

UNIT-I

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COMPUTER INFORMATION

What is computer: - Computer is an electronic device that is designed to work with information. The word “computer” comes from the word “compute” which means, to calculate machine. Computer cannot do anything without a program.

OR

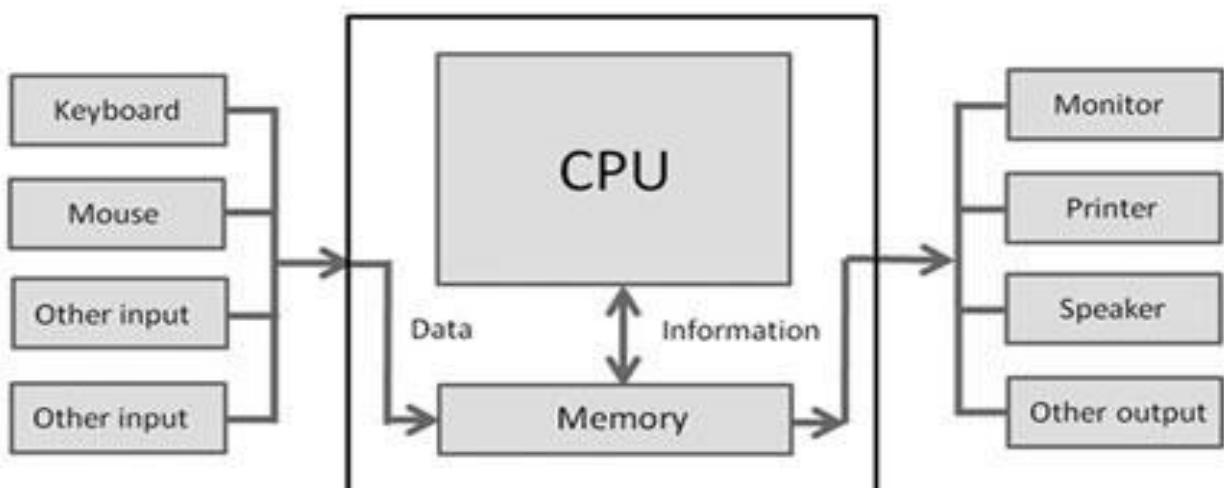
A computer is an electronic machine which processing data give us information. Charles Babbage is called the “Grand Father” of the computer. The first machine computer designed by Charles Babbage called Analytical Engine (1791-1871). It users read- only memory in the from punch card.



Punch Card Machine

Data processing consists of their sub activates:-

- ❖ Computer input data
- ❖ Managing output data



Input device: - Keyboard, mouse, touchpad, scanner, webcam, Fingerprint scanner



Keyboard



Fingerprint Scanner



Webcam

Output device: - Monitor Printer, Projector, Speakers, TV, and Microphone



Printer



Monitor



Projector

CHARACTERISTICS OF COMPUTER

1. Automatic
2. High speed
3. Accuracy
4. Diligence
5. Storage
6. Reliability
7. Data base
8. Reduction in paper
9. Reduction the manpower requirement
10. Increased ability to perform computation

Automatic: - Being a programmable machine, modern computer can be programmed in such a way that it can perform a series of tasks automatically after it has been started. Modern digital computer does not need a human operator to give different types of command.

High speed: - The computers in the past were did not have very fast speed. But now days due to the Invention of microprocessor. Now computer is a high speed device capable of performing arithmetic at unbelievable speed. The unit of speed in computer is microsecond, the nanosecond.

Accuracy: - Accuracy means correctness. Computer never does any mistakes if the instruction, input data and hardware devices are correct it always performs each and every task with 100% accuracy. But sometimes we get the phrase GIGO (Garbage in Garbage Out) is true to computer.

Diligence: - Unlike the human beings the computer never feels tired and bored to do a same task repeatedly. It cans continuous work from hours without reading any error and without grumbling. It works with same concentration even if 100 million instructions are to be performed it will perform the 100th million instructions with the same accuracy as the first instruction.

Storage: - A modern commuter can store large amount of data information and program in it. Any data or information can be retrieve at any time. Storage capacity in computer is measured in following Units.

$$\checkmark 0 \text{ or } 1 = 1 \text{ bit}$$

- ✓ 4 bites = 1 Nibble
- ✓ 8 bites = 1 Bytes
- ✓ 1024 Bytes = 1 KB
- ✓ 1024 KB = 1 MB
- ✓ 10024 MB = 1 GB
- ✓ 1024 GB = 1 TB
- ✓ 1024 TB = 1 PT

Reliability: - The reliability of the computer is indeed very high. Modern electronic components have long failure free lives. A microprocessor chip is said to have a life of 40 years even under adverse condition. Computer is also design so as to make maintenance easy.

Data Base:- The use of computer facility in business organization facilitates establishment of database. Database integrated data record and reduces data redundancy.

Reduces in the Paper work:- Computer eliminates the paper work, it help the storage of data in elaborately constructed database and files where they can be retrieved when needed.

Reduces the Manpower :- The number of persons required for performing various organizational activities will be reduced by using a computer a system.

Increased ability to perform computation:- The user of computer has helped in performing computation with school.

Limitations of Computers

Computer is a dumb machine and it cannot do any work without instruction from the user. It possesses no intelligence of its own. It is you to decide what you want to do and in what sequence. So a computer cannot take its own decision as you can.

The Application logic must be understood: - The computer can only process jobs which can be expressed in a finite number steps. Each step must be clearly defined. If the step in the solution can't be precisely stated, the job can't be done.

Environment: - The environment for operating should be suitable to it.

No Felling: - It does not have feelings or emotion, taste, knowledge and experience. Thus it does not get tired even after long hours of work. It does not distinguish between users.

Dependent on human felling

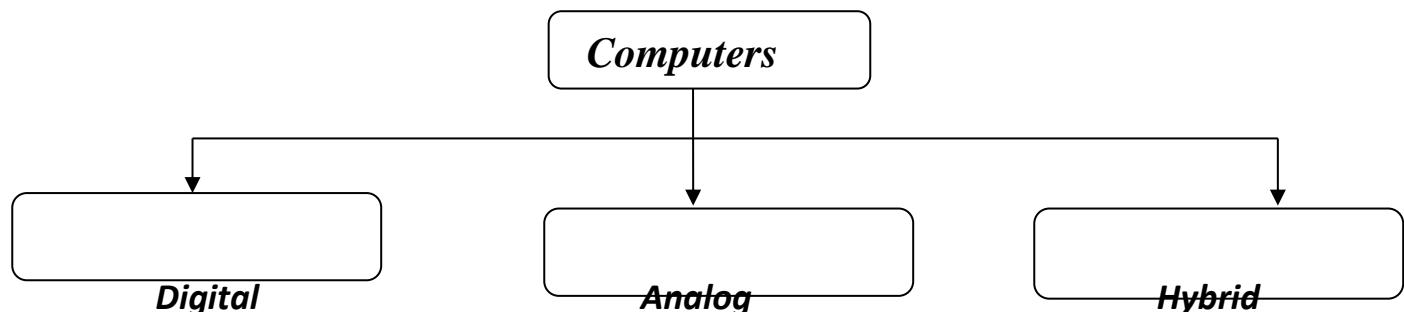
It requires a lot of looking offer.

It is very sensitive to dust particles even a small dust particles can make great to it.

Computers Classifications

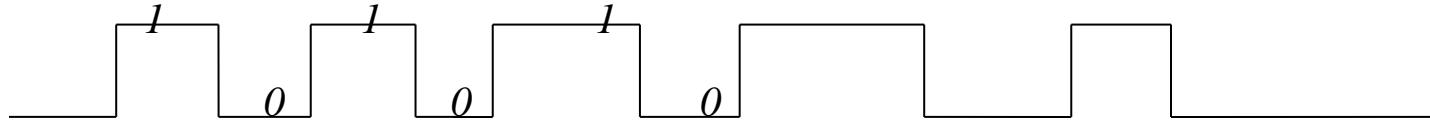
Computer can be classified in following four ways. These are as follows:-

1. Computer classification according to data representation techniques according to these techniques, computer can be classified into their type:-



Digital Computer:- Digital computer take input in the form of numbers, letter and Special characters, store it and store it and process it and give the output

in the form of numbers ,letter and special characters. Such computers process data (including text, sound, graphics and video) into a digital value.

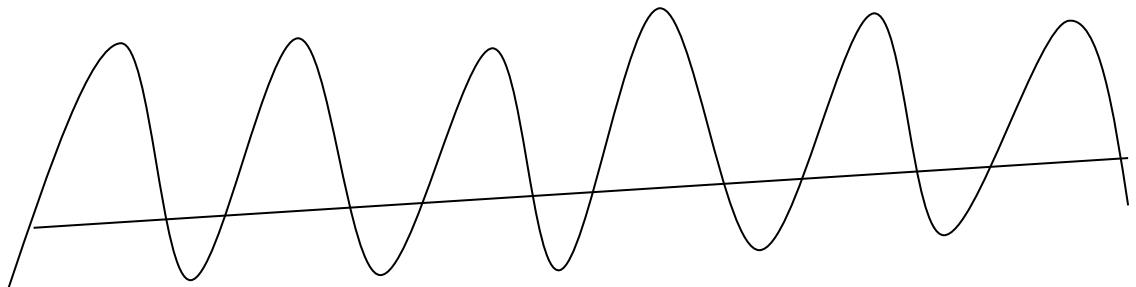


Digital Signal

Digital computers have the capabilities of adding multiplying and comparing. These provide highly accurate result.

Example of Digital Computer: - Desk Calculators,

Analog computers: - *These computers operate data presented to them in the form of continuously variable quantities like temperature pressure, reductions and the like. The representation of the flow of data is shown below:-*



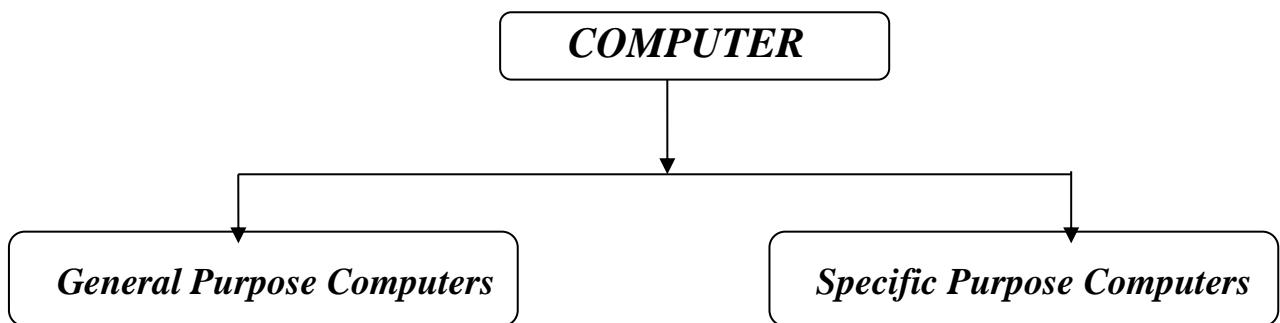
Analog Signal

Example of Analog Computer: - *Speedometer, Voltmeter, Wall clock, Flight Simulators for training pilots*

Hybrid Computer (Analog + Digital):- A hybrid computer is a combination of computers that are capable of inputting and outputting in both digital and analog signals. They are suitable where digital processing is necessary in respect of data collected in the analog from both analog hybrid are spinal purpose computers.

Example of Hybrid Computer:- In a hospital institute care unit (ICU) measures a patient's heart function, temperature & other vital signs. These measurements are in analog form. These measurements may then be converted into numbers (Digital Form).

2. **Classification of Computers According to purpose**:- There are two types of computers according to their purpose



General Purpose Computer:- Most computers in use today are General-Purpose computers those built for a great variety of processing jobs. Simply by using a general purpose computer and different software, various tasks can be accomplished. Including writing and editing (word processing), manipulating facts in a data base, tracking manufacturing inventory, making scientific calculations, or even controlling organization's security system, electricity consumption, and building temperature.

Example of General Purpose Computer:-computer used in school, college, office & home.

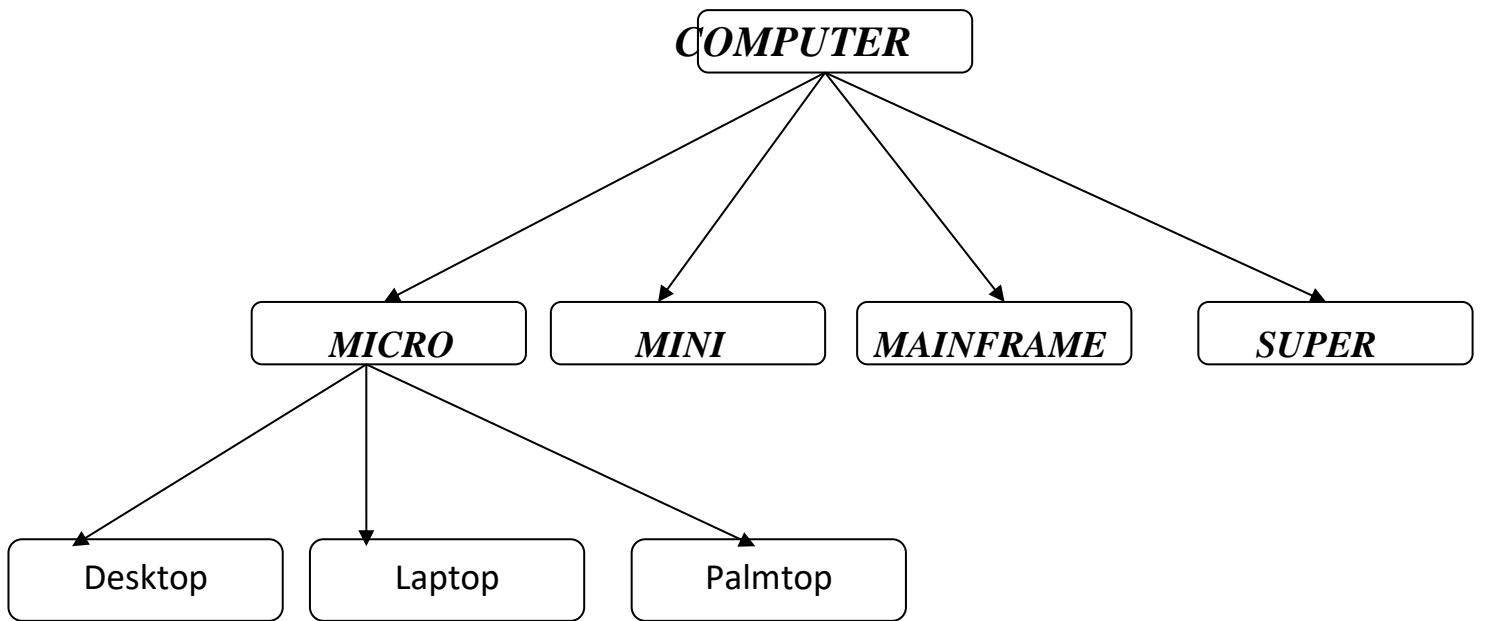
Specific Purpose Computer:- These computers are designed to handle a specific problem or to perform a single specific task. A set of instruction for the specific task is built into the machine. Hence these computers are not versatile. However, being designed for specific task, they can provide the result very quickly and efficiently.

Example of Specific Computer: - computer used for airline reservation, air traffic control, satellite tracking etc.

3. **Classification of computer According to use:** - According to use computer can be classified into two type:-
 - a) Scientific Computers
 - b) Business Computers

<i>Scientific Computer</i>	<i>Business Computer</i>
<ol style="list-style-type: none">1. Fast internal processing speed.2. Slow input / output device.3. Suitable for mathematical application solution of equations, design of air craft engine, bridges, building etc	<ol style="list-style-type: none">1. Relatively slow in processing.2. Fast input / output device.3. Suitable for jobs involving large input / output and few simple calculations (survey data, insurance billing etc.

4. **Computer classification by capacity performance criteria by :** - size ,cost, speed & memory



Micro Computers:-

A micro computer is small and low cost which usually consist of a microprocessor, a storage unit a power supply ,appropriate peripherals(keyboard, monitor, printer, disk drive etc) an operator system and other software programs. The micro computer is generally the smallest of the computer family.

They are mainly used for managing personal data of a small company or an individual that's why they are called Personal computer (PC).

The older pc started 8 bit processor with speed of 3.7MB and current pc 64 bit processor with speed of 4.66 GB. Some common pc's suppliers are – HP, Dell, Compaq, HCL, IBM, Wipro etc.

These are very famous due to following reasons-

- i. Useful
- ii. Something for everyone

- iii. *Inexpensive*
- iv. *Easy to use*

Microcomputer can be classified into 3 types:

- i. ***Desktop***
- ii. ***Laptop***
- iii. ***Palmtop***

- i. **Desktop**: - *Desktop computers or Personal computer most used computers in this world. They are placed on the top of desk. So they are called desktop computers. A personal computer microcomputer designed for use by one person at a time.*
- ii. **Laptop Or Notebook**: - *These are so small that they can be placed on your lap. They are portable computers and can be easily carried from one place to another. Since the laptop computer resembles a notebook, therefore they are also called notebook. The main advantage of this computer is that one can use this computer anywhere and anytime. These are expensive as compared to desktop computer*



LAPTOP



NOTEBOOK

- iii. **Palmtop Computer**: - *They are also called as personal Digital Assistant (PDA). These computers are small in size. These computers have capabilities of keeping track of appointment, meeting, call list, short messaging services image & video capturing. These computers*

are not as powerful as desktop computers. PDA users generally use a pen or electronic styles instead of a keyboard.



PALMATOP COMPUTER

Mini Computer:- A minicomputer is a medium-sized computer. That is more powerful than a microcomputer. These computers are usually designed to serve multiple users system so these are used in interactive application in industry research, organization, college, and universities. They are more expensive than microcomputers.



MINI COMPUTER

Example of Mini Computer: - Digital Alpha, Sun Ultra

Mainframe Computer:- Computers with large storage capacities and very high speed of processing (compared to mini- or microcomputers) are known as mainframe computers. They support a large number of terminals for

simultaneous use by a number of users like ATM transactions, banks flight scheduling, ticket reservation and insurance companies where large number of people need frequent access to the same data same time. They are also used as central host computers in distributed data processing system.



MAINFRAME COMPUTER

Example of Mini Computer: - IBM 370, S/390.

Super Computer:- Super computers are the fastest, costing and most powerfully computer available today. These contain multiple processor that work together to solve a single problem at a time. The size of these computers is hundreds of times bigger than a personal computer. Super computers are designed to maximize the numbers of FLOPS (Floating point operation per Second).



SUPER COMPUTER

Example of Mini Computer: - IBM Deep Blue

Super computer are primarily used in:-

- ✓ *Weather forecasting*
- ✓ *Petroleum exploration and production*
- ✓ *Remote sensing*
- ✓ *Nuclear reactions*
- ✓ *Defence*
- ✓ *Electronic design*
- ✓ *Chemical reaction*

India first super computer is PARM.

ANURAG is another super computer produced in India and the latest one is PARAM 10,000.

Elements of Computer System:-

A computer system consists of four elements as shown below-

- ✓ ***Hardware***
- ✓ ***Software***
- ✓ ***Users***
- ✓ ***Data***

Hardware:- *Computer hardware is the physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), system unit (graphic cards, sound cards, memory, motherboard and chips), and so on, all of which are physical objects that can be touched.*

Software:- Software represents the set of programs Without software, computers would be useless. For example, without your Internet browser software you would be unable to surf the Internet or read this page and without a software operating_system the browser would not be able to run on your computer

Users:- People are the computer operators, also known as users even if a computer can do its job without a person, people still design , build, program computer system.

Data - Data consists of text, numbers, sound and image that the computer can manipulate.

➤ ***What are Storage devices?***

Storage Devices are the data storage devices that are used in the computers to store the data. The computer has many types of data storage devices. Some of them can be

classified as the removable data Storage Devices and the others as the non removable data Storage Devices.

*Alternatively referred to as **digital storage**, **storage**, **storage media**, or **storage medium**, a **storage device** is any hardware capable of holding information on a computer. The storage device may hold, or save, the information temporarily or permanently.*

There are two types of storage devices used in computers: a primary storage device, such as RAM, and a secondary storage device, like a hard drive. Secondary storage can be removable, internal, or external storage. The picture shows an example of a Drobo, an external secondary storage device.

Without a storage device, your computer would not be able to save any settings or information and would be considered a dumb terminal.

The primary memory is the volatile memory and the secondary memory is the non volatile memory. The volatile memory is the kind of the memory that is erasable and the non volatile memory is the one where in the contents cannot be erased. Basically when we talk about the data storage devices it is generally assumed to be the secondary memory.

The secondary memory is used to store the data permanently in the computer. The secondary storage devices are usually as follows: hard disk drives – this is the most common type of storage device that is used in almost all the computer systems. The other ones include the floppy disk drives, the CD ROM, and the DVD ROM. The flash memory, the USB data card etc.

Difference between RAM & ROM:-

Read-only memory, or ***ROM***, is a form of data storage in computers and other electronic devices that can not be easily altered or reprogrammed. ***RAM*** is referred to as volatile memory and is lost when the power is turned off whereas ***ROM*** is non-volatile and the contents are retained even after the power is switched off.

Random-access memory, or **RAM**, is a form of data storage that can be accessed randomly at any time, in any order and from any physical location in contrast to other storage devices, such as hard drives, where the physical location of the data determines the time taken to retrieve it. RAM is measured in megabytes and the speed is measured in nanoseconds and RAM chips can read data faster than ROM.

Comparison chart

	<u>RAM</u>	<u>ROM</u>
Definition	Random Access Memory or RAM is a form of data storage that can be accessed randomly at any time, in any order and from any physical location., allowing quick access and manipulation.	Read-only memory or ROM is also a form of data storage that can not be easily altered or reprogrammed. Stores instructions that are not necessary for rebooting up to make the computer operate when it is switched off. They are hardwired.
Stands for	Random Access Memory	Read-only memory
Use	RAM allows the computer to read <u>data</u> quickly to run applications. It allows reading and writing.	ROM stores the program required to initially boot the computer. It only allows reading.
Volatility	RAM is volatile i.e. its contents are lost when the device is powered off.	It is non-volatile i.e. its contents are retained even when the device is powered off.
Types	The two main types of RAM are static RAM and dynamic RAM.	The types of ROM include PROM, EPROM and EEPROM.

Various Forms of Storage Devices:-

1. Floppy discs:-

A floppy disk is a data storage medium that is composed of a disk of thin, flexible floppy magnetic storage medium encased in a square or rectangular plastic shell. Floppy disks are read and written by a floppy disk drive.



Application:

Any use where small files such as word processing, small spreadsheets and databases need to be moved from one computer to another. Useful to backup small data files.

2. Fixed Hard Discs:-

A hard disk drive is the device used to store large amounts of digital information in computers and related equipment like iPods and games consoles such as the Xbox 360 and PS3.

Hard disk drives are used to store operating systems, software and working data. These are suitable for any application which requires very fast access to data for both reading and writing to. However, Hard disk drives may not be suitable for applications which need portability.



Almost all computers used a fixed hard disc. Used for on-line and real time processes requiring direct access. Used in file servers for computer networks to store large amount of data.

3. Portable Hard Discs:-

Portable hard discs are good fun because you can carry data about all over the place and transfer information, programs, pictures, etc between computers.



Advantages:

- *Greatly improved data cargo carrying capacity (relative to the 1.44 Mb floppy discs).*
- *You don't need to worry about the other person having the same type of special cartridge drive as yourself.*

Disadvantages:

- *Hard drives have to be handled quite carefully, and when being transported should be wrapped in something soft and put in a padded bag.*
- *More expensive than other forms of removable media.*

Application:

Portable disc discs are used to store very large files which need transporting from one computer to another and price is not an issue.

4. Magnetic Tapes:-

Magnetic tape has been used for **data storage** for over 50 years. When storing large amounts of data, tape can be substantially less expensive than disk or other data storage options. Tape storage has always been used with large computer systems. Modern usage is primarily as a high capacity medium for backups and archives.

Drawbacks:

Writing and retrieving data is slow. It uses serial access for reading and writing.

Application

Magnetic tapes are used for application which requires extremely large storage capacity where speed of access is not an issue.

It is commonly used for backups of file servers for computer networks, in a variety of batch processing applications such as reading of bank cheques, payroll processing and general stock control.



5. Optical backing storage media such as CDs and DVDs:-



- *CDs tend to be used for large files (but smaller than 1Gb) which are too big for a floppy disc to hold such as music and general animation.*
- *DVDs are used to hold very large files (several Gb) such as movie films. Both CDs and DVDs are portable i.e. they can be transported from one computer to another. Both can be used to store computer data.*
- *CD ROM/DVD ROM Applications which require the prevention of deletion of data, accidental or otherwise. CDs used by software companies for distributing software programs and data; by Music companies for distributing music albums and by book*

publishers for distributing encyclopedias, reference books etc. DVDs used by film distributors.

- *CD R/DVD R Applications which require a single ‘burning’ of data, e.g. CDs - recording of music downloads from the Internet, recording of music from MP3 format, recording of data for archiving or backup purposes. DVDs – recording of film movies and television programs.*
- *CD RW/DVD RW Applications which require the updating of information and ability to record over old data. Not suitable for music recording but is very useful for keeping generations of files. DVDs have between five and ten times the capacity of CDs.*

Solid state backing storage :

- *These are the smallest form of memory available in the market today.*
- *Widely used as removable storage.*
- *They are more robust than other forms of storage.*
- *Though expensive than other forms they can be easily written to and updated.*

6. Memory sticks/Pen drives:-



USB flash drives are typically removable and rewritable, much smaller than a floppy disk. Storage capacities typically range from 64 MB to 64 GB. USB flash drives offer potential advantages over other portable storage devices, particularly the floppy disk.

They have a more compact shape, operate faster, hold much more data, have a more durable design, and operate more reliably due to their lack of moving parts. Flash drives are widely used to transport files and backup data from computer to computer.

7. Flash memory cards:-



A **memory card** or **flash memory card** is a solid-state electronic flash memory data storage device used with digital cameras, handheld and Mobile computers, telephones, music players, video game consoles, and other electronics. Nowadays, most new PCs have built-in slots for a variety of memory cards; Memory Stick, Compact Flash, SD, etc. Some digital gadgets support more than one memory card to ensure compatibility.

➤ Visual Display Unit:



<http://www.computerhope.com>

VDU stands for "Visual Display Unit." A VDU displays images generated by a computer or other electronic device. The term VDU is often used synonymously with "monitor," but it can also refer to another type of display, such as a digital projector. Visual display units may be peripheral devices or may be integrated with the other components. For example, the Apple iMac uses an all-in-one design, in which the screen and computer are built into a single unit.

Early VDUs were primarily cathode ray tube (CRT) displays and typically had a diagonal size of 13 inches or less. During the 1990s, 15" and 17" displays became standard, and some manufacturers began producing displays over 20" in size. At the turn of the century, flat panel displays became more common, and by 2006, CRT displays were hard to find.

Today, it is common for computers to come with VDUs that are 20" to 30" in size. Thanks to the recent growth in LCD, plasma, and LED technology, manufacturing large screens is much more cost effective than before.



DAT (Digital Audio Tape)



DAT (Digital Audio Tape) is a standard medium and technology for the digital recording of audio on tape at a professional level of quality. A DAT drive is a digital tape recorder with rotating heads similar to those found in a video deck. Most DAT drives can record at sample rates of 44.1 kHz, the CD audio standard, and 48 kHz. DAT has become the standard archiving technology in professional and semi-professional recording environments for master recordings. Digital inputs and outputs on professional DAT decks allow the user to transfer recordings from the DAT tape to an audio workstation for precise editing. The compact size and low cost of the DAT medium makes it an excellent way to compile the recordings that are going to be used to create a CD master.

As an archiving medium, DAT is an alternative to consider along with:

- *Digital Data Storage (DDS1 through DDS3)*
- *Optical disc*
- *VHS tape*

Uses of DAT:-

Professional recording industry

DAT was used professionally in the 1990s by the professional audio recording industry as part of an emerging all-digital production chain also including digital multi-track recorders and digital mixing consoles that was used to create a fully digital recording.

Pre-recorded DAT

Several albums from multiple record labels were also released as pre-recorded DAT tapes in the first few years of the format's existence, in small quantities as well.

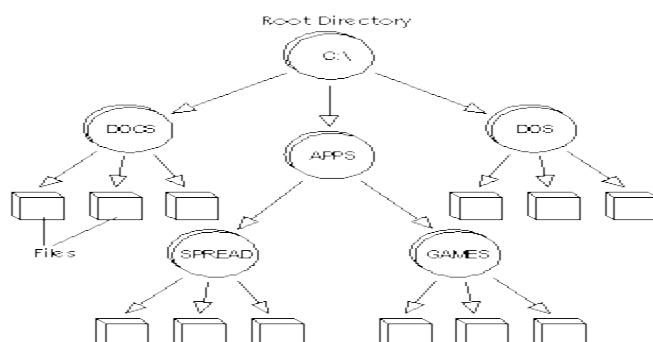
Amateur and home use

DAT was envisaged by proponents as the successor format to analogue audio cassettes in the way that the compact disc was the successor to vinyl-based recordings. It sold well in Japan, where high-end consumer audio stores stocked DAT recorders and tapes into the 2010s and second-hand stores generally continued to offer a wide selection of mint condition machines. DAT recorders proved to be comparatively expensive and few commercial recordings were available.

Computer data storage medium

The format was designed for audio use, but through the ISO [Digital Data Storage](#) standard was adopted for general data storage, storing from 1.3 to 80 GB on a 60 to 180 meter tape depending on the standard and compression. It is a sequential-access medium and is commonly used for [backups](#). Due to the higher requirements for capacity and integrity in data backups, a computer-grade DAT was introduced, called DDS (Digital Data Storage).

➤ **Directory**



(1) An organizational unit, or container, used to organize folders and files into a hierarchical structure. Directories contain bookkeeping information about files that are, figuratively speaking, beneath them in the hierarchy. You can think of a directory as a file cabinet that contains folders that contain files. Many graphical user interfaces use the term *folder* instead of *directory*.

Computer manuals often describe directories and file structures in terms of an inverted tree. The files and directories at any level are contained in the directory above them. To access a file, you may need to specify the names of all the directories above it. You do this by specifying a path.

The topmost directory in any file is called the *root directory*. A directory that is below another directory is called a *subdirectory*. A directory above a subdirectory is called the *parent directory*. Under DOS and Windows, the root directory is a back slash (\).

To read information from, or write information into, a directory, you must use an operating system command. You cannot directly edit directory files. For example, the DIR command in DOS reads a directory file and displays its contents.

(2) In networks, a database of network resources, such as e-mail addresses. See under *directory service*.

Disc Concepts

➤ **Disk Formatting**

Hard disks, the primary storage devices on your computer, need to be formatted before you can use them. When you format a disk, you configure it with a file system so that Windows can store information on the disk. Hard disks in new computers running Windows are already formatted. If you buy an

additional hard disk to expand the storage of your computer, you might need to format it.

Storage devices such as USB flash drives and flash memory cards usually come preformatted by the manufacturer, so you probably won't need to format them. CDs and DVDs, on the other hand, use different formats from hard disks and removable storage devices. For information about formatting CDs and DVDs, see [Which CD or DVD format should I use?](#)

Disk formatting process

Formatting a disk for use by an operating system and its applications typically involves three different processes. [\[NB 3\]](#)

1. *Low-level formatting (i.e., closest to the hardware) marks the surfaces of the disks with markers indicating the start of a recording block (typically today called sector markers) and other information like block [CRC](#) to be used later, in normal operations, by the [disk controller](#) to read or write data. This is intended to be the permanent foundation of the disk, and is often completed at the factory.*
2. *[Partitioning](#) divides a disk into one or more regions, writing data structures to the disk to indicate the beginning and end of the regions. This level of formatting often includes checking for defective tracks or defective sectors.*
3. *High-level formatting creates the [file system](#) format within a disk partition or a [logical volume](#). This formatting includes the data structures used by the OS to identify the logical drive or partition's contents. This may occur during operating system installation, or when adding a new disk. [Disk and distributed file system](#) may specify an optional boot block, and/or various volume and directory information for the operating system.*

➤ **Disk Booting**

A **boot disk** is a removable digital data storage medium from which a [computer](#) can load and run ([boot](#)) an [operating system](#) or utility program. The computer must have a built-in program which will load and execute a program from a boot disk meeting certain standards.

A boot disk (sometimes called a startup disk) was a type of removable media, such as a floppy disk, CD, or DVD, that contained Windows startup files that your computer could use to start Windows if the Windows system files on the hard disk became damaged or unusable.

Boot disks are used for:

- *Operating system installation*
- [Data recovery](#)
- [Data purging](#)
- *Hardware or software troubleshooting*
- [BIOS flashing](#)
- *Customizing an operating environment*
- *Software demonstration*
- *Administrative access in case of lost password is possible with an appropriate boot disk with some operating systems*
- *Games (e.g. for [Amiga](#) home computers)*

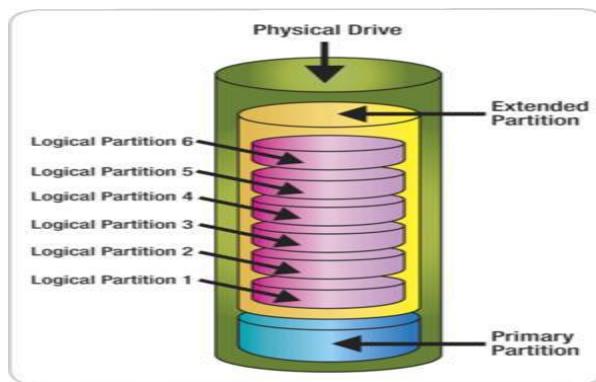
While almost all modern computers can boot from a hard drive containing the operating system and other software, they would not normally be called boot disks. [CD-ROMs](#) are the most common forms of media used, but other media, such as magnetic or paper tape drives, [zip drives](#), and more recently [USB flash drives](#) can be used. The computer's [BIOS](#) must support booting from the device in question.

➤ **Disk partitioning**

Disk partitioning is used to mean the partitioning or division of certain kinds of secondary storage (such as hard disk drives (HDDs)), via the creation of multiple partitions. Partitions are^{[2][3]} logical containers which are usually used to house filesystems, where operating systems, applications, and data are installed on. A single partition may span the entirety of a physical storage device.

A partition editor software program can be used to create, resize, delete, and manipulate these partitions on the HDD. A partition on a traditional mechanical hard drive consists of a range of cylinders of HDD—i.e. each partition is defined by both a start and end cylinder (the size of cylinders varying from disk to disk).

Benefits of multiple partitions:



Logical partitions require extended partitions. In Windows, extended partitions can be used to create many logical partitions.

Creating more than one partition has the following advantages:

- Having a separate area for operating system virtual memory swapping/paging.
- Keeping frequently used programs and data near each other.
- Having cache and log files separate from other files. These can change size dynamically and rapidly, potentially making a file system full.
- Use of multi-boot setups, which allow users to have more than one operating system on a single computer. For example, one could install Linux, BSD, Mac OS X, Microsoft Windows or other operating systems on different partitions of the same HDD and have a choice of booting into any compatible operating system at power-up.
- Separation of the operating system (OS) and program files from user files. This allows image backups (or clones) to be made of only the operating system and installed software.
- Protecting or isolating files, to make it easier to recover a corrupted file system or operating system installation. If one partition is corrupted, other file systems may not be affected.
- Raising overall computer
- "Short stroking", which aims to minimize performance-eating head repositioning delays by reducing the number of tracks used per HDD.
- Partitioning for significantly less than the full size available when disk space is not needed can reduce the time for diagnostic tools such as check disk to run or for full image backups to run.

Disadvantages of multiple partitions:

Creating more than one partition has the following disadvantages, as compared to having a single partition spanning the same disk area:

- Reduces the total space available for user storage on the disk, as it forces the operating system to duplicate certain file system administration areas on the disk for each partition.
- Reduces overall disk performance.
- Increases disk fragmentation because it lowers the average size of contiguous free blocks on each partition – as compared to a single partition of the same overall size – after the same amount of data has been written to them.
- May prevent using the whole disk capacity, because it may break free capacities apart.
- Hurts portability and might impose constraints on how entities might be linked together inside the file system.
- Moving files across volumes will require actual copying (of bytes), whereas moving files within a volume generally requires only the "meta-data" to be updated.

Data Communications Equipment (DCE) :



Data Communications Equipment (DCE) can be classified as equipment that transmits or receives analogue or digital signals through a network. DCE works at the physical layer of the OSI model taking data generated by Data Terminal Equipment (DTE) and converting it into a signal that can then be transmitted over a communications link. A common DCE example is a modem which works as a translator of digital and analogue signals.

DCE may also be responsible for providing timing over a serial link. In a complex network which uses directly connected routers to provide serial links, one serial interface of each connection must be configured with a clock rate to provide synchronization.

Other common DCE examples include:

- *ISDN adapters*
- *Satellites (including base stations)*
- *Microwave stations*
- *NIC (network interface cards)*

*DCE is sometimes said to stand for **Data Circuit-terminating Equipment**.*

DBMS

Data: - *Data is a collection of facts in row form that become information after people processing. Data is represented with the help of characters like-alphabets (A-Z, a) digits (0-9) or special characters (+, -, @, #, &) etc.*

Information: - *Processed data useful output- the result of data processing which can be used to help the individuals to make decisions.*

Data Processing:- *It is a series of actions & operations that convert input into output.*

Field/Data element/ item: - A meaningful collection of related character like name of a student in a class is represented by data item – Name

Record:- A meaningful collection of related fields.

A payroll record for an employee contains such data fields as –name, age, qualification, sex, basic pay etc.

File:- A meaningful collection of related records.

Roll no.	Name	Marks	Data item
1001	Anil	76	
1002	Rita	80	
1003	Aman	90	

Record

Database:- A collection of data file integrated & organized into a single comprehensive file system to minimize duplication of data to provide convenient access to information within that system to satisfy a wide variety of user needs.

DBMS:- A collection of programs required to store & retrieve the data from a database.

Examples of Data & Information:-

Marks obtained in different subjects in a particular examination of a student act as data by processing this data, result may be obtained. The result is the information, teacher user to declare a student pass or fail.

Characteristics of Information:-

1. Timeline – Means that information should be made available when it is needed for a particular purpose not behavior of an event as it really is.

- 2. Accuracy:-** *Information if it is to be of value, should be accurate should truly reflect the situation or behavior of an event as it really is.*
- 3. Completeness:-** *Information is considered as complete if it tells its users all what he wishes to know about a particular situation/ problem. The more the completeness of information the higher is its value.*
- 4. From:-** *Information is of value if it is provided to the user in the form it is useful best understood by it.*
- 5. Reliability:** - *The information should be reliable.*
- 6. Relevance:-** *It refers to current utility of information in decision making or problem solving. Thus in gains in value inf” it is relevant.*
- 7. Purpose:-** *Information must have purpose at the time it is transmitted to a person or machine otherwise it is simply data.*
- 8. Validity:** - *it measures the closeness of information to the purpose.*

The need of Information:-

- 1. Information is useful for making decisions.**
- 2. Information helps managers or users in lowering the level of uncertainties where they have to make a choice among several available alternatives.**
- 3. Information helps the users in tackling problem relating to their respective functional area.**
- 4. Information is used by management to plan the objective of organization.**

Traditional File Processing system:- *In early days, data was stored in files. For an application multiple files are required. Even file store maintains its own related data.*

Example:- A student inf” system will include file student profile student fees programs are dependent on the file & vice versa. When the physical format of file is changed the program has also to be changed.

Disadvantages:-

Duplicate Data:- *in file PS, separate file are used for different ape which lead to unnecessary repetition of data . This unnecessary repetition of data is known as Redundancy.*

File Student profile

<i>Student id</i>	<i>Student name</i>	<i>Study course</i>	<i>Student address</i>	<i>Student age</i>
A001	Mona	Comp sci.	Delhi	18
A002	Nisha	Physics	Noida	18

Data inconsistency:- In FPS, data is not consistent if a data item to be changed then all the fees containing that all the files must not be supported causing inconsistence.

The files can be accessed concurrently by multiple users uncontrolled concurrent update data in a file at same time.

Poor Data Security:- Data is stored in different files causing security problem.

Objectives / Characteristics/ Advantage of Database Approach:-

Minimal Redundancy:- in files system each application has its own private files. This can lead to considerable redundancy in store data with resultant waste in storage data.

Example:- A personal app" & an education record app" may each own containing department inf" for employees. These 2 files can e integrated & redundancy eliminated if the DBA is aware of the data requirements for both applications. Database system keeps data at place in database.

Data inconsistency is reduced:- Minimizing data redundancy using database system reduces data in consists too. Updating of data values becomes simple & there is no agreement in stored values.

Data is shared:- Means sharing the same data among more than one user can access to the same data though they may use it for different location and different computer. The database is designed to support-2 shared data. Authorized users are permitted to use the data from database.

Integrity: - Integrity of data means that data in database is always accurate, such that incorrect information cannot be stored in database. In order to maintain the integrity of data, some integrity constraints are enforced on the database. A DBMS should provide capabilities for defining and enforcing the constraints.

Example: Let us consider the case of college database and suppose that college having only B Tech, M Tech, M.Sc., BCA, BBA and BCOM classes.

Privacy as Security: - Data in database must be kept secrets & private data security refers to protection of data against accident or intention discloser to unauthorized or unauthorized modifications.

The database is kept secure by limiting access to the database by authorize personnel. Authorized users are generally retired to the particular data they can access & whether they can update it or not. Access is often controlled by passwords.

The following requirement is essential for data base security-

- The data should be protected from the fire, theft or other form of destruction.
- Data should be reconstructed able.
- Users of data base must be positively identifying before they can use it
- The sys. Must be able to check that user's actions are authorized.
- User's action should be monitored so that if they do something wrongs they are likely to be found.

Backup and Recovery: A DBMS must provide facilities for recovering from hardware or software failures. The backup and recovery subsystem of the DBMS is responsible for recovery.

Example:- if the computer system fails in the middle of a complex update program, the recovery subsystem is responsible for making sure that the database is restored to the state it was in before the program started executing.

Standards can be enforced:-Since DBMS is a central system, so standard can be enforced easily may be at Company level, Department level, National level or International level. The standardized data is very helpful during migration or interchanging of data. The file system is an independent system so standard cannot be easily enforced on multiple independent applications.

Data Migration:-Some data are referred very frequently & other only occasionally. It is desirable to store the frequently reference data in a tape & frequently accessed data may be stored on disk or drum.

Simplicity: - Its means that database is used to represent the overall logical view in a simple & neat fashion.

In many systems pointers are used in logical representation to show relationship between data in logical pointers is that as more & more relationships are added, the overall collection of pointers become highly & it difficult to represent.

Data Approach: - Database provides solutions for handling the problem of file system. In database approach, data is defined & stored centrally.

Definition of Database: - The major components of database are:-

Data:-A database is both integrated & shared. By integrated we mean the several distinct data files are unified in a manner that redundancy among these data files is wholly or partially eliminated.

Example: - A database may contain files for – Student Profile having student name, course etc. marks file having the marks of student in various subjects.

To prepare a report card, there is a need to get complete student profile along with the marks obtained in each subject.

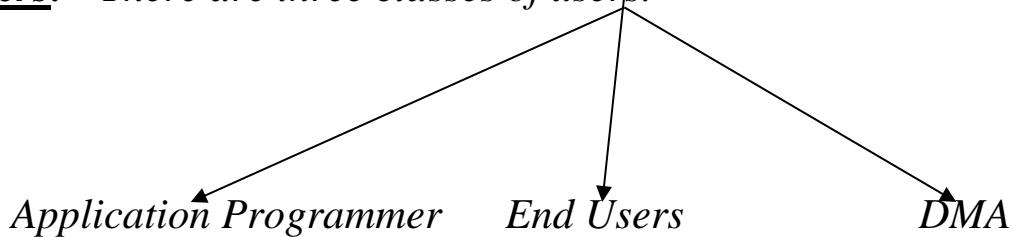
By shared means that the data stored in database can be shared by multiple users such that each user has access to the same data, which the users could use for diff. purpose

Example:- Data for course enrolled in student profile file is shared by ncc & the library dep. Both use the same data for different purpose.

Hardware:-It is physical device on which database system resides. Hardware consists of secondary storage volumes- disks, drums, magnetic disk drivers, I/O device controller, printers, connecting cable etc.

Software: - Between the hardware and the users there is a layer of software usually called the database management system or DBM. All requests from users for access to the database are handled by the DBMS.

Database Users:- There are three classes of users.



Application Programmer: - Professional programmers are those who are responsible for developing application programs or user interface. The application programs could be written using general purpose programming language or the commands available to manipulate a database.

End User:- Used for accessing the database from a terminal used these are of two type:-

Casual Users:- Are trained in the use of the on line query language and access data by entering queries at terminals.

Native Users: - Access data through appl" programs that have been written for them. They don't need to know any detail of the structure or language of the database system.

Database administrator: - Data is a person or group of person responsible for overall control of database. The administrator needs both technical and managerial skills key functions of a database administrator are:-

- ❖ Interaction with users & all levels of management.
- ❖ \design & coordination of data security measure to restrict unauthorized access.
- ❖ Responsibility and control over all database documentation

Some of the main Activities of DBA are following:-

1. Deciding the information contents of database system: - It is the DBA who decides information contents of database system DBA decides field, type of field and range of values that can be stored in field. In other words, DBA decides schema of database(schema is the structure of database files)
2. Deciding hardware device to be used:- It is a database administrator job to decide which hardware device will be most suitable for current database applications.
3. Deciding the users & data to be used by users: - it is the DBA who decide users of the database system. DBA also decides which information contents are to be used by any particular users.
4. Decides the backup and recovery method:- To avoid accidental loss of data backup of the data is maintained on regular intervals. It is the DBA who decides which data is to be backed up and when. If data is lost then it is the DBA how to recover data from the existing backup.
5. Deciding the validation check on the data:- it is the DBA who decides which check are to be maintained on existing data in database system.

6. *Deciding database dictionary & user's manual:- It is the responsibility of DBA to design database dictionary or user's manual which gives standardized procedures for access to database.*
7. *Monitoring Performance & responding to changing requirements: - The DBA is responsible for organizing the system as to get the performance that is "best for the enterprise and for making.*

DBMS and its Functions: -

A DBMS performs several important functions that guarantee integrity and consistency of data in the database. Most of these functions are transparent to end-users. There are the following important functions and services provided by a DBMS:

Function of DBMS:-

Data Definition: - The DBMS accepts the data definitions such as external schema, the conceptual schema, the internal schema, and all the associated mappings in source form. In other words DBMS must include language processor, component for each of the various data definition language (DDL).

Data manipulation: - DBMS must include a DML processor component. The DBMS must be able to handle requests from the users to see, retrieve, update, delete or add new records to the database.

Data Security & Integrity: - DBMS must monitor users' requests & reject any attempt to update the security & integrity rules defined by the DBA.

Data recovery & concurrency: - DBMS must enforce certain recovery & concurrency control.

Data Dictionary: - DBMS must provide a data dictionary function. The dictionary contains data about the data rather than just raw data. Data dictionary contains the information about entries attributes.

Components of DBMS:-

1. Data Definition Language (DDL) compiler: - DDL compiler takes the data definition statement that is in the source from & convert them the object from.
2. Data manager: - The data manager is the central software component of the DBMS. It is sometimes referred to as the database control system. One of the functions of the data manager is to convert operations in the user's queries coming directly via the query processor or\ indirectly via an application program from the user's logical view to a physical file system. The data manager is responsible for interfacing with the file system as show. Manager to provide the synchronization in the simultaneous operations performed by concurrent users and to maintain the backup and recovery operations.
3. File manager: - File manager takes care of structure of the files& managers the file space.
4. Disk Manager: - The disk manager is part of the operating system of the host computer and all physical input and output operations are performed by it. The disk manager transfers the block or page requested by the file manager so that the latter need not be concerned with the physical characteristics of the underlying storage media.
5. Data files: - It contains the data portion of the database.
6. Query Processor: - It is used to the online users query and converts it into efficient series of operation in from capable of being sent to the data manager for execution. It uses data dictionary.

7. **Data Dictionary**: - DBMS must provide a data dictionary function. The dictionary contains data about the data. Rather than just raw data D.D contains

Architecture of DBMS:- The Architecture of a database system provides a general framework for database system. The architecture for database system is proposed by ANSI/ SPARC study group & is called ANSI / SPARC architecture. ANSI (American national standards institute) or SPARC (Standard planning and requirement committee).

The DBMS architecture is divided into their level:-

- ❖ External level (view level)
- ❖ Conceptual level (Global level)
- ❖ Internal level (Physical level)

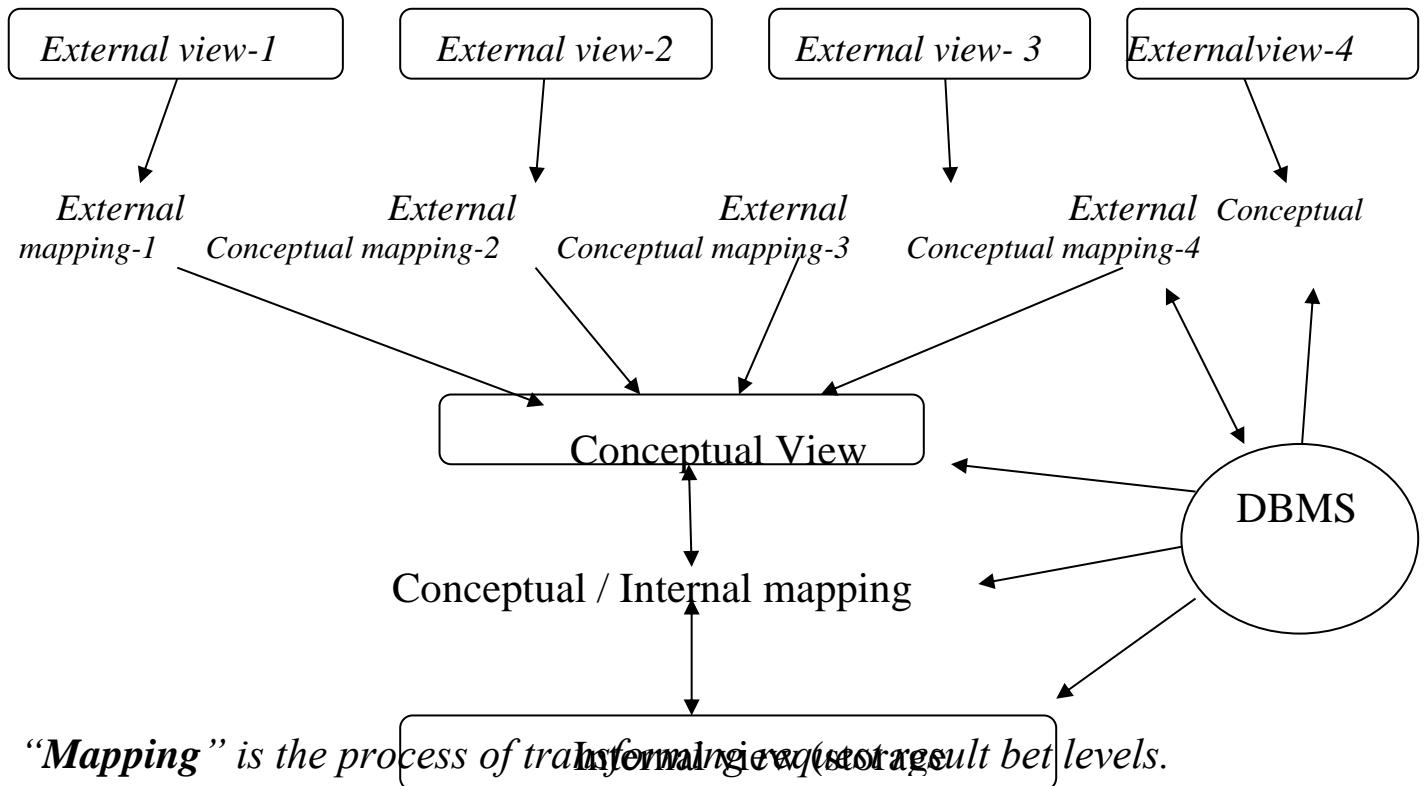
Internal level (physical level):- it is concerned with the way in which the data is actually stored. The internal level schema describes the physical storage structure of the database. It is concerned about how data is stored physically. It describe the organization of files, the access path to the database etc.

External level (view Level):- It is the users' view of the database. This level describes that part of the database that is relevant to each user. External level is the one which is closest to the end users. This level deals with the way in which individual users view data. Individual users are given different views according to the user's requirement.

Conceptual level: - It is the users' view of the database. This level describes that part of the database that is relevant to each user. External level is the

one which is closest to the end users. This level deals with the way in which individual users view data. Individual users are given different views according to the user's requirement.

There level are →



Two types of mapping with different views-

- External / conceptual mapping:- it defines the correspondence between a particular external view and the conceptual view. The user sees and manipulates a record corresponding to the external view.
- Conceptual/ internal Mapping:- It defines the correspondence between the conceptual view and the store database. It specifies how conceptual records and fields are represented at the internal level.

DBMS:-

A collection of interrelated data. This part of DBMS is usually referred to as the database.

*A set of application program used to access, update and manage that data. This portions' from the **Data Management system**. The interrelated set of data that forms the database needs to be stored & managed. So that the database can be accessed for the retrieval of data for insertion, deletion & update of data.*

DBMS handles all access to the database & manages the database managing the database implies that it provides a convenient environment to the users perform operation on the database for creation, insertion, deletion, updating & retrieval of data. DBMS defines the use of database. This keeps data secure from unauthorized access.

Function of DBMS, Architecture

Mapping – It is a term used for transforming requests & he results between different levels of DBMS architecture.

Example of DBMS is – oracle, Microsoft access.

File Oriented system versus Database system:-

Data Independence:- *It is the ability to use the database without knowing the representation detail.*

It is defined as capacity to change the schema at one level of database system in such a way that the schema at next higher level needs not to be changed

Reasons for data independence as follows:-

✓ To allow the DBMS to changes in the content, location, representation, organization of a database without causing reprogramming of ‘appl’ programs which use the database.

- A. Logical Data Independence:- Means that the overall logical structure of data may be changed without changing the application program. Changes include – Adding a record, adding a data item, updating constraints etc.
- B. Physical data independence:- Means that the physical layout & organization of data may be changed without changing either the overall logical structure of data or the “apl” programs.
The concept of data of data independence languages, where the interface is presented to user & the implementation (representation) details are hidden.
- C. Data redundancy:- In non-database system, each application has its own private files. Due to decentralization of the data, the file oriented system leads to uncontrolled duplication of data. This can lead to redundancy in stored data, which result in the wastage of storage location with controlled redundancy under DBMS, which saves space, this elimination redundancy don't inconsistency.
- D. Data integrity:- it describes the problem of ensuring that the data in the database is accurate. Integrity constraints can be viewed as a set of assertions to be obeyed when updating a database to preserve an error-free state. Even if redundancy is eliminated, the database may still contain incorrect data. Integrity checks which are important are check on data item records types.

Disadvantages of Database/ DBMS:-

1. High cost of DBMS:- A significant disadvantage of DBMS system is cost because a complete DBMS is very large sophisticated piece of software, it is expensive to purchase.

2. *High hardware cost*:- Additional memory and processing power may be required to run the DBMS, resulting in the need to upgrade the hardware.
3. *High programming cost*:- Because a DBMS is a complex tool with many features, it requires experienced programmers resulting in extra payment for their hire and expertise.
4. *Backup & recovery are more difficult*:- Determining the exact state of database at the time of failure may be a problem. It may be even more difficult to determine what should be done next. Even the failure of just one “ap” program may pose serious problems.
5. *Complex*:- Database processing tends to be complex, large amounts of data in many different formats can be interrelated in the database. Both the database system and the application program must be able to process this structure.
6. *High conversion cost*:- which an organization converts to a database system, data has been removed from files and loaded into the database which may be difficult and time consuming process.
7. *Data integrity*:- A failure in one component of an integrated system can stop the entire system.

What is RDBMS?

RDBMS stands for Relational Database Management System. RDBMS data is structured in database tables, fields and records. Each RDBMS table consists of database table rows. Each database table row consists of one or more database table fields. RDBMS store the data into collection of tables, which might be related by common fields (database table columns). RDBMS also provide relational operators to manipulate the data stored into the database tables. Most RDBMS use SQL as database query language. Edgar Codd introduced the relational database model. Many modern DBMS do not conform to the Codd's definition of a RDBMS, but nonetheless they are still considered to be RDBMS.

The most popular RDBMS are MS SQL Server, DB2, Oracle and MySQL.

What is NULL value?

A **NULL** value in a table is a value in a field that appears to be blank, which means a field with a **NULL** value is a field with no value. It is very important to understand that a **NULL** value is different than a zero value or a field that contains spaces. A field with a **NULL** value is one that has been left blank during record creation.

SQL Constraints:

Constraints are the rules enforced on data columns on table. These are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the database.

Constraints could be column level or table level. Column level constraints are applied only to one column whereas table level constraints are applied to the whole table.

Following are commonly used constraints available in SQL:

- **NOT NULL Constraint**: Ensures that a column cannot have **NULL** value.
- **DEFAULT Constraint**: Provides a default value for a column when none is specified.
- **UNIQUE Constraint**: Ensures that all values in a column are different.
- **PRIMARY Key**: Uniquely identified each rows/records in a database table.
- **FOREIGN Key**: Uniquely identified a rows/records in any another database table.
- **CHECK Constraint**: The CHECK constraint ensures that all values in a column satisfy certain conditions.
- **INDEX**: Use to create and retrieve data from the database very quickly.

Data Integrity:

The following categories of the data integrity exist with each RDBMS:

- **Entity Integrity**: There are no duplicate rows in a table.
- **Domain Integrity**: Enforces valid entries for a given column by restricting the type, the format, or the range of values.
- **Referential integrity**: Rows cannot be deleted, which are used by other records.
- **User-Defined Integrity**: Enforces some specific business rules that do not fall into entity, domain or referential integrity.

Database Normalization

Database normalization is the process of efficiently organizing data in a database. There are two reasons of the normalization process:

- *Eliminating redundant data, for example, storing the same data in more than one tables.*
- *Ensuring data dependencies make sense.*

Both of these are worthy goals as they reduce the amount of space a database consumes and ensure that data is logically stored. Normalization consists of a series of guidelines that help guide you in creating a good database structure.

Normalization guidelines are divided into normal forms; think of form as the format or the way a database structure is laid out. The aim of normal forms is to organize the database structure so that it complies with the rules of first normal form, then second normal form, and finally third normal form.

It's your choice to take it further and go to fourth normal form, fifth normal form, and so on, but generally speaking, third normal form is enough.

- [First Normal Form \(1NF\)](#)
- [Second Normal Form \(2NF\)](#)
- [Third Normal Form \(3NF\)](#)

ERP - Enterprise Resource Planning:-

Enterprise resource planning (ERP) is business [management](#) software—typically a suite of integrated applications—that a company can use to collect, store, manage and interpret data from many business activities, including:

- [Product planning](#), cost
- [Manufacturing](#) or service delivery
- [Marketing](#) and sales
- [Inventory management](#)
- [Shipping and payment](#)

ERP provides an integrated view of core business processes, often in real-time, using common [databases](#) maintained by a [database management system](#). ERP systems track business resources—cash, [raw materials](#), [production capacity](#)—and the status of business commitments: [orders](#), [purchase orders](#), and [payroll](#). The applications that make up the system share data across the various departments (manufacturing, purchasing, sales, [accounting](#), etc.) that provide the data. ERP facilitates information flow between all business functions, and manages connections to outside [stakeholders](#).

Software

The term '**software**' refers to the set of electronic program instructions or data a computer processor reads in order to perform a task or operation. In contrast, the term '**hardware**' refers to the physical components that you can see and touch, such as the computer hard drive, mouse, and keyboard.

Software means [computer instructions](#) or [data](#). Anything that can be [stored](#) electronically is software, in contrast to [storage devices](#) and display devices which are called [hardware](#).

The Difference between Software and Hardware

The terms *software* and *hardware* are used as both nouns and adjectives. For example, you can say: "The problem lies in the software," meaning that there is a problem with the program or data, not with the computer itself. You can also say: "It is a software problem."

The distinction between software and hardware is sometimes confusing because they are so integrally linked. Clearly, when you purchase a program, you are buying software. But to buy the software, you need to buy the disk (hardware) on which the software is recorded.

Software can be categorized according to what it is designed to accomplish. There are two main types of software: **systems software** and **application software**.

Systems Software

Systems software includes the programs that are dedicated to managing the computer itself, such as the **operating system**, file management utilities, and disk operating system (or DOS). The operating system manages the computer hardware resources in addition to applications and data. Without systems software installed in our computers we would have to type the instructions for everything we wanted the computer to do!



Applications Software

Application software, or simply **applications**, are often called productivity programs or end-user programs because they enable the user to complete tasks such as creating documents, spreadsheets, databases, and publications, doing online research, sending email, designing graphics, running businesses, and even playing games! Application software is specific to the task it is designed for and can be as simple as a calculator application or as complex as a word processing application. When you begin creating a

document, the word processing software has already set the margins, font style and size, and the line spacing for you. But you can change these settings, and you have many more formatting options available. For example, the word processor application makes it easy to add color, headings, and pictures or delete, copy, move, and change the document's appearance to suit your needs.

Microsoft Word is a popular word-processing application that is included in the **software suite** of applications called Microsoft Office. A software suite is a group of software applications with related functionality. For example, office software suites might include word processing, spreadsheet, database, presentation, and email applications. Graphics suites such as Adobe Creative Suite include applications for creating and editing images, while Sony Audio Master Suite is used for audio production.

A **Web browser**, or simply **browser**, is an application specifically designed to locate, retrieve, and display content found on the Internet. By clicking a **hyperlink** or by typing the **URL** of a website, the user is able to view Web sites consisting of one or more Web pages. Browsers such as Internet Explorer, Mozilla Firefox, Google Chrome, and Safari are just a few of the many available to choose from.

UNIT-2

Operating System

By
Jyoti
Dhanoly

Operating System is an integrated set of programs used to manage various resources & overall operations of a computer system.

Operating System is an important part of Computer, intermediate between user of a computer & Computer Hardware.

OR

It is a software that provides an interface between the computer hardware & the application programs or users.

OR

An Operating System is a system software that may be viewed as an organized collection of software consisting of procedures for operating a computer & provides an environment for execution of programs.

An Operating System (commonly abbreviated OS & O/S) is the software component of a computer system that is responsible for the management and coordination of activities and the sharing of the limited resources of the computer. The operating system acts as a host for applications that are run on the machine. As a host, one of the purposes of an Operating System is to handle the details of the operation of the hardware. This relieves application programs from having to manage these details and makes it easier to write applications. Almost all computers, including handheld computers, desktop computers, supercomputers, and even video games consoles, use an operating system of some type.

Some of the oldest models may however use an embedded operating system, that may be contained on a compact disk or other data storage device.

Operating systems offers a number of services to application programs and users. Application access these services through application programming interface (APIs) or system calls.

Users may also interact with the operating system with some kind a software user interface (UI) like typing commands by using command line interface (CLI) or using a graphical user interface (GUI, commonly pronounced "gooey"). For hand-held and desktop computers, the user interface is generally considered part of the O.S.. On large multi-user systems like Unix and Unix-like systems, the user interface is generally implemented as an application program that runs outside the operating system.

Common contemporary operating systems include Microsoft Windows, Mac OS, Linux and Solaris. Microsoft Windows has a significant majority of market share in the desktop and notebook computer markets, while servers generally run on Linux or other Unix-like systems. Embedded device markets are split amongst several operating systems.

Measuring System Performance →

Efficiency of an O.S. & overall performance of a Computer System are measured usually in terms of following parameters : →

- ① Throughput → The total amount of useful processing carried out by a

Objectives →

- ① Make a Computer System easier to use → An operating system hides details of hardware resources from programmers & other users & provides them with a convenient interface for using a computer system. It acts as an intermediary between hardware & its users.
- ② Manage the resources of a Computer System → An operating system manages all the resources of a computer system. This includes managing the communication between different devices, controlling the sequence & execution of processes, allocating space on hard disk etc.

Main functions of an Operating System →

- ① Process Management → Process management module takes care of creation & deletion of processes, scheduling of system resources to different processes requesting them.
- ② Memory Management → Memory management module takes care of allocation & de-allocation of memory space to programs in need of this resource.
- ③ File Management → file management module takes care of file-related activities such as organization, storage, retrieval, naming, sharing & protection of files.
- ④ Security → Security module protects the resources & information of a computer system against destruction & unauthorized access.

- ⑤ It provides an environment in which users & Appl. Software can do work.
- ⑥ It manages different resources of computer like - CPU time, memory space, file storage, I/O devices etc. During use of computer by other programs or users, O.S. manages various resources & allocates them whenever required efficiently.
- ⑦ It Controls the execution of different programs to prevent occurrence of error.

⇒ The O.S. for PC in early 1980's was DOS.

D.O.S. is a character based O.S. DOS was the 1st developed O.S. Compared to a DOS-based PC, to all window O.S. →

(i) Now, VDU can now display characters in diff. shapes & size & it can also display graphics.

In other words, it converts the 'character based' interface into a 'Graphical User Interface' (GUI).

⇒ In DOS, it can run only single task. But in Ws, a PC can run more than one program simultaneously. It does multitasking.

(iii) In Ws, there is no need to remember commands while in DOS it is necessary to remember commands.

→ Microsoft came out with a few versions of Ws, such as Ws1, Ws20, Ws386 (during 1985-88). However, these version did not become popular as the software was not very powerful & user friendly & PCs in those days did not have enough CPU power & memory.

Ws-3 announced in 1999 was the 1st Ws program that was

In 1992, Microsoft corporation announced WS-3.1 is not an O.S. It is a program that runs to create an open environment. That is, WS-3.1 is not an O.S. but an operating environment. To use WS-3.1 there is no need to load DOS. After loading DOS we can load WS-3.1. It enhances the power & use of a PC over DOS.

WS NT introduced by Microsoft Corpth almost at same time is a complete O.S. GUI used in WS NT is almost same as that used in WS 3.1, how ~~many~~ WS NT is more reliable. WS NT did not become popular because it needed a lot of hardware resources (CPU power & memory) that was not easily available in PCs in early 1990s.

In 1995, Micro. introduced WS-95. Unlike WS 3.1, WS 95 is a full-fledged O.S. It is 1st Version of WS to include plug & play as an internal part of O.S.

Micro. came out with an updated & enhanced version of WS-95 in form of WS-98. It has its own WS explorer that can help to copy & maintain files & manage directories. It also came with lots of useful applications such as wordpad, Notepad etc.

Microsoft released an updated Version WS-2000 & updated version of WS-98.

OS/2, Linux, Unix are other O.S. that are used on PCs.

History:-

1980	—	DOS
1985	—	WS-1
1988	—	WS-2.0
	—	WS-3.0
1990	—	WS-3
1992	—	WS-3.1 WS-NT
1995	—	WS-95

1. Process Management

A Process (also called job) is a program in execution. The main objective of Process Management module of an Operating System is to manage the processes submitted to a system in a manner to minimize idle time of processors (CPU, I/O processors etc.) of system.

Process Management in Early Systems →

In early computer systems, a job was executed typically in following manner:

- ① A programmer would first write the program on paper.
- ② The programmer or a data entry operator would then punch the program & its data on cards or paper tape.
- ③ The programmer would then submit the cards or paper tape containing the program & data at reception counter of a computer center.
- ④ An operator would then take the cards or paper tape & load it manually into the system from card reader or paper tape reader. The operator was also responsible for loading any other software resource (language Compiler) or setting hardware devices required for execution of job. Before loading of job, the operator had to use front panel switches of system to clear any data remaining in the main memory from previous job.
- ⑤ The operator would then set the appropriate switches

⑥ Finally, the operator would print & submit the result of execution of job at reception counter for the programmer to collect it later.

The same process was repeated for every job. The method was known as manual loading mechanism because jobs were loaded one after another in the system manually by an operator.

In this method, job-to-job transition was not automatic. Hence a computer remained idle while an operator loaded & unloaded jobs & prepared the system for a new job. This caused enormous wastage of valuable computer time. A method of automatic job-to-job transition was devised to reduce this idle time.

Batch Processing →

In this method, known as batch processing, when one job finishes, system control is transferred back automatically to operating system that performs housekeeping jobs (clearing any data remaining in memory from previous job) needed to load & run next job.

In Batch Processing System, jobs were executed in following manner—

- ① Programmers would prepare their programs & data on decks of cards or paper tapes & submitted them at reception counter of a computer center.
- ② The operator would collect all submitted programs periodically & would batch them together & then load them all at one time into Input device of system.
- ③ The operator would then give a command to the system to start execution of programs.

- ④ Jobs were then loaded automatically from input device & executed by system one-by-one without any operator intervention. i.e. the system would read the 1st job from Input device, execute it, print its result & then repeat these steps for each subsequent job until all jobs in submitted batch of jobs were over.
- ⑤ When all jobs in submitted batch were processed, the operator would separate & keep the printed output of each job at reception counter for programmers to collect them later.

Batch processing mechanism helped in reducing idle time of a computer system because job-to-job transition did not require any operator intervention.

Batch Processing / stacked job processing / serial / sequential / off-line / concurrent — Running of several computer programs one after another without human interaction to run each program individually.

MULTI PROGRAMMING →

The inter-leaved execution of 2 or more different & independent programs by same computer (by a single CPU)

In Batch Processing — The batched programs are loaded one after another in sequence into main memory for processing.

Once loaded, a program will remain in Main Memory until its execution is completed. So wastage of - expensive memory & full capacity of CPU.

In order to overcome the problem of under utilization of main memory & the CPU, the concept of multiprogramming was introduced in Operating System.

Since the operating speed of CPU is much faster than that of I/O operations, the CPU can allocate time to several programs instead of remaining idle when one is being busy with I/O operations.

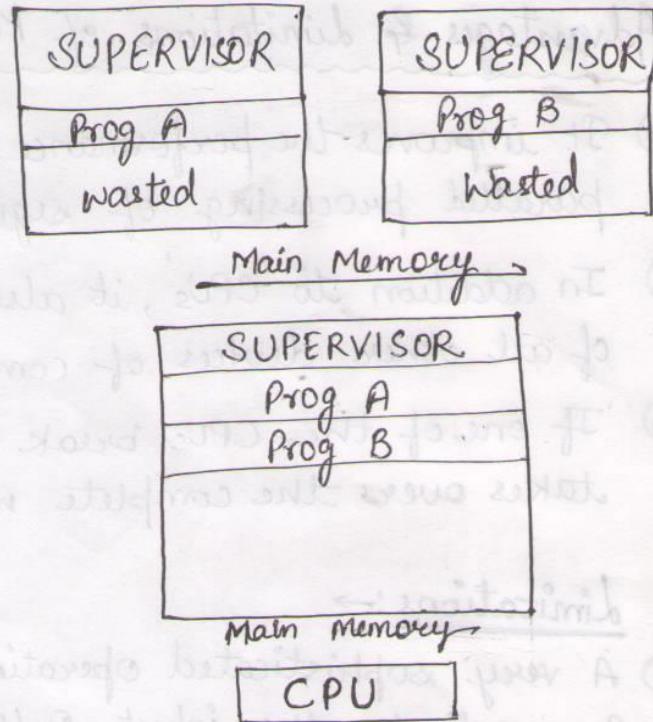
In it, when one is waiting for I/O transfer, another program is ready to utilize the CPU. Thus, it is possible for several users to share the time of CPU.

CPU is capable of executing only one instruction at a time. Hence at any given time, only one of the programs has control of CPU. Simultaneous execution of more than one program with a single CPU is impossible. It is not execution of instructions from several programs at same instant of time. It does not mean that there are a number of programs available to the CPU.

MULTI PROCESSING

It is the simultaneous execution of two or more programs by a computer system having more than one CPU.

The CPU can perform arithmetic & logical operations on parts of one or more programs while I/O operations are concurrently carried out by I/O processors on other parts of programs.



Main memory

CPU

Advantages & Limitations of Multiprocessing / Parallel Processing

- ① It improves the performance of Computer System by allowing parallel processing of segments of programs.
- ② In addition to CPUs, it also facilitates more efficient utilization of all other devices of computer system.
- ③ If one of the CPUs break down, the other CPUs automatically takes over the complete workload until repairs are made.

Limitations:

- ① A very sophisticated operating system is required to balance & coordinate the input, Output & processing activities of multiple CPUs.
- ② A large main memory is required.
- ③ Such systems are very expensive. In addition to high charges paid initially, regular operation & maintenance of these systems is also a costly affair.

MULTITASKING →

Technically speaking, Multitasking is same as Multiprogramming. Many authors do not distinguish between both because both refer to the same concept. However, some authors prefer to use the term - Multiprogramming for Multi-user Systems (Systems that are used by many users such as Mainframe & server class system)

Multitasking for Single-user Systems (Systems that are used by only one user at a time such as a Personal Computer)

Even in a single-user system, it is not necessary that the system processes only one job at a time. In fact, a user of a single user system often has multiple tasks.

ex: while compilation of a program is in progress in background user may be reading his/her e-mails in foreground.
In this manner, a user may work concurrently on many tasks.

Hence →

Multiprogramming → is interleaved interleaved execution of multiple jobs (of same or different users) in a multiuser system.

Multitasking → It is interleaved execution of multiple jobs (often referred to as tasks of same user) in a single user system.

MULTITHREADING →

A multithreaded program contains two or more threads that can run concurrently. Thus it is a specialized form of multitasking. Multithreading is useful in a no. of ways. It enables programmer to do multiple things at one time. Since all threads are running on a single processor, the flow of execution is shared between them. At a particular instance of time, a thread can be in any one of several states — running, blocked, ready, dead.

Motivation for Using Thread → The main motivation for using a multithreaded program are —

- ① Resource sharing can be achieved more efficiently & naturally among multiple threads of a process than among multiple processes because all threads of a process share the same address space.
- ② Due to sharing of address space & other operating system resources among the threads of a process, the overhead involved in C.P.U. switching among threads is very small as compared to CPU switch among processes having their own address spaces. This is the reason why threads are called Lightweight Processes.

- ③ The overhead involved in creating a new process is considerably greater than that for creating a new thread within a process.

Time-Sharing →

It is a mechanism to provide simultaneous interactive use of a computer system by many users in such a way that each one feels that he/she is the sole user of the system.

The principal notion of a timesharing system is to provide a large no. of users direct access to the computer for problem solving. This is accomplished by providing a separate terminal to each user. All these terminals are connected to main computer system. Thus, a timesharing system has many, even 100s of terminals linked up to the same computer at same time.

Unlike multiprogramming, where programs are executed on a priority basis, in timesharing, the CPU time is divided among all the users on a scheduled basis. The basic idea behind timesharing systems is to allow all user programs to have a brief share of CPU time in turn.

Each user program, beginning from the 1st program & proceeding through the last, is allocated a very short period of CPU time one by one. This short period of time during which a user gets the attention of CPU is known as a time slice/time slot/quantum. As human reaction times are a few seconds, a particular user will not notice any delay in executing his commands & normally feels that he is the sole user of the system.

Requirement of Time-sharing Sys —

- ① A no. of terminals connected to a system simultaneously, so that multiple users can the system simultaneously in interactive mode.
- ② Relatively large memory to support multiprogramming.

- ④ An alarm clock mechanism to send an interrupt signal to CPU after every time slice.

Advantages of Time-sharing System →

Although time-sharing systems are complex to design, they provide following advantages—

- ① Reduces CPU idle time — A user's thinking & typing speed is much slower than a computer's processing speed. Hence, during interactive usage of a system, while a user is engaged in thinking or typing his/her input, a time sharing system services many other users. Hence, time-sharing systems help in reducing CPU idle time & in turn, provide increased system throughput.

- ② Provides advantages of quick response time —

The special CPU scheduling algorithm used in this system ensures quick response time to all users. This feature helps in improving programmer's efficiency by making interactive programming & debugging much simpler & quicker. Multiple programmers can work simultaneously for writing, testing, debugging their programs or for typing out various approaches to a problem solving.

2.

MEMORY MANAGEMENT

In a Computer, there may be multiple processes executing at same time. Every process that needs to execute, requires a certain amount of memory. Memory management is one of the tasks handled by O/S. Memory management schemes handle the allocation of memory to different processes.

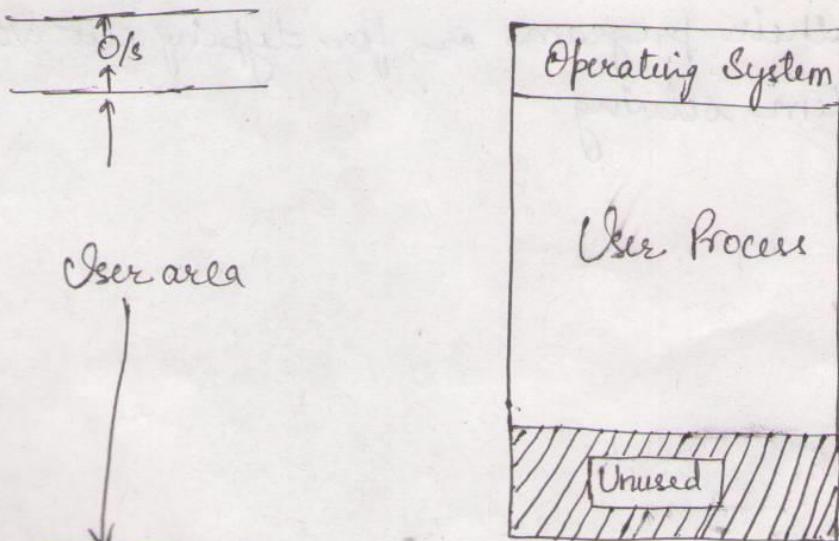
On completion of process execution, the memory is deallocated & made available to another process. Additionally, different processes that have been allocated memory should not interfere into each other's memory space. This requires some memory protection & sharing mechanism.

Uniprogramming Memory Model →

It is used in systems that process one job at a time & all system resources are available exclusively for the job until it completes.

In this memory management scheme ; one part of memory is used by O/S & its remaining part is available for use entirely by the currently active user process.

The O/S loads a program from disk into user area of memory & executes it. When the process finishes, it cleans up the user area of memory & then loads the next program to be executed.



does not lead to proper utilization of main memory resources. This is because the unoccupied memory space in user area (marked unused in fig.) remains unused for entire duration of execution of currently active user process.

Hence, this scheme is now used in very small or dedicated computer system only (systems used for a specific application only).

MUTIPROGRAMMING MEMORY MODELS →

In a multiprogramming system, multiple user processes need to reside simultaneously in main memory.

The two memory management schemes used to facilitate this are — Multiprogramming with fixed no. of memory partitions
Multiprogramming with variable no. of memory partitions

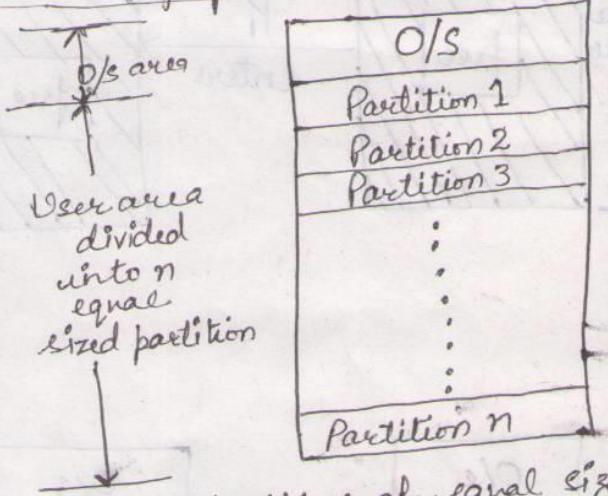
→ Multiprogramming with fixed no. of memory partitions →

In this scheme, the user area of memory is divided into a no. of fixed-sized partitions. Size of each partition is fixed. Each partition may contain exactly one process.

All new jobs are queued in an Input queue. When a partition is free, the next job from input queue is loaded into that partition.

When a process terminates, the partition occupied by it becomes free, used by another process.

Note: That in a system that uses partitions of different sizes, if a large partition becomes free, the 1st process in Input Queue



→ Multiprogramming with Variable no. of Memory Partitions →

In this scheme described above, since all partitions are of fixed size, any space in a partition that is in excess of actual memory requirement of the process loaded into it remains unused. On an average, 50% of memory may remain unused due to this, resulting in under utilization of memory resources. To overcome this problem, another scheme with variable no. of memory partitions was introduced. In this scheme, no., size & locations of partitions vary dynamically as processes enter & exit the system.

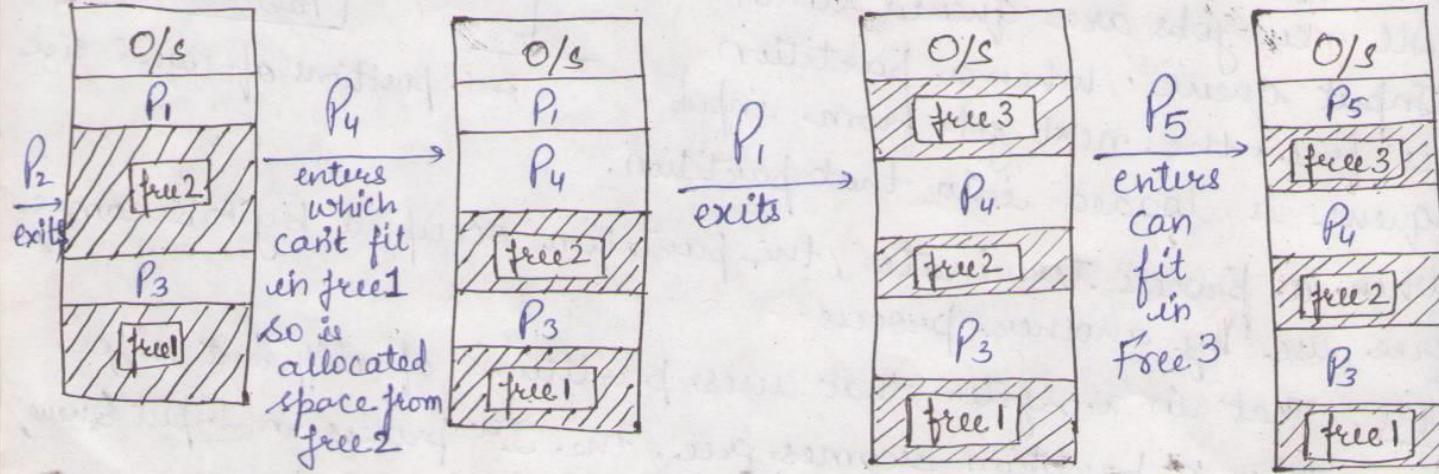
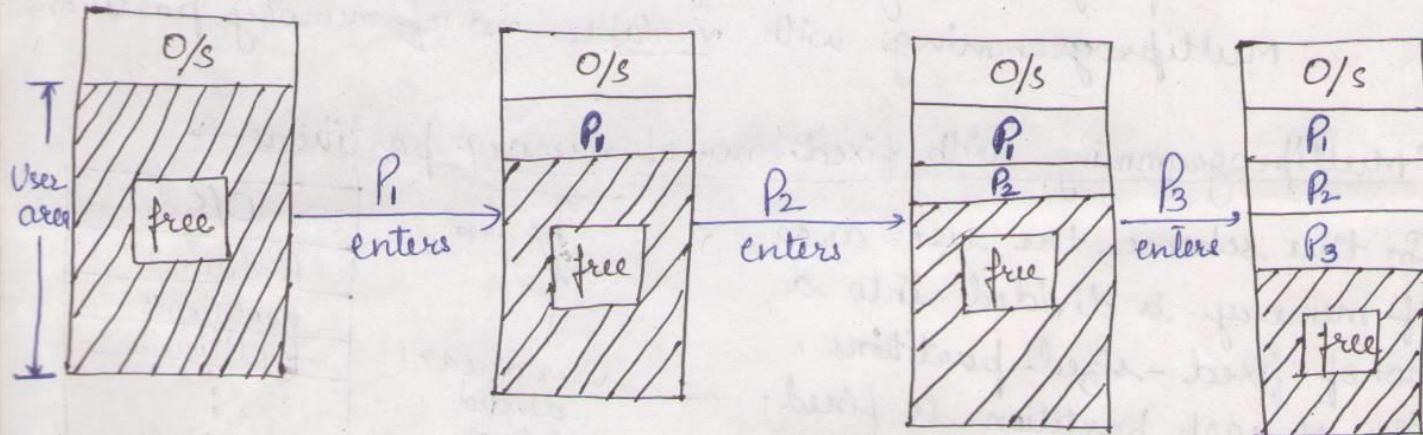


Fig. illustrates this memory management scheme with an example.

Initially, all memory in user area is available for user processes. When a process enters the system, only as much memory is needed by it is allocated to it, keeping the rest available for future requests. As processes enter & exit, memory partitions are allocated & de-allocated. Since memory requirement of different processes is generally different, as processes enter & exit, various sizes of free memory blocks are created in memory. OS maintains a table to keep track of free memory blocks. When a new process arrives, it searches for a free block that is large enough for this process. If the free block is too large, it is split into two parts. One part is large enough to be allocated to the process, while the other part that contains remaining memory is entered as a smaller free block in free blocks table. When a process terminates, it releases the partition allocated to it. The released partition is entered as a free memory block in free blocks table.

However, if the released partition is adjacent to any free block /cs, it is merged with it to create a large free block & the associated entries in free blocks tables are updated properly. In this manner, no., sizes & locations of partitions vary dynamically as processes enter & exit the system.

VIRTUAL MEMORY

Conventional memory management schemes, discussed till now, suffer from two main limitations.

- ① A process can't be loaded (hence executed) until sufficient free memory for loading the entire process becomes available. This ~~memory~~ may delay a process's turn around time.
- ② A process can't be loaded (hence executed) in a system where main memory size is less than the total memory required by process.

✓ Virtual memory is a memory management scheme that overcomes these limitations by allowing execution of processes that might not be loaded in main memory completely i.e. it enables execution of a process even if the process is loaded in memory partially.

- ③ Swapping → It is the process of transferring a block of data from on-line secondary storage to main memory or vice-versa (as it has larger capacity than main memory)
 - when data is transferred from on-line secondary storage to main memory, it is called — Swapping in of data.
 - when data is transferred from main memory to on-line secondary storage, it is — Swapping out of data.
- ④ Virtual memory is commonly implemented by Demand Paging.

✓ In Demand Paging, the processes reside in on-line secondary memory. When a process executes & a page is required, that page is swapped-in into the memory. This allows execution of large-sized programs without loading them.

3.

FILE MANAGEMENT

A file is a collection of related information. Every file has a name, its data & attributes. Name of a file uniquely identifies it in a system. User access files by their names. A file's data is its contents. Attributes of a file contain other information about file as — data & time of its creation, date & time of last access, date & time of last update, its current size, its protection features (who can access the file & in what way) etc. File management module of an Operating System takes care of file-related activities — structuring, accessing, naming, sharing & protection of files.

File Access Methods —

To use the information stored in a file, it must be accessed & read in main memory. Two commonly supported file access methods at Operating System level are sequential & random access. They are —

① Sequential Access Files — These are used normally with sequential access storage media — magnetic tape. Contents of this file can be accessed only sequentially; started at beginning.

② Random Access File — are used normally with random access storage media — magnetic or optical disks. Unlike a sequential access file, contents of this file can be accessed randomly, irrespective of the order in which records are stored. These files are essential for many applications.

ex. In a railway reservation system, information about all tickets booked for a particular train may be stored in a single file. If a customer wants to cancel an already booked seat, reservation program must be able to access the specific record for that seat.

FILE OPERATIONS

An operating system provides a set of operations to deal with files & their contents. A typical set of file operations may be as follows -

- ① Create - is used to create a new file.
- ② Delete - is used to delete an existing file that is no longer needed.
- ③ Open - is used to open an existing file that a user wants to start using it.
- ④ Read - is used to read data stored in file.
- ⑤ Write - is used to write new data in a file.
- ⑥ Seek - is used with random access files to set position read/write pointer to a specific place in file so that data can be read from or written to that position.
- ⑦ Get attributes - is used to access the attributes of a file.
- ⑧ Set attributes - is used to change user-settable attributes of a file (protection).
- ⑨ Rename - is used to change name of an existing file.
- ⑩ Copy - is used to ~~show~~ create a copy of a file.

File Naming

When a file is created, its creator gives it a name that can be later used to access the file. The rules for naming files vary from one Operating System to another. fol. ex →

- ① Ms-DOS allows only upto 8 characters for a file name.

Macintosh allows only upto 31 "

Microsoft windows " 255 "

- Q. Some Operating Systems allow only letters & numbers to be used in file names, whereas others also allow special characters.
letter 3 from Ram, remainder 2 to Sham are valid.
- ③ Some O/S distinguish (UNIX) between upper case & lower case letters, whereas other (DOS) do not.
- ④ File extensions usually indicate something about the file & are often used by applications to check for intended type of file before operating on it.

Some Popular Operating Systems

UNIX → It is a multi-user, time sharing Operating System. Although it can be used on a wide variety of computers, ranging from notebook computers to super computers.

UNIX was developed in early 1970s at Bell laboratories by Ken Thompson & Dennis Ritchie. It was the first Operating System to be written in a high-level language C. UNIX was written in C language, moving it to a new machine, known as porting, it was much easier. This was an important reason for its popularity & availability on a wide variety of systems.

MS-DOS - (discussed)

4

SECURITY

Computer security deals with protecting various resources & information of a computer system against destruction & unauthorized access. It involves both external & internal security.

External Security →

It deals with securing a computer system against external factors such as fires, floods, earthquakes, leaking out of stored information by a person who has access to information etc. The commonly used methods for external security include maintaining backup copies of stored information at places far away from original information, using security guards to allow entry of authorized persons only into computer center, allowing access to sensitive information to trusted employee users only.

Internal Security → mainly deals with foll aspects -

(a) User authentication — Once a user is allowed physical access to a computer, the computer must check the user's identification before allowing the user to use it. User authentication mechanisms take care of this requirement. Passwords used for logging into a computer, electronic cards used in bank ATMs & biometric devices that verify some unique physical characteristic of a user (such as fingerprint, face appearance, voice etc.) are some commonly used user authentication mechanisms.

(b) Access Control — A computer is often shared by many users. It also contains many resources & several types of information. Obviously, not all resources & information are meant for all users.

to restrict the user's access to those resources/information that he/she is authorized to access.
Access control mechanism takes care of this requirement.

- ④ Cryptography → Even if a user somehow manages to gain access to some information that he/she is not authorized to access, some mechanism is needed to ensure that the user can't make use of that information. Cryptography mechanisms take care of this requirement.

5. COMMAND INTERPRETATION ⇒

This module (known as Command Interpreter) of an Operating System provides a set of commands using which users give instructions to a computer for getting their jobs processed.

Commands supported by command interpretation module are known as "System calls".

When a user gives instructions to a computer by using these system calls, Command interpreter takes care of interpreting these commands & directing the computer's resources to handle the user's request.

Hence Command Interpreter provides a user interface to hide hardware details of a system from its users.

Two Broad Categories of user interfaces supported by various Oper-

Command Line Interface

Graphical User Interface

- ① Command Line Interface —

Users give instructions to computers by typing commands in this textual user interface i.e. to enter a command a user will

If a user types a command incorrectly, Command Interpreter responds with a message indicating that it did not understand the command. When this happens, the user has to retype the command correctly.

⑥ Graphical User Interface (GUI) →

It is much easier to learn & use than CLI. Unlike, CLI in which commands are textual, GUI commands are graphical.

GUI provides a screen full of graphic icons (small images on screen) or menus to users & allows them to make rapid selection from displayed icons or menus to give instructions to computer.

In CUI, we use command to delete.

In GUI, the same operation can be performed by using a mouse to drag the icon that represents the file. Then simply releasing the button causes the file to disappear.

6.

DEVICE MANAGEMENT

- ① Several Peripheral devices like mouse, hard disk, printer, plotter etc. are connected to the computer.
- ② OS manages & controls the devices attached to computer. OS provides appropriate functionality to the application programs for controlling different aspects of the devices.
- ③ OS handles the devices by combining both hardware & SW techniques. The OS communicates with I/O hardware via device driver Software. The device driver Software comes along with each device.
- ④ OS enables handling of the different I/O devices in a uniform way. The complexity of handling different devices is abstracted & hidden in device drivers of the devices. The device drivers hide the differences among different device controllers & present a uniform interface to the Operating System.
- ⑤ In addition to managing the peripheral devices, OS also provides various services related to I/O like – I/O scheduling buffering, spooling & error handling.
- ⑥ Scheduling of I/O requests involves ordering the requests to improve performance of the system & provide fair access to all processes. For this, a queue of request is maintained for each device. The I/O scheduler rearranges the queue to improve the efficiency of overall system.
- ⑦ Buffer → It is a memory area that stores data, while it is being transferred between two devices. The speed at which I/O devices can transfer data is different from speed at which

(VIII)

SPOOL -

(Simultaneous Peripheral Operation On line)

It is a buffer in memory area or disk. Spooling is commonly used for printers. Users may give several print commands & continue working with other operations. The printer can print only one job at a time. Rest of the jobs are stored in spool in a queue & printer accesses the spool when it is ready to print the next job.

UNIT-III

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Single User & Multi User

Operating System is system software. This software acts as an interface between the user and the computer. It also controls and coordinates different operations of computer. These operating systems are categorized on basis of users and their tasks.

Single user operating systems:-

A single-user operating system is a system in which only one user can access the computer system at a time. On the other hand, a multi-user operating system allows more than one user to access a computer system at one time. Single user operating systems can be split into two types:

- single user, single application operating systems
- single user, multi tasking operating systems

Single user, single application

This type of operating system only has to deal with one person at a time, running one user application at a time. An example of this kind of operating system would be found on a mobile phone. There can only be one user using the mobile and that person is only using one of its applications at a time.

Single user, multi-tasking

You will find this kind of operating system on a personal computer. The operating system is designed mainly with a single user in mind, but it can deal with many applications running at the same time. For example, you might be writing an essay, while searching the internet, downloading a video file and also listening to a piece of music.

Example operating systems are:

- Windows
- Linux
- Mac OS X

The difference compared to the Single-Use, Single Application operating system is that it must now handle many different applications all running at the same time.

The memory available is also very different, for example it is quite normal to have Gigabytes of RAM available on a personal computer which is what allows so many applications to run.

Multi-user:

A multi-user operating system allows many different users to take advantage of the computer's resources simultaneously. The operating system must make sure that the requirements of the various users are balanced, and that each of the programs they are using has sufficient and separate resources so that a problem with one user doesn't affect the entire community of users.

UNIX and **Mainframe Operating Systems** are examples of multi-user operating systems. A multi-user operating system lets more than one user access the computer system at one time. Access to the computer system is normally provided via a network, so that users access the computer remotely using a terminal or other computer. These terminals nowadays are generally personal computers and use a network to send and receive information to the multi-user computer system.

Examples of multi-user operating systems are UNIX, Linux and mainframes such as the IBM AS400.

The multi user operating systems must manage and run all user requests, ensuring they do not interfere with each other. Devices which can only be used by one user at a time, like printers and disks must be shared amongst all those requesting them so that all the output documents are not jumbled up.

If each user tried to send their document to the printer at the same time, the end result would be garbage. Instead, documents sent are placed in a queue, and each document is printed in its entirety before the next document to be printed is retrieved from the queue. It is similar to a situation where in you are waiting for your turn in a ticket counter to get a ticket. The ticket issuer issues the ticket when your turn comes. Here also all the printing

jobs wait in a queue and jobs are printed one after the other. Some priority can also be set to some jobs so that they can be taken up early according to some priority.

Comparison between Single User and Multi-User Operating System:

	Single User	Multi-User
Definition	A single user operating system provides facilities to be used on one computer by only one user.	A multi-user operating system has been designed for more than one user to access the computer at the same or different time.
Types	<p>Single user, single task: A single task is performed by one user at a time. Example- The Palm OS for Palm handheld computers.</p> <p>Single user, multi-task: Several programs are run at the same time by a single user. For example- Microsoft Windows.</p>	<p>Time sharing systems: These systems are multi-user systems in which CPU time is divided among the users. The division is made on the basis of a schedule.</p> <p>Most batch processing systems for the mainframe computers can also be considered as ‘multi user.’</p>
Attributes	Simple	Complex

Examples	Windows 95, Windows NT Workstation and Windows 2000 professional.	Unix, Linux and mainframes such as the IBM AS400.
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Workstation:

A **workstation** is a special computer designed for technical or scientific applications. Intended primarily to be used by one person at a time, they are commonly connected to a local area network and run multi-user operating systems. The term *workstation* has also been used loosely to refer to everything from a mainframe computer terminal to a PC connected to a network, but the most common form refers to the group of hardware offered by several current and defunct companies such as Sun Microsystems, Silicon Graphics, Apollo Computer, HP and IBM which opened the door for the 3D graphics animation revolution of the late 1990s.

Workstations offered higher performance than mainstream personal computers, especially with respect to CPU and graphics, memory capacity, and multitasking capability. Workstations were optimized for the visualization and manipulation of different types of complex data such as 3D mechanical design, engineering simulation (e.g. computational fluid dynamics), animation and rendering of images, and mathematical plots. Typically, the form factor is that of a desktop computer, consist of a high resolution display, a keyboard and a mouse at a minimum, but also offer multiple displays, graphics tablets, 3D mice (devices for manipulating 3D objects and navigating scenes), etc. Workstations were the first segment of the computer market to present advanced accessories and collaboration tools.

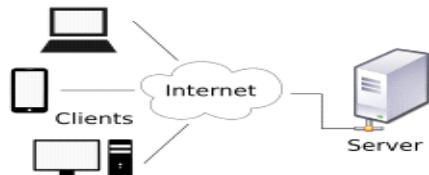
It is a type of computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other types of applications that require a moderate amount of computing power and relatively high quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, at least 64 MB (megabytes) of RAM, built-in network support, and a graphical user interface. Most workstations also have a mass storage device such as a disk drive, but a special type of workstation, called a diskless workstation, comes without a disk drive. The most common operating systems for workstations are UNIX and Windows NT.

In terms of computing power, workstations lie between personal computers and minicomputers, although the line is fuzzy on both ends. High-end personal computers are equivalent to low-end workstations. And high-end workstations are equivalent to minicomputers.

Client–Server Model:

The **client-server relationship** describes the relation between the clients and how it makes a service request to the server, and how the server can accept these requests, process them, and return the requested information to the client. The interaction between client and server is often described using sequence diagrams. Sequence diagrams are standardized in the Unified Modeling Language.



A computer network diagram of clients communicating with a server via the Internet.

The client–server model of computing is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters, called clients. Often clients and servers communicate over a computer network on separate hardware, but both client and server may reside in the same system. A server host runs one or more server programs which share their resources with clients. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await incoming requests.

Examples of computer applications that use the client–server model are Email, network printing, and the World Wide Web

The basic type of client-server architecture employs only two types of hosts: clients and servers. This type of architecture is sometimes referred to as two-tier. The two-tier architecture means that the client acts as one tier and server process acts as the other tier.

Characteristics of Client:

- Always initiates requests to servers.
- Waits for replies.
- Receives replies.
- Usually connects to a small number of servers at one time.
- Usually interacts directly with end-users using any user interface such as graphical user interface.

Characteristics of Server:

- Always wait for a request from one of the clients.
- Serve clients requests then replies with requested data to the clients.
- A server may communicate with other servers in order to serve a client request.
- A server is a source which sends request to client to get needed data of users.

Advantages

- Client-server architecture enables the roles and responsibilities of a computing system to be distributed among several independent computers.
- Updating the data are much easier to administrators
- Ensure security, user friendly interfaces, and ease of use.
- It works with multiple different clients of different specifications.

Disadvantages

- Networks traffic blocking
- Failure of one server , clients' cannot served request

Computer Network

A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users. It connects a number of computers and other electronic devices. Computers on a network are sometimes called *nodes*. Computers and devices that allocate resources for a network are called *servers*.

A computer network or data network is a telecommunications network which allows computers to exchange data. In computer networks, networked computing devices pass data to each other along network links (data connections). Data is transferred in the form of packets. The connections between nodes are established using either cable media or wireless media. The best-known computer network is the Internet.

Network computer devices that originate, route and terminate the data are called network nodes. Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Two such devices are said to be networked together when one device is able to exchange information with the other device, whether or not they have a direct connection to each other.

Computer networks support applications such as access to the World Wide Web, shared use of application and storage servers, printers, and fax machines, and use of email and instant messaging applications.

The computers and devices which are part of the network can "talk" to each other and exchange information. In addition to the computers and devices which are connected, other devices are often needed for the network to operate properly. Examples for such devices include hubs and switches. A network using one technology can be connected to another

one using a different technology with a component which is known as router. Firewalls are commonly used to protect the network. In general, networks that use cables to connect can operate at higher speeds than those using wireless technology. Networks are either circuit switched or packet switched.

Computers can be part of several different networks. Networks can also be parts of bigger networks. The *local area network* in a small business is usually connected to the *corporate network* of the larger company. Any connected machine at any level of the organization may be able to access the *Internet*, for example to demonstrate computers in the store, display its catalogue through a web server, or convert received orders into shipping instructions.

To set up a network an appropriate media is required. This can be wired or wireless. Twisted-pair, co-axial or fiber-optic are examples of cable and infra-red, blue-tooth, radio-wave, micro-wave etc. are wireless media used for networking. When you are working with a mere LAN, computers, media and peripherals are sufficient. But when you are working with a wider range you have to use some additional devices like bridge, gateway or router to connect different small or large networks. And obviously a protocol must be maintained.

To set up a network you have to select an appropriate topology to arrange the hardware devices using the media. Topologies generally used are bus-topology, ring-topology, star-topology, tree-topology, object-oriented topology etc. Among these star-topology and tree-topology are most popular nowadays.

Techopedia Explains Computer Network

One of the earliest examples of a computer network was a network of communicating computers that functioned as part of the U.S. military's Semi-Automatic Ground Environment (SAGE) radar system. In 1969, the University of California at Los Angeles, the Stanford Research Institute, the University of California at Santa Barbara and the University of Utah were connected as part of the Advanced Research Projects Agency Network (ARPANET) project. It is this network that evolved to become what we now call the Internet.

Networks are used to:

- Facilitate communication via email, video conferencing, instant messaging, etc.
- Enable multiple users to share a single hardware device like a printer or scanner

- Enable file sharing across the network
- Allow for the sharing of software or operating programs on remote systems
- Make information easier to access and maintain among network users

Work Characteristics

- **Topology** : The geometric arrangement of a computer system. Common topologies include a bus, star, and ring.
- **Protocol** : The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called *Ethernet*. Another popular LAN protocol for PCs is the *IBM token-ring network* .
- **Architecture** : Networks can be broadly classified as using either a *peer-to-peer* or *client/server architecture*.

Benefits of networking

There are lots of advantages from build up a network, but the three big facts are-

File Sharing: From sharing files you can view, modify, and copy files stored on a different computer on the network just as easily as if they were stored on your computer.

Resource Sharing: Resources such as printers, fax machines, Storage Devices (HDD, FDD and CD Drives), Webcam, Scanners, Modem and many more devices can be shared.

Program Sharing: Just as you can share files on a network, you can often also share program on a network. For example, if you have the right type of software license, you can have a shared copy of Microsoft Office, or some other program, and keep it on the network server, from where it is also run.

Types of Networks:

- LAN (Local Area Networking)
- WLAN (Wireless Local Area Networks)
- MAN (Metropolitan Area Networks)
- WAN (Wide Area Networks)
- PAN (Personal Area Network)
- CAN (Campus Area Networks)
- SAN (Storage or System Area Network)
- VPN (Virtual Private Network)

- EPN (Enterprise Private Network)

Local Area Network

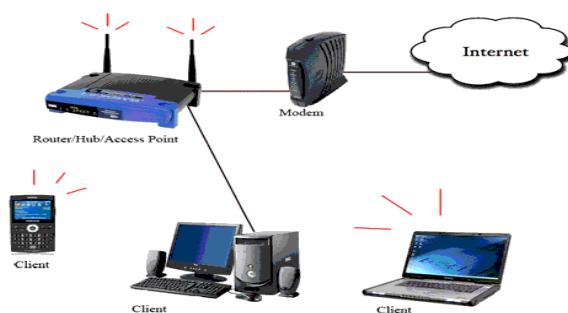
A **local area network**, or **LAN**, consists of a computer network at a single site, typically an individual office building. A LAN is very useful for sharing resources, such as data storage and printers. LANs can be built with relatively inexpensive hardware, such as hubs, network adapters and Ethernet cables.

LAN is used primarily in small areas such as schools, hospitals and office buildings. Local Area Networking is one of the older types of networks. TCP/IP is used as the method of communication between computers in Local Area Networking. Due to its small size, it is possible for one person to administrate a Local Area Network. LANs are viable to quick change, using a bus network topology that allows for easy access to the Local Area Network.

The smallest LAN may only use two computers, while larger LANs can accommodate thousands of computers. A LAN typically relies mostly on wired connections for increased speed and security, but wireless connections can also be part of a LAN. High speed and relatively low cost are the defining characteristics of LANs.

LANs are typically used for single sites where people need to share resources among themselves but not with the rest of the outside world. If a local area network, or LAN, is entirely wireless, it is referred to as a wireless local area network, or WLAN.

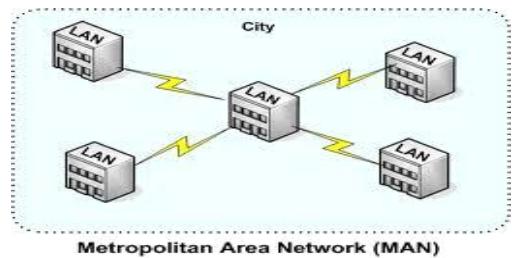
WLAN(Wireless Local Area Networks)



Wireless Local Area Networks are much like LAN networks, except they do not require network cables to connect each other. Radio and infrared signals are used to communicate between machines while using a wireless local area network. Wireless LANs allow for small amounts of mobility while being connected to the internet. Wireless Area Networks are commonly seen being used by a WiFi internet connection. Wireless LAN connections offer a surprising amount of mobility for users with laptops and smart phones while being able to stay connected to the internet by different networking topology.

Metropolitan Area Network

A **metropolitan area network**, or **MAN**, consists of a computer network across an entire city, college campus or small region. A MAN is larger than a LAN, which is typically limited to a single building or site. Depending on the configuration, this type of network can cover an area from several miles to tens of miles. A MAN is often used to connect several LANs together to form a bigger network. When this type of network is specifically designed for a college campus, it is sometimes referred to as a campus area network, or CAN.



MANs are not commonly used these days, they are used to create communication between systems in an entire city. Hence a MAN area falls between the sizes Local Area Networks, and Wide Area Networks. MANs are used by city specific businesses such as the New York Times in the state of New York.

Wide Area Network

A **wide area network**, or **WAN**, occupies a very large area, such as an entire country or the entire world. A WAN can contain multiple smaller networks, such as LANs or MANs. The Internet is the best-known example of a public WAN.

Private Networks

One of the benefits of networks like PAN and LAN is that they can be kept entirely private by restricting some communications to the connections within the network. This means that those communications never go over the Internet.

For example, using a LAN, an employee is able to establish a fast and secure connection to a company database without encryption since none of the communications between the employee's computer and the database on the server leave the LAN. But what happens if the same employee wants to use the database from a remote location? What you need is a private network.



Wide Area Networks are used to connect server machines and computers across continents or countries for constant information updates. Wide Area Networks, are used across the globe, many networks connect with one another across continents to create one giant Wide Area Network. WANs use optic fiber as their communication medium. The largest example of a WAN is the internet itself, which connects all users to the information and data that is available on the internet.

Personal Area Network

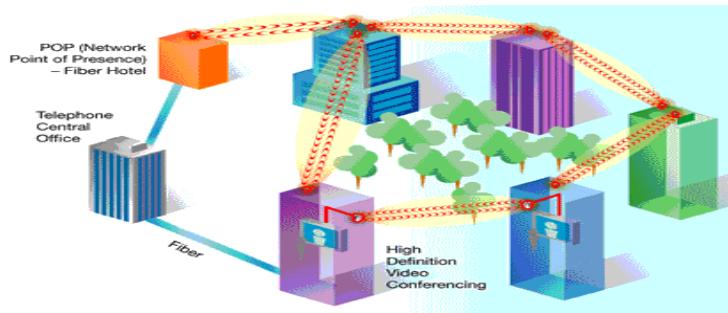
A Personal Area Network, or PAN, is a computer network organized around an individual person within a single building. This could be inside a small office or residence. A typical PAN would include one or more computers, telephones, peripheral devices, video game consoles and other personal entertainment devices.

If multiple individuals use the same network within a residence, the network is sometimes referred to as a home area network, or **HAN**. In a very typical setup, a residence will have a single wired Internet connection connected to a modem. This modem then provides both wired and wireless connections for multiple devices. The network is typically managed from a single computer but can be accessed from any device.

This type of network provides great flexibility. For example, it allows you to:

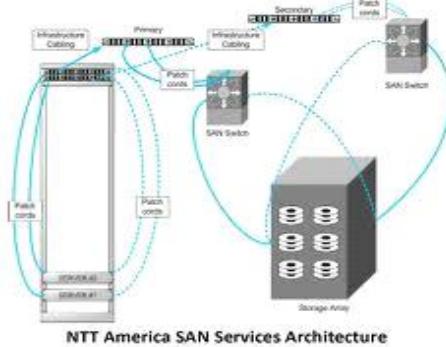
- Send a document to the printer in the office upstairs while you are sitting on the couch with your laptop.
- Upload the photo from your cell phone to your desktop computer.
- Watch movies from an online streaming service to your TV.

CAN (Campus Area Networks)



Campus Area Networks are usually a connection of many small LAN networks which are often used on university campuses and office buildings. Campus Area Networks allow for easy file sharing between different departments as all the files are usually shared on the server machines of each LAN network. This type of network offers a lot of simplicity in the transfer and downloading of files.

SAN (Storage Area Network)



Storage Area Networks are primarily used as information databases. They are not usually used by large organizations or similar entities. They are specifically used for the storage of information, and easy retrieval of specific pieces of data whenever required. Storage Area Networks are usually used by websites which offer downloading services.

Storage area networks (SANs) provide a high-speed infrastructure to move data between storage devices and file servers.

Advantage

- Performance is fast.
- Availability is high because of the redundancy features available.
- Distances can span up to 10 kilometers.
- Management is easy because of the centralization of data resources.

Disadvantage of SANs is their cost.

VPN (Virtual Private Network)

A virtual private network (VPN) is a special type of secured network. A VPN is used to provide a secure connection across a public network, such as an internet. Extranets typically use a VPN to provide a secure connection between a company and its known external users or offices.

Authentication is provided to validate the identities of the two peers.

Confidentiality provides encryption of the data to keep it private from prying eyes.

Integrity is used to ensure that the data sent between the two devices or sites has not been tampered with.

EPN (Enterprise Private Network)

One approach to a private network is to build an enterprise private network, or EPN. An EPN is a computer network that is entirely controlled by one organization, and it is used to connect multiple locations. Historically, telecommunications companies, like AT&T, operated their own network, separate from the public Internet. EPNs are still fairly common in certain sectors where security is of the highest concern. For example, a number of health facilities may establish their own network between multiple sites to have full control over the confidentiality of patient records.

Network Protocol:

A **network protocol** defines rules and conventions for communication between network devices. Protocols for computer networking all generally use packet switching techniques to send and receive messages in the form of *packets*.

Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that specify how data is packaged into messages sent and received.

Some protocols also support message acknowledgement and data compression designed for reliable and/or high-performance network communication. Hundreds of different computer network protocols have been developed each designed for specific purposes and environments.

Protocols exist at several levels in a telecommunication connection. For example, there are protocols for the data interchange at the hardware device level and protocols for data interchange at the application program level. In the standard model known as Open Systems Interconnection (OSI), there are one or more protocols at each layer in the telecommunication exchange that both ends of the exchange must recognize and observe. Protocols are often described in an industry or international standard.

The TCP/IP Internet protocols, a common example, consist of:

- Transmission Control Protocol (TCP), which uses a set of rules to exchange messages with other Internet points at the information packet level
- Internet Protocol (IP), which uses a set of rules to send and receive messages at the Internet address level
- Additional protocols that include the Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP), each with defined sets of rules to use with corresponding programs elsewhere on the Internet

There are many other Internet protocols, such as the Border Gateway Protocol (BGP) and the Dynamic Host Configuration Protocol (DHCP).

Network Topology:

Computer network topology is the way various components of a network (like nodes, links, peripherals, etc) are arranged. Network topologies define the layout, virtual shape or structure of network, not only physically but also logically. The way in which different systems and nodes are connected and communicate with each other is determined by topology of the network.

Network Topology is the schematic description of a network arrangement, connecting various nodes (sender and receiver) through lines of connection. The way in which the connections are made is called the topology of the computer network.

Network topology specifically refers to the physical layout of the network, especially the locations of the computers and how the cable is run between them.

Topology can be physical or logical:-

Physical Topology is the physical layout of nodes, workstations and cables in the network; while **logical topology** is the way information flows between different components.

An example is a local area network (LAN): Any given node in the LAN has one or more physical links to other devices in the network; graphically mapping these links results in a geometric shape that can be used to describe the physical topology of the network. Conversely, mapping the data flow between the components determines the logical topology of the network.

In general, Physical Topology relates to a core network whereas Logical Topology relates to basic network.

Factors to be taken into consideration while choosing a Network topology

- 1) Scale of your project (in terms of number of components to be connected).
- 2) Amount of traffic expected on the network.
- 3) Budget allotted for the network i.e. amount of money you are willing to invest.
- 4) Required response time

Most common types of topologies are:

- **Bus**
- **Star**
- **Ring**
- **Mesh**
- **Tree**
- **Hybrid**

1. BUS Topology:

All the devices on a bus topology are connected by one single cable. When one computer sends a signal up the wire, all the computers on the network receive the information, but only one accepts the information. The rest rejects the message. One computer can send a message at a time. A computer must wait until the bus is free before it can transmit. When the signal reaches the end of the wire, it bounces back and travels back up the wire. When a signal echoes back and forth along an unterminated bus, it is called ringing. To stop the signals from ringing, attach terminators at either end of the segment. The terminators absorb the electrical energy and stop the reflection.



Features of Bus Topology

- It transmits data only in one direction.
- Every device is connected to a single cable

Advantage of Bus Topology:

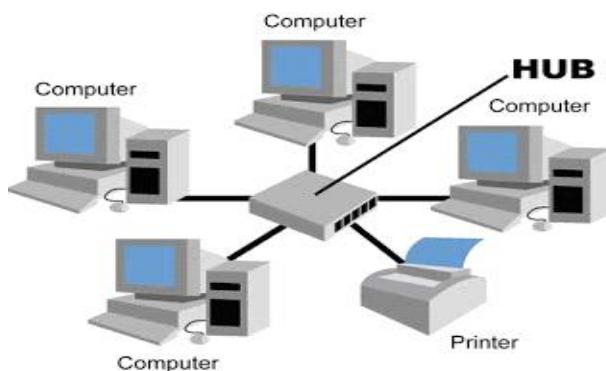
- It is cost effective.
- Used in small networks.
- It is easy to understand.
- Easy to expand joining two cables together.
- It is simple, reliable in small network.
- Requires the least amount of cable to connect the computers and less expensive

Disadvantage of Bus Topology:

- Heavy network traffic can slow a bus considerably
- Each barrel connector weakens the electrical signal
- Difficult to troubleshoot a bus
- Cables fails then whole network fails.
- If network traffic is heavy or nodes are more the performance of the network decreases.
- Cable has a limited length.
- It is slower than the ring topology.

2. STAR Topology:

All the cables run from the computers to a central location, where they are all connected by a device called a **Hub**. Each computer on a star network communicates with a central hub that resends the message either to all the computers or only to the destination computers. Hub can be active or passive in the star network. Active hub regenerates the electrical signal and sends it to all the computers connected to it. Passive hub does not amplify or regenerate signal and does not require electrical power to run. We can expand a star network by placing another star hub.



Features of Star Topology

- Every node has its own dedicated connection to the hub.
- Acts as a repeater for data flow.
- Can be used with twisted pair, Optical Fibre or coaxial cable.

Advantages:

- Easy to modify and add new computers to a star net
- Center of a star net is a good place to diagnose network faults
- Several cable types can be used with the hub
- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.

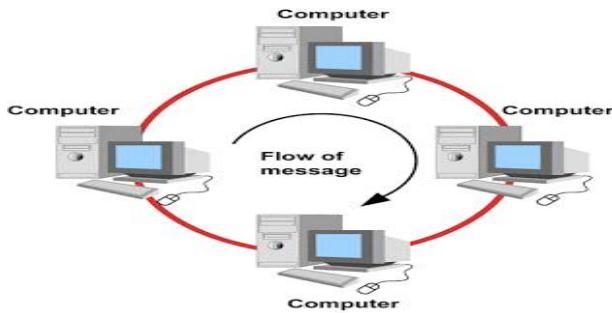
- Easy to setup and modify.
- Only that node is affected which has failed rest of the nodes can work smoothly.

Disadvantages:

- Central hub fails, the whole network fails to operate
- Many star networks require a device at the central point to rebroadcast or switch network traffic.
- Costs more for cabling in star net than bus.
- Cost of installation is high.
- Expensive to use.
- Performance is based on the hub that is it depends on its capacity

3. RING Topology:

Each computer is connected to the next computer, with the last one connected to the first. Every computer is connected to the next computer in the ring, and each retransmits what it receives from the previous computer. The message flow around the ring in one direction. Some ring networks do token passing. It passes around the ring until a computer wishes to send information to another computer. The computer adds an electronic address and data and sends it around the ring. Each computer in sequence receives the token and the information and passes them to the next until either the electronic address matches the address of the computer or the token returns to the origin. The receiving computer returns a message to the originator indicating that the message has been received. The sending computer then creates another token and places it on the network, allowing another station to capture the token and being transmitted.



Features of Ring Topology

- A number of repeaters are used and the transmission is unidirectional.
- Date is transferred in a sequential manner that is bit by bit.

Advantages:

- No computer can monopolize the network
- The fair sharing of the network allows the net to degrade gracefully as more users are added.
- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand

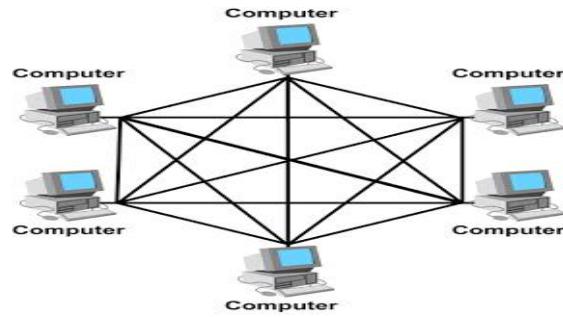
Disadvantages:

- Failure of one computer can affect the total network
- Difficult to troubleshoot
- Adding or removing Computers disrupts the network

4. MESH Topology:

The mesh topology is a point-to-point connection to other nodes or devices. Traffic is carried only between two devices or nodes to which it is connected. It connects all devices (nodes) to each other for redundancy and fault tolerance. It is used in WANs to interconnect LANs and for mission critical networks like those used by banks and financial institutions.

Implementing the mesh topology is expensive and difficult. Mesh has $n(n-2)/2$ physical channels to link h_n devices.



Types of Mesh Topology:

- **Partial Mesh Topology:** In this topology some of the systems are connected in the same fashion as mesh topology but some devices are only connected to two or three devices.
- **Full Mesh Topology:** Each and every nodes or devices are connected to each other.

Features of Mesh Topology

- Fully connected.
- Robust.
- Not flexible.

Advantages:

- Fault tolerance & can be diagnosed easily.
- Guaranteed communication channel capacity
- Easy to troubleshoot
- Each connection can carry its own data load.
- It is robust.
- Provides security and privacy.

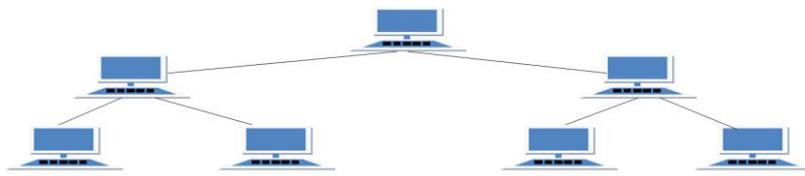
Disadvantages:

- Installation and configuration is difficult.

- Cabling cost is more.

5. TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.



Features of Tree Topology

- Ideal if workstations are located in groups.
- Used in Wide Area Network.

Advantages of Tree Topology

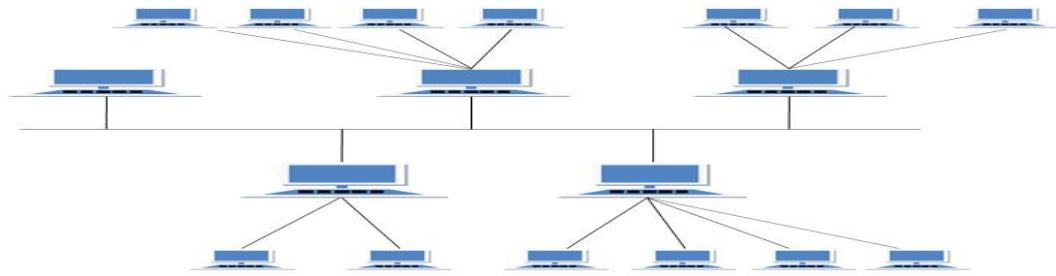
- Extension of bus and star topologies.
- Expansion of nodes is possible and easy.
- Easily managed and maintained.
- Error detection is easily done.

Disadvantages of Tree Topology

- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, network fails.

6. HYBRID Topology

It is two different types of topologies which is a mixture of two or more topologies. For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).



Features of Hybrid Topology

- It is a combination of two or more topologies
- Inherits the advantages and disadvantages of the topologies included

Advantages of Hybrid Topology

- Reliable as Error detecting and trouble shooting is easy
- Effective
- Scalable as size can be increased easily
- Flexible

Disadvantages of Hybrid Topology

- Complex in design
- Costly

UNIT-IV

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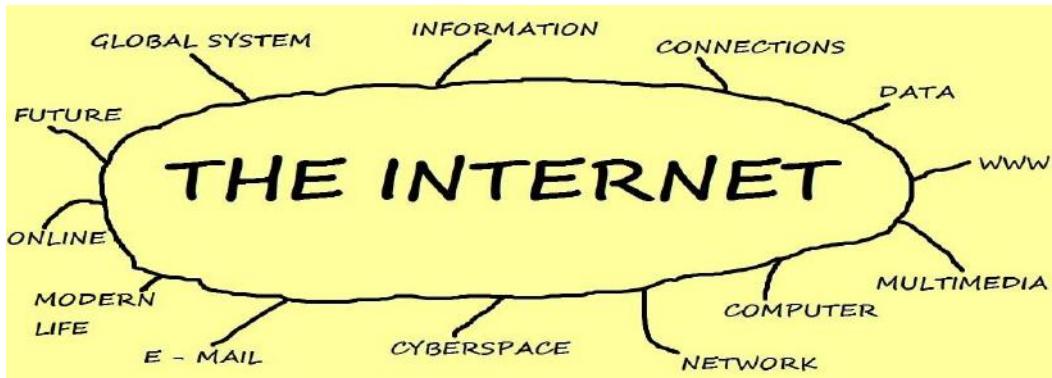
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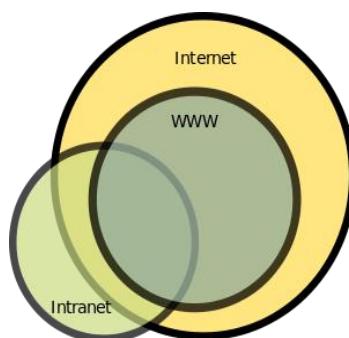
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Structure of the Internet:



Contents:

- 1 The Internet
- 2 World Wide Web (WWW)
- 3 Intranet
- 4 Routers



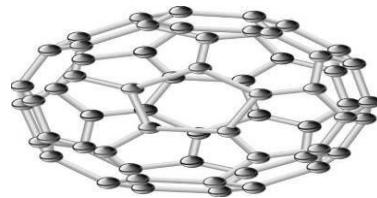
Internet

It is a worldwide system which has the following characteristics:

- Internet is a world-wide / global system of interconnected computer networks.
- Internet uses the standard Internet Protocol (TCP/IP)
- Every computer in internet is identified by a unique IP address.
- IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer's location.
- A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name.
- For example, a DNS server will resolve a name <http://www.tutorialspoint.com> to a particular IP address to uniquely identify the computer on which this website is hosted.
- Internet is accessible to every user all over the world.



A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols.



The **Internet** is a global system of interconnected [computer networks](#) that use the standard [Internet protocol suite](#) (TCP/IP) to link several billion devices worldwide. It is a

network of networks^[1] that consists of millions of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), the infrastructure to support email, and peer-to-peer networks for file sharing and telephony.

A means of connecting a computer to any other computer anywhere in the world via dedicated routers and servers. When two computers are connected over the Internet, they can send and receive all kinds of information such as text, graphics, voice, video, and computer programs.

No one owns Internet, although several organizations the world over collaborate in its functioning and development. The high-speed, fiber-optic cables (called backbones) through which the bulk of the Internet data travels are owned by telephone companies in their respective countries.

The Internet grew out of the Advanced Research Projects Agency's Wide Area Network (then called ARPANET) established by the US Department Of Defense in 1960s for collaboration in military research among business and government laboratories. Later universities and other US institutions connected to it. This resulted in ARPANET growing beyond everyone's expectations and acquiring the name 'Internet.'

The development of hypertext based technology (called World Wide web, WWW, or just the Web) provided means of displaying text, graphics, and animations, and easy search and navigation tools that triggered Internet's explosive worldwide growth.

Uses of Internet:

- 1) **Email:** By using internet now we can communicate in a fraction of seconds with a person who is sitting in the other part of the world. Today for better communication, we can avail the facilities of Email.
- 2) **Information:** The biggest advantage that internet offering is information. The internet and the World Wide Web has made it easy for anyone to access information and it can be of any type, as the internet is flooded with information.
- 3) **Business:** World trade has seen a big boom with the help of the internet, as it has become easier for buyers and sellers to communicate and also to advertise their

sites. Now a day's most of the people are using online classified sites to buy or sell or advertising their products or services.

- 4) **Social Networking:** Today social networking sites have become an important part of the online community. Almost all users are members use it for personal and business purposes. It's an awesome place to network with many entrepreneurs who come here to begin building their own personal and business brand.
- 5) **Shopping:** Now a day's almost anything can be bought with the use of the internet. In countries like US most of consumers prefer to shop from home. We have many shopping sites on internet like amazon.com, Dealsglobe.com etc.
- 6) **Entertainment:** When people surf the Web, there are numerous things that can be found. Music, hobbies, news and more can be found and shared on the Internet. There are numerous games that may be downloaded from the Internet for free.
- 7) **E-Commerce:** Ecommerce is the concept used for any type of business deals that involves the transfer of information across the globe via internet.
- 8) **Services:** Many services are now provided on the internet such as online banking, job seeking, purchasing tickets for your favorite movies, and guidance services on array of topics in the every aspect of life, and hotel reservations and bills paying.
- 9) **Job Search:** Internet makes life easy for both employers and job seekers as there are plenty of job sites which connect employers and job seekers.
- 10) **Dating/Personals:** People are connecting with others though internet and finding their life partners. Internet not only helps to find the right person but also to continue the relationship.

Intranet

Intranet is the generic term for a collection of private computer networks within an organization. An intranet uses [network technologies](#) as a tool to facilitate communication between people or work groups to improve the data sharing capability and overall knowledge base of an organization's employees.

An **Intranet** is a [computer network](#) that uses [Internet Protocol](#) technology to share information, [operational systems](#), or computing services within an organization. This term is used in contrast to *extranet*, a network between organizations, and instead refers to a network within an organization. Sometimes, the term refers only to the organization's internal [website](#), but may be a more extensive part of the organization's information technology infrastructure, and may be composed of multiple [local area networks](#). The objective is to organize each individual's desktop with minimal cost, time and effort to be more productive, cost efficient, timely, and competitive.

An intranet may host multiple private websites and constitute an important component and focal point of internal communication and collaboration. Any of the well known Internet protocols may be found in an intranet, such as [HTTP](#) (web services) and [FTP](#) (file transfer protocol). Internet technologies are often deployed to provide modern interfaces to legacy information systems hosting corporate data.

Some features of Intranet:

- Intranet is system in which multiple PCs are connected to each other.
- PCs in intranet are not available to the world outside the intranet.
- Usually each company or organization has their own Intranet network and members/employees of that company can access the computers in their intranet.
- Each computer in Intranet is also identified by an IP Address which is unique among the computers in that Intranet.



Similarities in Internet and Intranet:

- Intranet uses the internet protocols such as TCP/IP and FTP.
- Intranet sites are accessible via web browser in similar way as websites in internet. But only members of Intranet network can access intranet hosted sites.

- In Intranet, own instant messengers can be used as similar to yahoo messenger/gtalk over the internet.

Differences in Internet and Intranet:

- Internet is general to PCs all over the world whereas Intranet is specific to few PCs.
- Internet has wider access and provides a better access to websites to large population whereas Intranet is restricted.
- Internet is not as safe as Intranet as Intranet can be safely privatized as per the need.

Benefits:

- Workforce productivity
- Time
- Communication
- Web publishing
- Business operations and management
- Cost-effective
- Enhance collaboration
- Cross-platform capability
- Built for one audience
- Promote common corporate culture Immediate updates
- Supports a distributed computing architecture.

World Wide Web

World Wide Web - a system of interlinked hypertext documents accessed via the Internet

The first thing to notice is that the World Wide Web is not the internet, but a subset of what the internet offers. Many people use the terms *Internet* and *World Wide Web*, or just the *Web*, interchangeably, but the two terms are not synonymous. The [World Wide Web](#) is only one of hundreds of services used on the Internet. The WWW is accessed

through a web browser linking files together using hyperlinks and was invented by a British computer scientist, Sir [Tim Berners-Lee](#) in 1989.

The Web is a global set of [documents](#), [images](#) and other resources, logically interrelated by [hyperlinks](#) and referenced with [Uniform Resource Identifiers](#) (URIs). URIs symbolically identifies services, [servers](#), and other databases, and the documents and resources that they can provide. [Hypertext Transfer Protocol](#) (HTTP) is the main access protocol of the World Wide Web. [Web services](#) also use HTTP to allow software systems to communicate in order to share and exchange business logic and data.

The internet hosts all forms of data, including games, video, telecommunications etc. while the WWW only transmits hypertext documents.

The **World Wide Web (www, W3)** is an [information system](#) of interlinked [hypertext](#) documents that are accessed via the [Internet](#) and built on top of the [Domain Name System](#). It has also commonly become known simply as *the Web*. Individual document pages on the World Wide Web are called [web pages](#) and are accessed with a software application running on the user's computer, commonly called a [web browser](#). Web pages may contain text, [images](#), videos, and other [multimedia](#) components, as well as [web navigation](#) features consisting of [hyperlinks](#).

World Wide Web browser software, such as Microsoft's [Internet Explorer](#), [Mozilla Firefox](#), [Opera](#), [Apple's Safari](#), and [Google Chrome](#), lets users navigate from one web page to another via hyperlinks embedded in the documents. These documents may also contain any combination of [computer data](#), including graphics, sounds, [text](#), [video](#), [multimedia](#) and interactive content that runs while the user is interacting with the page. [Client-side software](#) can include animations, [games](#), [office applications](#) and scientific demonstrations. Through [keyword](#)-driven [Internet research](#) using [search engines](#) like [Yahoo!](#) and [Google](#), users worldwide have easy, instant access to a vast and diverse amount of online information. Compared to printed media, books, encyclopedias and traditional libraries, the World Wide Web has enabled the decentralization of information on a large scale.

The Web has also enabled individuals and organizations to [publish](#) ideas and information to a potentially large [audience](#) online at greatly reduced expense and time delay. Publishing a web page, a blog, or building a website involves little initial [cost](#) and many cost-free services are available. However, publishing and maintaining large, professional web sites with attractive, diverse and up-to-date information is still a difficult and expensive proposition. Many individuals and some companies and groups use [web logs](#) or blogs, which are largely used as easily updatable online diaries. Some commercial

organizations encourage [staff](#) to communicate advice in their areas of specialization in the hope that visitors will be impressed by the expert knowledge and free information, and be attracted to the corporation as a result.

One example of this practice is [Microsoft](#), whose [product developers](#) publish their personal blogs in order to pique the public's interest in their work. Collections of personal web pages published by large service providers remain popular, and have become increasingly sophisticated. Whereas operations such as [Angelfire](#) and [GeoCities](#) have existed since the early days of the Web, newer offerings from, for example, Facebook and Twitter currently have large followings. These operations often brand themselves as [social network services](#) rather than simply as web page hosts.

Router

A **router** is a device that forwards data packets along networks. A **router** is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network. **Routers** are located at gateways, the places where two or more networks connect.



It is a networking device that forwards [data packets](#) between [computer networks](#). A router is connected to two or more data lines from different networks (as opposed to a [network switch](#), which connects data lines from one single network). When a data packet comes in on one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its [routing table](#) or [routing policy](#), it directs the packet to the next network on its journey. This creates an overlay [internetwork](#). Routers perform the "traffic directing" functions on the [Internet](#). A data packet is typically forwarded from one router to another through the networks that constitute the internetwork until it reaches its destination node.

Internet Services

Internet service providers (ISP) companies or institutions (such as T-Com, Iskon or CARNet in Croatia, AT&T in US and MTNL in India), which have satellite or optical connections with several major Internet node abroad (mainly in the direction of America and Europe) and thus ensuring high capacity connection to the rest of the Internet world. However, practice has shown that it can barely follow the needs of the growing number of members of Internet communities. When selecting an ISP of significance is the number of services that it provides to its customers.

User from their computers at work or at home by joining the Internet can:

- Exchange electronic mail (e-mail) to any Internet user in any location on the planet.
- Participate in off-line discussions via e-mail with people with similar interests through 'mailing lists' and 'News Groups'.
- Participate live (in real time) in a conversation with another person via the 'Internet video phone' (like Skype), or audio-video conferencing between multiple people using a specially designed computer programs and equipment.
- Participate in on-line (directly, in real time) written discussion with a larger group of people who use the 'Internet Relay Chat' (IRC) service - chat rooms.
- To work on a remote computer using the 'Telnet' service or some per function quite the same.
- Read multimedia documents found on WWW (World Wide Web) that contain text, graphics, sound, and video using intelligent browser web presentation, as 'Google Chrome', 'Firefox' or 'Internet Explorer' program support.
- Learning and practicing for the exam and achieve appropriate certification.
- Search the Web, documents, various WWW sites or via dedicated international service, as 'Google' and 'Yahoo!', over subscribed keywords to find the desired documents.
- Advertise your business in a variety of ways, from setting up video clips to the creation of their own website.
- Paying bills through the 'Internet Banking'.
- Buy and spend money, advertise and offer for sale.

- Read web editions of newspapers or say 'IT Alphabet'.
- Electronic Mail (E-mail)
- News Groups
- FTP (File Transfer Protocol)
- Voice / Video Communication – Skype
- Social networks- **FACEBOOK, TWITTER, LINKEDIN, MYSPACE, INSTAGRAM**
- Web-Hosting (DATACENTER)
- Electronic Mail (E-mail)
- News Groups
- FTP (File Transfer Protocol)

Various services provided by the Internet

1. E-Mail

Short for **Electronic mail**, **e-mail** or **email** is a message that may contain [text](#), [files](#), [images](#), or other [attachments](#) sent through a network to a specified individual or group of individuals. The first e-mail was sent by Ray Tomlinson in [1971](#). By [1996](#), more electronic mail was being sent than postal mail. The following is a breakdown of an Internet e-mail address example.

support@computerhope.com

The first portion all e-mail addresses, the part before the @ symbol, contains the [alias](#), [user](#), group, or department of a company. Next, the @ ([at sign](#)) is used as a divider in the e-mail address; required for all [SMTP](#) e-mail addresses. Finally, *computerhope.com* is the [domain name](#) to which the user belongs.

How to send and receive e-mail:-

To send and receive e-mail messages you can use an e-mail program, also known as an e-mail client, such as [Microsoft Outlook](#) or [Mozilla Thunderbird](#). When using an e-mail client, you must have a server that stores and delivers your messages; provided by your [ISP](#) or in some cases, another company. An e-mail client needs to connect to the [server](#) to download new e-mail, whereas email stored online (see next section) updates automatically when you visit the site. An alternative way of sending and receiving e-mail is an online e-mail service or [webmail](#). Examples include [Hotmail](#), [Gmail](#), and [Yahoo Mail](#). Many of the online e-mail services, including the aforementioned ones, are free or have a free account option.

Writing an e-mail:-

When writing a new e-mail message, it should look something like the example window below. As can be seen, several [fields](#) are required when sending an e-mail. The **To** field is where you type the e-mail address of the person who you are sending the message to, **From** should contain your e-mail address, If you are replying to a message, the To and From fields are automatically filled out; if it's a New Message, you'll need to enter them

manually. Next, the [CC or Carbon Copy](#) field allows you to send a copy of the message to another e-mail address, but is not mandatory. The Subject Line, although not required, should consist of a few words describing what the e-mail is about. Finally, the Message Body is the location you type your main message. It often contains your [signature](#) at the bottom; similar to a hand-written letter.



What makes a valid e-mail address?

There are several rules that an e-mail address must follow in order to be valid.

- As mentioned earlier, an e-mail must have a [username](#) followed by an @ ([at sign](#)) which is followed by the [domain name](#) with a [domain suffix](#).
- The username cannot be longer than 64 characters long and the domain name should have no more than 254 characters.
- There should be only one @ sign in an e-mail address.
- The space and special characters: (), : ; < > \ [] are allowed. Occasionally, a [space](#), [backslash](#), and [quotation mark](#) work but must be preceded with a forward slash. Although valid some e-mail providers do not allow these characters.

2. World Wide Web (WWW)

"The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge."

The World Wide Web is a system of Internet servers that support specially formatted documents. The documents are formatted in a markup language called HTML (*HyperText Markup Language*) that supports links to other documents, as well as graphics, audio, and video files. This means you can jump from one document to another simply by clicking on hot spots. Not all Internet servers are part of the World Wide Web.

3. Domain Name Server

DNS is an acronym for **Domain Name Server**, and is the system used to translate word-based addresses of systems (such as *WWW.EXAMPLE.COM*) to the numerical IP (Internet Protocol) address of the computer or system that should be located at that address. All computers and systems on the Internet use addresses that look similar to: 5.8.15.16.

Domain Name Server:

- DNS is the way that Internet domain names are located & translated into IP addresses.
- A domain name is a meaningful, easy-to-remember 'label' for an IP address.
- IP addresses are fine for computers, but difficult to recognize and remember for humans.
- Examples:

203.215.177.33	www.vu.edu.pk
216.239.33.101	www.google.com

- Maintaining a single, central table of domain name/IP address relationships is impractical
 - Billions of DNS-IP translations take place every day
 - The DNS-IP tables get updated continuously

- Tables of DNs & IP addresses are distributed throughout the Internet on numerous servers
- There is a DNS server at most ISPs. It converts the domain names in our Internet requests to actual IP addresses
- In case it does not have a particular domain name in its table, it makes a request to another DNS server on the Internet

When you use an alphanumeric address such as *WWW.EXAMPLE.COM*, your computer needs to understand what numerical IP addresses it needs to contact, and this is accomplished through DNS servers. The answer is delivered back to the requesting computer via the DNS listed for the domain name.

All domains have at least two DNS servers as seen through [WHOIS lookups](#) such as *NS1.EXAMPLE.COM* and *NS2.EXAMPLE.COM*, and your request for anything related to the domain name gets sent to one of these servers. In response, the DNS server sends back the IP address that you should contact. This works for the Web Site, Mail Servers, and anything else based on the domain name.

4. Mailing List

A mailing list is a collection of names and addresses used by an individual or an organization to send material to multiple recipients. The term is often extended to include the people subscribed to such a list, so the group of subscribers is referred to as "the mailing list", or simply "the list".

If you were a magazine publisher, you would have a list of the mailing addresses of all the subscribers to the magazine. In the case of an electronic mailing list, we use a list of email addresses from people interested in hearing about or discussing a given topic.

Types of mailing lists

There are two common types of email mailing lists:

- (a) Announcement lists
- (b) Discussion lists.

Announcement lists are used so that one person or group can send announcements to a group of people, much like a magazine publisher's mailing list is used to send out magazines. For example, a band may use a mailing list to let their fan base know about their upcoming concerts.

A **discussion list** is used to allow a group of people to discuss topics amongst themselves, with everyone able to send mail to the list and have it distributed to everyone in the group. This discussion may also be moderated, so only selected posts are sent on to the group as a whole, or only certain people are allowed to send to the group. For example, a group of model plane enthusiasts might use a mailing list to share tips about model construction and flying.

Some common terms:

- A "post" typically denotes a message sent to a mailing list. (Think of posting a message on a bulletin board.)
- People who are part of an electronic mailing list are usually called the list's "members" or "subscribers."
- "List administrators" are the people in charge of maintaining that one list. Lists may have one or more administrators.
- A list may also have people in charge of reading posts and deciding if they should be sent on to all subscribers. These people are called list moderators.
- Often more than one electronic mailing list will be run using the same piece of software. The person who maintains the software which runs the lists is called the "site administrator." Often the site administrator also administrates individual lists.

5. **Usenet**

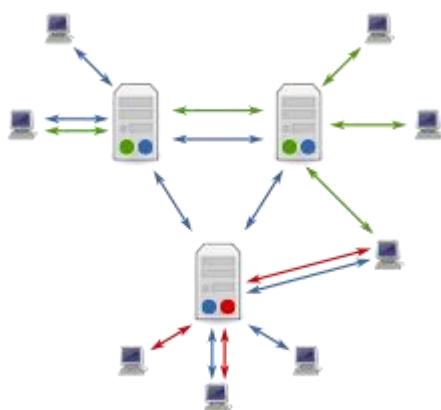
Usenet is a collection of user-submitted notes or messages on various subjects that are posted to servers on a worldwide network. Each subject collection of posted notes is known as a **newsgroup**. There are thousands of newsgroups and it is possible for you to form a new one. Most newsgroups are hosted on Internet-connected servers, but they can also be hosted from servers that are not part of the Internet. Usenet's original

protocol was UNIX-to-UNIX Copy ([UUCP](#)), but today the Network News Transfer Protocol ([NNTP](#)) is used.

Usenet is a worldwide distributed Internet discussion system. It was developed from the general-purpose UUCP dial-up network architecture. Tom Truscott and Jim Ellis conceived the idea in 1979, and it was established in 1980.^[1] Users read and post messages (called *articles* or *posts*, and collectively termed *news*) to one or more categories, known as newsgroups. Usenet resembles a bulletin board system (BBS) in many respects and is the precursor to Internet forums that are widely used today. Usenet can be superficially regarded as a hybrid between email and web forums. Discussions are threaded, as with web forums and BBSes, though posts are stored on the server sequentially.

Most browsers, such as those from Netscape and Microsoft, provide Usenet support and access to any newsgroups that you select. On the Web, Google and other sites provide a subject-oriented directory as well as a search approach to newsgroups and help you register to participate in them. In addition, there are other newsgroup readers, such as Knews, that run as separate programs.

A diagram of Usenet servers and clients. The blue, green, and red dots on the servers represent the groups they carry. Arrows between servers indicate newsgroup group exchanges (feeds). Arrows between clients and servers indicate that a user is subscribed to a certain group and reads or submits articles.



One notable difference between a BBS or web forum and Usenet is the absence of a central server and dedicated administrator. Usenet is distributed among a large, constantly changing conglomeration of servers that store and forward messages to one another in so-called news feeds. Individual users may read messages from and post

messages to a local server operated by a commercial usenet provider, their Internet service provider, university, employer, or their own server.

6. FTP: File Transfer Protocol

File Transfer Protocol (FTP) is a standard Internet [protocol](#) for transmitting files between computers on the Internet. Like the Hypertext Transfer Protocol ([HTTP](#)), which transfers displayable Web pages and related files, and the Simple Mail Transfer Protocol ([SMTP](#)), which transfers e-mail, FTP is an application protocol that uses the Internet's [TCP/IP](#) protocols. FTP is commonly used to transfer Web page files from their creator to the computer that acts as their [server](#) for everyone on the Internet. It's also commonly used to download programs and other files to your computer from other servers.

As a user, you can use FTP with a simple command line interface (for example, from the Windows MS-DOS Prompt window) or with a commercial program that offers a graphical user interface. Your Web browser can also make FTP requests to download programs you select from a Web page. Using FTP, you can also update (delete, rename, move, and copy) files at a server. You need to [logon](#) to an FTP server. However, publicly available files are easily accessed using [anonymous FTP](#).

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Basic FTP support is usually provided as part of a suite of programs that come with TCP/IP. However, any FTP client program with a graphical user interface usually must be downloaded from the company that makes it.

7. TELNET

Telnet is a user command and an underlying [TCP/IP protocol](#) for accessing remote computers. Through Telnet, an administrator or another user can [access](#) someone else's computer remotely. On the Web, [HTTP](#) and FTP protocols allow you to request specific files from remote computers, but not to actually be logged on as a user of that computer. With Telnet, you log on as a regular user with whatever privileges you may have been granted to the specific [application](#) and [data](#) on that computer.

A Telnet command request looks like this (the computer name is made-up):

telnet the.libraryat.whatis.edu

The result of this request would be an invitation to log on with a user-id and a prompt for a password. If accepted, you would be logged on like any user who used this computer every day.

Telnet is most likely to be used by program developers and anyone who has a need to use specific applications or data located at a particular [host](#) computer.

Some features of Telnet are as follows:

- TELNET is a *protocol* that provides "a general, bi-directional, eight-bit byte oriented communications facility".
- Telnet is a *program* that supports the TELNET protocol over TCP.
- Many application protocols are built upon the TELNET protocol.

8. CHATTING

Chat is a text-based communication that is live or in real-time. For example, when talking to someone in chat any typed text is received by other participants immediately. This is different from other text-based communications such as [e-mail](#) where it could be a couple of hours, days, or weeks to receive a response.

There are also several million users chatting through other networks such as [IRC](#). A good example of a chat on IRC is the [Computer Hope chat](#).

On the Internet, chatting is talking to other people who are using the Internet at the same time you are. Usually, this "talking" is the exchange of typed-in messages requiring one

site as the repository for the messages (or "chat site") and a group of users who take part from anywhere on the Internet. In some cases, a private chat can be arranged between two parties who meet initially in a group chat. Chats can be ongoing or scheduled for a particular time and duration. Most chats are focused on a particular topic of interest and some involve guest experts or famous people who "talk" to anyone joining the chat.

Chats are conducted on online services (especially America Online), by bulletin board services, and by Web sites. Several Web sites, notably Talk City, exist solely for the purpose of conducting chats. Some chat sites such as Worlds Chat allow participants to assume the role or appearance of an [avatar](#) in a simulated or *virtual reality* environment.

Talk City and many other chat sites use a protocol called [Internet Relay Chat](#).

A chat can also be conducted using sound or sound and video, assuming you have the bandwidth access and the appropriate programming.

9. CONFERENCING

Conference is:

- a meeting for consultation or discussion:
- a conference between a student and his adviser.
- the holding of a series of meetings or [conferences](#).
- participation in a [conference](#) that involves use of a particular electronic technology:
- audio conferencing; video conferencing(web conferencing)
- Compare [teleconferencing](#) ,[videoconferencing](#).

Conference phones are used to initiate and conduct conference calls, which enable multiple callers to listen and/or talk on the same call. In a conference call, the host participants typically run the call with a conference phone, while remote participants dial in to a number that connects them to a conference bridge that links the various telephone

lines together. Conference calls are frequently used for business meetings and corporate earnings reports, and are also commonly paired with Web conferences for online presentations and sharing documents.

Web conferencing allows users to carry on business meetings and seminars, make presentations, conduct demonstrations, provide online education and offer direct customer support. Control of the session can be passed among users so that any attendee can act as the main presenter. The most effective Web conferencing solutions require high-speed [Internet](#) connections at all user sites.

Several vendors offer Web conferencing services for a nominal monthly fee. System requirements are modest. Most personal computers have sufficient resources to use Web conferencing through their existing browsers. Installation of the supporting [software](#), if any, is easy and there is practically no learning curve.

10. TELEPHONY

Telephony is the technology associated with the electronic transmission of voice, [fax](#), or other information between distant parties using systems historically associated with the telephone, a handheld device containing both a speaker or transmitter and a receiver. With the arrival of computers and the transmittal of digital information over telephone systems and the use of radio to transmit telephone signals, the distinction between *telephony* and *telecommunication* has become difficult to make.

Internet telephony is the use of the Internet rather than the traditional telephone company infrastructure and rate structure to exchange spoken or other telephone information. Since access to the Internet is available at local phone connection rates, an international or other long-distance call will be much less expensive than through the traditional call arrangement.

On the Internet, three new services are now or will soon be available:

- The ability to make a normal voice phone call (whether or not the person called is immediately available; that is, the phone will ring at the location of the person called) through the Internet at the price of a local call
- The ability to send fax transmissions at very low cost (at local call prices) through a gateway point on the Internet in major cities
- The ability to send voice messages along with text e-mail

You can now add telephone capabilities to your computer by adding a telephony board, available for under \$300, that combines the functions of modem, sound board, speakerphone, and voicemail system. A telephony board is often integrated into new machines targeted for small business and home office users.

A Telephony API ([TAPI](#)) is available from Microsoft and Intel that allows Windows client applications to access voice services on a server and that interconnects PC and phone systems. Both Microsoft and Netscape provide or plan to provide support for voice e-mail.