being continuously variable along amplitude and frequency.

Image Source: https://www.guru99.com/analog-vs-digital.html

Analog Transmission

Advantages

- Easier in processing
- Best suited for audio and video transmission.
- It has a low cost and is portable.
- It has a much higher density so that it can present more refined information.
- Not necessary to buy a new graphics board.
- Uses less bandwidth than digital sounds
- Provide more accurate representation of a sound
- It is the natural form of a sound.

Image Source: https://www.guru99.com/analog-vs-digital.html

Analog Transmission

Disadvantages

- Analog tends to have a lower quality signal than digital.
- The cables are sensitive to external influences.
- The cost of the Analog wire is high and not easily portable.
- Low availability of models with digital interfaces.
- Recording analog sound on tape is quite expensive if the tape is damaged
- It offers limitations in editing

Image Source: https://www.guru99.com/analog-vs-digital.html

Analog Transmission

Disadvantages

- Tape is becoming hard to find
- It is quite difficult to synchronize analog sound
- Quality is easily lost
- Data can become corrupted
- Plenty of recording devices and formats which can become confusing to store a digital signal
- Digital sounds can cut an analog sound wave which means that you can’t get a perfect reproduction of a sound
- Offers poor multi-user interfaces

Image Source: https://www.guru99.com/analog-vs-digital.html

Digital Transmission

Concept

- It is a series of discrete pulses, representing one bits and zero bits.

Image Source: https://www.guru99.com/analog-vs-digital.html

Digital Transmission

Advantages

- Digital data can be easily compressed.
- Any information in the digital form can be encrypted.
- Equipment that uses digital signals is more common and less expensive.
- Digital signal makes running instruments free from observation errors like parallax and approximation errors.
- A lot of editing tools are available
- You can edit the sound without altering the original copy
- Easy to transmit the data over networks

Image Source: https://www.guru99.com/analog-vs-digital.html

Digital Transmission

Disadvantages

- Sampling may cause loss of information.
- A/D and D/A demands mixed-signal hardware
- Processor speed is limited
- Develop quantization and round-off errors
- It requires greater bandwidth
- Systems and processing is more complex.

Image Source: https://www.guru99.com/analog-vs-digital.html

Analog and Digital Signals

Systems and Applications

- Audio recording and reproduction
- Temperature sensors
- Image sensors
- Radio signals
- Telephones
- Control systems
- Communication systems (broadband, cellular)
- Networking and data communications
- Digital interfaces for programmability

Image Source: https://www.guru99.com/analog-vs-digital.html

Base band and Broadband transmission

Broadband system and Baseband transmission

- Broadband system use modulation techniques to reduce the effect of noise in the environment.
- Baseband is a digital signal. It is transmitted on the medium using one of the signal codes like NRZ, RZ Manchester biphase-M code etc. is called baseband transmission.

Image Source: https://www.computernetworkingnotes.com/networking-tutorials/differences-between-baseband-and-broadband-explained.html

Network cables and connectors

Coaxial Cables

- A solid-core copper wire conductor runs down the middle of the cable.
- Around that solid-core copper wire is a layer of insulation, and
- Covering that insulation is braided wire and metal foil shield, which shields against electromagnetic interference.
- A final layer of plastic insulation jacket covers the braided wire.

Image Source: https://techdifferences.com/difference-between-optical-fibre-and-coaxial-cable.html

Network cables and connectors

Coaxial Cables Types

- There are two types of coaxial cabling:
- ThinNet and
- ThickNet.

Image Source: https://slideplayer.com/slide/14121004/

Network cables and connectors

Twisted Pair Cables

- A pair of wires forms a circuit that can transmit data.
- The pairs are twisted to provide protection against crosstalk.

Image Source: https://slideplayer.com/slide/14121004/

Network cables and connectors

Unshielded Twisted Pair (UTP)

- Unshielded Twisted Pair (UTP) cable is the most common networking media.
- Unshielded Twisted Pair (UTP) consists of four pairs of thin, copper wires covered in color-coded plastic insulation that are twisted together.

Image Source: https://www.fiberoptics4sale.com/blogs/archive-posts/95046918-what-is-unshielded-twisted-pair-utp-cable

Network cables and connectors

Shielded Twisted Pair (STP) cables

- Shielded Twisted Pair (STP) cables additionally have an overall conducting metallic shields covering four twisted pair wires.
- There may be another conducting metallic shields covering individual twisted pairs also.
- These metallic shields blocks out electromagnetic interference to prevent unwanted noise from the communication circuit.

Image Source: https://www.electronicsmedia.info/2018/01/02/unshielded-twisted-pair-and-shielded-twisted-pair-cable/

Network cables and connectors

Types of Connectors

- Ethernet Cable Connectors

- RJ45 connectors are used for CAT6 cables and CAT5e cables.
- These connectors for twisted-pair Ethernet cables are similar in appearance to a standard telephone cord connector.

Image Source: https://www.homedepot.com/c/ab/types-of-cables-and-connectors-in-networking/9ba683603be9fa5395fab90e9250f90

Network cables and connectors

Types of Connectors

- Coaxial Cable Connectors
- BNC connectors are a type of F-series connectors commonly found in households.
- This type of connector for RG59 or RG6 coaxial cable is used for cable television equipment, broadcast TV antenna applications and CCTV security camera installations.

Image Source: https://www.homedepot.com/c/ab/types-of-cables-and-connectors-in-networking/9ba683603be9fa5395fab90e9250f90

Network cables and connectors

Types of Connectors

- USB Connectors
- USB (Universal Serial Bus) connectors typically join external devices to a personal computer or are used for mobile phone charging.

Image Source: https://www.homedepot.com/c/ab/types-of-cables-and-connectors-in-networking/9ba683603be9fa5395fab90e9250f90

Network cables and connectors

Types of Connectors

- Fiber Optic Cable Connectors
- These types of connectors in networking must align glass fibers with precision to allow for communication.

Image Source: https://www.homedepot.com/c/ab/types-of-cables-and-connectors-in-networking/9ba683603be9fa5395fab90e9250f90

Physical and logical topologies

Physical Topology

- Physical topology indicates arrangement of different elements of a network.
- It reflects physical layout of devices and cables to a form a connected network.

Image Source: https://www.javatpoint.com/computer-network-topologies

Physical and logical topologies

Logical Topology

- Logical Topology reflects arrangement of devices and their communication.
- It is the transmission of data over physical topology.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Bus Topology

- The bus topology is designed in such a way that all the stations are connected through a single cable known as a backbone cable.
- Each node is either connected to the backbone cable by drop cable or directly connected to the backbone cable.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Ring Topology

- Ring topology is like a bus topology, but with connected ends.
- The node that receives the message from the previous computer will retransmit to the next node.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Star Topology

- Star topology is an arrangement of the network in which every node is connected to the central hub, switch or a central computer.
- The central computer is known as a server, and the peripheral devices attached to the server are known as clients.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Tree topology

- Tree topology combines the characteristics of bus topology and star topology.
- A tree topology is a type of structure in which all the computers are connected with each other in hierarchical fashion.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Mesh topology

- Mesh technology is an arrangement of the network in which computers are interconnected with each other through various redundant connections.
- There are multiple paths from one computer to another computer.

Image Source: https://www.javatpoint.com/computer-network-topologies

Types of Network Topology

Hybrid Topology

- The combination of various different topologies is known as Hybrid topology.
- A Hybrid topology is a connection between different links and nodes to transfer the data.

Image Source: https://www.javatpoint.com/computer-network-topologies

Asynchronous & Synchronous Transmission

Synchronous Transmission

- In Synchronous Transmission, data is sent in form of blocks or frames.
- This transmission is the full duplex type.

Image Source: https://www.guru99.com/difference-between-synchronous-and-asynchronous-transmission.html

Asynchronous & Synchronous Transmission

Asynchronous Transmission

- In Asynchronous Transmission, data is sent in form of byte or character.
- This transmission is the half duplex type transmission.

Image Source: https://www.guru99.com/difference-between-synchronous-and-asynchronous-transmission.html

Different types of Protocols

Different types of protocols

Definitions

- Definition 1: A protocol is a standard set of rules that allow electronic devices to communicate with each other.
- Definition 2: A protocol is a set of guidelines to govern the data transfer between the devices.

Image Source: https://upload.wikimedia.org/wikipedia/commons/thumb/0/0d/Protocol_architecture.svg/220px-Protocol_arc

Transmission Control Protocol

Introduction

- It provides a full transport layer services to applications.
- TCP is a connection oriented protocol and offers end-to-end packet delivery. It acts as back bone for connection
- TCP is a reliable protocol as it detects the error and retransmits the damaged frames.

Image Source: https://lh3.googleusercontent.com/proxy/MmQAe8LlPH97fO51WtYBRv6hMEL4GNj-QprSgwN8WXL_zGga4j

Transmission Control Protocol

Transmission Control Protocol Offers

- Stream Data Transfer.
- Reliability.
- Efficient Flow Control
- Full-duplex operation.
- Multiplexing.
- TCP offers connection oriented

Image Source: https://lh3.googleusercontent.com/proxy/MmQAe8LlPH97fO51WtYBRv6hMEL4GNj-QprSgwN8WXL_zGga4j

Sending Host
Receiving Host
Application Layer
Packet
& rlogin host
Transport Layer
TCP segment
Internet Layer
IP datagram
Data Link Layer
Frame
Physical Network Layer
Frame
Application Layer
Receives request for login
Transport Layer
TCP segment
Internet Layer
IP datagram
Data Link Layer
Frame
Physical Network Layer
Frame
Network media
Frame
Physical Network Layer
Frame
Frame
Physical Network Layer
Frame
Network media

Transmission Control Protocol

Benefits

- It is an Open standard and is independent of hardware and software manufacturer.
- It can send data between different computer systems running completely through Operating system.
- It is separated from the underlying hardware and it will run over Ethernet, tokens ring and even over dial-up

Image Source: https://lh3.googleusercontent.com/proxy/MmQAe8LlPH97fO51WtYBRv6hMEL4GNj-QprSgwN8WXL_zGga4j

Internet Protocol

Introduction

- Internet Protocol is connectionless and unreliable protocol. It ensures no guarantee of successfully transmission of data.
- In order to make it reliable, it must be paired with reliable protocol such as TCP at the transport layer.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/internet-protocol-in-tcp-ip.jpg

Network Topology

Data Flow

Image Source: https://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/IP_stack_connections.svg/350px-IP_stack_co

Internet Protocol

Image Source: htthttps://upload.wikimedia.org/wikipedia/commons/thumb/3/3b/UDP_encapsulation.svg/1024px-UDP_enca

Internet Protocol

Internet Protocol

Image Source: https://www.w3.org/People/Frystyk/thesis/tcp.gif

Internet Protocol

Points to remember

- The length of datagram is variable.
- The Datagram is divided into two parts: header and data.
- The length of header is 20 to 60 bytes.
- The header contains information for routing and delivery of the packet.

Image Source: https://www.w3.org/People/Frystyk/thesis/tcp.gif

User Datagram Protocol (UDP)

Introduction

- **User Datagram Protocol (UDP)** is a Transport Layer protocol. UDP is a part of the Internet Protocol suite, referred to as UDP/IP suite.
- Though Transmission Control Protocol (TCP) is the dominant transport layer protocol used with most of the Internet services; provides assured delivery, reliability, and much more but all these services cost us additional overhead and latency.

Image Source:
https://media.geeksforgeeks.org/wp-content/uploads/UDP-header.png

User Datagram Protocol (UDP)

Header

- **Source Port:** Source Port is a 2 Byte long field used to identify the port number of the source.
- **Destination Port:** It is a 2 Byte long field, used to identify the port of the destined packet.

Image Source:
https://media.geeksforgeeks.org/wp-content/uploads/UDP-header.png

User Datagram Protocol (UDP)

Header

- **Length:** Length is the length of UDP including the header and the data. It is a 16-bits field.
- **Checksum:** Checksum is 2 Bytes long field. It is the 16-bit one's complement of the one's complement sum of the UDP header, the pseudo-header of information from the IP header, and the data, padded with zero octets at the end (if necessary) to make a multiple of two octets.

Image Source:
https://media.geeksforgeeks.org/wp-content/uploads/UDP-header.png

POP Protoco

Introduction

- The POP protocol stands for Post Office Protocol. As we know that SMTP is used as a message transfer agent.
- When the message is sent, then SMPT is used to deliver the message from the client to the server and then to the recipient server.

Image Source:
https://static.javatpoint.com/tutorial/computer-network/images/pop-protocol.png

POP Protocol

Working of the POP3 protocol

- To establish the connection between the POP3 server and the POP3 client, the POP3 server asks for the user name to the POP3 client.
- If the username is found in the POP3 server, then it sends the ok message.
- It then asks for the password from the POP3 client; then the POP3 client sends the password to the POP3 server.

Image Source:
https://static.javatpoint.com/tutorial/computer-network/images/pop-protocol2.png

POP Protocol

Working of the POP3 protocol

- If the password is matched, then the POP3 server sends the OK message, and the connection gets established.
- After the establishment of a connection, the client can see the list of mails on the POP3 mail server.
- In the list of mails, the user will get the email numbers and sizes from the server. Out of this list, the user can start the retrieval of mail.

Image Source:
https://static.javatpoint.com/tutorial/computer-network/images/pop-protocol2.png

Hypertext Transfer Protocol

Introduction

- HTTP is a communication protocol. It defines mechanism for communication between browser and the web server.
- HTTP request comprises of lines which contains:
    - Request line
    - Header Fields

Image Source: https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/images/HTTP.png

Hypertext Transfer Protocol

Key Points

- The first line i.e. the Request line specifies the request method i.e. Get or Post.
- The second line specifies the header which indicates the domain name of the server from where index.htm is retrieved.

Image Source: https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/images/HTTP.png

Hypertext Transfer Protocol

Key Points

- HTTP Response
  - Like HTTP request, HTTP response also has certain structure. HTTP response contains:
  - Status line
  - Headers
- Message body

Image Source: https://www.ntu.edu.sg/home/ehchua/programming/webprogramming/images/HTTP.png

Hypertext Transfer Protocol Secure

Introduction

- Hypertext Transfer Protocol Secure (HTTPS) is an extension of the Hypertext Transfer Protocol (HTTP). It is used for secure communication over a computer network, and is widely used on the Internet.

- In HTTPS, the communication protocol is encrypted using Transport Layer Security (TLS) or, formerly, Secure Sockets Layer (SSL).

Image Source: https://www.edhotels.com/wp-content/uploads/2020/04/Difference-Between-HTTP-and-HTTPS.png

Hypertext Transfer Protocol Secure

Advantages

- User Data is Encrypted
- You'll Enjoy Better SEO
- Protects your website from Phishing

Image Source: https://www.researchgate.net/profile/S_Dormido/publication/232652131/figure/fig5/AS:300619400269833@

Hypertext Transfer Protocol Secure

Advantages

- Authentication of the accessed website, and protection of the privacy and integrity of the exchanged data while in transit.
- It protects against man-in-the-middle attacks, and the bidirectional encryption of communications between a client and server protects the communications against eavesdropping and tampering.

Image Source: https://www.researchgate.net/profile/S_Dormido/publication/232652131/figure/fig5/AS:300619400269833@

Hypertext Transfer Protocol Secure (SSL)

Limitations

- SSL/TLS does not prevent the indexing of the site by a web crawler
- SSL (Secure Sockets Layer) and TLS (Transport Layer Security) encryption can be configured in two modes: simple and mutual.

Image Source: https://www.researchgate.net/profile/S_Dormido/publication/232652131/figure/fig5/AS:300619400269833@

History of SSL and TLS releases

Limitations

- SSL 1.0 – never publicly released due to security issues.
- SSL 2.0 – released in 1995. Deprecated in 2011. Has known security issues.
- SSL 3.0 – released in 1996. Deprecated in 2015. Has known security issues.

Image Source: https://techdifferences.net/wp-content/uploads/2019/01/Difference-Between-SSL-and-TLS-1024x800.png

File Transfer Protocol

Introduction

- FTP is used to copy files from one host to another browser and the web server.
- FTP creates two processes such as Control Process and Data Transfer Process at both ends i.e. at client as well as at server.
- FTP establishes two different connections: one is for data transfer and other is for control information.

Image Source: https://blog.ipswitch.com/hs-fs/hubfs/ftp-diagram.png?width=750&height=378&name=ftp-diagram.png

File Transfer Protocol

Introduction

- Control connection is made between control processes while Data Connection is made between
- FTP uses port 21 for the control connection and Port 20 for the data connection.

Image Source: https://blog.ipswitch.com/hs-fs/hubfs/ftp-diagram.png?width=750&height=378&name=ftp-diagram.png

File Transfer Protocol

Image Source:
https://www.tutorialspoint.com/internet_technologies/images/internet-ftp_model.jpg

Simple Mail Transfer Protocol

Introduction

- SMTP is a set of communication guidelines that allow software to transmit an electronic mail over the internet is called Simple Mail Transfer Protocol.
- It is a program used for sending messages to other computer users based on e-mail addresses.

Image Source:
https://serversmtp.com/wp-content/uploads/2018/02/what-is-an-smtp-server.png

Simple Mail Transfer Protocol

Introduction

- It provides a mail exchange between users on the same or different computers, and it also supports:
- It can send a single message to one or more recipients.
- Sending message can include text, voice, video or graphics.
- It can also send the messages on networks outside the internet

Image Source:
https://serversmtp.com/wp-content/uploads/2018/02/what-is-an-smtp-server.png

Simple Mail Transfer Protocol

Simple Mail Transfer Protocol

Open System Interconnection Model(OSI)

Introduction

- OSI stands for Open Systems Interconnection. It has been developed by ISO – ‘International Organization of Standardization‘, in the year 1984.
- Designed to show the flow of moving data from one software application of one computer to another software application of another computer.

Image Source:
https://cdn.educba.com/academy/wp-content/uploads/2019/07/OSI-Model.png

Open System Interconnection Model(OSI)

Introduction

- Open Systems Interconnection (OSI) model is the virtual model which describes the Concept of a computer system with the concern of internal structure and technology.

Image Source:
https://cdn.educba.com/academy/wp-content/uploads/2019/07/OSI-Model.png

Open System Interconnection Model(OSI)

Open System Interconnection Model(OSI)

Physical Layer Functions

- The lowest layer of the OSI reference model is the physical layer. It is responsible for the actual physical connection between the devices.
- Bit synchronization
- Bit rate control
- Physical topologies and Transmission mode

The physical layer is responsible for movements of individual bits from one hop (node) to the next.

Image Source:
https://qph.fs.quoracdn.net/main-qimg-2187fc128c7d7fe4aaaba74d2c4c7300

Open System Interconnection Model(OSI)

Physical Layer Functions

- Hub, Repeater, Modem, Cables are Physical Layer devices.
- Network Layer, Data Link Layer and Physical Layer are also known as Lower Layers or Hardware Layers.

Image Source:
https://qph.fs.quoracdn.net/main-qimg-2187fc128c7d7fe4aaaba74d2c4c7300

Open System Interconnection Model(OSI)

Data Link Layer (DLL) Functions

- The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error-free from one node to another, over the physical layer.
- Packet in Data Link layer is referred as Frame.

Image Source: https://electricalfundablog.com/wp-content/uploads/2018/09/3-Data-Link-Layer-in-OSI-Model.png

Open System Interconnection Model(OSI)

Data Link Layer (DLL) Functions

- Data Link layer is handled by the NIC (Network Interface Card) and device drivers of host machines.
- Switch & Bridge are Data Link Layer devices.
  - Logical Link Control (LLC)
  - Media Access Control (MAC)

Image Source: https://electricalfundablog.com/wp-content/uploads/2018/09/3-Data-Link-Layer-in-OSI-Model.png

Open System Interconnection Model(OSI)

Data Link Layer (DLL) Functions

- Framing
- Physical addressing
- Error control
- Flow Control
- Access control

Image Source: https://ars.els-cdn.com/content/image/3-s2.0-B9780123821966000029-f02-31-9780123821966.jpg

Open System Interconnection Model(OSI)

Data Link Layer (DLL) Functions

- Packet in Data Link layer is referred as Frame.
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- Switch & Bridge are Data Link Layer devices.

Image Source: https://ars.els-cdn.com/content/image/3-s2.0-B9780123821966000029-f02-31-9780123821966.jpg

Open System Interconnection Model(OSI)

Network Layer Functions

- Network layer works for the transmission of data from one host to the other located in different networks. It also takes care of packet routing.
- Routing: The network layer protocols determine which route is suitable from source to destination.
- Logical Addressing

Image Source:
https://fossbytes.com/wp-content/uploads/2016/04/network-layer-osi-model.jpg

Open System Interconnection Model(OSI)

Network Layer Functions

- Segment in Network layer is referred as Packet.
- Network layer is implemented by networking devices such as routers.

Image Source:
https://fossbytes.com/wp-content/uploads/2016/04/network-layer-osi-model.jpg

Open System Interconnection Model(OSI)

Transport Layer Functions

- Service provided by transport layer
- Connection Oriented Service: It is a three-phase process which include
  - Connection Establishment
  - Data Transfer
  - Termination / disconnection

Connection less service: It is a one-phase process and includes Data Transfer

Image Source: https://www.technologyuk.net/computing/computernetworks/internet/images/tcp_end_to_end_communicati

Open System Interconnection Model(OSI)

Transport Layer Functions

- Data in the Transport Layer is called as Segments.
- Transport layer is operated by the Operating System. It is a part of the OS and communicates with the Application Layer by making system calls.
- Transport Layer is called as Heart of OSI model.

Image Source: https://www.technologyuk.net/computing/computernetworks/internet/images/tcp_end_to_end_communicati

Open System Interconnection Model(OSI)

Session Layer Functions

- This layer is responsible for establishment of connection, maintenance of sessions, authentication and also ensures security.
- Session establishment, maintenance and termination
- Synchronization
- Dialog Controller

Image Source:
https://images.slideplayer.com/26/8849149/slides/slide_2.jpg

Open System Interconnection Model(OSI)

Session Layer Functions

- All the below 3 layers(including Session Layer) are integrated as a single layer in the TCP/IP model as “Application Layer”.
- Implementation of these 3 layers is done by the network application itself. These are also known as Upper Layers or Software Layers.

Image Source:
https://images.slideplayer.com/26/8849149/slides/slide_2.jpg

Open System Interconnection Model(OSI)

Presentation Layer Functions

- Presentation layer is also called the Translation layer.
- The data from the application layer is extracted here and manipulated as per the required format to transmit over the network.
- Translation.

Image Source:
https://static.docsity.com/documents_pages/2012/11/03/73287fb7f97f04abcee7ddaf02e6d49e.png

Open System Interconnection Model(OSI)

Presentation Layer Functions

- Encryption/ Decryption
- Compression: Reduces the number of bits that need to be transmitted on the network.

Image Source:
https://static.docsity.com/documents_pages/2012/11/03/73287fb7f97f04abcee7ddaf02e6d49e.png

Open System Interconnection Model(OSI)

Application Layer Functions

- The functions of the Application layer are :
- Network Virtual Terminal
- FTAM-File transfer access and management
- Mail Services
- Directory Services

Fig: Application Layer

Image Source:
https://1.bp.blogspot.com/-COEWCeLXPH8/XV0SQahkDKI/AAAAAAAAAoQ/ZR0HtmlMt0sDtyEMOFXzyboPUxMCg48pQCLcBGAs/s1600/application%2Blayer.jpg

Media Access Methods

Introduction

- A media access method refers to the manner in which a computer terminal on a network gains and controls access to the network's physical medium such as a cable.
- The prime objective of media access is to prevent data packets from colliding when two or more computer terminals on a network try to transmit data simultaneously over a network.

Image Source:
https://lh6.googleusercontent.com/v1XCMM7aMys/TXQjf_saj7I/AAAAAAAACF0/xiFNvKeGorU/s1600/Taxo nomy

Media Access Methods

Introduction

- Given below are some of the common media access methods:
  1. CSMA/CD
  2. CSMA/CA
  3. Demand Priority
  4. Token Passing

Image Source: https://lh6.googleusercontent.com/v1XCMM7aMys/TXQjf_saj7I/AAAAAAAACF0/xiFNvKeGorU/s1600/Taxo nomy

Media Access Methods

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- This is a media access method which defines how the network places data on the cable and how it takes it off.
- CSMA/CD specifies how bus topologies such as Ethernet handle transmission collisions.
- It usually operates in two modes of Carrier Sense, Multiple Access and Collision Detection.

Image Source: https://image.slidesharecdn.com/csmamohammedabuibaid-160701034304/95/carrier-sense-multiple-access-csma-11-638.jpg?cb=1467345036

Media Access Methods

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- **Carrier Sense** means that each station on the LAN continually listens to (tests) the cable for the presence of a signal prior to transmitting.
- **Multiple Access** means that there are many computers attempting to transmit and compete for the opportunity to send data (i.e., they are in contention).

Image Source: https://image.slidesharecdn.com/csmamohammedabuibaid-160701034304/95/carrier-sense-multiple-access-csma-11-638.jpg?cb=1467345036

Media Access Methods

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- **Collision Detection** means that when a collision is detected, the stations will stop transmitting and wait a random length of time before retransmitting the data.

Image Source: https://image.slidesharecdn.com/csmamohammedabuibaid-160701034304/95/carrier-sense-multiple-access-csma-11-638.jpg?cb=1467345036

Media Access Methods

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- CSMA/CA stands for Carrier-Sense Multiple Access with Collision Avoidance and is a media access method very similar to CSMA/CD.
- The difference is that the CD (collision detection) is changed to CA (collision avoidance).

Image Source: https://image.slidesharecdn.com/csmamohammedabuibaid-160701034304/95/carrier-sense-multiple-access-csma-14-638.jpg?cb=1467345036

Media Access Methods

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

- Instead of detecting and reacting to collisions, CSMA/CA tries to avoid them by having each computer signal its intention to transmit before actually transmitting.
- In effect, the transmitting computer gives a “Request” prior to transmitting.

Image Source: https://image.slidesharecdn.com/csmamohammedabuibaid-160701034304/95/carrier-sense-multiple-access-csma-14-638.jpg?cb=1467345036

Media Access Methods

Token Passing

- Token passing is a media access method by which collisions are prevented.
- Collisions are eliminated under token passing because only a computer that possesses a free token (a small data frame) is allowed to transmit.
- The token passing method also allows different priorities to be assigned to different stations on the ring.

Image Source:
https://images.slideplayer.com/16/5013077/slides/slide_10.jpg

Media Access Methods

Token Passing

- Transmissions from stations with higher priority take precedence over stations with lower priority.
- Token passing works best in an environment where a relatively large number of shorter data frames are being transmitted.

Image Source:
https://images.slideplayer.com/16/5013077/slides/slide_10.jpg

Media Access Methods

Token Passing

There are two common error conditions that can occur on a token passing LAN:

a) Constant Frame Error

A token cannot be acknowledged and continues to be passed around the ring.

b) Lost Token Error

A token is accidentally “hung up” or removed from the ring.

Image Source:
https://images.slideplayer.com/16/5013077/slides/slide_10.jpg

Media Access Methods

Demand Priority

- Demand priority is the new Ethernet media access method that will probably replace the popular but older CSMA/CD method.
- In demand priority, an active hub is an essential requirement that can control the access to the network.

Image Source: https://onlinelibrary.wiley.com/cms/asset/70bc301f-349e-41bd-a976-bfcaf792ffcc/ett2869-toc-0001-m.jpg

Media Access Methods

Demand Priority

- The terminals on a network are required to obtain permission from the hub before they start transmitting the bytes over a network.

Image Source: https://onlinelibrary.wiley.com/cms/asset/70bc301f-349e-41bd-a976-bfcaf792ffcc/ett2869-toc-0001-m.jpg

Media Access Methods

Demand Priority

- In this the terminals involved in communication can send and receive at the same time.
- The transmission can be prioritized based on the requirements; for example, time sensitive data such as video can be given priority.

Image Source: https://onlinelibrary.wiley.com/cms/asset/70bc301f-349e-41bd-a976-bfcaf792ffcc/ett2869-toc-0001-m.jpg

Media Access Methods

Difference

CSMA/CD	Token Passing
Used primarily by Ethernet LANs.	Used primarily by Token Ring LANs.
Works best in larger networks with relatively fewer, longer data frames.	Works best in small to medium size networks with many short data frames
Does not allow different priorities to be assigned to stations.	Allows different priorities to be assigned to stations.
Normally less expensive than token passing.	Normally more expensive than **CSMA/CD.**

DNS Service

Introduction

- Domain Name System (DNS) is an Internet service that translates the domain names into IP addresses, which computer can understand.
- Every device connected to the internet has a unique IP address which other machines use to find the device.

Image Source:
https://www.eternalsoftsolutions.com/blog/wp-content/uploads/2019/02/how_dns_works.png

DNS Records

Records	Description	Function
A	Address Record	It returns a 32bit IP addresses. This is where the actual Website is redirected towards most commonly.
CNAME	Canonical Name Record	This is an Alias. The DNS Server will continue to lookup with this new name.
DNAME	Delegation Name	This again is an alias for a name and also its subname, unlike CNAME, which is only an alias for itself. But similar to CNAME, the DNS Server tries to lookup with this new name as well.
DNSKEY	DNS KEY Record	There is another record known as KEY record which I haven't mentioned here. The format of DNSKEY is same as the KEY, and is used in DNSSEC (more in description).

DNS Records

Records	Description	Function
LOC	Location Record	This provides the geographical location depending upon the domain name.
MX	Mail Exchange Record	This is related to the email routing which I mentioned previously. This maps the domain name with the email ID.
NS	Name Server Record	Provides a DNS ZONE to authorized name servers.
TKEY	Secret Key Record	This is the Key used with TSIG which is encrypted under Public Key.

DNS Records

Records	Description	Function
TSIG	Transaction Signature	This is used to authenticate updates coming from an approved source or name server. It is used along with TKEY.
TXT	Text Record	This file provides machine data related to frameworks and encryption.

DNS Service

There are 4 DNS servers involved in loading a webpage:

- DNS recursor - The DNS recursor is a server designed to receive queries from client machines through applications such as web browsers.
- Root nameserver - The root server is the first step in translating (resolving) human readable host names into IP addresses

Image Source: https://d1.awsstatic.com/Route53/how-route-53-routes-traffic.8d313c7da075c3c7303aaef32e89b5d0b7885

DNS Service

There are 4 DNS servers involved in loading a webpage:

- TLD nameserver - The top level domain server (TLD) ,This nameserver is the next step in the search for a specific IP address, and it hosts the last portion of a hostname (In example.com, the TLD server is “com”).

Image Source: https://d1.awsstatic.com/Route53/how-route-53-routes-traffic.8d313c7da075c3c7303aaef32e89b5d0b7885

DNS Service

There are 4 DNS servers involved in loading a webpage:

- Authoritative nameserver - If the authoritative name server has access to the requested record, it will return the IP address for the requested hostname back to the DNS Recursor (the librarian) that made the initial request.

Image Source: https://www.internetsociety.org/wp-content/uploads/2019/02/dnsprivacy1.gif

DNS Lookup Process

DHCP Service

Introduction

- Dynamic Host Configuration Protocol (DHCP) is a network management protocol used to dynamically assign an Internet Protocol (IP) address to any device, or node, on a network so they can communicate using IP.
- The DHCP client will demand an IP address by broadcasting a DHCP Discover message to the local subnet.

Image Source:
https://ars.els-cdn.com/content/image/1-s2.0-S0045790612001140-fx1.jpg

DHCP Service

Image Source:
https://networkencyclopedia.com/wp-content/uploads/2019/08/configuring-dhcp-scope.jpg

DHCP Service

DHCP Process

1. **DHCPDISCOVER:** The client broadcasts a request for a DHCP server.
2. **DHCPOFFER:** DHCP servers on the network offer an address to the client.
3. **DHCPREQUEST:** The client broadcasts a request to lease an address from one of the offering DHCP servers.

Image Source:
https://networkencyclopedia.com/wp-content/uploads/2019/08/dhcp.jpg

DHCP Service

DHCP Process

4. DHCPACK: The DHCP server that the client responds to acknowledges the client, assigns it any configured DHCP options, and updates its DHCP database. The client then initializes and binds its TCP/IP protocol stack and can begin network communication.

Image Source:
https://networkencyclopedia.com/wp-content/uploads/2019/08/dhcp.jpg

Windows Internet Name Service

Introduction

- Windows Internet Name Service, or WINS, is a Microsoft Windows service that dynamically registers NetBIOS names of computers on the network.
- The Windows Internet Naming Service (WINS) converts the NetBIOS host names into IP addresses.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/wins-windows-internet-name-service.jpg

Windows Internet Name Service

Introduction

- It allows the Windows machines on a given LAN segment to recognize Windows machines on other LAN segments.
- It was designed specifically to support NetBIOS over TCP/IP (NetBT)

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/wins-windows-internet-name-service.jpg

Windows Internet Name Service

Advantages

- In order for NetBIOS hosts (servers and clients running pre-Windows 2000 versions of Microsoft Windows) to communicate on a network, their NetBIOS names must first be resolved into IP addresses. WINS servers perform this task.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/wins-windows-internet-name-service.jpg

Windows Internet Name Service

Advantages

- Directed traffic to WINS servers generates less network traffic than broadcasts.
- WINS provides a mechanism for browsing network resources across multiple domains and subnets.
- The WINS database of NetBIOS name to IP address mappings is dynamically maintained, eliminating the need for lmhosts files on clients.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/wins-windows-internet-name-service.jpg

Windows Internet Name Service

Example

- In this example, the following occurs:

1. A WINS client, HOST-A, registers any of its local NetBIOS names with WINS-A, its configured WINS server.
2. Another WINS client, HOST-B, queries WINS-A to locate the IP address for HOST-A on the network.
3. WINS-A replies with the IP address for HOST-A, 192.168.1.20.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/windows-internet-name-service-wins.gif

Remote Access Service

Introduction

- A remote access service (RAS) is any combination of hardware and software to enable the remote access tools or information that typically reside on a network of IT devices.
- A remote access service connects a client to a host computer, known as a remote access server.

Image Source: https://slideplayer.com/slide/14892336/91/images/2/Remote+Access+Just+another+computer+on+the+network.+Functions+as+if+it+was+on+the+LAN..jpg

Remote Access Service

Introduction

- RAS is arranged within an organization and directly connected with the organization's internal network and systems.

Image Source: https://slideplayer.com/slide/14892336/91/images/2/Remote+Access+Just+another+computer+on+the+network.+Functions+as+if+it+was+on+the+LAN..jpg

Remote Access Service

Introduction

- A remote access server (RAS) is a type of server that provides a suite of services to remotely connected users over a network or the Internet.
- It operates as a remote gateway or central server that connects remote users with an organization's internal local area network (LAN).

Image Source: https://slideplayer.com/slide/14892336/91/images/2/Remote+Access+Just+another+computer+on+the+network.+Functions+as+if+it+was+on+the+LAN..jpg

Remote Access Service

Introduction

- RAS is a service that allows remote clients to connect to the server over a modem using a RAS-based protocol such as the Serial Line Internet Protocol (SLIP) or the newer Point-to-Point Protocol (PPP).

Image Source: https://slideplayer.com/slide/14892336/91/images/2/Remote+Access+Just+another+computer+on+the+network.+Functions+as+if+it+was+on+the+LAN..jpg

Remote Access Service

Introduction

- PPP can run with network protocols such as TCP/IP, IPX/SPX, and NetBEUI; SLIP only supports TCP/IP.
- Examples : Team Viewer, Ammyy software

Image Source: https://slideplayer.com/slide/14892336/91/images/2/Remote+Access+Just+another+computer+on+the+network.+Functions+as+if+it+was+on+the+LAN..jpg

Remote Access Service

Web Service

Introduction

- Web service is a standardized medium to circulate communication between the client and server applications on the World Wide Web.
- A web service is a software module that is designed to perform a certain set of tasks.

Image Source:
Source:https://documentation.alphasoftware.com/pages/Guides/Services/Web%20Service%20Clients/imag es/WebServicesSimple.jpg

Web Service

Web Services Architecture

- Provider
- Requestor
- Broker - The broker is nothing but the application which provides access to the UDDI. The UDDI, as discussed in the earlier topic enables the client application to locate the web service.(UDDI stands for Universal Description, Discovery, and Integration.)

Image Source:
https://www.guru99.com/images/3-2016/032316_0646_Webservicea3.png

Web Service

Types of Web Services

1. There are mainly two types of web services.
2. SOAP stands for Simple Object Access Protocol
3. SOAP a XML-based protocol for accessing web services
4. SOAP is platform and language independent
5. SOAP is a W3C recommendation for communication between two applications

Image Source: https://documentation.alphasoftware.com/pages/Guides/Services/Web%20Service%20Clients/images/WebServicesOverview.jpg

Web Service

Web Service
Java
PHP
C
.net
Java
APIs
API
API requests
API response
Server/Data Source
Web service
XML/JSON/HTTP request
internet
Client
XML/JSON/HTTP response
Internal system
SOAP CLIENT
SOAP SERVICE
(1) Client
Request
Web/AP Server
(3)
SOAP
XML
(2) SOAP Server
DB Server
Web/AP Server
SOAP Web services

Web Service

Types of Web Services

- **REST** stands for **R**epresentational **S**tate **T**ransfer. REST is an architectural style not a protocol.
- Restful Web Service is a lightweight, maintainable, and scalable service that is built on the REST architecture.
- Restful Web Service, expose API from your application in a secure, uniform, stateless manner to the calling client.

Image Source:
https://res.cloudinary.com/practicaldev/image/fetch/s--FkyXorEz--/c_limit%2Cf_auto%2Cfl_progressive%2Cq_auto%2Cw_880/https://thepracticaldev.s3.amazonaws.com/i/ueg7okh8thprev2cay9s.jpg

Web Services

Web Services API

Web Service

Advantages

Type	Advantages	Description
SOAP	**Security**	SOAP defines its own security known as WS Security
	Language and Platform independent	SOAP web services can be written in any programming language and executed in any platform
RESTful	**Fast**	RESTful Web Services are fast
	Language and Platform independent	It is also language and platform independent
	Can use SOAP	RESTful web services can use SOAP web services as the implementation
	Permits different data format	RESTful web service permits different data format such as Plain Text, HTML, XML and JSON

Web Service

Disadvantages

Disadvantages	Description
Slow	SOAP uses XML format that must be parsed to be read. It defines many standards that must be followed while developing the SOAP applications. So it is slow and consumes more bandwidth and resource.
WSDL Dependent	SOAP uses WSDL and doesn't have any other mechanism to discover the service

Disadvantages

Introduction

- Monitoring and Filtering

1) Proxy servers allow us to do several kind of filtering such as:
2) Content Filtering
3) Filtering encrypted data
4) Bypass filters
5) Logging and eavesdropping

Image Source:
https://www.temok.com/blog/wp-content/uploads/2019/08/Featured.jpg

How Proxy Server Works

Image Source:
https://www.google.com/url?sa=i&url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FProxy_server&psig=

Types of proxy servers

Forward Proxy

- In this the client requests its internal network server to forward to the internet.

Image Source:
https://www.tutorialspoint.com/internet_technologies/images/internet-forward_proxy.jpg

Types of proxy servers

Open Proxy

- Open Proxies helps the clients to conceal their IP address while browsing the web.

Image Source:
https://www.tutorialspoint.com/internet_technologies/images/internet-open_proxy.jpg

Types of proxy servers

Reverse Proxy

- In this the requests are forwarded to one or more proxy servers and the response from the proxy server is retrieved as if it came directly from the original Server.

Image Source:
https://www.tutorialspoint.com/internet_technologies/images/internet-reverse_proxy.jpg

Install & configure the different types of network devices in a network

15 Hours

In this section, we will discuss:

- Functions of Network Interface Card (NIC)
- Repeaters
- Hub
- Switches
- Routers
- Bridges.
- Internet Service Provider

Network Devices

Functions of Network Interface Card (NIC)

- It is an electronic device that joins a computer to a computer network, usually a LAN.
- The NIC contains the electronic circuitry required to connect using a wired connection (e.g., Ethernet) or a wireless connection (e.g., WiFi).

Image Source: https://techterms.com/definition/nic

Network Devices

Repeaters

- Repeaters receive network signals on one port, amplify them, and repeat them out the other port.
- Since they operate only at the Physical layer of the OSI model, repeaters can intersect different media types but cannot convert protocols.
- The purpose of a repeater is to extend the maximum distance of a single network segment.

Image Source: https://www.tp-link.com/ae/support/faq/151/

Network Devices

Hub

- A hub (also called a concentrator) serves as a central joining point for several network devices.
- At a basic level, a hub is nothing more than a multiport repeater.
- A hub repeats what it obtains on one port to all other ports.

Image Source: https://www.lynda.com/Windows-Server-tutorials/Exploring-hubs/408231/435884-4.html

Network Devices

Types of hub

- **Active Hub** – It is usually powered and amplifies and cleans up the signal it receives, thus doubling the effective segment distance limitation for the specific topology.
- **Passive Hub** – Typically it is unpowered and makes only physical, electrical connections. Usually, the maximum segment distance of a topology is shortened because the hub takes some power away from the signal strength in order to do its job.

2.Passive Hub

- Act as connection point, not as repeater.
- Do not require electricity to run.
- Inexpensive and easy to configure.

Image Source: https://www.slideshare.net/patelgopal1044/network-d

Switches

What is a Switch

- Switches are key building blocks for any network.
- They can connect multiple devices such as computers , printers , access points & servers etc. on same network within a building or campus .

Image Source: https://www.indiamart.com/proddetail/networking-switches-dlink-and-digisol-11032831233.html

Switches

Role of switches in networking

- Switching in a computer network is achieved by using switches.
- Network switches operates at layer 2 (Data Link Layer) in the OSI Model
- It is operated in a full duplex mode.

Image Source: https://www.indiamart.com/proddetail/networking-switches-dlink-and-digisol-11032831233.html

Switches

Types of switches (Unmanaged Switches)

- These are the switches that are used in home networks and small businesses.
- They do not need to be configured as they work on home /small networks .
- They require small cabling and they are least expensive too.

Image Source: https://www.netgear.com/business/products/switches/unmanaged/

Switches

Types of switches (Managed Switches)

- These are the switches used in large organizations containing a large network.
- These are costly but their scalability makes them an ideal option for a network that is going.
- They are achieved by setting a simple network management protocol(SNMP)

Image Source: https://www.netgear.com/business/products/switches/unmanaged/

Switches

Types of switches (LAN Switches)

- These are also known as Ethernet switches or Data switches.
- They are used to reduce network congestion or bottleneck by distributing a package of data only to its intended recipient

Image Source: https://www.netgear.com/business/products/switches/unmanaged/

Switches

Types of switches (PoE Switches)

- PoE switches are used in PoE technology which stands for Power over Ethernet.
- Technology that integrate data and power on the same cable allowing power devices to receive data in parallel to power

Image Source: https://www.wifi-stock.com/details/zq-poes-8-7.html/products/switches/unmanaged/

Switches

Advantages of switching

- Increases the bandwidth of the network.
- Reduces the workload of individual PC as it sends the information to only that device which has been addressed.
- Increases the overall performance of the network by reducing the traffic on the network.

Image Source: https://www.indiamart.com/proddetail/networking-switches-dlink-and-digisol-11032831233.html

Switches

Disadvantages of switching

- It is expensive as compared to network bridges.
- It cannot determine the network connectivity issues easily.
- Proper designing and configuration of the switches are required to handle multicast packets

Image Source: https://www.indiamart.com/proddetail/networking-switches-dlink-and-digisol-11032831233.html

Routers

What is a Router

- The Router is a physical or virtual internetworking device that is designed to receive, analyze, and forward data packets between computer networks.
- Some popular companies that develop routers are cisco , ibm , hp , asus , juniper d-link etc.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

What is a Router

- Is used in LAN and WAN Environments.
- It shares information with other routers. in networking
- It uses the RIP(Routing Information Protocol) to transfer the data across the network.
- It is more expensive than other network devices like switches and hubs.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Features of Routers

- A router works on the third layer (network layer) of OSI model
- It allows the users to connect to several LAN and WAN .
- Routers are capable of routing the traffic in a large networking system by subnetting .
- Routers provide the redundancy as it always works in master and slave mode.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Types of Routers (Wireless Router)

- They used to offer a wifi connectivity to laptop , smartphones and other devices.
- Wireless routers are capable of generating a wireless signal in your home or office.
- If the connection is indoors , the range of wireless router is 150 feet and when the connection is outdoors ,the range is upto 300 feet.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Types of Routers (BRouter)

- It is the combination of bridge and the router.
- It allows the transferring the data between network like a bridge and like a router , it can also route the data within the network to the individual systems.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Types of Routers (Core Router)

- It is a router that can route the data within a network, but it is not able to route the data between the networks.
- It is a computer communication system device and the backbone of networks, as it helps to link all network devices.
- It is used by Internet Service Providers (ISPs).

Carrier Routing System-X (CRS-X)

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Types of Routers (Edge Router)

- An edge router is a lower-capacity device that is placed at the boundary of a network.
- It is also known as an access router.
- It allows a internal network to connect to the external network.
- It uses bgp(border gateway protocol) for communication.

Image Source: https://www.technodabbler.com/edge-router-x/

Routers

Types of Routers (Broadband Router)

- Broadband routers are used to provide high speed internet access to computers.
- It is needed when you connect to the internet through phone and use voice over IP technology (VOIP).
- It is configured and provided by the Internet Service Provider (ISP).

Image Source: https://www.technodabbler.com/edge-router-x/

Routers

Advantages of Routers

- Security
- Performance enhancement
- Reliability
- Networking Range

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Routers

Disadvantages of Routers

- They operates on routable network protocols.
- They are expensive.
- They are slower as they need to analyse from layer 1 throw layer 3 of OSI model.

Image Source: https://www.lifewire.com/what-is-a-router-2618162

Bridges

What is bridges

- A networking Bridge is a device that divides a network into the segments.
- Each segment represent a separate collision domain , & each collision domain has its own separate bandwidth
- A Bridge works at layer 2 (Data link layer) of the OSI Model.

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Types of bridges (Transparent Bridge)

- It is an Invisible bridge in the computer network.
- The main function of this bridge is to block or forward the data depending on the MAC address.
- The other devices within the network are unaware of the existence of bridges.

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Types of bridges (Translational Bridge)

- It plays a key role in changing a networking system from one type to another.
- These bridges are used to connect two different networks like token ring and Ethernet.
- This bridge can add or remove the data based on traveling direction, and fields from the frames as needed.

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Types of bridges (Source-Route Bridge)

- It is a one type of technique used for token ring network and it is designed by IBM.
- The total frame route is embedded in one frame so it allow the bridge to make precise decision of how the frame is forwarding using a network.
- In this method two similar network segments are connected to data link layer.

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Functions of Bridges

- It is used to divide the local area network into several segments.
- In the osi model it works under the data link layer
- It is used to store the address of MAC in PC used in a network.

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Advantages of Bridges

- It acts as a repeater to extend a network.
- Collisions can be reduced.
- Bridges increases the available bandwidth to individual nodes.
- It avoids waste bandwidth
- The length of the network can be increased

Image Source: https://jackleachipt.wordpress.com/bridge/

Bridges

Disadvantages of Bridges

- It is unable to read specific IP address because they are more troubled with the mac address.
- They cannot help while building the network between the different architectures of network.
- It does not handle more variable and complex data load which occurs from WAN.

Image Source: https://jackleachipt.wordpress.com/bridge/

Internet Service Provider

What is ISP

- An Internet Service Provider (ISP) ia a company that provides customers with internet access.
- An Internet Service Provider (ISP) is also known as Internet Access Provider (IAP).
- ISPs also provide their customers with the ability to communicate with one another.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (Dial-up Internet Access)

- It is the oldest technology to provide internet access by modem to modem connection using telephone lines.
- This method has become outdated today due to slow connection speed.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (DSL)

- DSL stands for ‘Digital Subscriber Line’ is an advanced version of Dial-up internet access method.
- This method offers Asymmetric Digital Subscriber(ASDL), where upload speed is less than download speed, and Symmetric Digital Subscriber (SDSL), where upload and download speed are equal.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (Wireless Broadband)

- WiBB is a modern broadband technology for internet access.
- It allows high-speed wireless internet within a large area.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (Wifi Internet)

- Wifi stands for ‘Wireless fidelity’.
- It is a wireless networking technology that provides wireless high-speed internet connections using Radio waves.
- It is commonly used in public places such as hotels, airports, restaurants, etc.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (ISDN)

- ISDN stands for Integrated Services Digital Network.
- It is a telephone system network which integrates a high quality digital transmission of voice and data over the same standard phone line.

Image Source: https://www.javatpoint.com/isp-full-form/

Internet Service Provider

Types of ISPs (Ethernet)

- It is a wired LAN (Local Area Network) where computers are connected within a primary physical space.
- It enables devices to communicate with each other via a protocol (a set of rules or common network language).
- It may provide different speed such as 10 Mbps, 100 Mbps and 10 Gbps.

Image Source: https://www.javatpoint.com/isp-full-form/

Modern Network Security

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Modern Network Security

Why Internet Security

- Cybersecurity refers to the practice of reducing cyber risk through the protection of the entire information technology (IT) infrastructure, including systems, applications, hardware, software, and data.
- It is very important in today's world.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Modern Network Security

Importance of Cyber Security

- Cyber-attacks (Unauthorized access to your Systems)
- Data breaches (Exposure of sensitive business, customer, & supplier data)
- Identity thefts (the theft of logins, passwords, and other sensitive, personally identifiable data)

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Modern Network Security

Cyber Security Practise Areas

- Data Security
- Application Security
- Network Security
- Operational Security
- Cloud Security

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Modern Network Security

Cyber Security Practise Areas

- Identity and Access Management(IAM)
- Privileged Access Management(PAM)
- Vulnerability Management (VM)
- Enterprise Mobility Management (EMM)
- Business Continuity (BC) and Disaster Recovery (DR).

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Threats and the Basics of securing a network

Common Network Security Threats

- Computer Viruses
- DOS (Denial of service) attack
- Trojan Horse
- Adware and Spyware
- Computer Worm
- Phishing
- Rootkit
- SQL Injection attack
- Malware

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Threats and the Basics of securing a network

Cyber Security Best Practices

- Audit your existing IT ecosystem
- Complete a gap Analysis
- Used a risk based approach to cyber security
- Take the advantages of modern cyber security software
- Implement robust identity and access management

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Cyber Security Best Practices

- Use privileged access management
- Employ vulnerability scanning
- Use of Cyber Security Frameworks

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Threats and the Basics of securing a network

Network security Models

- Firewalls
- Antivirus Software
- Passwords
- Cryptography
- Algorithms

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Threats and the Basics of securing a network

Firewalls

- A firewall is a software program or hardware that stops the hackers, viruses and worms that try to reach computer.
- It scans every message and blocks that information that does not meet the security norms.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Benefits of Firewalls

- Shield from Vulnerable services.
- Logging and statistics on network usage, and misuse of it.
- Policy enforcement.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Authentication

- User Identification and Password.
- A signed digital certificate or even a fingerprint.
- User's voice, hand configuration, fingerprint, etc.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Intrusion Detection System

- Intrusion Detection System (IDS) are mainly concentrated on recognizing possible occurrences, logging information and reporting attempts.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Antivirus software

- Antivirus software is a program or set of programs that are designed to prevent, search for, detect and remove software viruses and other malicious software like worms, trojans, adware, etc.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Benefits of Antivirus software

- Scan specific files or directories.
- Allows to schedule scans to automatically run for you.
- Allows you to initiate scan of a particular file or entire computer or of a CD or flash drive at any time.
- Removes any malicious code detected.
- Show you the ‘health’ of your computer.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Some popular Antivirus software

- Norton
- Kaspersky
- McAfee
- BullGuard
- Avast Antivirus
- Panda Cloud Antivirus
- Quick Heal Antivirus
- AVG

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Cryptography

- The term cryptography means the concept of encryption and decryption together.
- Cryptography is the method in which plain text message is encoded that is called ciphertext at the transmitters end, which is then conveyed to the receiver. The receiver then decrypts to get the original message back.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Techniques of Cryptography

- Symmetric Key Cryptography : In this the significant component used is equal for both encoding and decoding.
- Asymmetric Key Cryptography : In this the key element used is unlike for both encryption as well as decryption.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Threats and the Basics of securing a network

Some Populars Encryption Algorithms

- Triple DES
- RSA
- Blowfish
- Twofish
- AES

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Secure Administrative Access

Techniques for secure administrative access

- Setting User modes passwords
- Setting Privilege mode passwords
- Encryption Passwords in config files
- Setting access privilege levels
- Restrict telnet to the Device

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Secure Administrative Access

Techniques for secure administrative access

- Restrict web browser access to the Device.
- Restrict SNMP access to the Device.

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Secure Administrative Access

User Mode Passwords

- **Console (con) port** Access for the console cable. Figure shows a typical console port on a router.
- **Auxiliary (AUX) port** A console-like access that can be attached to an external modem for a dial-up connection.

```
interface FastEthernet0/0
 ip address 192.168.0.1 255.255.255.0
!
line con 0 ????????<-Console connection
 login
line aux 0 ????????<-AUX connection
 login
line vty 0 4 ??????<-Virtual terminal connections
 login
end
```

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Secure Administrative Access

User Mode Passwords

```
interface FastEthernet0/0
 ip address 192.168.0.1 255.255.255.0
!
line con 0 ????????<-Console connection
 login
line aux 0 ????????<-AUX connection
 login
line vty 0 4 ??????<-Virtual terminal connections
 login
end
```

- **Virtual terminal (vty) ports** The access points for Telnet sessions.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Secure Administrative Access

Privilege Mode Passwords

- **1** User exec mode only (prompt is router>), the default level for login
- **15** Privileged exec mode (prompt is router#), the Enable mode
- **0** Seldom used, but includes five commands: disable, enable, exit, help, and logout

mode	Indicates the configuration level being assigned. This includes all router configuration modes, including exec, configure, and interface.
level	Indicates the level being defined.
command	Indicates the command to be included. If you specify exec mode, then the command must be an **exec mode** command.
reset	Resets the privilege level of the command to the default privilege level.

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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Secure Administrative Access

Privilege Mode Passwords

```
Rtr1(config)#privilege exec level 7 ping
Rtr1(config)#privilege exec level 7 show startup-config
Rtr1(config)#privilege exec level 7 show ip route
Rtr1(config)#privilege exec level 7 show ip int brief
Rtr1(config)#enable secret level 7 tESt7
```

- The Syntax is

privilege *mode* {level *level command* | reset *command*}

Image Source: https://antivirus.comodo.com/blog/computer-safety/importance-of-internet-security/

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LAN Security Considerations.

Understand Types of Network Devices

- To build a strong network and defend it, you need to understand the devices that comprise it. Here are the main types of network devices; viz. Hub, Switch, Router, Gateway

https://cdn.educba.com/academy/wp-content/uploads/2019/10/Types-of-Network-Devices.png

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LAN Security Considerations.

Know Network Defenses

- Using the proper devices and solutions can help you defend your network. Here are the most common ones you should know about; Firewall, IDS, IPS, NAC, Web Filters, Load Balancers, Proxy Server, Anti DDoS, Spam Filter

https://securityintelligence.com/wp-content/uploads/2015/04/application.jpg

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LAN Security Considerations.

Segregate Your Network

- Network segmentation involves segregating the network into logical or functional units called zones.
- You can separate them using routers or switches or using virtual local area networks (VLANs), which you create by configuring a set of ports on a switch to behave like a separate network.

https://www.cdn.geeksforgeeks.org/wp-content/uploads/52555.png

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LAN Security Considerations.

Segregate Your Network (Continue)

- Segmentation is also useful in data classification and data protection.
- Virtualization is another way to segment a network.
- Segmentation limits the potential damage of a compromise to whatever is in that one zone.

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LAN Security Considerations.

Segregate Your Network (Continue)

- Types of Network Segments:
  - Public Networks
  - Semi-private Networks
  - Private Networks
  - Demilitarized Zone (DMZ)
  - Software-Defined Networking (SDN)

https://upload.wikimedia.org/wikipedia/commons/thumb/e/e8/VPN_overview-en.svg/330px-VPN_overview-en.svg.png

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LAN Security Considerations.

Place Your Security Devices Correctly

- As you design your network segregation strategy, you need to determine where to place all your devices
- To determine where to place other devices, you need to consider the rest of your network configuration

https://www.websense.com/content/support/library/deployctr/v78/images/na_multiple_segments.png

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LAN Security Considerations.

Use Network Address Translation

- Network address translation (NAT) enables organizations to compensate for the address deficiency of IPv4 networking.
- NAT translates private addresses (internal to a particular organization) into routable addresses on public networks such as the internet.

https://upload.wikimedia.org/wikipedia/commons/thumb/c/c7/NAT_Concept-en.svg/1200px-NAT_Concept-en.svg.png

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LAN Security Considerations.

Use Network Address Translation (Continue)

- In particular, NAT is a method of connecting multiple computers to the internet (or any other IP network) using one IP address.
- NAT complements firewalls to provide an extra measure of security for an organization's internal network

https://www.onlinecomputertips.com/images/networking/n146.jpg

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LAN Security Considerations.

Don’t Disable Personal Firewalls

- Personal firewalls are software-based firewalls installed on each computer in the network. They work in much the same way as larger border firewalls
- Instead of disabling personal firewalls, simply configure a standard personal firewall according to your organization’s needs

https://anydifferencebetween.com/wp-content/uploads/2016/09/Difference-Between-Personal-Firewall-and-Network-Firewall.jpg

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LAN Security Considerations.

Use Centralized Logging and Immediate Log Analysis

- Record suspicious logins and other computer events and look for anomalies
- This helps you reconstruct what happened during an attack
- You can take steps to improve your threat detection process and quickly block attacks in the future

Time	DoS Mode	DoS Source	Virtual Server	Event	Type	Action	Attack ID
2016-06-13 18:14:37	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:36	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:35	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:34	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:33	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:32	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:31	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:30	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:29	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:28	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:27	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:26	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:25	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Allow	3510932495
2016-06-13 18:14:24	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Drop	3510932495
2016-06-13 18:14:22	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Drop	3510932495
2016-06-13 18:14:21	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Drop	3510932495
2016-06-13 18:14:20	Enforced	Aggregate	/Common/span-virtual-all	Attack Sampled	UDP flood	Drop	3510932495

https://techdocs.f5.com/kb/global/manual_images/MAN-0622-00_v5/GUID-5C04B3DD-5407-48DA-B07C-FE85A65D21ccnh.png

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LAN Security Considerations.

Use Web Domain Whitelisting

- Limiting users to browsing only the websites you've explicitly approved helps in two ways
  - First, it limits your attack surface
  - Second, whitelisting limits hackers' options for communication after they compromise a system

https://www.chorus.co/media/1346/whitelisting-blacklisting.png

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LAN Security Considerations.

Route Through a Proxy Server

- All outbound web access should be routed through an authenticating server where access can be controlled and monitored
- Using a web proxy helps ensure that an actual person, not an unknown program, is driving the outbound connection

https://www.seobility.net/en/wiki/images/8/8a/Proxy-Server.png

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LAN Security Considerations.

Use Honeypots and Honeynets

- A Honeypot is a separate system that appears to be an attractive target but is in reality a trap for attackers
- A Honeynet is the next logical extension of a honeypot — it is a fake network segment that appears to be a very enticing target

https://www.umangsoftware.com/wp-content/uploads/2019/08/honeypot_2.png

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LAN Security Considerations.

Protect Your Network from Insider Threats

- To deal with insider threats, you need both prevention and detection strategies
- The most important preventive measure is to establish and enforce the least-privilege principle for access management and access control

https://media.threatpost.com/wp-content/uploads/sites/103/2019/09/10155113/insider-threat.jpg

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LAN Security Considerations.

Monitor and Baseline Network Protocols

- You should monitor the use of different protocol types on your network to establish baselines both the organization level and a user level

https://lh3.googleusercontent.com/proxy/CQHj5c84rlAv_hk62zwW3XZXbpCAvNWIZRifeTQ1e8xosDTwhEnTEhmteGbwK6aVP-Q9JA8Yah4n9lSEQeosf3EVR2-jM61kDEfAqnWcYKyhH63AdKN2kdN6u_Apu5yWZg

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LAN Security Considerations.

Use VPNs

- A virtual private network (VPN) is a secure private network connection across a public network
- With a VPN, the remote end appears to be connected to the network as if it were connected locally
- To improve security, VPNs usually encrypt data

https://embed-fastly.wistia.com/deliveries/d108d6daa05c480eacfc817179f39db37f4c118c.webp?image_crop_resized=1280x720

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LAN Security Considerations.

Use Multiple Vendors

- In addition to diversity of controls, you should strive for diversity of vendors
- Each vendor uses the same malware detection algorithms in all its products, if your workstation, network and firewall antimalware solutions all come from vendor A, then anything missed by one product will be missed by all others

https://www.networkcomputing.com/sites/default/files/styles/flexslider_full/public/1-intro_9_0.jpg?itok=K1U7xKmz

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LAN Security Considerations.

Use Your Intrusion Detection System Properly

- To get the most value from your IDS, take advantage of both ways it can detect potentially malicious activities
  - Anomaly Detection
  - Misuse Detection

https://slideplayer.com/slide/12716983/76/images/1/IDS%2FIPS+Intrusion+Detection+System%2F+Intrusion+Prevention+System.jpg

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LAN Security Considerations.

Automate Response to Attacks

- Many network devices and software solutions can be configured to automatically take action when an alarm is triggered, which dramatically reduces response time.

https://i.ytimg.com/vi/Lq7qd0sGw7E/maxresdefault.jpg

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LAN Security Considerations.

Automate Response to Attacks (Continue)

- Suggested Actions:
  - Block IP
  - Terminate Connection
  - Collect additional information
  - Look for the point of initial access
  - Determine how malicious software was deployed

https://www3.rocketsoftware.com/rocketd3/support/documentation/fc/38/Admin/fcsocketterminatebutton.png

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LAN Security Considerations.

Physically Secure Your Network Equipment

- Physical controls should be established and security personnel should ensure that equipment and data do not leave the building.
- Moreover, direct access to network equipment should be prohibited for unauthorized personnel.

https://www.tailorednetworks.com/images/easyblog_shared/January_2019/1-7-19/b2ap3_large_physical_security_offer_400.jpg

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Network Security Devices

Firewall

- One of the first lines of defense in a network
- A firewall isolates one network from another.
- Firewalls either can be standalone systems or included in other devices
- You can find both hardware and software firewall solutions

https://m.media-amazon.com/images/I/31ZROS8moRL._SR500,500_.jpg

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Network Security Devices

Intrusion Detection System (IDS)

- An IDS enhances cybersecurity by spotting a hacker or malicious software on a network so you can remove it promptly to prevent a breach or other problems
- Use the data logged about the event to better defend against similar intrusion incidents in the future

https://www.thesecuritybuddy.com/data-breaches-prevention/what-is-ids-intrusion-detection-system-how-does-it-work/

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Network Security Devices

Intrusion prevention system (IPS)

- An IPS is a network security solution that can not only detect intruders, but also prevent them from successfully launching any known attack.
- Intrusion prevention systems combine the abilities of firewalls and intrusion detection systems

https://www.exabeam.com/wp-content/uploads/2019/01/ips_security.png

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Network Security Devices

Network Access Control (NAC)

- Involves restricting the availability of network resources to endpoint devices that comply with your security policy
- NAC is most useful when the user environment is fairly static and can be rigidly controlled

https://www.cisco.com/c/en/us/products/security/what-is-network-access-control-nac/_jcr_content/Grid/subcategory_atl_8a_copy_layout-subcategory-atl/anchor_info_127c.img.png/1584526264097.png

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Network Security Devices

Web Filters

- Web filters are solutions that prevents user browser from loading certain pages from particular websites.
- There are different web filters designed for individual, family, institutional and enterprise use

https://cdome.comodo.com/images-new/home/web-filtering.png

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Network Security Devices

Proxy Server

- Proxy servers act as negotiators for requests from client software seeking resources from other servers.
- A client connects to the proxy server, requesting some service (for example, a website); the proxy server evaluates the request and then allows or denies it.
- In organizations, proxy servers are usually used for traffic filtering and performance improvement

https://s3.amazonaws.com/lintel-blogs-static-files/wp-content/uploads/2019/12/24050525/word-image-3.png

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Network Security Devices

Anti-DDoS Devices

- Anti-DDoS devices detect distributed denial of service (DDoS) attacks in their early stages, absorb the volume of traffic and identify the source of the attack.

https://www.accuwebhosting.com/blog/wp-content/uploads/2017/10/anti-ddos-attacks.jpg

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Network Security Devices

Load Balancers

- Load balancers are physical units that direct computers to individual servers in a network based on factors such as server processor utilization, number of connections to a server or overall server performance

https://www.f5.com/content/dam/f5-com/page-assets-en/home-en/resources/glossary/what%20is%20load%20balancing.png

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Network Security Devices

Spam Filter

- Spam filters detect unwanted email and prevent it from getting to a user's mailbox. Spam filters judge emails based on policies or patterns designed by an organization or vendor

https://blog.comodo.com/wp-content/uploads/anti-spam-filtering-techniques.jpg

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Able to Configure and Perform Remote Accessing & Routing.

In this section, we will discuss:

- Overview of Remote Access
- VPN Concept
- Remote Access Authentication Protocol
- TCP/IP Routing

Overview of Remote Access

Introduction to Remote Access

- Remote access is the act of connecting to IT services, applications, or data from a location other than headquarters.
- This connection allows users to access a network or computer remotely via the internet.

Image Source: https://1e1851c3a3519282423c-9ba0ce2ac411d9ff878c3235c5043bea.ssl.cf1.rackcdn.com/post/remote-desktop-

Overview of Remote Access

Introduction to Remote Access

- For example, storing and access files in the cloud grants remote access to a network that stores those files.
- Examples of include services such as Dropbox, Microsoft One Drive, and Google Drive.

Image Source: https://my5xi5jq5p-flywheel.netdna-ssl.com/wp-content/uploads/2020/02/remote-access-vpn.svg

Overview of Remote Access

How Remote Access Works

- Remote access simply works by linking the remote user to the host computer over the internet. ...

Image Source: https://www.cloudcodes.com/img-new/article/what-is-remote-access-control-big.jpg

Overview of Remote Access

How Remote Access Works

- Once the software is installed, the local computer can access the remote computer and perform several tasks like running applications, managing updates, and even handling administrative tasks.

Image Source:
https://s3.studytonight.com/curious/uploads/pictures/1632209457-79542.png

Overview of Remote Access

Types of Remote Access

- In the past, remote access was possible by hardwiring to a telephone network.
- Analog modems and dial-up technology allowed two different devices to interact with one another by calling assigned phone numbers.
- This has changed significantly with broadband technology.

Image Source: https://computertechpro.net/wp-content/uploads/2019/01/blog-dont-underestimate-smart-and-secure-remote-access-840x420.jpg

Overview of Remote Access

Types of Remote Access

- Broadband
- Cable Broadband
- DSL (digital subscriber line)
- Cellular internet service
- Satellite
- Fiber optics broadband

Image Source: https://computertechpro.net/wp-content/uploads/2019/01/blog-dont-underestimate-smart-and-secure-remote-access-840x420.jpg

Types of Remote Access

Broadband

- Broadband provides remote users with high-speed connection options to business networks and to the internet.

Image Source:https://www.snetconnect.com/images/Wireless-Broadband/Wireless-Broadband-Graphic.png

Types of Remote Access

Cable Broadband

- Cable broadband shares the bandwidth with many users.

Image Source:https://www.ciscopress.com/content/images/chap3_9781587134326/elementLinks/03fig01.jpg

Types of Remote Access

DSL (digital subscriber line)

- DSL (digital subscriber line) uses a telephone network and is not always available if the infrastructure is poor.

Image Source:https://media.geeksforgeeks.org/wp-content/uploads/Capture-86.png

Types of Remote Access

Cellular internet service

- Cellular internet service uses mobile devices via a wireless connection; only possible if a cellular network is available.

Image Source:https://hackaday.com/wp-content/uploads/2020/12/vpn-wikiimage.png?w=400

Types of Remote Access

Satellite

- Satellite uses satellites to provide internet access.

Image Source: https://www.scadalink.com/support/img/dwg-slapp-sat-2.gif

Types of Remote Access

Fiber optics broadband

- Fiber optics broadband one of the best ways to transfer massive amounts of data and do so quickly.

Image Source:https://telecomtalk.info/wp-content/uploads/2020/07/differences-fiber-optic-broadband-standard-connection.jpg

Overview of Remote Access

Remote Access Protocol

- PPP (Point-to-Point Protocol)
- IPsec (Internet Protocol Security)
- PPTP (Point-to-Point Tunneling)
- L2TP (Layer Two Tunneling Protocol)
- Remote Authentication Dial-In User Service (RADIUS)
- Terminal Access Controller Access Control System (TACACS)

Image Source:
https://support.novell.com/techcenter/articles/img/nc200112dFig1.gif

Remote Access Protocol

PPP (Point-to-Point Protocol)

- Point-to-Point Protocol (PPP) enables hosts to set up a direct connection between two endpoints.

Image Source: https://image3.slideserve.com/6628395/point-to-point-protocol-n.jpg

Remote Access Protocol

IPsec (Internet Protocol Security)

- IPsec (Internet Protocol Security) enables authentication and encryption for IP packet transfers using several security protocols.

Image Source: https://cdn.ttgtmedia.com/rms/onlineimages/security-ipsec_tunnel_mode_mobile.png

Remote Access Protocol

PPTP (Point-to-Point Tunneling)

- Point-to-Point Tunneling (PPTP) is one of the oldest protocols for implementing virtual private networks.
- However, over the years, it has proven to be vulnerable to many types of attack.
- Although PPTP is not very secure, it persists in some cases.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/point-to-point-tunneling-protocol-pptp.gif

Remote Access Protocol

Layer Two Tunneling Protocol (L2TP)

- L2TP (Layer Two Tunneling Protocol) VPN protocol without authentication or encryption; usually paired with another protocol.

Image Source: https://sc1.checkpoint.com/documents/R76/CP_R76_VPN_AdminGuide/45218.gif

Remote Access Protocol

Remote Authentication Dial-In User Service (RADIUS)

- Remote Authentication Dial-In User Service (RADIUS) is a networking protocol that provides centralized authentication, authorization, and accounting (AAA) management for users who connect and use a network service.

Image Source: https://www.tech-faq.com/wp-content/uploads/RADIUS.gif

Remote Access Protocol

Terminal Access Controller Access Control System (TACACS)

- Terminal Access Controller Access-Control System (TACACS) refers to a family of related protocols handling remote authentication and related services for networked access control through a centralized server.

	TACACS+	RADIUS
Functionality	Separates AAA	Combines Authentication and Authorization
Transport Protocol	TCP	UDP
Challenge/ Response	Bidirectional	Unidirectional
Protocol Support	Full Support	No ARA No NetBEUI
Confidentiality	Entire Packet-Encrypted	Password-Encrypted

Image Sourcehttps://2.bp.blogspot.com/-jQ2GHIJGQsA/WgL3eKjhexI/AAAAAAAAFrA/MzZ5HRYf7UQoTwZkCSIAjntnYd6K5ioXACLcBGAs/s1600/Screen%2BShot%2B2017-11-08%2Bat%2B5.53.33%2BPM.png

VPN Concept

Introduction to VPN

- VPN stands for the virtual private network.
- A virtual private network (VPN) is a technology that creates a safe and encrypted connection over a less secure network, such as the internet.
- A Virtual Private Network is a way to extend a private network using a public network such as the internet.

Image Source:
https://www.okta.com/sites/default/files/styles/1640w_scaled/public/media/image/2020-12/What-is-a-VPN.png?itok=VLLDnRu

VPN Concept

VPN Benefits

- Secure your network
- Hide Your Private Information
- Network Scalability
- Reduce Support Costs

Image Source:https://i.pinimg.com/originals/8a/3e/16/8a3e16757aa24e512564e10665b4702f.jpg

VPN Concept

Features of VPN

- Security
- Reliability
- Scalability

Image Source:https://cdn.ttgtmedia.com/rms/onlineImages/sWAN_VPN_03.jpg

Features of VPN

Security

- The VPN should protect data while it's traveling on the public network.
- If intruders attempt to capture the data, they should be unable to read or use it.

Image Source: https://www.cloudwards.net/wp-content/uploads/2018/01/vpn-security.png

Features of VPN

Reliability

- The VPN should protect data while it's traveling on the public network.
- If intruders attempt to capture the data, they should be unable to read or use it.

Image Source:https://i1.wp.com/pingify.me/wp-content/uploads/vpn-security-internet-privacy.png?w=884&ssl=1

Features of VPN

Scalability

- As a business grows, it should be able to extend its VPN services to handle that growth without replacing the VPN technology altogether..

Image Source: https://www.attilasec.com/hubfs/how%20scalable%20are%20hardware%20vpns.jpg

VPN Concept

Types of VPN

- Public VPN
- Remote Access VPN
- Site-to-Site VPN

Image Source: https://www.elprocus.com/wp-content/uploads/types_of_virtual_private_network.png

Types of VPN

Public VPN

- Public VPN is a type of VPN connection that can be accessed publicly or openly by end users.
- It differs from standard or private VPN, which is generally reserved for specific users, organizations or subscribers.
- It is normally accessed using a standard Internet connection.

Image Source: https://cooldroid.net/wp-content/uploads/what-is-a-vpn-1068x475.jpg

Types of VPN

Remote Access VPN

- Remote access VPN allows a user to connect to a private network and access its services and resources remotely.
- The connection between the user and the private network happens through the Internet and the connection is secure and private.
- Remote Access VPN is useful for business users as well as home users.

Image Source: https://www.greyson.com/wp-content/uploads/2020/03/remote-access-vpn-1.png

Types of VPN

Site-to-Site VPN

- A Site-to-Site VPN is also called as Router-to-Router VPN and is mostly used in the corporates.
- Companies, with offices in different geographical locations, use Site-to-site VPN to connect the network of one office location to the network at another office location.

Image Source: https://openvpn.net/wp-content/uploads/vpn_server_resources/layer-3-routing-diagram.png

VPN Concept

VPN Tunneling

- A VPN tunnel is an encrypted link between your computer or mobile device and an outside network.
- A VPN tunnel connects your smartphone, laptop, computer, or tablet to another network in which your IP address is hidden and all the data you generate while surfing the web is encrypted.

Image Source
https://www.researchgate.net/publication/320536838/figure/fig1/AS:732633726214157@1551684900881/VPN-Tunneling-structure.png:

VPN Concept

Equipment used for VPN

- Network access server
- Firewall
- AAA Server
- VPN Concentrator
- VPN-enabled/VPN-optimized Router
- VPN-enabled Firewall
- VPN Client

Image Source: https://www.webhostingsecretrevealed.net/wp-content/uploads/2018/12/what-is-vpn-service.jpg

Equipment used for VPN

Network access server

- As previously described, a NAS is responsible for setting up and maintaining each tunnel in a remote-access VPN.
- As previously described, a NAS is responsible for setting up and maintaining each tunnel in a remote-access VPN.

Image Source: https://www.researchgate.net/profile/Zornitsa-Yakova/publication/256843676/figure/fig2/AS:297856234737671@1448025868760/Remote-access-VPN-1.png

Equipment used for VPN

Firewall

- A firewall provides a strong barrier between your private network and the Internet.
- IT staff can set firewalls to restrict what type of traffic can pass through from the Internet onto a LAN, and on what TCP and UDP ports. Even without a VPN, a LAN should include a firewall to help protect against malicious Internet traffic.

Image Source:
https://docs.oracle.com/cd/A97630_01/em.920/a96670/img/firewalc.gif

Equipment used for VPN

AAA Server

- The acronym stands for the server's three responsibilities: authentication, authorization and accounting.
- For each VPN connection, the AAA server confirms who you are (authentication), identifies what you're allowed to access over the connection (authorization) and tracks what you do while you're logged in (accounting).

Image Source: https://media.geeksforgeeks.org/wp-content/uploads/20200418171147/AAa11.gif

Equipment used for VPN

VPN Concentrator

- This device replaces an AAA server installed on a generic server.
- The hardware and software work together to establish VPN tunnels and handle large numbers of simultaneous connections.

Image: https://vpnpick.com/wp-content/uploads/2015/02/VPN-Concentrator-Setup.jpg

Equipment used for VPN

VPN-enabled/VPN-optimized Router

- This is a typical router that delegates traffic on a network, but with the added feature of routing traffic using protocols specific to VPNs.

Image: https://www.techrepublic.com/a/hub/i/2015/06/03/4d31da68-098c-11e5-940f-14feb5cc3d2a/r00220001108jim03_01.gif

Equipment used for VPN

VPN-enabled Firewall

- This is a conventional firewall protecting traffic between networks, but with the added feature of managing traffic using protocols specific to VPNs.

Image: https://www.techrepublic.com/a/hub/i/2015/06/03/4d31da68-098c-11e5-940f-14feb5cc3d2a/r00220001108jim03_01.gif

Equipment used for VPN

VPN Client

- This is software running on a dedicated device that acts as the tunnel interface for multiple connections.
- This setup spares each computer from having to run its own VPN client software.

Image: https://www.concordia.ca/content/concordia/en/finearts/cda/support/faq/vpn-client/_jcr_content/content-main/image_1660899872.img.png/1586871321105.png

VPN Concept

VPN Security

- L2F (Layer 2 Forwarding)
- PPTP (Point-to-Point Tunneling Protocol)
- L2TP (Layer 2 Tunneling Protocol)

Image Source: https://sites.google.com/site/virtualprivatenetworks/_/rsrc/1472764625920/website-builder/what-is-vpn.png

VPN Security

L2F (Layer 2 Forwarding)

- L2F (Layer 2 Forwarding) developed by Cisco; uses any authentication scheme supported by PPP.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/l2f-layer2-forwarding-cisco.jpg

VPN Security

PPTP (Point-to-Point Tunneling Protocol)

- PPTP (Point-to-point Tunneling Protocol) supports 40-bit and 128-bit encryption and any authentication scheme supported by PPP.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/09/point-to-point-tunneling-protocol-pptp.gif

VPN Security

L2TP (Layer 2 Tunneling Protocol)

- L2TP (Layer 2 Tunneling Protocol) combines features of PPTP and L2F and fully supports IPSec; also applicable in site-to-site VPNs

Image Source: https://sc1.checkpoint.com/documents/R76/CP_R76_VPN_AdminGuide/45218.gif

Remote Access Authentication Protocol

Password Authentication Protocol (PAP)

- PAP is the least secure authentication protocol.
- The username and password is sent in plaintext.
- It does not protect against anyone listening to network traffic from stealing the username and password.

Image Source: https://i0.wp.com/networkustad.com/wp-content/uploads/2020/05/Picture1.png

Password Authentication Protocol (PAP)

Features of PAP

- The password is sent in cleartext.
- All network operating systems support PAP.
- It uses a two-way Handshake Protocol.
- It is non-interactive.
- PAP supports both one-way authentication (unidirectional) and two-way authentication (bidirectional).

Image Source: https://i0.wp.com/networkustad.com/wp-content/uploads/2020/05/Picture1.png

Password Authentication Protocol (PAP)

When to use PAP

PAP is usually used in the following scenarios:

- When the application doesn't support CHAP.
- Circumstances where it is necessary to send a plain text password to simulate a login at the called device (remote host).
- When there is the occurrence of incompatibilities between different vendors of CHAP.

Image Source: http://orbit-computer-solutions.com/wp-content/uploads/2015/10/PAP-Authentication-Protocol.jpg

Password Authentication Protocol (PAP)

Advantage of CHAP over PAP

Some of the advantages are:

- CHAP is more secure than PAP.
- CHAP can provide authentication periodically to recognize that the user accessing the PPP link is the same or not.
- In CHAP, the real passwords are never shared on the link instead a hash value of it is calculated and transferred.

Fig: Challenge-Handshake Authentication Protocol

Image Source: https://webeduclick.com/wp-content/uploads/2020/02/Challenge-Handshake-Authentication-Protocol-CHAP.png

Password Authentication Protocol (PAP)

Advantage of PAP over CHAP

- The only advantage PAP holds over CHAP is that it is supported by the all the network operating system vendors therefore it can be said that PAP is used where CHAP is not supported.
- But if CHAP is supported then it is recommended to use CHAP as it is more secure.

Fig: Challenge-Handshake Authentication Protocol

Image Source: https://webeduclick.com/wp-content/uploads/2020/02/Challenge-Handshake-Authentication-Protocol-CHAP.png

Remote Access Authentication Protocol

CHAP

- Challenge Handshake Authentication Protocol (CHAP) is a Point-to-point protocol (PPP) authentication protocol developed by IETF (Internet Engineering Task Force).
- It is used at the initial startup of the link. Also, it performs periodic checkups to check if the router is still communicating with the same host.

CHAP (Challenge Handshaking Authentication Protocol) (3)

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/CHAP-Challenge-Handshaking-Authentication-

Remote Access Authentication Protocol

Features of CHAP

- It uses 3-way handshaking protocol (not like TCP). First, the authenticator sends a challenge packet to the peer then, the peer responds with a value using its one way hash function.
- The authenticator then matches the received value with its own calculated hash value. If the values match then the authentication is acknowledged otherwise, the connection will be terminated.

CHAP (Challenge Handshaking Authentication Protocol) (3)

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/CHAP-Challenge-Handshaking-Authentication-Protocol.jpg

Remote Access Authentication Protocol

Features of CHAP

- It uses one-way hash function called MD5.
- It also authenticates periodically to check if the communication is taking place with the same device or not.

CHAP (Challenge Handshaking Authentication Protocol) (3)

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/CHAP-Challenge-Handshaking-Authentication-

Challenge Handshake Authentication Protocol (CHAP)

Features of CHAP

- Also, it provides more security than PAP (Password Authentication Procedure) as the value used (find out by hash function) is changed variably.
- CHAP requires to know the plaintext of the secret as it is never sent over the network.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/CHAP-Challenge-Handshaking-Authentication-

Challenge Handshake Authentication Protocol (CHAP)

CHAP Packets

- Challenge packet
- Response Packet
- Success packet
- Failure packet

Image Source:https://cdn.ttgtmedia.com/rms/onlineimages/challenge_handshake_authentication_protocol-f_mobile.png

Challenge Handshake Authentication Protocol (CHAP)

The Extensible Authentication Protocol (EAP)

- Extensible Authentication Protocol (EAP) is an authentication framework, not a specific authentication mechanism, frequently used in wireless networks and point-to-point connections.
- It provides some common functions and negotiation of authentication methods called EAP methods.

Image Source: https://i0.wp.com/wentzwu.com/wp-content/uploads/2020/03/extensible-authentication-protocol-eap-1.jpg?ssl=1

Remote Access Authentication Protocol

MS-CHAP

- Microsoft Challenge Handshake Authentication Protocol version 2 (MS-CHAP v2) is a password-based authentication protocol which is widely used as an authentication method in PPTP-based (Point to Point Tunneling Protocol) VPNs.

Image Source: https://docs.microsoft.com/en-us/openspecs/windows_protocols/ms-chap/ms-chap_files/image001.png

Remote Access Authentication Protocol

MS-CHAP v2

- Microsoft Challenge Handshake Authentication Protocol version 2 (MS-CHAP v2) is a password-based authentication protocol which is widely used as an authentication method in PPTP-based (Point to Point Tunneling Protocol) VPNs.

Image Source: https://i.stack.imgur.com/Iu8Bi.jpg

Remote Authentication Dial-In User Service (RADIUS)

What is RADIUS

- Remote Authentication Dial-In User Service (RADIUS) is a networking protocol that provides centralized authentication, authorization, and accounting (AAA) management for users who connect and use a network service.

Image Source: https://blog.miniorange.com/wp-content/uploads/sites/19/2021/02/radius-mfa-flow.webp

Remote Authentication Dial-In User Service (RADIUS)

How it works

- The working of the RADIUS Server depends on the exact nature of the RADIUS ecosystem.
- However, all servers have AAA capabilities (Authentication, Authorization, and Accounting).
- In some RADIUS ecosystems, a RADIUS Server can also act as a proxy client to other RADIUS Servers.

Image Source:https://www.freelancinggig.com/blog/wp-content/uploads/2019/05/What-is-RADIUS-Server.png

Remote Authentication Dial-In User Service (RADIUS)

Background Information

- Communication between a network access server (NAS) and a RADIUS server is based on the User Datagram Protocol (UDP).
- Generally, the RADIUS protocol is considered a connectionless service.
- Issues related to server availability, retransmission, and timeouts are handled by the RADIUS-enabled devices rather than the transmission protocol.

Image Source:https://www.freelancinggig.com/blog/wp-content/uploads/2019/05/What-is-RADIUS-Server.png

Remote Authentication Dial-In User Service (RADIUS)

RADIUS is a Client/Sver Protocol

- RADIUS is a client/server protocol.
- The RADIUS client is typically a NAS and the RADIUS server is usually a daemon process running on a UNIX or Windows NT machine.
- The client passes user information to designated RADIUS servers and acts on the response that is returned.

Image Source:https://www.freelancinggig.com/blog/wp-content/uploads/2019/05/What-is-RADIUS-Server.png

Remote Authentication Dial-In User Service (RADIUS)

Connection Steps

This figure shows the interaction between a dial-in user and the RADIUS client and server.

- User initiates PPP authentication to the NAS.
- NAS prompts for username and password (if Password Authentication Protocol [PAP]) or challenge (if Challenge Handshake Authentication Protocol [CHAP]).
- User replies.

Image Source: https://www.cisco.com/c/dam/en/us/support/docs/security-vpn/remote-authentication-dial-user-service-radius/12433-32a.gif

Remote Authentication Dial-In User Service (RADIUS)

Connection Steps

- RADIUS client sends username and encrypted password to the RADIUS server.
- RADIUS server responds with Accept, Reject, or Challenge.
- The RADIUS client acts upon services and services parameters bundled with Accept or Reject.

Image Source: https://www.cisco.com/c/dam/en/us/support/docs/security-vpn/remote-authentication-dial-user-service-radius/12433-32a.gif

Remote Authentication Dial-In User Service (RADIUS)

Authentication and Authorization

- A RADIUS Server supports a variety of methods to authenticate a user.
- RADIUS Server authentication and authorization go hand in hand and usually start when a user tries to connect to the RADIUS Client using a username and password.

Image Source:https://docs.microsoft.com/en-us/windows/win32/nps/images/ias01.png

Remote Authentication Dial-In User Service (RADIUS)

Accounting

- The accounting features of the RADIUS protocol can be used independently of RADIUS authentication or authorization.
- The RADIUS accounting functions allow data to be sent at the start and end of sessions, indicating the amount of resources (such as time, packets, bytes, and so on) used during the session.

Image Source: https://www.researchgate.net/profile/Dr-Govardhan/publication/228973856/figure/fig2/AS:300905783152653@1448752937571/RADIUS-accounting-In-Accounting-Request-packet-the-generation-of-Request-Authenticator.png

TCP/IP Routing

Introduction to TCP/IP Routing

- TCP/IP (Transmission Control Protocol/Internet Protocol) is a set of protocols independent of the physical medium used to transmit data, but most data transmission for Internet communication begins and ends with Ethernet frames.
- The Ethernet can use either a bus or star topology.

Image Source https://www.cisco.com/c/dam/en/us/support/docs/ip/routing-information-protocol-rip/13769-fig-5-new.gif:

TCP/IP Routing

Protocol Types

- Host Route
- Network Route
- Default Route

Image Source: https://cdn.educba.com/academy/wp-content/uploads/2019/05/Routing-Protocol.jpg

Protocol Types

Host Route

- Defines a gateway that can forward packets to a specific host or gateway on another network.

Image Source:
https://docs.oracle.com/cd/E95619_01/html/esbc_ecz810_configuration/img/GUID-F7451319-0AEC-4793-8027-7CBE81E7FB05-default.png

Protocol Types

Network Route

- Defines a gateway that can forward packets to any of the hosts on a specific network.

Image Source: https://networkencyclopedia.com/wp-content/uploads/2019/08/routing.jpg

Protocol Types

Default Route

- Defines a gateway to use when a host or network route to a destination is not otherwise defined.

Image Source: https://www.networxsecurity.org/fileadmin/user_upload/images/2015-08/Default_Route.jpg

TCP/IP Routing

Static & Dynamic Routing

- In TCP/IP, routing can be one of two types: static or dynamic.
- With static routing, you maintain the routing table manually using the route command.
- Static routing is practical for a single network communicating with one or two other networks.

Image Source: https://snabaynetworking.com/wp-content/uploads/2019/10/Static-Routing-vs-Dynamic-Routing-565x420.jpg

TCP/IP Routing

Static & Dynamic Routing

- With dynamic routing, daemons update the routing table automatically.
- Routing daemons continuously receive information broadcast by other routing daemons, and so continuously update the routing table.

Image Source: https://snabaynetworking.com/wp-content/uploads/2019/10/Static-Routing-vs-Dynamic-Routing-565x420.jpg

TCP/IP Routing

Gateways

- Gateways are a type of router. Routers connect two or more networks and provide the routing function.
- Some routers, for example, route at the network interface level or at the physical level.

Image Source: https://i.ytimg.com/vi/ai5bFPVToMU/maxresdefault.jpg

TCP/IP Routing

Interior and Exterior Gateways

- Interior Gateway Protocol (IGP) is a Routing Protocol which is used to find network path information within an Autonomous System.
- Exterior Gateway Protocol (EGP) is a Routing Protocol which is used to find network path information between different Autonomous Systems.

Image Source: https://snabaynetworking.com/wp-content/uploads/2019/12/routing-protocols-2.gif

TCP/IP Routing

Gateway Protocols

- Routing Information Protocol Next Generation
- Open Shortest Path First (OSPF)
- Exterior Gateway Protocol (EGP)
- Border Gateway Protocol (BGP)
- Border Gateway Protocol 4+
- Intermediate System to Intermediate System (IS-IS)

Image Source: https://documents.trendmicro.com/images/TEx/articles/protocol-gateways-fig-1.png

Gateway Protocols

Routing Information Protocol Next Generation

- Routing Information Protocol or RIP is one of the first routing protocols to be created.
- RIP is used in both Local Area Networks (LANs) and Wide Area Networks (WANs), and also runs on the Application layer of the OSI model.
- There are multiple versions of RIP including RIPv1 and RIPv2.

Image Source: https://static.javatpoint.com/tutorial/computer-network/images/rip-protocol.png

Gateway Protocols

Open Shortest Path First (OSPF)

- Open Shortest Path First or OSPF protocol is a link-state IGP that was tailor-made for IP networks using the Shortest Path First (SPF) algorithm.
- The SPF routing algorithm is used to calculate the shortest path spanning-tree to ensure efficient data transmission of packets.

Image Source https://media.geeksforgeeks.org/wp-content/uploads/rrf.png:

Gateway Protocols

Exterior Gateway Protocol (EGP)

- Exterior Gateway Protocol or EGP is a protocol that is used to exchange data between gateway hosts that neighbor each other within autonomous systems.
- In other words, EGP provides a forum for routers to share information across different domains.

Image Source:https://networkencyclopedia.com/wp-content/uploads/2019/08/exterior-gateway-protocol.jpg

Gateway Protocols

Border Gateway Protocol (BGP)

- Border Gateway Protocol or BGP is the routing protocol of the internet that is classified as a distance path vector protocol.
- BGP was designed to replace EGP with a decentralized approach to routing.

Image Sourcehttps://www.cisco.com/c/dam/en/us/support/docs/ip/border-gateway-protocol-bgp/212881-border-gateway-protocol-bgp-optimal-ro-01.jpeg:

Gateway Protocols

Border Gateway Protocol 4+

- Border Gateway Protocol version 4 (BGP4) is an exterior gateway protocol that performs inter-autonomous system (AS) or inter-domain routing.
- It peers to other BGP-speaking systems over TCP to exchange network reachability and routing information.

Image Source:https://www.cisco.com/c/dam/en/us/support/docs/ip/border-gateway-protocol-bgp/212881-border-gateway-protocol-bgp-optimal-ro-02.jpeg

Gateway Protocols

Intermediate System to Intermediate System (IS-IS)

- Intermediate System-to-Intermediate System (IS-IS) is a link-state, IP routing protocol and IGPP protocol used on the internet to send IP routing information.
- IS-IS uses a modified version of the Dijkstra algorithm.
- An IS-IS network consists of a range of components including end systems, (user devices), intermediate systems (routers), areas, and domains.

Image Source: https://networkdirection.net/wp-content/uploads/RoutingAndSwitching/IS-IS.png

Thank You