Introduction to computer:
Definition:
   (i) Computer is an electronic device/machine, which can perform various arithmetic and logical operations with-in parts of a second.

   (ii) Computer is an electronic and programmable machine, which processes raw data into meaningful information.

Characteristic of computer:
   1. **Speed:** A computer is a very fast device. It can perform in a few seconds the amount of work that a human being can do in an entire year. An powerful computer is capable of performing about 3-4 million simple arithmetic operations per seconds.

   2. **Accuracy:** The accuracy of a computer is consistently high and the degree of accuracy of a particular computer depends upon its design. But for a particular computer, each and every calculation is performed with the same accuracy.

   3. **Diligence:** Unlike human beings, a computer is free from monotony, tiredness, lack of concentration etc, and hence can work for hours together without creating any error.

   4. **Versatility:** Versatility is one of the most wonderful things about the computer. A computer is capable of performing almost any task provided that the task can be reduced to a series of logical steps.

   5. **Power of remembering:** A computer can store and recall any amount of information because of its secondary storage capability. Even after several years, the information recalled will be as accurate as on the day when it was fed to the computer.

   6. **No I.Q.** A computer is not a magical device. It can only perform tasks that a human being can. It possesses no intelligence of its own. It has to be told what to do and in what sequence.

   7. **No Feelings:** Computers have no feelings because they are machine. Based on our feelings, taste, knowledge and experience, we often make certain judgments in our day to day life. But computers cannot make such judgments on their own.

Generations of Computer:

First Generation (1945-1955)

Technology	**:** Vacuum Tubes
Size	**:** Too bulk in size (Very large)
Speed	**:** very slow (Hundred instructions per second)
Storage	: Magnetic Drum & Magnetic Tape
Input	: Punched cards & Paper Tape
Output	: Punched cards & printed Reports
Portability	**:** not portable
Use	**:** limited commercial use
Languages	**:** Machine language & Assembly language.
Example	**:** ANIAC, EDSAC, EDVAC, IBM 700 Series

Second Generation (1955-1965)

Technology	**:** Transistors
Size	**:** Smaller than first generation
Speed	**:** Higher than first generation (Thousands instructions per second)
Storage	**:** Magnetic tape & magnetic disk
Input	: Punched cards
Output	: Punched cards & printed Reports
Portability	**:** Better portability
Use	**:** Commercial production was wider but costly
Languages	**:** Assembly & High-level language- FORTRAN, COBOL, BASIC
Example	**:** IBM 1620 series, PDP1, PDP3.

Third Generation (1965-1975)

Technology	: IC (Integrated Circuit)
Size	**:** Smaller in size than previous generation
Speed	**:** High speed (Millions instructions per second)
Storage	**:** Magnetic Tape and Magnetic disk
Input	: Key to tape & key to disk
Output	: Printed Reports, Video Displays
Portability	**:** Easily portable
Use	**:** Commercial production was easier and cheaper
Languages	**:** High-level languages- COBOL, BASIC, PASCAL, C.
Example	**:** IBM 307 Series, CDC 7600 Series

Fourth Generation (1975-1990)

Technology	**:** LSI (Large Scale Integration) &
	VLSI (Very Large Scale Integration) Semiconductor Circuit.
Size	**:** Smallest in size among all previous generations
Speed	**:** Higher Speed (Ten Million instructions per second)
Storage	**:** Magnetic Disk, Floppy Disk, Hard Disk
Input	: Keyboard data entry & Direct input devices
Output	: Video Displays, Printed Reports, Audio Responses
Portability	**:** Easily Portable
Use	**:** Commercial production was cheapest and used for general purpose
Languages	**:** High-level Languages- C, C++, SQL, Java.
Example	**:** IBM 3090/600 Series, Intel 8080.

Fifth Generation (1990-Present)

Technology	**:** SLSI (Super Large Scale Integration) &
	ULSI (Ultra Large Scale Integration) Semiconductor Circuit.
Size	**:** Very-Very Small
Speed	**:** Fastest computers (Billions instructions per second)
Storage	**:** Optical Disk, Flash Memory
Input	: Speech Input, Touch Screen
Output	: Graphics, Displays, Voice Response
Portability	**:** Fully Portable
Use	**:** Totally General Purpose
Languages	**:** AI (Artificial Intelligence) like-LISP, PROLOG
Example	**:** Laptops, Palm-Tops, PDA (Personal Digital Assistant)

CPU Architecture:
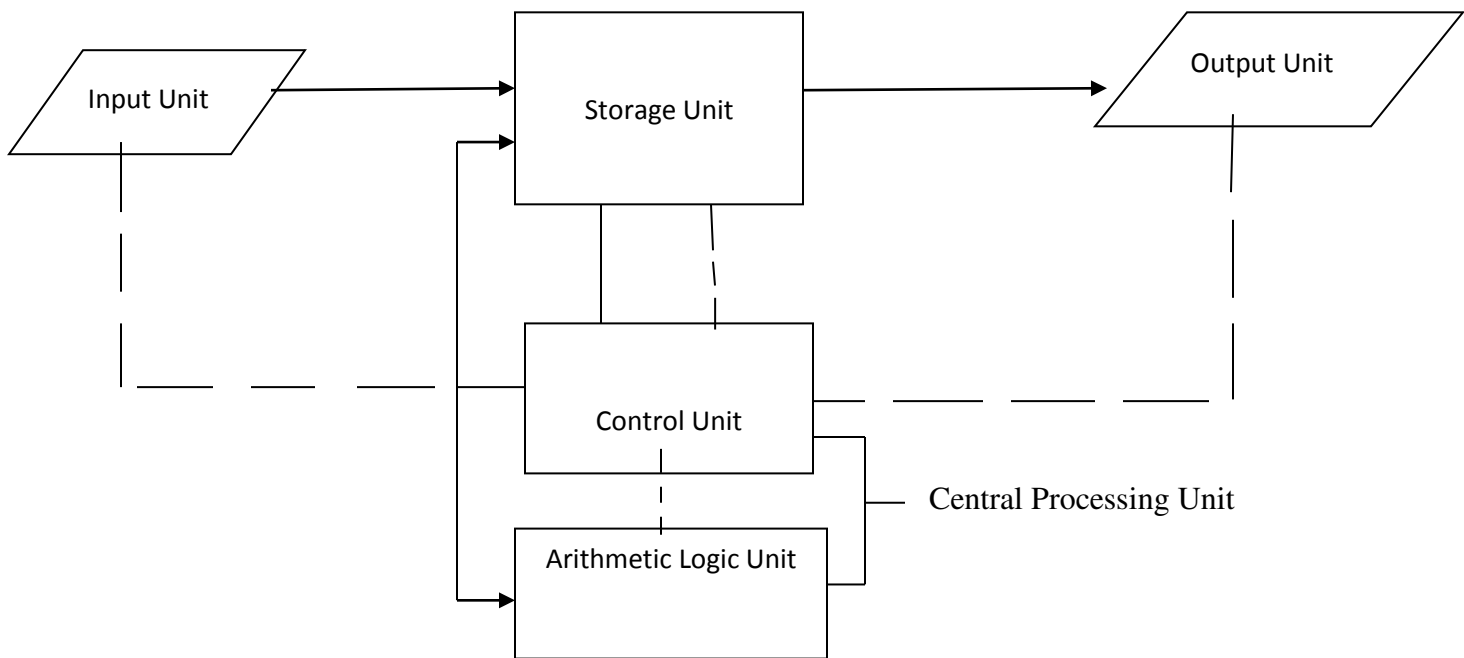
Block Diagram of Computer System

Functions of Computer System Units:

Input Unit:
1. It accepts (or reads) the list of instructions and data from the outside world.
2. It converts these instructions and data in computer acceptable form.
3. It supplies the converted instructions and data to the computer system for the future processing.

Output Unit:
1. It accepts the results produced by the computer which are in coded form and hence cannot be easily understood by us.
2. It converts these coded results to human acceptable (readable) form.
3. It supplies the converted results to the outside world.

Storage Unit:
1. All the data to be processed and the instruction required for processing (received from input devices).
2. Intermediate results of processing.
3. Final results of processing before these results are released to an output device.

Arithmetic Logic Unit:
The arithmetic logic unit (ALU) of a computer system is the place where the actual execution of the instructions takes place during the processing operation. To be more precise, all calculations are performed and all comparisons (decisions) are made in the ALU.

Control Unit:

Control unit acts as a central nervous system for the other components of the computer. It manages and coordinates the entire computer system. It obtains instructions from the program stored in main directory, interprets the instructions, and issues signals that cause other units of the system to execute them.

Central Processing Unit:
The control unit and the arithmetic logic of a computer system are jointly known as central processing unit (CPU). The CPU is the brain of any computer system. In a human body, all major decisions are taken by the brain and the other parts of the body function are directed by the brain. Similarly, in a computer system, all major calculations and comparison are made inside the CPU and the CPU is also responsible for activating and controlling the operations of other units of a computer system.

Input Devices and Output Devices:

Input Devices:

1. Keyboard: A keyboard is the primary input device , that is used for entering data directly into a computer. Data is entered into the computer by pressing a set of keys available with these devices. A keyboard is similar to the keyboard of a typewriter.
It contains alphabets, digits, special characters, some control keys. When a key is pressed an electronic signal is produced which is detected by an electronic circuit called keyboard encoder. The function of an encoder is to detect which keys has been pressed and send binary code to the computer. Old model keyboard have 84 keys. Some upgraded keyboard have 101/102/105/106/110 keys.
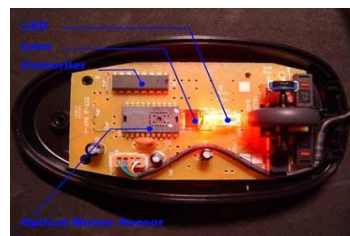

2. Pointing Devices

(a) Mouse: A mouse is a pointing device that functions by detecting two dimensional motion relative to its supporting surface. Physically a mouse consists of an object held under one of the users hand with one or more buttons. The mouse sometime features other elements such as wheels, which allow the user to perform various system dependent operations. There are two types of mouse:

Mechanical: The ball mouse has two freely rotating rollers. They are located 90 degrees apart. One roller detects the forward –backward motion of the mouse and other detects the left-right motion.
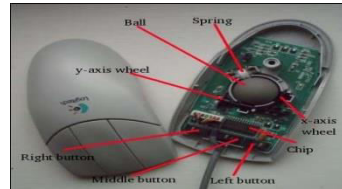
Optical and laser: Optical mouse make use of one or more light emitting diodes (LEDs) and an imaging array of photodiodes to detect movement to the underlying surface. A laser mouse is an optical mouse that uses laser light.

(b) Track ball: Track ball is also a pointing device and contain a ball which can rotate in any direction. The user spins the ball in different directions to move the cur4sor on the screen. The associated electronic circuitry detedts the direction ands speed of the spin. The information is sent to the processor.

(c) Joystick: A joystick is also a pointing device. It is used to move the cursor position on a screen. Its function is similar to that of a mouse. A joystick is a stick which has spherical ball at its lower end . The lower spherical ball moves in a socket. The joystick can be moved right or left .forward or backward. The circuitry inside the joystick detects and measures the displacement of the joystick from its central position .The information is sent to the processor.

Scanners: Scanner is a kind of input device. An **image scanner**—often abbreviated to just **scanner**—is a device that optically scans images, printed text, handwriting, or an object, and converts it to a digital image. This provides faster and more accurate data entry. Common examples found in offices are variations of the *desktop (or flatbed) scanner* where the document is placed on a glass window for scanning. *Hand-held scanners*, where the device is moved by hand, used for industrial design, test and measurement, gaming and other applications. Important types of scanners are Optical scanners and magnetic ink character readers.

Optical scanners: The optical scanners are capable of reading information recorded on paper, employing light source and light Sensors. The following are the commonly used optical scanners:

OCR (Optical Character Reader): An optical character reader detects alphanumeric characters printed or typewritten on paper. It may be a handheld scanner or a page scanner to detect light reflected from a line or from a page of the text. The change in the reflected light is converted to binary data which is sent to the processor.

Flat-bed   Hand-Held

OMR (Optical Mark Reader): Special marks such as square or bubble are prepared on examination answer sheets or questionnaires. The user fill in these square or bubble with soft pencil or ink to indicate their choice. These marks are detected by an optical mark reader and the corresponding signal are sent to the processor.

BCR (Bar Code Reader): This method uses a number of bars (lines) of varying thickness and spacing between then to indicate the desired information. Bar code are used on most grocery items. An optical bar reader can read such bars and convert them into electrical pulses to be processed by a computer. The most commonly used bar code is universal product code (UPC) The UPC code uses a series of vertical bars of varying width. These bars are detected as ten digits. The First five digits identify the supplier or manufacturer of the item. The second five digits identify individual product.

MICR (Magnetic Ink Character Reader): MICR is widely used by banks to process large volumes of cheques and deposit forms written every day. A special ink called magnetic ink is used to write characters on the cheques and deposit forms which are to be processed by an MICR. MICR is capable of reading characters on a paper written with magnetic ink. The magnetic ink is magnetized during the input process. The MICR reads the magnetic patterns of the written characters.
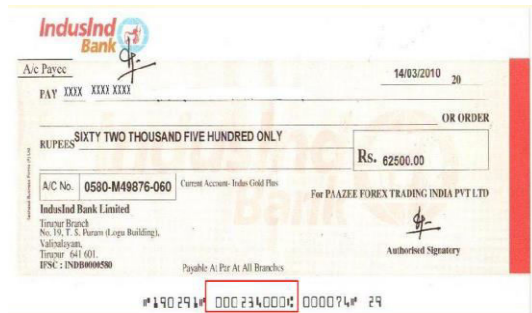
Touch Screen: A **touch screen** is an electronic visual display that can detect the presence and location of a touch within the display area. The term generally refers to touching the display of the device with a finger or hand. Touch screens can also sense other passive objects, such as a stylus. Touch screens are common in devices such as game consoles, all-in-one computers, tablet computers, and smart phones.

Output Devices:
Monitor (VDU): The Visual Display Unit (VDU), is called monitor or video monitor. Most computers contain CRT for visual display. Other types of display units are also available in flat screen such as LCD (Liquid Cristal Display), LED (Light Emitting Diodes) and plasma display.
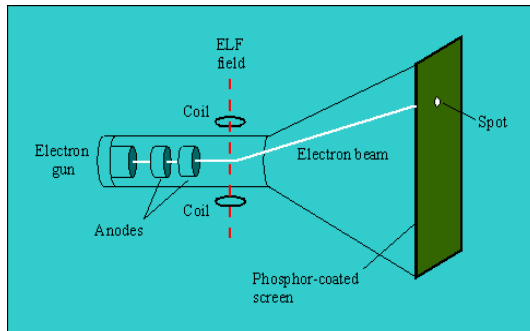

(CRT)   **(LCD)**

Cathode ray tube (CRT): A cathode ray tube (CRT) is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. Most desktop computer displays make use of CRTs. The CRT in a computer display is similar to the "picture tube" in a television receiver.


Working: A cathode ray tube consists of several basic components, as illustrated below. The electron gun generates a narrow beam of electrons. The anodes accelerate the electrons. Deflecting coils produce an extremely low frequency electromagnetic field that allows for constant adjustment of the direction of the electron beam. There are two sets of deflecting coils: horizontal and vertical.(In the illustration, only one set of coils is shown for simplicity.) The intensity of the beam can be varied. The electron beam produces a tiny, bright visible spot when it strikes the phosphor-coated screen.

The illustration shows only one electron gun. This is typical of a monochrome, or single-color, CRT. However, virtually all CRTs today render color images. These devices have three electron guns, one for the primary color red, one for the primary color green, and one for the primary color blue. The CRT thus produces three overlapping images: one in red (R), one in green (G), and one in blue (B). This is the so-called RGB color model.

Flat panel displays: Flat panel displays encompass a growing number of electronic visual display technologies. They are far lighter and thinner than traditional television sets and video displays that use cathode ray tubes (CRTs).

Liquid crystal panels: Liquid crystal displays are lightweight, compact, portable, cheap, more reliable, and easier on the eyes than CRTs. They are used in various electronics like watches, calculators, and notebook computers.
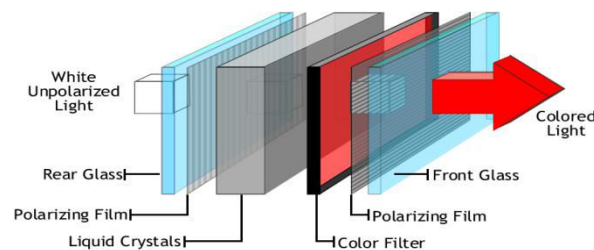
Working: A thin layer of liquid crystal, a liquid that exhibits crystalline properties, is sandwiched between 2 electrically conducting plates. The top plate has transparent electrodes deposited on it, and the back plate is a mirror. By applying proper electrical signals across the plates, various segments of the liquid crystal can be activated, causing changes in their light diffusing or polarizing properties. These segments can either transmit or block light. An image is produced by passing light through selected segments of the liquid crystal and then reflected it back from the mirror to the viewer.
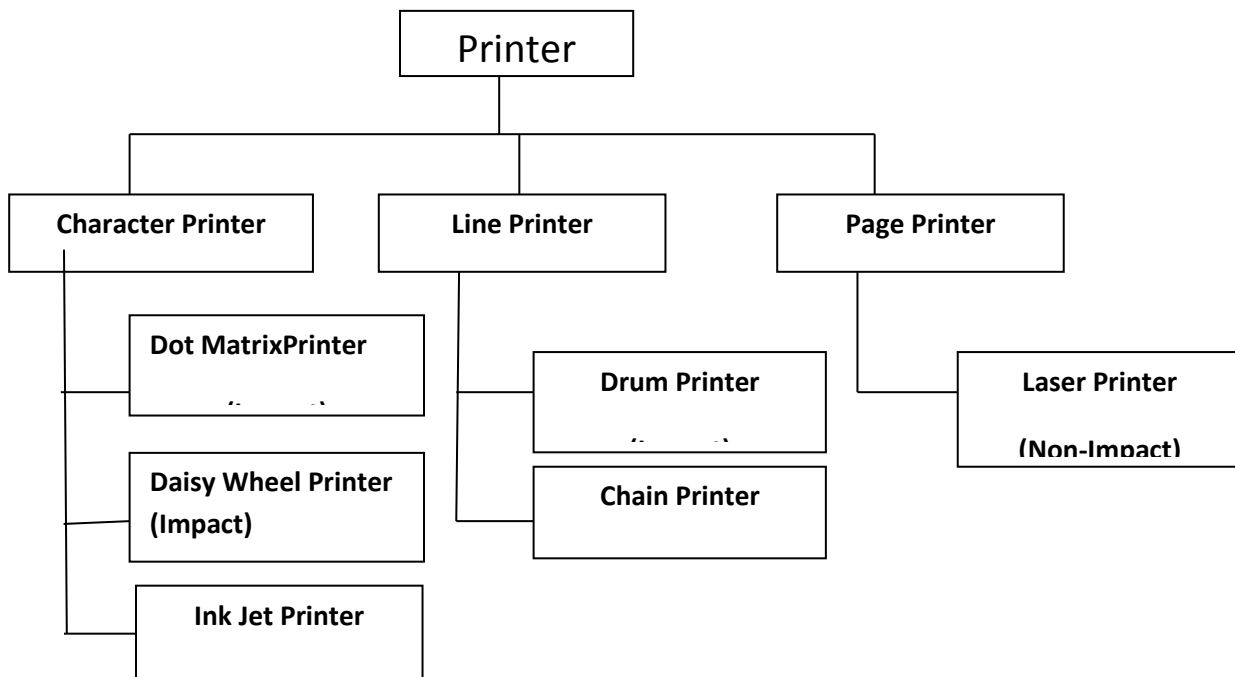
Type of Printers:

Printer: Printers are commonly used output device. They provide information in a permanent readable form. They produce printed output of result, programs and data. Printers which are used with computers are classified as follows:

1) Character printer
2) Line printer
3) Page printer

A character printer prints one character of the text at a time .A line printers prints one line of the text at a time. A page printer prints one page of the text at a time.

The printers have been classified above as to how they print. There is one more classification which depends on the technology used in their manufacture. According to this consideration, the printers are classified in to the following to broad categories:

❖ Impact printers
❖ Non impact printers

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                          ┌──────────────┐
                          │   Printer    │
                          └──────┬───────┘
        ┌────────────────────────┼────────────────────────┐
 ┌──────────────┐        ┌──────────────┐          ┌──────────────┐
 │Character     │        │ Line Printer │          │ Page Printer │
 │Printer       │        └──────────────┘          └──────────────┘
 └──────────────┘
     ┌─────────────────┐      ┌─────────────────┐       ┌─────────────────┐
     │ Dot MatrixPrinter│      │  Drum Printer   │       │  Laser Printer  │
     │                 │      │                 │       │                 │
     └─────────────────┘      └─────────────────┘       │  (Non-Impact)   │
     ┌─────────────────┐      ┌─────────────────┐       └─────────────────┘
     │ Daisy Wheel     │      │  Chain Printer  │
     │ Printer         │      └─────────────────┘
     │ (Impact)        │
     └─────────────────┘
     ┌─────────────────┐
     │ Ink Jet Printer │
     └─────────────────┘
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Impact printer use electromechanical mechanism that causes hammers or pins to strike against a ribbon and paper to print the text.
Non – impact printers do not use electromechanical printing head to strike against ribbon and paper. They use Thermal, chemical, electrostatic and laser or inkjet technology for printing.

Character Printer:

Dot Matrix: A **dot matrix printer** or **impact matrix printer** is a type of computer printer with a print head that runs back and forth, or in an up and down motion, on the page and prints by impact, striking an ink-soaked cloth ribbon against the paper, much like the print mechanism on a typewriter. However, unlike a typewriter or daisy wheel printer, letters are drawn out of a dot matrix, and thus, varied fonts and arbitrary graphics can be produced. Because the printing involves mechanical pressure, these printers can create carbon copies and carbonless copies. Its speed of printing varies from 50 to 500 cps.

Daisy Wheel: A daisy wheel type letter quality printer was used in past for good quality printing. It is no longer used. It has embossed character just like those of a typewriter. The character are embossed on leaves placed on a wheel. An electric motor is used to rotate the wheel rapidly. When the desired character comes in the correct position a solenoid driven hammer strikes it against the ribbon to print the character on the paper.


Ink-Jet: An ink-jet printer uses dot matrix approach to print text and graphics. Most ink –jet printers use multiple Jets vertically aligned on a cartridge, which moves horizontally across a page. The ink cartridges contain a column of tiny heaters. When a heater is activated a drop of ink is exploded onto the paper. The print head contain an ink cartridge which is made up of a number of ink filled firing chambers, each attached to a nozzle thinner than a human hair. When an electric current is passed through a resistor, this causes the ink to boil and form a vapour

bubble. The vapour bubble expands and pushes ink through the nozzle to form a droplet at the tip of the nozzle. The pressure of vapour bubble forces the droplets to move to the paper.
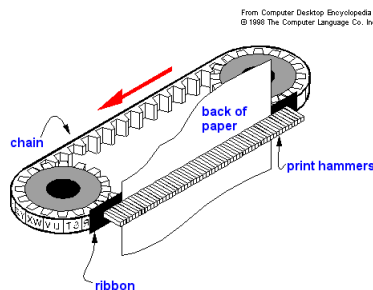

Line Printer:

Drum Printer: A drum printer uses a rapidly rotating drum(cylinder) which contain a complete raised characters set in each band around the cylinder. Each character position along the text line contain a band of raised character set. There is a magnetically driven hammer in each character position of the line. The printer receives all characters to be printed in one line of the text from the processor. The hammer hit the paper and ribbon against the desired character on the drum when it comes in the printing position. Its noise level is high. Its speed varies from 200-2000 lines per minute.
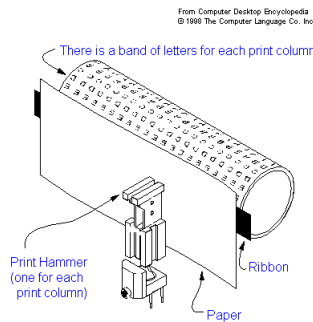
Chain printer: Chain printer use a rapidly rotating chain which is called print chain. The print chain contains characters. Each link of the chain is character font. Magnetically driven hammers are there in each print position. The printer receives all the character to be printed in one line from the processor. Printers print one line at a time. Chain may contain more then one character set. When the desired character comes under the print position the hammer strikes the ribbon and paper against the character. The noise level of the printer is high. Its speed lies in the range of 400-2400 lines per minute.

Laser printers: Laser printers are page printers. An entire page is processed at a time. They use laser beam to produce an image of the page containing text/graphics, on a photosensitive drum. The drum is coated with negatively charged photo-conductive material. A computer controls the laser beam to turn it on and off when it is sent to the drum. The points where laser beam strikes become positively charged. The laser beam causes a negatively charged film to change its negative charge to positive charge. The area of the drum surface where laser beam does not strike, retain their negative charge. Negative charge ink powder called toner is used in a laser printer for printing. The laser exposed area of the drum attracts toner. Paper is positively charged when it passes through the printer. The positive charge on the paper is stronger than the positive charge on the laser exposed surface on the drum. The paper charge being more positive, pulls the toner off the drum and puts it on the paper. The surface of the drum which does not attract toner gives white areas on the paper. Low speed laser printers print 8-10 pages per minute and high speed laser printer prints 200 pages per minute.
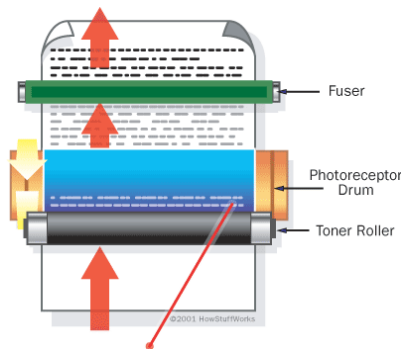
Colour Printers:

A printer capable of printing more than one color. Most color printers are based on the CMYK color model, which prints in four basic colors: cyan, magenta, yellow, and black. By printing combinations of different colors close to each other (or, in the case of thermal dye transfer printers, on top of each other), the CMYK model can simulate most other colors (except for special colors such as fluorescent yellow). This is the same technique used in process color offset printing, which is the technology used to print most color books, magazines, and other paper materials. Some lower-price printers use only three colors -- cyan, magenta, and yellow -- but these printers cannot print true black and their colors tend to be a bit faded.

Secondary Storage Devices: The magnetic and optical memory is used as secondary (auxiliary) memory. The information which is not being currently processed by CPU reside in the secondary memory. The information needed by the CPU for current processing is transferred from the secondary to the main memory.

Magnetic Memory: Magnetic memory is a permanent type memory. IT is non-volatile. It is used as secondary and backup memory. Digital data 1 or 0 is stored on the magnetic coating (film) applying electric pulses of suitable polarity to the magnetizing coil of a read/write head. A modern computer uses the following types of magnetic memory:

1. Magnetic tape
2. Magnetic disk: Hard-disk and floppy disk.

Magnetic Tape: Magnetic tape is a sequential (or serial) access type storage device. It is suitable for backup storage. A magnetic tape is low-cost device and it has large storage capacity. It can also be used as offline secondary storage. When a large volume of information is to be processed sequentially, it can be stored on a magnetic tape. Magnetic tapes are also used for transporting data from one place to another or from one computer to another. Its main drawback is that it stores information sequentially. A file or particular information stored on a magnetic tape cannot be accessed directly on random basis as it is done in hard disk or floppy disk.

A magnetic tape is made of Mylar plastic material coated with magnetic material (iron oxide) only one side of the tape. Magnetic tapes are available in ½ inch,1/4 inch, 8mm and 3mm sizes.
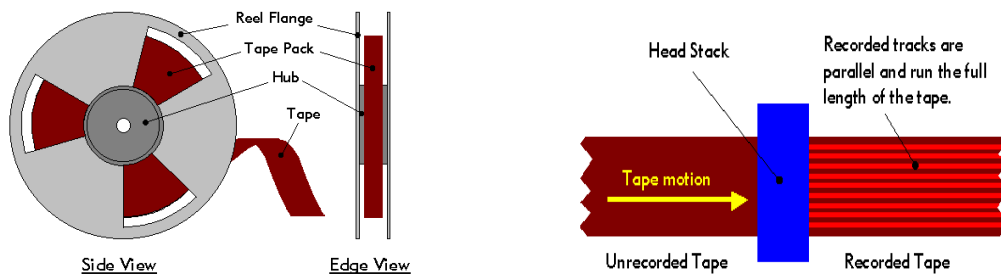

Magnetic Disks: Magnetic disks include hard disk and floppy disks. Working principal is same for both hard disk and floppy disk. A Magnetic disk is a surface device. It stores data on its surface. Its surface is divided into circular concentric tracks, and each track is divided into sectors. In configuration of a magnetic disk all tracks have same number of sectors. The number of bytes stored in each sector is kept same. Therefore all tracks store the same amount of data.

Important definition:
Access Time: The time required to move the read/write head to the addressed sector is known as access time. Access time is the sum of seek time and latency time.
Seek time: The time required to move the read/write head to the addressed track is called seek time.
**Latency time:** The latency time (or search time) is the time required to bring the starting position of the addressed sector under the read/write head.
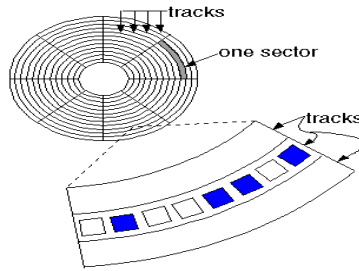
Hard Disk: Hard disks are on-line storage devices. The term on-line means that the device (hard disk) is permanently connected to the computer system. When computer is on the device is available to store information or to give information. Hard disks are used as secondary memory for mass (bulk) storage of information permanently. They store programs, data, operating system, compilers, application programs, etc.

Hard disk is made of aluminum (or other metal or metal alloy) with a thin coating of magnetic material (iron oxide) over it.

Capacity of hard disk = Number of surface x Number of tracks per surface x Number of sectors per track x number of bytes per sector.
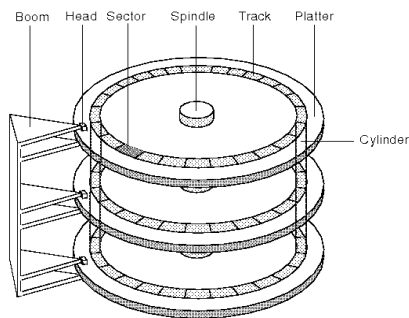
Floppy Disks: Floppy disks are made of Mylar (a plastic material) coated with magnetic material (iron oxide). The disk is not a hard plate, rather it is a very thin piece of flexible plastic, and hence, it is called floppy disk. They are removable disks. A floppy disk is inserted into the computer system when needed. It is an inexpensive storage device and it is used as backup memory. Different sizes of memory are: 5.25 inch and 3.5 inch diameter. The storing capacity of a 5.25 inch floppy is 1.2 MB and the storing capacity of a 3.5 inch floppy is 1.44 MB.
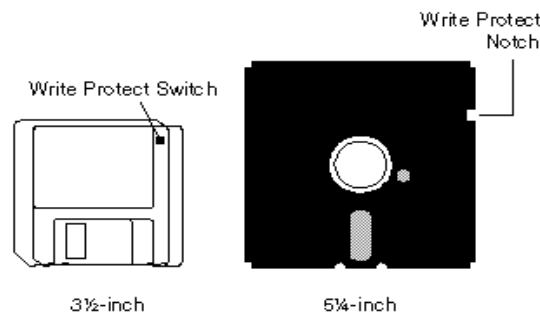
Optical disks

Information is written or read from an optical disk using laser beam .an optical disk has very high storing capacity, up to 20GB . Only one surface of an optical disk is used to store data. There are following types of optical disk:

CD-ROM
CD-R (WORM)
CD-R/W
DVD-ROM, DVD-R, DVD R/W

CD: CD stands for Compact Disk. The disk is made up of a resin, such as polycarbonate. Its capacity is 700 MB.

CD-ROM: It is an optical ROM. Prerecorded data can be read out. The manufacturer writes data on CD-ROMs. It is coated with a material which will change when a high intensity laser beam is focused on it.

The advantage of a CD-ROM is its high storing capacity, mass copy of information stored, Removable from the computer. Its main disadvantage is longer access time as compared to that of a magnetic hard disk. It cannot be updated because it is read only memory.

CD-R (Recordable) or WORM: It is Write Once Read Many (WORM) type optical disk memory. The users can write data on WORM and read the written data as many times as desired.

CD-R/W (Erasable optical disk): It is a read/write optical disk memory. Information can be written to and read from the disk. The disk contents can be erased and new data can be rewritten.

DVD stands for Digital Versatile Disks. Earlier it was called Digital Video Disk. A DVD stored much more data than CD-ROM. Their capacities are 4.7GB, 8.5GB etc.

Backing up your Data: In information technology, a **backup**, or the process of backing up, refers to the copying and archiving of computer data so it may be used to *restore* the original after a data loss event.

Since a backup system contains at least one copy of all data worth saving, the data storage requirements can be significant. Organizing this storage space and managing the backup process can be a complicated undertaking. A data repository model can be used to provide structure to the storage. Nowadays, there are many different types of data storage devices that are useful for making backups. There are also many different ways in which these devices can be arranged to provide geographic redundancy, data security, and portability.

Graphics:

Graphics for print and graphics for display on computer monitors use different resolutions. While monitors are constrained by the 72 or 96 pixels per inch limitation, standard deskjet printers currently print in the range of 4800x1200 dpi (dots per inch) and pictures in magazines typically print at a resolution of 150 dpi. Unlike computer graphics, with images for print, a higher resolution will yield a higher quality image. Therefore, if you intend to print an image, you want to use a higher resolution than you would for a web graphic to achieve a higher quality print.

Graphic File Types

There are many different file types associated with graphics, however, only a few types are suitable for web use. The most widely supported web image formats are jpeg, gif, and png.

JPEG (Joint Photographic Experts Group) – The jpeg image format allows up to 16 million colors and is the best choice for image with many colors or color gradations (especially photographs). Jpeg is a "lossy" format which means that each time the image is saved and compressed, image information is lost and quality is degraded. Jpeg images allow for various levels of compression. Low compression means high image quality, but large file size. High compression means lower image quality, but smaller file size.

GIF (Graphic Information Format) Gif is a "lossless" image format, meaning that the quality of the image is not degraded through compression. The limitation of gif images is that the color palette includes only 256 colors. Therefore, the gif format is a good choice for simpler graphics with a smaller number of solid colors. The gif format also allows for transparent backgrounds, which allows the background color of the web page to show behind the graphic.

PNG (Progressive Network Graphics) PNG is a newer image format that provides a combination of many features of both jpeg and gif. The PNG format allows for use of millions of colors as well as providing the ability to have transparent backgrounds. The one drawback to PNG's is that the format is not supported by all web browsers, particularly older browsers.

Other file formats – Computer graphics may also be present in a number of other different formats such as .bmp, .tiff, and .eps. These formats have their particular uses, such as for print graphics, but are not suitable for display on the web. To use one of these types of files on the web, open it in your graphics program and then save it as either a jpeg, gif, or png.

Pixels and Resolution:

Pixels
Computer based images are comprised of thousands of tiny dots of color called pixels. These are the small dots you see if you put your face too close to your television or computer screen. Each digital image is comprised of thousands or millions of individual pixels, each with its own color. When these groups of pixels are viewed as a whole, we see the entire image. Most computer monitors have display sizes of 800x600 pixels, 1024x768 pixels, or 1280x1024 pixels.

Resolution
Resolution indicates the number of pixels that are displayed per inch for an image (or pixels per centimeter). Most computer monitors display at resolutions of 72 pixels per inch or 96 pixels per inch. If an image is 72 pixels wide, then it will display as 1 inch big on a monitor that is set to a resolution of 72 pixels/inch. It is important to remember that for computer graphics, a higher resolution (pixels/inch) does not mean a higher quality image. What is important is the total size, in pixels, of the image.

Fonts and Range of Colours:

Fonts:
A font is the combination of typeface and other qualities, such as size, pitch, and spacing. For example, Times Roman is a typeface that defines the shape of each character. Within Times Roman, however, there are many fonts to choose from -- different sizes, italic, bold, and so on.

Range of colors:

To change the font color of text within Microsoft Word, follow the below steps.
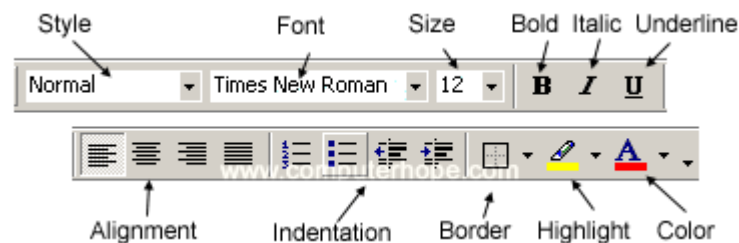
1. Select or Highlight the text.

2. Click the down arrow next to the color icon as shown in the above example. Usually, the icon is letter A with a red underline.

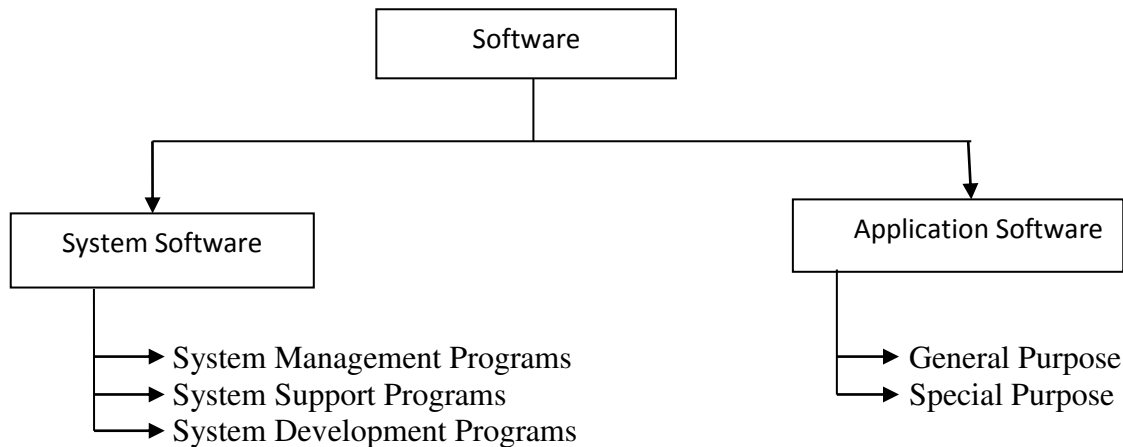3. After clicking the down arrow for the color, select what color you wish to make the text.

   If you do not have any text to highlight or wish to type text in a different color, move the cursor to the location of where you want to new text, click the down arrow on the font color option on the formatting toolbar and select the color you wish to use.

Software:

Computer can perform only those works which are instructed by us. For a particular problem, set of instructions are required, these set of instructions are called program or software.

Software is a program or set of programs which is written for computer for controlling and conducting all the functions of computer or implementing any application task.

Types of software:

```
                          ┌─────────────┐
                          │  Software   │
                          └─────────────┘
                                 │
            ┌────────────────────┴────────────────────┐
            ▼                                          ▼
  ┌──────────────────┐                    ┌──────────────────────┐
  │ System Software  │                    │ Application Software │
  └──────────────────┘                    └──────────────────────┘
            │                                          │
     → System Management Programs              → General Purpose
     → System Support Programs                 → Special Purpose
     → System Development Programs
```

System Software: The Software which is specially designed to conduct and control, all hardware activities of compute as well as for interfacing between the hardware and the application programs to perform the various information processing tasks. These software are divided into three types:

System Management Programs
System Support Programs
System Development Programs

System Management Programs: At the time of execution of various information processing jobs, these programs manage the hardware, software and data resources of the computer system. Examples of these types of programs are
(1)Operating System
(2)Database management system

System Support Programs: Different kind of support services are provided by the computer. So these types of operations and management are handled by these types of programs. Examples are:
(1)System Utilities
(2)Security Monitors

System Development Programs: when we are preparing some information system programs or procedures or other kinds of application programs these development programs are used. Examples are

(1)Programming Environment

(2)Programming language Translator

Application Software: These programs are designed to fulfil the information processing needs of end users or for some specific application. They are also divided into two types.

General Purpose: These programs are designed to fulfil the basic information processing needs of end users related to home, education, business, scientific and many other purposes. Examples are:

(1)Word processing programs

(2)Electronic Spreadsheets

Special Purpose: These programs are specially designed to handle a specific application task. They are available in several varieties. Examples are:

(1) Commercial Application programs

(2) Scientific & Research application programs.

UNIT-II

Digital Logic and Gates:

A logic gate is an elementary building block of a digital circuit. Most logic gates have two inputs and one output. At any given moment, every terminal is in one of the two binary conditions *low* (0) or *high* (1), represented by different voltage levels. In most logic gates, the low state is approximately zero volts (0 V), while the high state is approximately five volts positive (+5 V).

There are seven basic logic gates: AND, OR, XOR, NOT, NAND, NOR, and XNOR.

The *AND gate* is so named because, if 0 is called "false" and 1 is called "true," the gate acts in the same way as the logical "and" operator. The following illustration and table show the circuit symbol and logic combinations for an AND gate. (In the symbol, the input terminals are at left and the output terminal is at right.) The output is "true" when both inputs are "true." Otherwise, the output is "false."

AND gate

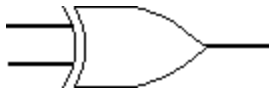| Input 1	Input 2	Output
0	0	0
0	1	0
1	0	0
1	1	1

The *OR gate* gets its name from the fact that it behaves after the fashion of the logical inclusive "or." The output is "true" if either or both of the inputs are "true." If both inputs are "false," then the output is "false."

OR gate

| Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	1

The *XOR* (*exclusive-OR*) *gate* acts in the same way as the logical "either/or." The output is "true" if either, but not both, of the inputs are "true." The output is "false" if both inputs are "false" or if both inputs are "true." Another way of looking at this circuit is to observe that the output is 1 if the inputs are different, but 0 if the inputs are the same.

XOR gate

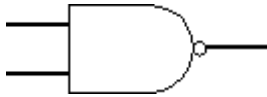| Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

A logical *inverter* , sometimes called a *NOT gate* to differentiate it from other types of electronic inverter devices, has only one input. It reverses the logic state.
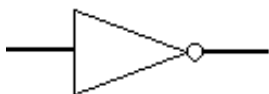
Inverter or NOT gate
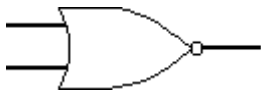
Input	Output
1	0
0	1

The *NAND gate* operates as an AND gate followed by a NOT gate. It acts in the manner of the logical operation "and" followed by negation. The output is "false" if both inputs are "true." Otherwise, the output is "true."

NAND gate

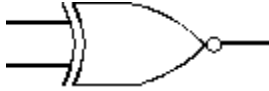| Input 1	Input 2	Output
0	0	1
0	1	1
1	0	1
1	1	0

The *NOR gate* is a combination OR gate followed by an inverter. Its output is "true" if both inputs are "false." Otherwise, the output is "false."

NOR gate

Input 1	Input 2	Output
0	0	1
0	1	0
1	0	0
1	1	0

The *XNOR (exclusive-NOR) gate* is a combination XOR gate followed by an inverter. Its output is "true" if the inputs are the same, and "false" if the inputs are different.

XNOR gate

Input 1	Input 2	Output
0	0	1
0	1	0
1	0	0
1	1	1

Using combinations of logic gates, complex operations can be performed. Arrays of logic gates are found in digital integrated circuits (ICs).

Boolean Algebra:
Boolean Algebra is an algebra of logic. It is one of the most basic tools to analyze and design logic circuits. It is named after George Boole who developed it in 1854. The original purpose of this algebra was to simplify logical statements and solve logical problems. It uses only the binary numbers i.e. 0 and 1. It is also called as **Binary Algebra** or **logical Algebra**.

Boolean Laws

There are six types of Boolean Laws.

Commutative law

Any binary operation which satisfies the following expression is referred to as commutative operation.

(i) A.B = B. A   (ii) A + B = B + A

Commutative law states that changing the sequence of the variables does not have any effect on the output of a logic circuit.

Associative law

This law states that the order in which the logic operations are performed is irrelevant as their effect is the same.

(i) $(A.B).C = A.(B.C)$ (ii) $(A+B) + C = A + (B+C)$

Distributive law

Distributive law states the following condition.

$A.(B+C) = A.B + A.C$

AND law

These laws use the AND operation. Therefore they are called as **AND** laws.

(i) $A.0 = 0$ (ii) $A.1 = A$

(iii) $A.A = A$ (iv) $A.\overline{A} = 0$

OR law

These laws use the OR operation. Therefore they are called as **OR** laws.

(i) $A + 0 = A$ (ii) $A + 1 = 1$

(iii) $A + A = A$ (iv) $A + \overline{A} = 1$

INVERSION law

This law uses the NOT operation. The inversion law states that double inversion of a variable results in the original variable itself.

$\overline{\overline{A}} = A$

Introduction to Number Systems:

A number system is a system of writing for expressing numbers. It is the mathematical notation for representing numbers of a given set by using digits or other symbols in a consistent manner. It provides a unique representation to every number and represents the arithmetic and algebraic structure of the figures. It also allow us to operate arithmetic operations like addition, subtraction and division.

Different number systems are mentioned below.

1. Decimal number system (Base- 10)

2. Binary number system (Base- 2)
3. Octal number system (Base-8)
4. Hexadecimal number system (Base- 16)

Two types of number systems are:
- Non-positional number systems
- Positional number systems

Non-positional number systems

Use symbols such as I for 1, II for 2, III for 3, IIII for 4, IIIII for 5, etc. Each symbol represents the same value regardless of its position in the number. The symbols are simply added to find out the value of a particular number. It is difficult to perform arithmetic with such a number system.

Positional number systems

It uses only a few symbols called digits. These symbols represent different values depending on the position they occupy in the number.

Decimal Number System

It is also known as Base 10 Number System. The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 because it uses ten digits from 0 to 9. In decimal number system, the positions successive to the left of the decimal point represent units, tens, hundreds, thousands and so on.

Every position shows a particular power of the base (10). For example, the decimal number 1457 consists of the digit 7 in the units position, 5 in the tens place, 4 in the hundreds position, and 1 in the thousands place whose value can be written as

$(1\times1000) + (4\times100) + (5\times10) + (7\times1)$

$(1\times10^3) + (4\times10^2) + (5\times10^1) + (7\times1)$

$1000 + 400 + 50 + 7$

1457

Binary Number System

Binary number systems are also known as Base 2 number system wherein, only two binary digits exist, i.e., 0 and 1. Specifically, the usual base-2 is a radix of 2. The figures described under this system are known as binary numbers which are the combination of 0 and 1. For example, 110101 is a binary number.

We can convert any system into binary and vice versa.

For example, to write $(14)_{10}$ as binary number

Solution:

$(14)_{10} = 1110_2$

Octal Number System

It is also known as Base 8 Number System. It uses eight digits, 0,1,2,3,4,5,6,7. Each position of a digit represents a specific power of the base (8).

Example

Octal Number : 12570_8

Calculating Decimal Equivalent:

Step	Octal Number	Decimal Number
Step 1	12570_8	$((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0))_{10}$
Step 2	12570_8	$(4096 + 1024 + 320 + 56 + 0)_{10}$
Step 3	12570_8	5496_{10}

Note : 12570_8 is normally written as 12570.

Hexadecimal Number System

It is also known as Base 16 Number System. It uses 10 digits and 6 letters,
0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

Letters represents numbers starting from 10. A = 10. B = 11, C = 12, D = 13, E = 14, F = 15.

Example

Hexadecimal Number : $19FDE_{16}$

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (F \times 16^2) + (D \times 16^1) + (E \times 16^0))_{10}$
Step 2	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (15 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))_{10}$
Step 3	$19FDE_{16}$	$(65536 + 36864 + 3840 + 208 + 14)_{10}$
Step 4	$19FDE_{16}$	106462_{10}

Computer Codes

Computer codes are used for internal representation of data in computers. As computers use binary numbers for internal data representation, computer codes use binary coding schemes

- In binary coding, every symbol that appears in the data is represented by a group of bits
- The group of bits used to represent a symbol is called a byte.
- As most modern coding schemes use 8 bits to represent a symbol, the term byte is often used to mean a group of 8 bits.
- Commonly used computer codes are BCD, EBCDIC, and ASCII.

BCD

BCD stands for **B**inary **C**oded **D**ecimal
- It is one of the early computer codes.
- It uses 6 bits to represent a symbol.
- It can represent 64 (26) different characters.

Char	BCD Code		Octal
	Zone	Digit	
A	11	0001	61
B	11	0010	62
C	11	0011	63
D	11	0100	64
E	11	0101	65
F	11	0110	66
G	11	0111	67
H	11	1000	70
I	11	1001	71
J	10	0001	41
K	10	0010	42
L	10	0011	43
M	10	0100	44

Char	BCD Code		Octal
	Zone	Digit	
N	10	0101	45
O	10	0110	46
P	10	0111	47
Q	10	1000	50
R	10	1001	51
S	01	0010	22
T	01	0011	23
U	01	0100	24
V	01	0101	25
W	01	0110	26
X	01	0111	27
Y	01	1000	30
Z	01	1001	31

Character	BCD Code		Octal Equivalent
	Zone	Digit	
1	00	0001	01
2	00	0010	02
3	00	0011	03
4	00	0100	04
5	00	0101	05
6	00	0110	06
7	00	0111	07
8	00	1000	10
9	00	1001	11
0	00	1010	12

Example

Show the binary digits used to record the word BASE in BCD

Solution:

B = 110010 in BCD binary notation
A = 110001 in BCD binary notation
S = 010010 in BCD binary notation
E = 110101 in BCD binary notation

So the binary digits

110010	110001	010010	110101
B	A	S	E

will record the word BASE in BCD

EBCDIC

EBCDIC stands for **E**xtended **B**inary **C**oded **D**ecimal **I**nterchange **C**ode
It uses 8 bits to represent a symbol.
It can represent 256 (28) different characters.

Char	EBCDIC Code		Hex
	Digit	Zone	
A	1100	0001	C1
B	1100	0010	C2
C	1100	0011	C3
D	1100	0100	C4
E	1100	0101	C5
F	1100	0110	C6
G	1100	0111	C7
H	1100	1000	C8
I	1100	1001	C9
J	1101	0001	D1
K	1101	0010	D2
L	1101	0011	D3
M	1101	0100	D4

Char	EBCDIC Code		Hex
	Digit	Zone	
N	1101	0101	D5
O	1101	0110	D6
P	1101	0111	D7
Q	1101	1000	D8
R	1101	1001	D9
S	1110	0010	E2
T	1110	0011	E3
U	1110	0100	E4
V	1110	0101	E5
W	1110	0110	E6
X	1110	0111	E7
Y	1110	1000	E8
Z	1110	1001	E9

Character	EBCDIC Code		Hexadecimal Equivalent
	Digit	Zone	
0	1111	0000	F0
1	1111	0001	F1
2	1111	0010	F2
3	1111	0011	F3
4	1111	0100	F4
5	1111	0101	F5
6	1111	0110	F6
7	1111	0111	F7
8	1111	1000	F8
9	1111	1001	F9

Example

Using binary notation, write EBCDIC coding for the word BIT. How many bytes are required for this representation?

Solution:

B = 1100 0010 in EBCDIC binary notation
I = 1100 1001 in EBCDIC binary notation
T = 1110 0011 in EBCDIC binary notation

Hence, EBCDIC coding for the word BIT in binary notation will be

<u>11000010</u>   <u>11001001</u>   <u>11100011</u>
    B   I   T

3 bytes will be required for this representation because each letter requires 1 byte (or 8 bits)

ASCII

ASCII stands for **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange.
- ASCII is of two types – ASCII-7 and ASCII-8.
- ASCII-7 uses 7 bits to represent a symbol and can represent 128 (27) different characters.
- ASCII-8 uses 8 bits to represent a symbol and can represent 256 (28) different characters.
- First 128 characters in ASCII-7 and ASCII-8 are same.

Character	ASCII-7 / ASCII-8		Hexadecimal Equivalent
	Zone	Digit	
0	0011	0000	30
1	0011	0001	31
2	0011	0010	32
3	0011	0011	33
4	0011	0100	34
5	0011	0101	35
6	0011	0110	36
7	0011	0111	37
8	0011	1000	38
9	0011	1001	39

Character	ASCII-7 / ASCII-8		Hexadecimal Equivalent
	Zone	Digit	
A	0100	0001	41
B	0100	0010	42
C	0100	0011	43
D	0100	0100	44
E	0100	0101	45
F	0100	0110	46
G	0100	0111	47
H	0100	1000	48
I	0100	1001	49
J	0100	1010	4A
K	0100	1011	4B
L	0100	1100	4C
M	0100	1101	4D

Character	ASCII-7 / ASCII-8		Hexadecimal Equivalent
	Zone	Digit	
N	0100	1110	4E
O	0100	1111	4F
P	0101	0000	50
Q	0101	0001	51
R	0101	0010	52
S	0101	0011	53
T	0101	0100	54
U	0101	0101	55
V	0101	0110	56
W	0101	0111	57
X	0101	1000	58
Y	0101	1001	59
Z	0101	1010	5A

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ASCII – 7 Coding Scheme

Example

Write binary coding for the word BOY in ASCII-7. How many bytes are required for this representation?

Solution:

B = 1000010 in ASCII-7 binary notation
O = 1001111 in ASCII-7 binary notation
Y = 1011001 in ASCII-7 binary notation

Hence, binary coding for the word BOY in ASCII-7 will be

1000010   1001111   1011001
   B   O   Y

Since each character in ASCII-7 requires one byte for its representation and there are 3 characters in the word BOY, 3 bytes will be required for this representation

ASCII – 8 Coding Scheme

Example

Write binary coding for the word SKY in ASCII-8. How many bytes are required for this representation?

Solution:

S = 01010011 in ASCII-8 binary notation
K = 01001011 in ASCII-8 binary notation
Y = 01011001 in ASCII-8 binary notation

Hence, binary coding for the word SKY in ASCII-8 will be

<u>01010011</u>   <u>01001011</u>   <u>01011001</u>
    S   K   Y

Since each character in ASCII-8 requires one byte for its representation and there are 3 characters in the word SKY, 3 bytes will be required for this representation

Unit – 3

Computer Program

A sequence or set of instructions that a computer can interpret and execute.
A program (noun) is executable software that runs on a computer. A program consists of compiled code that can run directly from the computer's operating system. Examples of programs include Web browsers, word processors, video games, and system utilities. These programs are often called applications. On Windows, programs typically have an .EXE file extension, while Macintosh programs have an .APP extension. Programmers create programs by writing code that instructs the computer what to do. The functions and commands written by the programmer are collectively referred to as source code. When the code is finished, the source code file or files are compiled into an executable program.

Programming Languages
A programming language is a set of written symbols that instructs the computer hardware to perform specific tasks. A programming language consists of all the symbols, characters, and usage rules that permit people to communicate with computers.

First Generation Languages (1GL)
The first generation program language is pure machine code, that is just ones and zeros, e.g. 0010010010101111101010110. Programmers have to design their code by hand then transfer it to a computer by using a punch card, punch tape or flicking switches. There is no need to translate the code and it will run straight away.

Benefits
Code can be fast and efficient

Drawback
Code cannot be ported to other systems and has to be rewritten. Code is difficult to edit and update

Second-generation languages (2GL)
Second-generation languages (2GL) include "assembly language". These programming languages were popular during the late 1950s. A second-generation

language uses alphabet letters, so programming is technically easier than just using complex series of zeros and ones. Second-generation languages offer various assembly mnemonics, which makes it easier for programmers to remember the codes. They are generally not used today by the public, but some third-generation language programs are still used. Second-generation languages use an assembler to convert language statements into machine language. Unlike the first generation languages, programs can be written symbolically, using English words (also known as mnemonics), in a way that a human can understand and are subsequently converted into machine language by an assembler. Assembly languages are specific to computer and CPU.

Benefits

- Code can be fast and efficient
- As it is closer to plain English, it is easier to read and write when compared to machine code

Third Generation Languages (3GL)
Third generation languages, also known as high-level languages, are very much like everyday text and mathematical formulas in appearance. The third-generation languages, or 3GL, are high-level languages, such as C, C++, Java, JavaScript, and Visual Basic.

Most high level languages are considered to be procedure-oriented, or Procedural languages, because the program instructions comprise lists of steps, procedures, that tell the computer not only what to do but how to do it. The programmer spends less time developing software with a high level language than with assembly or machine language because fewer instructions have to be created.

A language translator is required to convert a high-level language program into machine language. Two types of language translators are used with high level languages: compilers and interpreters.

Benefits

- Easily writing programs as compare to machine language and assembly languages.
- To provide programs that can be used on more than one type of machine with very few changes.

Fourth Generation programming languages (4GL)
Fourth generation languages are also known as very high level languages. They are non-procedural languages, so named because they allow programmers and users to specify what the computer is supposed to do without having to specify how the computer is supposed to do it. It requires fewer instructions to accomplish a task than a third generation language.

Fourth generation languages need approximately one tenth the number of statements that a high level languages needs to achieve the same results. Because they are so much easier to use than third generation languages, fourth generation languages allow users, or non-computer professionals, to develop software. The fourth-generation languages, or 4GL, are languages that consist of statements similar to statements in a human language. Fourth generation languages are commonly used in database programming and scripts examples include Perl, PHP, Python, Ruby, and SQL.

Benefits

- Increasing the speed of developing programs.
- Minimizing user effort to obtain information from computer.
- Decreasing the skill level required of users so that they can concentrate on the application rather than the intricacies of coding, and thus solves their own problems without the aid of a professional programmer.
- Minimizing maintenance by reducing errors and making programs that are easy to change.

Fifth Generation programming languages (5GL)
Natural Languages represent the next step in the development of programming languages, i-e fifth generation languages. The text of a natural language statement very closely resembles human speech. In fact, one could word a statement in several ways perhaps even misspelling some words or changing the order of the words and get the same result. These languages are also designed to make the computer "smarter". The fifth-generation languages, or 5GL, are programming languages that contain visual tools to help develop a program. Examples of fifth generation languages include Mercury, OPS5, and Prolog.

The use of natural language touches on expert systems, computerized collection of the knowledge of many human experts in a given field, and artificial intelligence, independently smart computer systems.

Classification of Programming Language

1. **Low Level Languages**

   A computer programming language that is closer to machine language than to human language. A low-level programming language is one that is very basic and close to the machine's native language. A low-level programming language can be thought of as a building block language for software. Machine and Assembly Languages are the examples of low level languages.

   a) **Machine Language:** Machine code is the language the computer can understand directly. Machine code consists of sequences of binary digits. Machine language instructions typically use some bits to represent operations, such as addition, and some to represent operands, or perhaps the location of the next instruction. Machine language is difficult to read and write, but fast to execute.

   b) **Assembly Language:** Assembly code is the most common low-level language and requires assembler to translate into machine code. Assembly code can be converted to machine code using an assembler. Assembly language is based on some alphanumeric symbols. These symbols are called MNEMONICS. Assembly language use English-like strings (ADD, SUM, MOV, INR etc.) instead of 0's and 1's.

2. **High Level Languages**

   A high-level language is a programming language designed to simplify computer programming. The main problem with machine and assembly language is that they are closely related to the structure of computer (i.e. machine dependent). Due to this the programmer must have very detailed knowledge of the instruction set, architecture and connection of peripherals to the ports etc.

   High level language developed to overcome all the above difficulties and it is clearly resemble English and mathematics. The main advantage of high-level languages over low-level languages is that they are easier to read, write, and maintain. Ultimately, programs written in a high-level language must be translated into machine language by a compiler or interpreter. Most common programming languages are considered high-level languages. Examples are C++, C#, Cobol, Fortran, Java, JavaScript, C, Pascal, Perl, PHP, Python etc.

   (A) Procedural Oriented Language

   All the general purpose programming languages which are able to solve a variety of problems are called procedural oriented language. These are also called third generation language.

(B) Problem oriented Language

Fourth generation language designed to solve specific applications by enabling us to describe what we want rather than step-by-step procedures for getting there.

(C)   Natural / AI Language

Natural/ AI language are still in the development stage. The term artificial (AI), was first coined by John Mc Carthy during 70s. The term AI is defined as: "The simulation of human intelligence on a machine, so as to make the efficient to identify and use the right piece of "Knowledge" at a given step of solving a problem". A system capable of planning and executing the right task at the right time is generally called intelligent.

Programming Techniques

1) Top-down approach

Top-down programming focuses on the use of modules. It is therefore also known as modular programming. In this approach, a large project divides into small programs, and these programs are known as modules.

C programming language supports this approach for developing projects. It is always good idea that decomposing solution into modules in a hierarchal manner. The basic task of a top-down approach is to divide the problem into tasks and then divide tasks into smaller sub-tasks and so on.

In this approach, first we develop the main module and then the next level modules are developed. This procedure is continued until all the modules are developed.

Advantages of top-down approach:
1. In this approach, first, we develop and test most important module.
2. This approach is easy to see the progress of the project by developer or customer.
3. Using this approach, we can utilize computer resources in a proper manner according to the project.
4. Testing and debugging is easier and efficient.
5. In this approach, project implementation is smoother and shorter.
6. This approach is good for detecting and correcting time delays.

Top Down Design
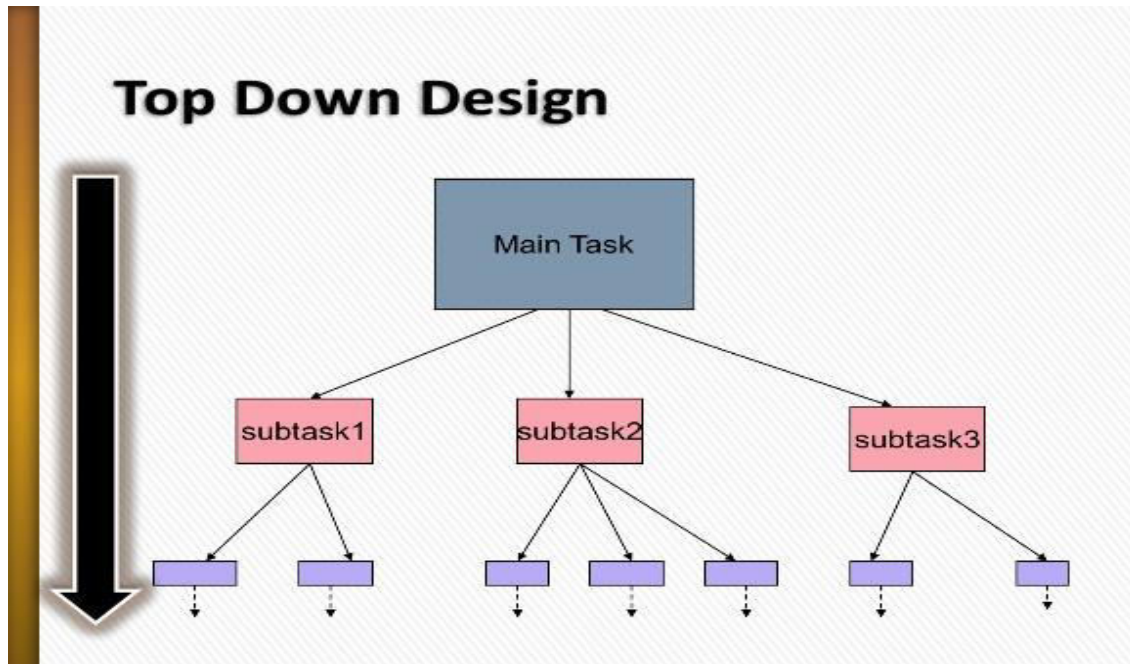
2) Bottom-up approach

C++ used the bottom-up approach for project development. It is an alternative approach to the top-down approach.

In this approach, bottom level modules developed first (Lower level module developed, tested and debugged). Then the next module developed, tested and debugged. This process is continued until all modules have been completed.

This approach is exactly opposite to the top-down approach. This approach is good for reusability of code.

Bottom up Design
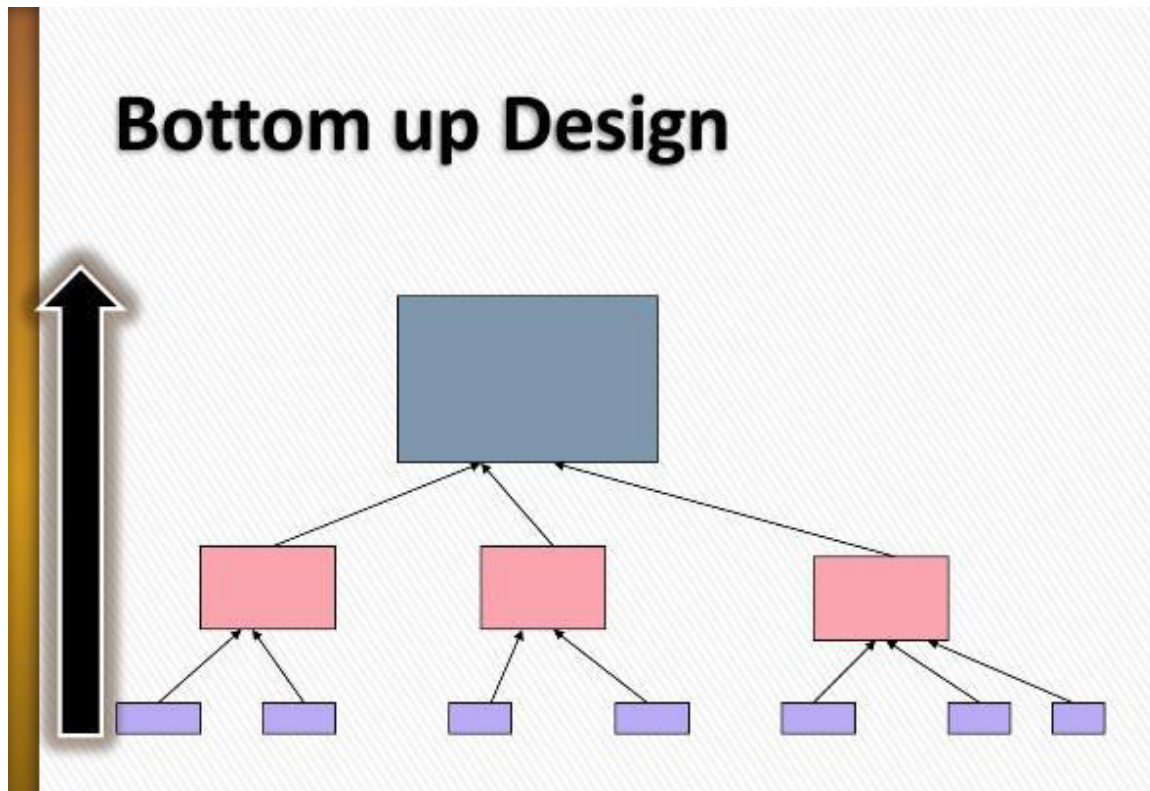
Structured Programming

Structured programming is concerned with the structures used in a computer program. Generally, structures of computer program comprise decisions, sequences, and loops. The **decision structures** are used for conditional execution of statements (for example, 'if statement). The **sequence structures** are used for the sequentially executed statements. The **loop structures** are used for performing some repetitive tasks in the program.

Structured programming forces a logical structure in the program to be written in an efficient and understandable manner. The purpose of structured programming is to make the software code easy to modify when required. Some languages such as Ada, Pascal, and dBase are designed with features that implement the logical program structure in the software code. Primarily, the structured programming focuses on reducing the following statements from the program.

1. 'GOTO' statements.
2. 'Break' or 'Continue' outside the loops.
3. Multiple exit points to a function, procedure, or subroutine. For example, multiple 'Return' statements should not be used.

4. Multiple entry points to a function, procedure, or a subroutine.

Structured programming generally makes use of top-down design because program structure is divided into separate subsections. A defined function or set of similar functions is kept separately. Due to this separation of functions, they are easily loaded in the memory. In addition, these functions can be reused in one or more programs. Each module is tested individually. After testing, they are integrated with other modules to achieve an overall program structure. Note that a key characteristic of a structured statement is the presence of single entry and single exit point. This characteristic implies that during execution, a structured statement starts from one defined point and terminates at another defined point.

Uses of Branching and Looping in Programming

We can control the flow of a program using branching and looping statements. Branching statements give us code which is optionally executable, depending on the outcome of certain tests which we can define. Looping statements are used to repeat a section of code a number of times or until a condition has been reached.

Branching statements (also called conditional statements) let you make decisions in code. Branching statements are used to control the flow of a program by checking one or more conditions. There are two branching or decision making statements:

1. **If Statement**

2. **Switch Statement**

1. **If Statement:** It allows you to test whether statements are true or false and then execute statement block.
   There are four types of if statements:

(a) **If Statement**

If statement is the simplest form of the control statement. It is very frequently used in allowing the flow of program execution and decision making.

The if structure has the following syntax:

if(condition)

{

Statement Block;

}

if the condition is true then execute the following statement block or if the condition is false the computer skips the statement block and moves on to the next instruction in the program.

Example:

```
#include<iostream.h>
#include<conio.h>
void main()
{
int x,y;
x = 7;
y = 5;
if(x > y)
{
Cout<<"x is greater than y";
}
getch();
}
```

(b)if else statement

This statement is used to test a condition and execute a statement block if the condition is true and execute statement block associated with else if it is false.

if(condition)

{

Statement Block;

}

else

{

Statement Block;

```
}
```

Example:

```
#include<iostream.h>
#include<conio.h>
void main()
{
    int x, y;
    x = 5;
    y = 7;
    if (x > y)
    {
        printf("x is greater than y");
    }
    else
    {
        printf("y is greater than x");
    }
    getch();
}
```

(c) if else if ladder statement

If we wants to check the two or more conditions then we can use the if-else if ladder.

Syntax:

```
if(condition 1)
{
    statement-block1;
}
else if(condition 2)
```

```
{
    statement-block2;
}
else if(condition 3)
{
    statement-block3;
}
else
    default-statement;
```

The expression is tested from the top (of the ladder) to downwards. As soon as the true condition will found, the statement associated with it is executed.

(d) Nested if Statement
If statement inside other if statement is known as Nested if statement. The nested if...else statement allows you to check for multiple test expressions and execute different codes for more than two conditions.

Syntax:
```
if( condition 1)
 {
    if(condition 2)
 {
Statement Block;
 }
 }
```

Example:

```
#include <iostream.h>
int main()
{
    int a,b,c;
    cout<<"Enter 3 numbers:";
```

```cpp
    cin>>a>>b>>c;
     if(a>=b)
     {
        if(a>=c)
           cout<<a<<" is largest";
        else
           cout<<c<<" is largest";
     }
     else if(b>=c)
              cout<<b<<" is largest";

     else
              cout<<c<<" is largest";

     getch();
}
```

2. Switch Statement

A **switch** statement allows a variable to be tested for equality against a list of values. When a match is found then corresponding statement block will be executed.Each value is called a case, and the variable being switched on is checked for each case.

Syntax:

The syntax for a switch statement in C++ is as follows:

switch(expression)

{

  case constant-expression :

    statement block;

    break; //optional

  case constant-expression :

statement block;

break; //optional

// you can have any number of case statements.

default : //Optional

statement(s);

}

The following rules apply to a switch statement −

- The **expression** used in a **switch** statement must have an integral or enumerated type.

- You can have any number of case statements within a switch. Each case is followed by the value to be compared to and a colon.

- The **constant-expression** for a case must be the same data type as the variable in the switch, and it must be a constant or a literal.

- When a break statement is reached, the switch terminates, and the flow of control jumps to the next line following the switch statement.

- Not every case needs to contain a break. If no break appears, the flow of control will *fall through* to subsequent cases until a break is reached.

- A **switch** statement can have an optional **default** case, which must appear at the end of the switch. The default case can be used for performing a task when none of the cases is true. No break is needed in the default case.

Example:
#include <iostream.h>
void main ()
{
  // local variable declaration:
  char grade = 'D';

```cpp
    switch(grade)
{
    case 'A' :
        cout << "Excellent!" << endl;
        break;
    case 'B' :
    case 'C' :
        cout << "Well done" << endl;
        break;
    case 'D' :
        cout << "You passed" << endl;
        break;
    case 'F' :
        cout << "Better try again" << endl;
        break;
    default :
        cout << "Invalid grade" << endl;
    }
    cout << "Your grade is " << grade << endl;
    getch();
}
```

Looping Statement

There may be a situation, when you need to execute a block of code several numbers of times. In general, statements are executed sequentially: The first statement in a function is executed first, followed by the second, and so on.

A loop statement allows us to execute a statement or group of statements multiple times.

There are 3 type of loops in C++ language

1. while loop

2. for loop

3. do-while loop

1. *do-while loop*

It executes a statement block until the condition becomes false. When the test expression is false, do...while loop is terminated. The body of do...while loop is executed once before the test expression is checked.

The syntax of do..while loop is:
```
do {
   statement block;
}
while (testExpression);
```

Example:

```
#include <iostream.h>

void main()

{

Int i=1;

 do {

   cout<<i<<endl;

      i=i+1;

   }

   while(i<= 10);

getch();

}
```

2. **While Statement**

While loop executes a statement block until the condition becomes false. When the test expression is false, while loop is terminated.

Syntax:

```
while (testExpression)
{
    Statement Block;
}
```

Example:

```
#include <iostream.h>

int main()

{

Int i=1;

        while(i<= 10)

 {

   cout<<i<<endl;

    i=i+1;

  }

getch();

}
```

3. For Statement

for loop is used to execute a set of statement repeatedly until a particular condition is satisfied.**.**

Syntax:

```
for(initialization; condition; increment/decrement)

 {

  statement-block;

 }
```

In **for** loop we have exactly two semicolons, one after initialization and second after condition. In this loop we can have more than one initialization or increment/decrement, separated using comma operator. **for** loop can have only one **condition**.

Example:

```
#include <iostream.h>
void main()
{
    int n, factorial = 1;

    cout << "Enter a positive integer: ";
    cin >> n;
    for (int i = 1; i <= n; ++i)
{

        Factorial=factorial * i;
 }
    cout<< "Factorial of "<<n<<" = "<<factorial;
    getch();
}
```

Function

A function is a group of statements that together perform a task. Every C++ program has at least one function, which is main(), and all the most trivial programs can define additional functions.

You can divide up your code into separate functions. How you divide up your code among different functions is up to you, but logically the division usually is such that each function performs a specific task.

A function declaration tells the compiler about a function's name, return type, and parameters. A function definition provides the actual body of the function.

The C++ standard library provides numerous built-in functions that your program can call. For example, function strcat() to concatenate two strings, function memcpy() to copy one memory location to another location and many more functions.

A function is known with various names like a method or a sub-routine or a procedure etc.

Defining a Function

The general form of a C++ function definition is as follows −

```
return_type function_name( parameter list )
{
   body of the function
}
```

A C++ function definition consists of a function header and a function body. Here are all the parts of a function −

Return Type − A function may return a value. The return_type is the data type of the value the function returns. Some functions perform the desired operations without returning a value. In this case, the return_type is the keyword void.

Function Name − This is the actual name of the function. The function name and the parameter list together constitute the function signature.

Parameters − A parameter is like a placeholder. When a function is invoked, you pass a value to the parameter. This value is referred to as actual parameter or argument. The parameter list refers to the type, order, and number of the parameters of a function. Parameters are optional; that is, a function may contain no parameters.

Function Body − The function body contains a collection of statements that define what the function does.

Example

Following is the source code for a function called max(). This function takes two parameters num1 and num2 and return the biggest of both −

// function returning the max between two numbers

```
int max(int num1, int num2)
{
  // local variable declaration
  int result;
  if (num1 > num2)
    result = num1;
  else
    result = num2;
  return result;
}
```

Function Declarations

A function declaration tells the compiler about a function name and how to call the function. The actual body of the function can be defined separately.

A function declaration has the following parts −

```
return_type function_name( parameter list );
```

For the above defined function max(), following is the function declaration −

```
int max(int num1, int num2);
```

Parameter names are not important in function declaration only their type is required, so following is also valid declaration −

```
int max(int, int);
```

Function declaration is required when you define a function in one source file and you call that function in another file. In such case, you should declare the function at the top of the file calling the function.

Calling a Function

While creating a C++ function, you give a definition of what the function has to do. To use a function, you will have to call or invoke that function.

When a program calls a function, program control is transferred to the called function. A called function performs defined task and when it's return statement is executed or when its function-ending closing brace is reached, it returns program control back to the main program.

To call a function, you simply need to pass the required parameters along with function name, and if function returns a value, then you can store returned value. For example −

```cpp
#include <iostream>
// function declaration
int max(int num1, int num2);

int main () {
   // local variable declaration:
   int a = 100;
   int b = 200;
   int ret;

   // calling a function to get max value.
   ret = max(a, b);
   cout << "Max value is : " << ret << endl;

   return 0;
}

// function returning the max between two numbers
int max(int num1, int num2) {
   // local variable declaration
   int result;
```

```
   if (num1 > num2)
      result = num1;
   else
      result = num2;

   return result;
}
```

I kept max() function along with main() function and compiled the source code. While running final executable, it would produce the following result −

Max value is : 200

Function Arguments

If a function is to use arguments, it must declare variables that accept the values of the arguments. These variables are called the formal parameters of the function.

The formal parameters behave like other local variables inside the function and are created upon entry into the function and destroyed upon exit.

Types of functions

1) Predefined standard library functions – such as puts(), gets(), getch(), clrscr() etc – These are the functions which already have a definition in header files (.h files like stdio.h and iostream.h), so we just call them whenever there is a need to use them.

2) User Defined functions – The functions that we create in a program are known as user defined functions.

Decomposition

Decomposition is the process of breaking a large problem into more manageable sub-problems. The motivating principle is that large problems are disproportionately harder to solve than small problems. It's much easier to write two 500-line programs than one 1000-line program. In C the unit of decomposition is the function. In C++ or Java the unit of decomposition is the class. For decomposition to work, the subparts of the whole problem should be as

independent from each other as possible. That does not mean that they subparts will not depend on each other at all. They should just not depend on details of each other unnecessarily. Independence is especially important in group projects where different sub problems are attacked by different people. The programmer needs to be able to focus on each problem without worrying about the rest of the program. The need for good decomposition is magnified as the number of lines and the number of programmers grows.

Functional Decomposition

Functional Decomposition is a fundamental analysis technique. It breaks a complex problem into successive layers of more manageable and comprehensive pieces, resulting in a hierarchically structured Function Chart that describes the problem and/or solution in levels of increasing detail.

In Functional Decomposition, the lower level functions/processes completely describe the parent. A function/process at a lower level cannot exist unless it is included within its parent function/process.

Functional Decomposition drives the analysis process. The logical functions and processes become the subject, and therefore the focus, of interviews and verification activities such as walk-throughs. Similarly, the logical processes will eventually be organized into application systems. The Functional Decomposition must therefore be approached in a systematic manner. It must aim to ensure that each function and process is conceptually and operationally independent.

Concepts of Coupling and Cohesion

The aim of Functional Decomposition is to identify functions which are highly cohesive and loosely coupled. This makes them conceptually and operationally independent and promotes more stable business systems.

Coupling is a measure of the degree to which two functions are interdependent. Loose coupling is good because changes to one function can be made with less impact on other functions, i.e., you do not have to know about other functions to make changes to the function being studied.

Cohesion is a measure of the strength of association of the processes within a function. High cohesion is good because highly cohesive functions that perform one well-defined objective are easier to understand and maintain.

Benefits of Good Functional Decomposition

A good Functional Decomposition helps the analysis in several ways:

- The simplicity of the structure and representation aids in understanding the breakdown of functions and processes.
- Specifying the precise requirements and features for each function becomes easier because the functions and processes are broken down into smaller units.
- The partitioning and independence of the functions localizes errors and minimizes system faults.
- It allows the customer to view and discuss the organization in a form that can be dealt with, i.e., as a collection of functions, rather than as a continuous process.
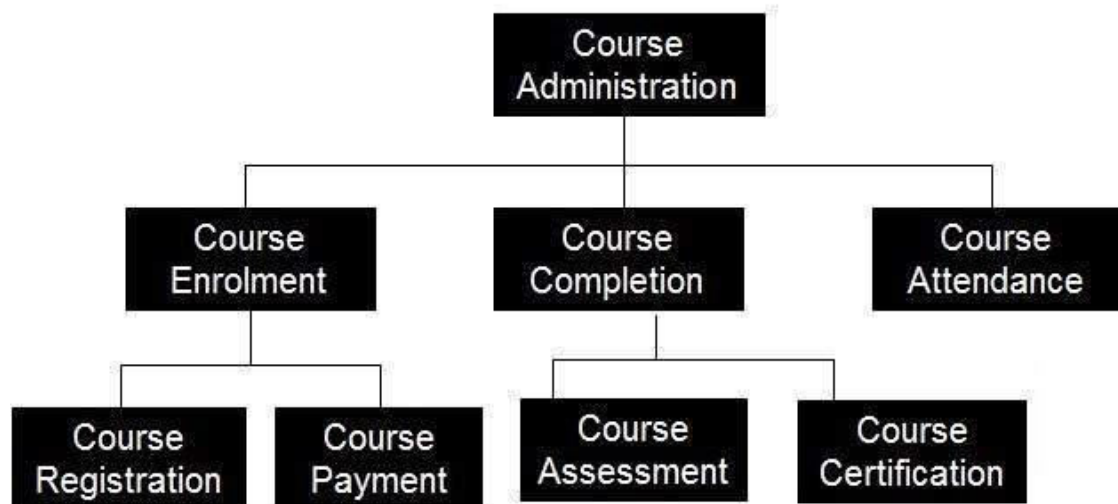
Unit-4

Internet

The Internet is generally defined as a global network connecting millions of computers. More than 190 countries are linked into exchanges of data, news and opinions. The Internet is a global network of billions of computers and other electronic devices. No one actually owns the Internet, and no single person or organization controls the Internet in its entirety.

The history of the Internet begins with the development of electronic computers in the 1950s. Initial concepts of wide area networking originated in several computer science laboratories in the United States, United Kingdom, and France.[1] The US Department of Defense awarded contracts as early as the 1960s, including for the development of the ARPANET project, directed by Robert Taylor and managed by Lawrence Roberts. The first message was sent over the ARPANET in 1969 from computer science Professor Leonard Kleinrock's laboratory at University of California, Los Angeles (UCLA) to the second network node at Stanford Research Institute (SRI).

In 1981 NSF supported the development of the Computer Science Network (CSNET). CSNET connected with ARPANET using TCP/IP, and ran TCP/IP over X.25, but it also supported departments without sophisticated network connections, using automated dial-up mail exchange.

The terms internet and World Wide Web are often used interchangeably, but they are not exactly the same thing; the internet refers to the global communication system, including hardware and infrastructure, while the web is one of the services communicated over the internet. The World Wide Web—usually called the Web for short—is a collection of different websites you can access through the Internet. A website is made up of related text, images, and other resources. Websites can resemble other forms of media—like newspaper articles or television programs—or they can be interactive in a way that's unique to computers.

The purpose of a website can be almost anything: a news platform, an advertisement, an online library, a forum for sharing images, or an educational site

Once you are connected to the Internet, you can access and view websites using a type of application called a web browser. Just keep in mind that the web browser itself is not the Internet; it only displays websites that are stored on the Internet.

How does the Internet work?

It's important to realize that the Internet is a global network of physical cables, which can include copper telephone wires, TV cables, and fiber optic cables. Even wireless connections like Wi-Fi and 3G/4G rely on these physical cables to access the Internet.

When you visit a website, your computer sends a request over these wires to a server. A server is where websites are stored, and it works a lot like your computer's hard drive. Once the request arrives, the server retrieves the website and sends the correct data back to your computer.

Other things you can do on the Internet

One of the best features of the Internet is the ability to communicate almost instantly with anyone in the world. Email is one of the oldest and most universal ways to communicate and share information on the Internet, and billions of people use it. Social media allows people to connect in a variety of ways and build communities online. There are many other things you can do on the Internet. There are thousands of ways to keep up with news or shop for anything online. You can pay your bills, manage your bank accounts, meet new people, watch TV, or learn new skills. You can learn or do almost anything online.

WWW

The term WWW refers to the World Wide Web or simply the Web. The World Wide Web consists of all the public Web sites connected to the Internet worldwide, including the client devices (such as computers and cell phones) that access Web content. The WWW is just one of many applications of the Internet and computer networks.

The World Web is based on these technologies:

- HTML - Hypertext Markup Language
- HTTP - Hypertext Transfer Protocol
- Web servers and Web browsers

The WWW, the newest Internet service accelerated the growth of internet by giving it an easy to use, point and click ,graphical interface .Users are attracted to the WWW because it is interactive ,combines graphics ,text, sound and animation in to a rich communication medium.

The www is many things to its millions of users .It is used as market place ,art gallery, library, community center, school, publishing house and whatever else its author create.

The World Wide Web and HTTP:

(1) Allow you to create links from one piece of information to another.

(2) Can incorporate references to sounds, graphics and movies etc.

 (3) Communication with other Internet Protocols, such as FTP (File transfer protocol), Gopher, and Telnet.

The web presents information as a series of documents often referred to as web pages that were prepared using the Hypertext Markup Language (HTML). Using HTML, the document author can specially code sections of the documents to point to other information resources. These specially coded sections are referred to hypertext links. The WWW is non linear with no top, or no bottom .Non linear means we do not have to follow a hierarchical path to information resources.

The complete set of documents residing on all Internet servers that use the HTTP protocol, accessible to users via a simple point-and-click system. Collection of internet resources (such as FTP telnet Usenet), hyperlinked text, audio, and video files and remote sites that can be accessed and searched by browsers based on standards such as HTTP and TCP/IP. Also called the web, A part of the Internet accessed through a graphical user interface and containing documents often connected by hyperlinks called also Web Therefore World wide web is an information system on the Internet which allows documents to be connected to other documents by hypertext links, enabling the user to search for information by moving from one document to another.

Web Browser

Web Browser is an application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar.

Web browser can show text, audio, video, animation and more. It is the responsibility of a web browser to interpret text and commands contained in the web page.

Earlier the web browsers were text-based while now a days graphical-based or voice-based web browsers are also available. Following are the most common web browser available today:

Browser	Vendor
Internet Explorer	Microsoft
Google Chrome	Google
Mozilla Firefox	Mozilla
Netscape Navigator	Netscape Communications Corp.
Opera	Opera Software
Safari	Apple
Sea Monkey	Mozilla Foundation
K-meleon	K-meleon

A Browser provides a number of useful functions:

- It allows you to enter the address of the site called a URL.
- It formats web documents for display on your screen.

- It allows you to back up and go forward through pages you have already visited.
- It allows you to copy text from the screen and paste it into a word processing program.
- It allows you to print the document you see on the screen.
- It makes it possible to transfer files-text, graphics, movies, animations, sounds, and programs from other computers to your computer (called downloading).
- It allows you to send and receive emails and other internet services such as ftp (file transfer protocol), gopher, and Usenet news-groups.

URL:

URL stands for Uniform Resource Locator. It is the standard way to give the address of any resource (files, images, etc.) on the Internet that is accessible through the World Wide Web (WWW). URLs tell you what kind of site you are accessing (Web page, gopher site, ftp site, telnet link, etc.) and where the site is located. Examples include the following:

http://www.hunter.cuny.edu/
gopher://gopher://gopher.genethon.fr/11/Biblio/Journaux
telnet://cunix.cc.columbia.edu
ftp://ftp.apple.com/
news://bionet.cellbiol
mailto:userid@host.domain

Domain Name:

Domain name is the unique name that identifies an Internet site. Domain Names always have 2 or more parts, separated by dots. The part on the left is the most specific, and the part on the right is the most general. If the address ends in .edu it is an educational institution, .com is a company, .gov a government organization, and so on.

edu : educational institution (Hunter College: hunter.cuny.edu)
com : commercial business (CNN: cnn.com)
org : non profit organization (United Nations: un.org)
 net : for companies or organizations that run large networks (Teachers Net: teachers.net)
gov : government (US Dept. of Edu.: ed.gov)
mil: military agencies (US Navy: navy.mil)

There are also two letter international country codes (Geographical Domain names) as part of domain names. (In the U.S. country codes are not used in Higher education) -- (Ex: us, ca, uk, in, de, tr, at, jp, il, etc.)
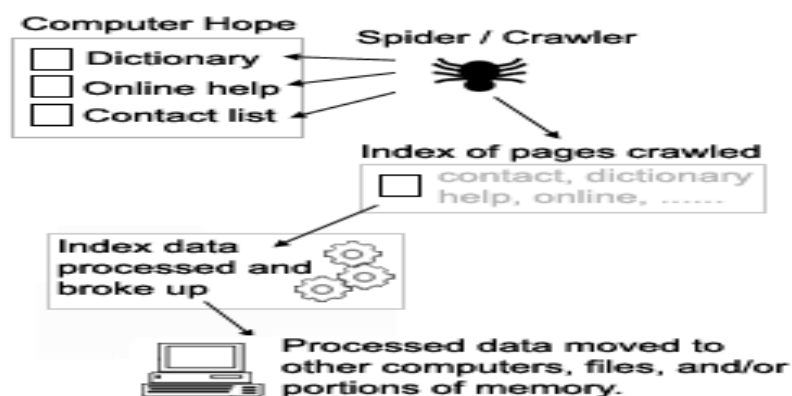
Search Engine

Search engines are programs that search documents for specified keywords and return a list of the documents where the keywords were found. A search engine is a software program or script available through the Internet that searches documents and files for keywords and returns the results of any files containing those keywords. Today, there are thousands of different search engines available on the Internet, each with their own abilities and features. The first search engine ever developed is considered Archie, which was used to search for FTP files and the first text-based search engine is considered Veronica. Today, the most popular and well-known search engine is Google. Other popular search engines include AOL, Ask.com, Baidu, Bing and Yahoo.

How to access a search engine

For users, a search engine is accessed through a browser on their computer, Smartphone, tablet, or another device. Today, most new browsers use an Omnibox, which is a text box at the top of the browser that shows the address and is where you can also search on the Internet. You can also visit one of the major search engines home page to perform a search.

How a search engine works

Because large search engines contain millions and sometimes billions of pages, many search engines not only just search the pages but also display the results depending upon their importance. This importance is commonly determined by using various algorithms.

As illustrated in the image on the right, the source of all search engine data is a spider or crawler, which automatically visits pages and indexes their contents. Once a page has been crawled, the data contained within the page is processed and indexed. Often, this can involve the steps below.

- Strip out stop words.
- Record the remaining words in the page and the frequency they occur.
- Record links to other pages.
- Record information about images or other embedded media.

The data collected above is used to rank the page and is the primary method a search engine uses to determine if a page should be shown and in what order. Finally, once the data is processed it is broken up into one or more files, moved to different computers, or loaded into memory where it can be accessed when a search is performed.

Locating information on the web

A browser is a program on your computer that enables you to search ("surf") and retrieve information on the Worldwide Web (WWW), which is part of the Internet. The Web is simply a large number of computers linked together in a global network, that can be accessed using an address (URL, Uniform Resource Locator, e.g. http://www.vyapam.nic.in for the Vyapam, in the same way that you can phone anyone in the world given their telephone number.

URLs are often long and therefore easy to type incorrectly.   They all begin with http://, and many (but not all) begin with http://www. In many cases the first part (http://, or even http://www.) can be omitted, and you will still be able to access the page.

URLs are constructed in a standard fashion. Take, for example, the address of this page:

http://vyapam.nic.in/result/operator/basics.html

The ".in" indicates that the server is in India. The page you have accessed is called basics.html, and it resides in a folder on the server called "operator", which is in the folder called "result".   If the URL that you type does not work, and you have typed it correctly (no mistakes are allowed!), the reason may be that the host has renamed the web page, or moved it to another folder on the server, or you are not

allowed access to that level. Most information is found on the Internet by utilizing search engines. A search engine is a web service that uses web robots to query millions of pages on the Internet and creates an index of those web pages. Internet users can then use these services to find information on the Internet.

A search engine is a program which helps you find content that you are a looking for. There are a variety of search engines but the most widely used one is Google's search engine.

Typically you type in to Google what you are looking for and a screen similar to the following is displayed.
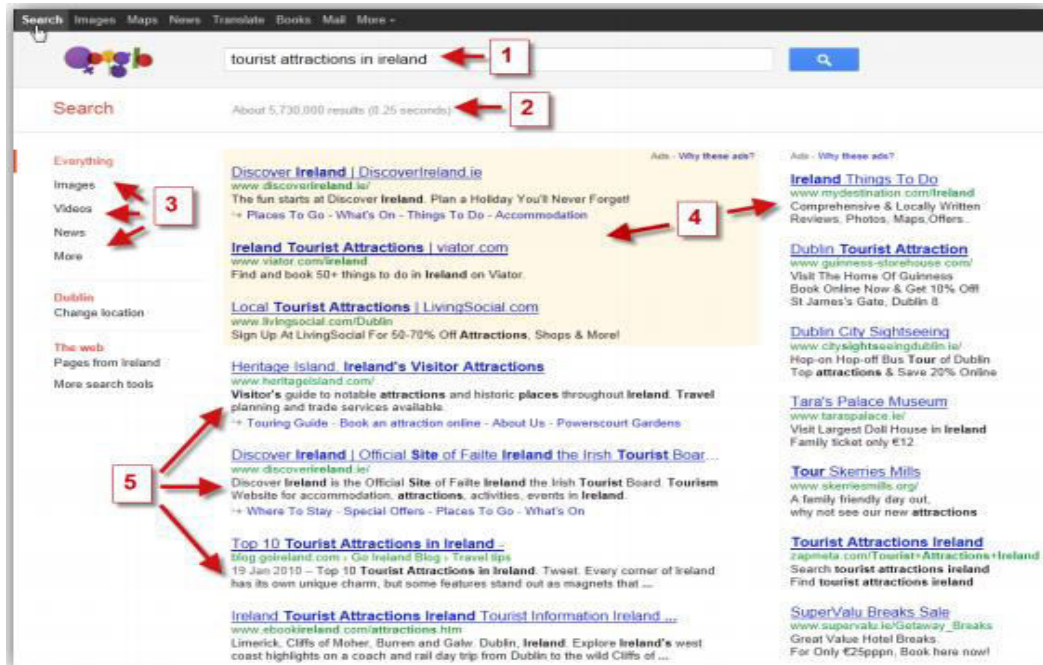
1. This is the search term you have typed in.

2. This is where Google lists out the total results it has found based on these search terms (see the section "Guidelines on Searching" that follows). In the example above, Google found over 5.7 million web pages that it thought matched or closely matched the search term 'tourist attractions in ireland''.

3. Google displays other types of search results based on this query. For example, you may want to look at videos that match the words 'tourist attractions in ireland', images, news articles, and so on.

4. Google displays advertisements both at the top of the results list and over on the right hand side. The advertisements that are displayed are based on you searching for information that is relevant to them. The advertiser does not pay any money for these ads unless you actually click on the advertisement. If you click on the advertisement you are brought to a web page containing more information.

5. This is the search results. On the first page of search results Google displays a list of the web pages that it thinks most accurately match the search terms. For the first search result in the list you will see there are additional links for Contact Us, Recruitment, and so on. Google will automatically display these for certain sites and it's generally for sites that are very popular.

Applications of Information Technology

IT in business and Industry

One of the first and largest applications of computers is keeping and managing business and financial records. Most large companies keep the employment records of all their workers in large databases that are managed by computer programs. Similar programs and databases are used in business functions like billing customers; tracking payments received and payments to be made; and tracking supplies needed and items produced, stored, shipped, and sold. In fact, practically all the information companies need to do business involves the use of computers and Information Technology. Almost all the financial transactions in the world are done electronically. Newer technologies like m-commerce have enabled almost everybody to carry out routine financial transactions on the move.

Computers are everywhere and business and industries are using them. Without computer, modern corporation could not even exist. Most business activities involve transactions with suppliers, employees, or customers. Computers can make these transactions possible. Now that it's so easy to connect a computer at home to all of the computers at the office, more and more people are working at home.

Using desktop publishing programs, or even sophisticated word processing programs, people can create sales letters, brochures, price lists, newsletters, and even book length manuals. Financial analysis is performed throughout the company from top management on down. People can analyze investments, sales, expenses, markets and other aspects of business using both numbers and graphs. Computer has had a major impact in industries where products are designed and manufactured. Computer-aided design (CAD) is used to developed products. Computer-aided manufacturing (CAM) is used to produce them. Factory floors are becoming increasingly populated by computers used for many purposes including inventory control and planning and process control. Computers are also used to run robots that create, finish, assemble, and test products and their components.

Every day, people use computers in new ways. Computers and other electronic devices are becoming increasingly affordable. They continue to be more powerful as information-processing tools as well as easier to use. Humans are continually becoming dependant on IT-enabled devices for carrying out simple tasks like remembering a phone number to complex ones like flying a fighter plane. Information Technology has applications in almost all aspects of our life. Some of the important ones are:

Home and at Play

When your computer is connected to a CD ROM drive, encyclopedic information, movies and animation are instantly available. When your Computer is connected to the phone line, you can visit your community or other parts of the world. The lines between work, play and education are beginning to disappear as resources once available only at work or school become available in the home.

The World Wide web or on-line services such as CompuServe, America On-Line and Microsoft Network are only a phone call away From the comfort of your home you can research school or work assignment exchange email, join special interest groups, download files, play games or make airline reservations. Sales catalogs are now being computerized and many catalogs are even being put on the web so you can do on line shopping.

Community activities are listed on a web site in a Marblehead Massachusetts. Accessible from any computer with an internet connection, you can read the newspaper, shop want-ads, or read review of the movie in town. It's all there, in one easy to find source.

Reference materials from science and engineering data to phone numbers are being digitized. You can get much of this material on CD-ROM discs or over the internet. Students are often able to research their assignments without leaving their homes or dorms. Here's a popular site on vernal pools and their significance to our environment.

Home shopping and banking are growing areas of computing. The largest online bookstore in the world allows you to purchase books and movies, and it even gift wraps.

Computers at Play

For some time games have been played on personal computers, and increasingly the line between education and games is growing happily thin, below the magic bus, an educational game for 6-10 years old. Takes them on a tour of solar system computer can add some fun to the learning process.

Above a flight simulator allows both children and adults to experience being a pilot and to learn about the principles of flying.

Although they are a long way from fulfilling their potential, computers may become the most amazing teaching tool ever invented. They can pace instruction differently for each student, animate important concepts and use interactivity to involve students in the learning process. In the future, imaging having immediate access to all the great books and articles ever written all the great photographs ever taken and all the great painting ever painted. Your access to educational resources will seem unlimited by today's standards.

IT in Education

The advent of Information Technology has changed the meaning of the term "literate", with computer literacy being almost as important as basic literacy in many cases. Computer education is an essential course at the primary level in most schools across the world. With more information getting digitized every day, and the internet making it accessible to anyone across the world, students are increasingly relying on electronic sources of information rather than physical libraries for their needs. Instructional methodology has also undergone a sea change with use of images, animations, videos, presentations and e-learning to complement traditional techniques.

As technology has advanced, educational software has become a major influence at all levels from elementary schools to universities. The ability to connect computers

and students together over a network such as the internet opens up fantastic educational opportunities. At colleges computers are increasingly being used to teach courses like the once you're taking. Computers are especially valuable for students with special needs.

Computers in Training

Training programs in business and various organizations are huge and expensive. To save money and improve performance, companies are using computer based training to train people on procedures and techniques they need to know in their jobs. CBT ranges from relatively simple online help systems to sophisticated virtual reality machines such as those used by the military and airlines to train pilots training programs in organizations rely heavily on information technology such as video conferencing.

IT in Entertainment and the Arts

Information technology isn't limited to the areas where you would most expect to find it such as business and industry. It's also being widely used in the entertainment and arts worlds. From making movies like pixar's toy story. The first all digital animated feature film, to modern dance at the local college to professional sports, computers are at work. There are almost as many applications as there are entertainments and artists.

Computers in Entertainment

IT has changed the lifestyle of most people. The convergence of various technologies has created various options for entertainment like games, streaming music and video, digital television broadcasts, satellite radio, animated movies etc. which can be accessed with the help of mobile phones, PDAs, notebook computers or on television either with a cable connection or wirelessly using newer-generation WiFi, CDMA or GPRS technologies.

Computers are used in entertainment to create or enhance a production or performance. The tools have become so sophisticated that it's becoming almost impossible to distinguish between the real and the artificial in film and photography. Movies computers are widely used to create special effects in big budget movies. Animation in earlier days bugs bunny the road runner and while.

Computers in the Arts

Computers play a growing role in dance, photography, painting and many other arts. The fluid movements in dance are difficult if not impossible to convey

through printed text and drawings. However, with computers the movements can be brought to life through animation. The computer and the web allow you to visit most of the art museums in the world from your home. Photos can be digitized by dropping them off at your local photo store, or you can take digitized photos with one of the   newer digital cameras. You can manipulate them in hundreds of ways. You can cut people from one photo and paste them into another seamlessly.

Computers in Science and Engineering

Supercomputers have numerous applications in chemistry and physics. Satellites are commonly used in information technology they may simply relay signals from one point to another eliminating the need for wires between two locations. They also broadcast TV and even internet signals. Physicians use information technology to understand the human body and to diagnose disorders. In an attempt to better understand earthquakes, scientists use computers to gather and plot data. IT is also used in astronomy.

Scientific progress in fields like biotechnology is almost entirely dependent on the use of computers and other microprocessor-controlled devices. Using supercomputers, meteorologists predict future weather by using a combination of observations of weather conditions from many sources, a mathematical representation of the behavior of the atmosphere, and geographic data. Computer-aided design (CAD) and computer-aided manufacturing (CAM) programs have led to improved products in many fields, especially where designs tend to be very detailed. Computer programs make it possible for engineers to analyze designs of complex structures such as power plants and space stations.

Information Technology plays an important role in medicine. For example, a scanner takes a series of pictures of the body by means of computerized axial tomography (CAT) or magnetic resonance imaging (MRI). A computer then combines the pictures to produce detailed three-dimensional images of the body's organs. In addition, the MRI produces images that show changes in body chemistry and blood flow. Most critical life support equipment are programmed to respond to changes in the patient's status in split-seconds, thereby reducing the response time and risk of human error. Newer concepts like robotic surgery enable specialists to perform surgeries from remote locations. Genomic studies greatly depend on supercomputing power to develop technologies for the future.

IT in Governance

The concept of e-governance is one of the most novel applications of Information Technology whereby it is changing the lives of millions across the globe. Computerization of Government activities makes it easier to supervise and audit, and makes the administration more responsive to the needs of society. It also bridges the divide between the Government and the people. Technologies like touch-screen kiosks help disseminate information on land records, photo identity cards, pending bills etc. and enable even illiterate people to take more informed decisions. India is leading the world in the effective use of IT for elections.

Information Technology plays a vital role in most of our daily activities. There is hardly anyone who has not been affected or influenced by IT. With each passing day, newer applications of IT are being developed which increase our interaction with and dependence on IT-enabled devices. Therefore, understanding this technology and using it creatively is imperative to human progress.

Unit -5

Internet Connectivity

Internet connectivity is the process that enables individuals and organizations to connect to the Internet using computer terminals, computers, and mobile devices, sometimes via computer networks. Once connected to the Internet, users can access Internet services, such as email and the World Wide Web. There are a lot of different ways of connecting to the internet today. Internet connectivity means fact of being connected to the internet.
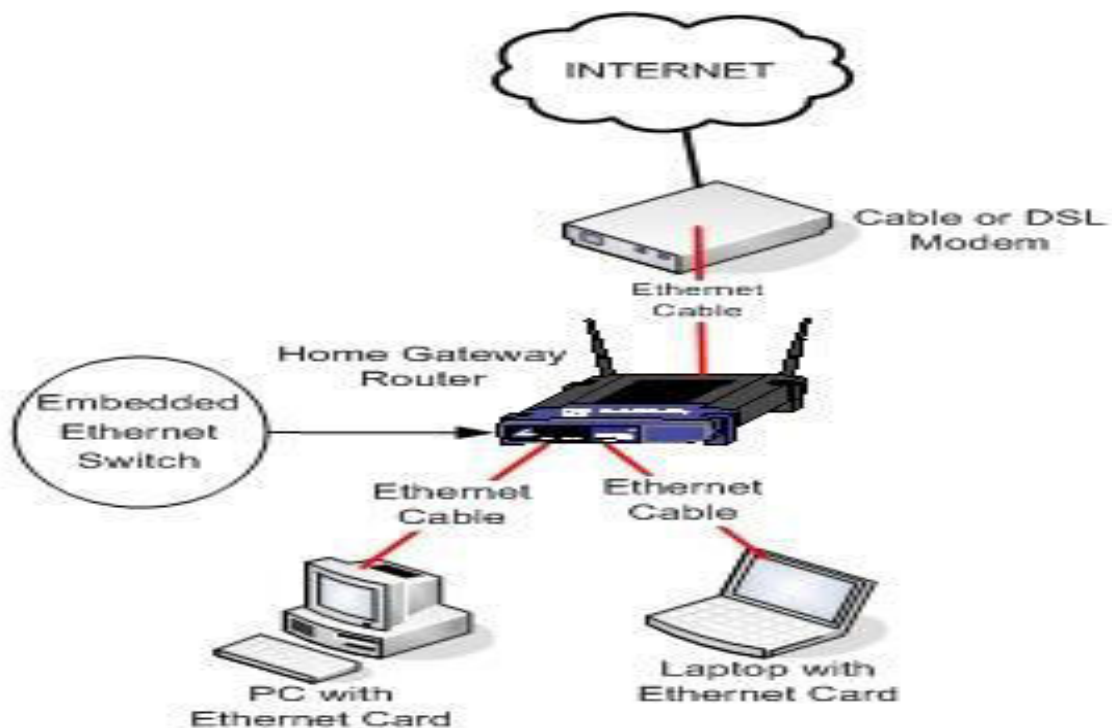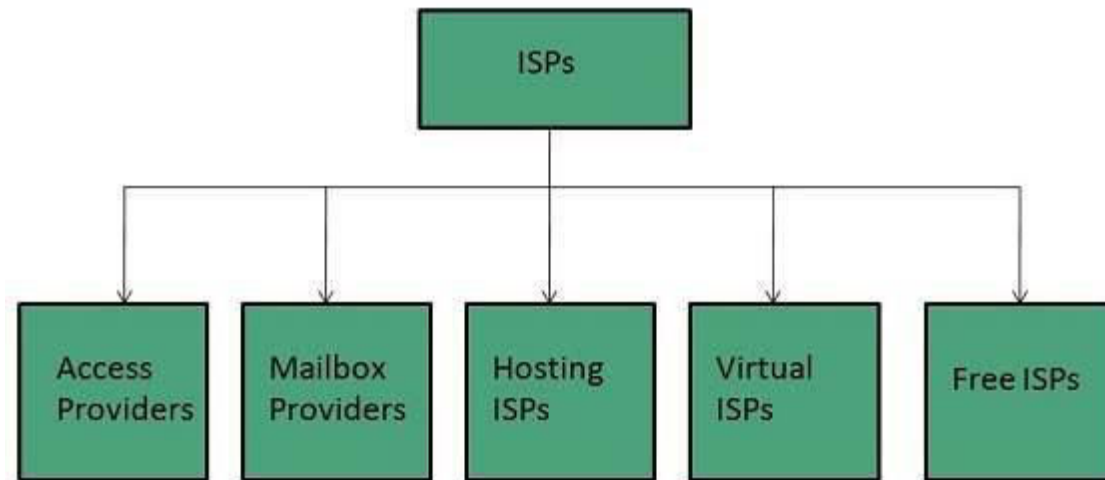

Internet Service Providers (ISP)

Internet Service Provider (ISP) is a company offering access to internet. They offer various services:

- Internet Access
- Domain name registration
- Dial-up access
- Leased line access

ISP Types

ISPs can broadly be classified into six categories as shown in the following diagram:

ACCESS PROVIDERS

They provide access to internet through telephone lines, cable wi-fi or fiber optics.

MAILBOX PROVIDER

Such providers offer mailbox hosting services.

HOSTING ISPS

Hosting ISPs offers e-mail, and other web hosting services such as virtual machines, clouds etc.

VIRTUAL ISPS

Such ISPs offer internet access via other ISP services.

FREE ISPS

Free ISPs do not charge for internet services.

Connection Types

There exist several ways to connect to the internet. Following are these connection types available:

1. Dial-up Connection
2. ISDN

3. Leased Connection

4. DSL

5. Cable TV Internet connections

6. Satellite Internet connections

7. Wireless Internet Connections

Dial-up Connection

Dial-up connection uses telephone line to connect PC to the internet. It requires a modem to setup dial-up connection. This modem works as an interface between PC and the telephone line. Dial up connections are the oldest, most out of date connections still available today. They are incredibly slow, unreliable, take up your phone line, and they make the very loud and annoying dial up sound when connecting to the internet.

There is also a communication program that instructs the modem to make a call to specific number provided by an ISP.

Dial-up connection uses either of the following protocols:

1. Serial Line Internet Protocol (SLIP)

2. Point to Point Protocol (PPP)

The following diagram shows the accessing internet using modem:
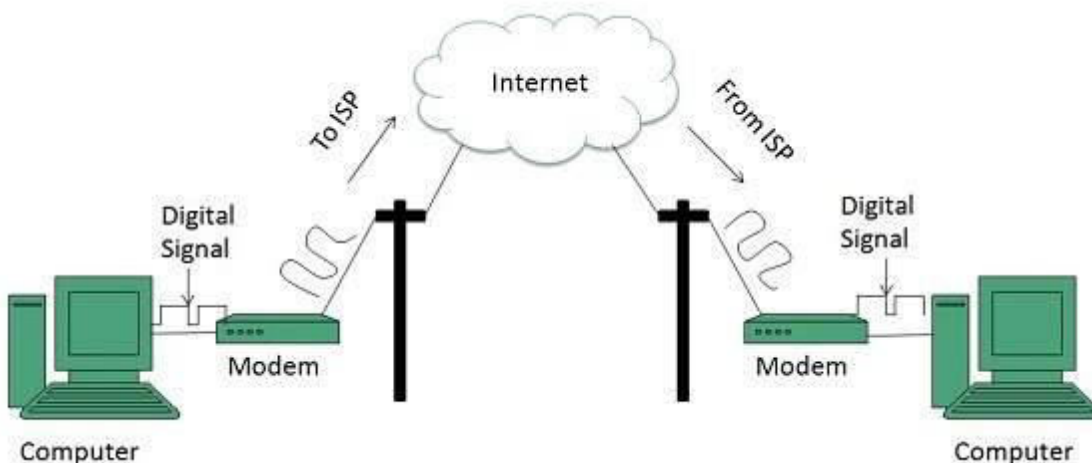
ISDN

ISDN is acronym of **Integrated Services Digital Network.** It establishes the connection using the phone lines which carry digital signals instead of analog

signals. ISDN offers Internet connectivity at speeds of up to 128 Kbps through the use of digital phone lines. ISDN is a dial-up service that has been provided by telephone companies for many years.

To access any of these dial-up accounts you need the followings;

- Computer
- Modem
- Telephone Connection
- Shell or TCP/IP/ISDN account from the ISP
- Internet client software such as Internet browser

There are two techniques to deliver ISDN services:

1. Basic Rate Interface (BRI)

2. Primary Rate Interface (PRI)

Key points:

- The BRI ISDN consists of three distinct channels on a single ISDN line: t1o 64kbps B (Bearer) channel and one 16kbps D (Delta or Data) channels.

- The PRI ISDN consists of 23 B channels and one D channels with both have operating capacity of 64kbps individually making a total transmission rate of 1.54Mbps.

The following diagram shows accessing internet using ISDN connection:
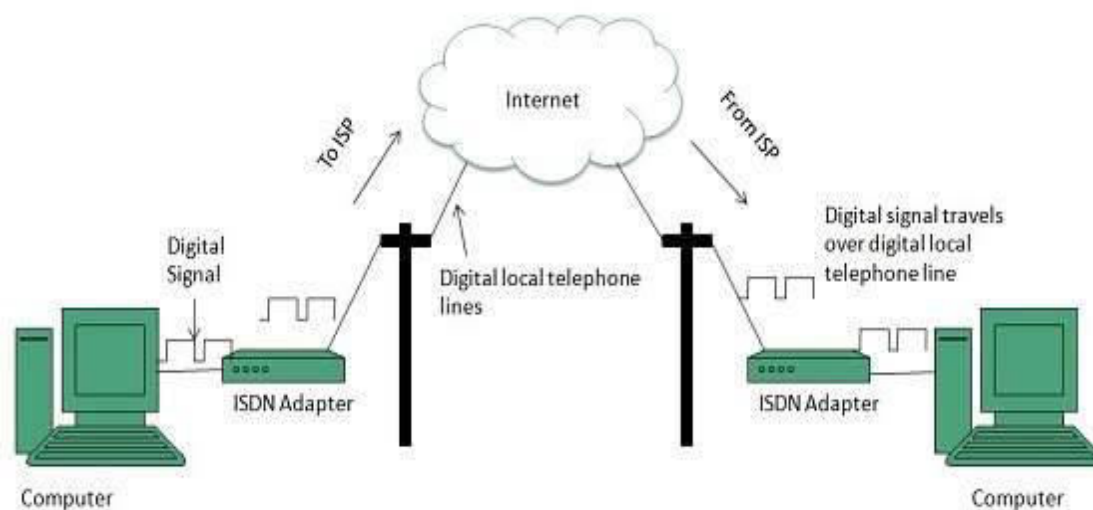
Leased Connection

Leased connection is also known as direct Internet access or Level Three connection. It is the secure, dedicated and most expensive, level of Internet connection. With leased connection, your computer is dedicatedly and directly connected to the Internet using high speed transmission lines. It is on-line twenty-four hours a day, seven days a week.

DSL

DSL is acronym of **Digital Subscriber Line.** It is a form of broadband connection as it provides connection over ordinary telephone lines. DSL stands for Digital Subscriber Line. In a DSL connection you are using a 2 way phone line to connect to the internet, without disturbing your phone. DSL is the most common form of home internet connection today, and is also very popular for small businesses.

Following are the several versions of DSL technique available today:

1. Asymmetric DSL (ADSL)

2. Symmetric DSL (SDSL)

3. High bit-rate DSL (HDSL)

4. Rate adaptive DSL (RDSL)

5. Very high bit-rate DSL (VDSL)

6. ISDN DSL (IDSL)

All of the above mentioned technologies differ in their upload and download speed, bit transfer rate and level of service.

The following diagram shows that how we can connect to internet using DSL technology:


Internet Access Using DSL Modem
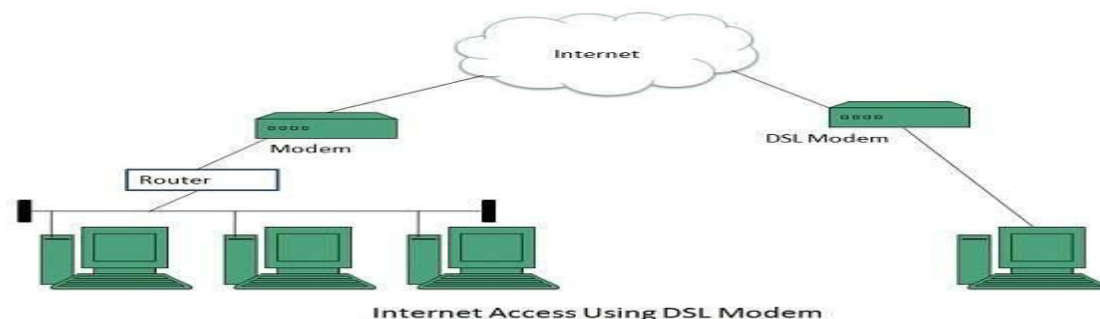
Cable TV Internet Connection

Cable TV Internet connection is provided through Cable TV lines. It uses coaxial cable which is capable of transferring data at much higher speed than common telephone line.

Key Points:

- A cable modem is used to access this service, provided by the cable operator.

- The Cable modem comprises of two connections: one for internet service and other for Cable TV signals.

- Since Cable TV internet connections share a set amount of bandwidth with a group of customers, therefore, data transfer rate also depends on number of customers using the internet at the same time.

The following diagram shows that how internet is accessed using Cable TV connection:
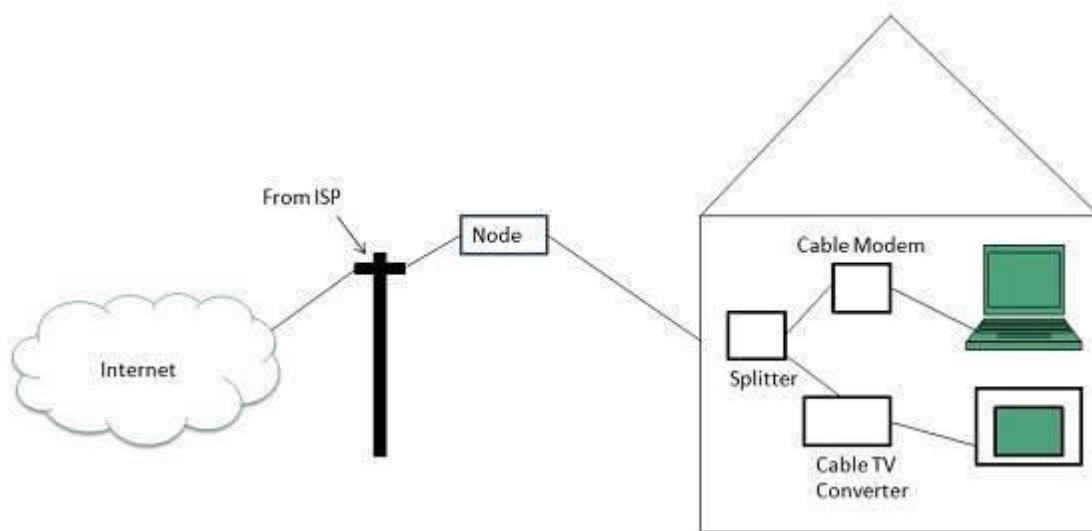
Satellite Internet Connection

Satellite Internet connection offers high speed connection to the internet. There are two types of satellite internet connection: one way connection or two way connection.

In one way connection, we can only download data but if we want to upload, we need a dialup access through ISP over telephone line.

In two way connection, we can download and upload the data by the satellite. It does not require any dialup connection.

The following diagram shows how internet is accessed using satellite internet connection:
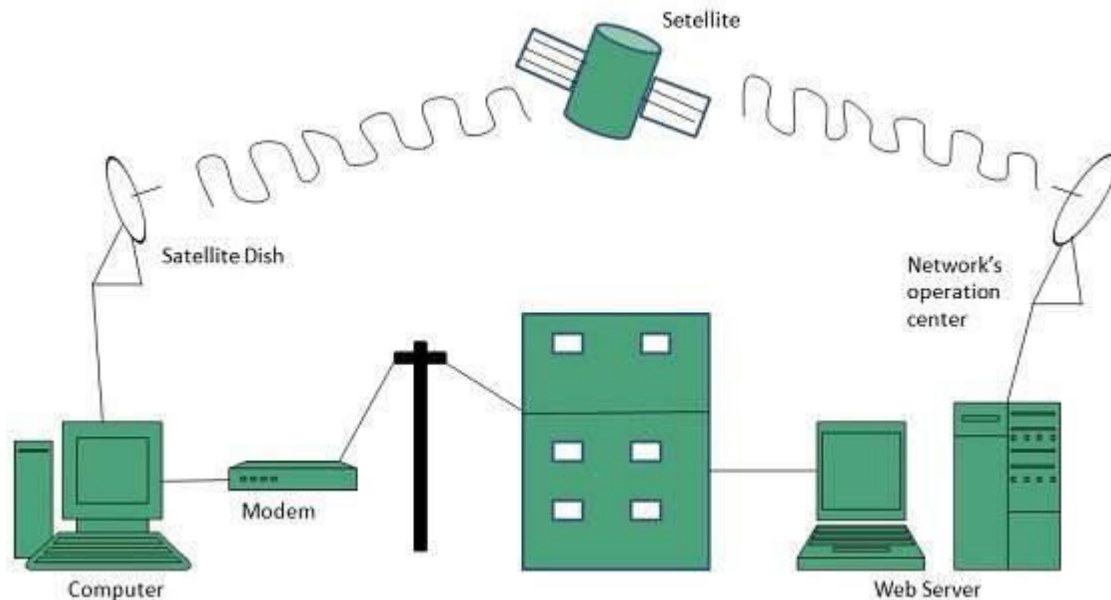
Wireless Internet Connection

Wireless Internet Connection makes use of radio frequency bands to connect to the internet and offers a very high speed. The wireless internet connection can be obtained by either WiFi or Bluetooth.

Key Points:

- Wi Fi wireless technology is based on IEEE 802.11 standards which allow the electronic device to connect to the internet.

- Bluetooth wireless technology makes use of short-wavelength radio waves and helps to create personal area network (PAN).
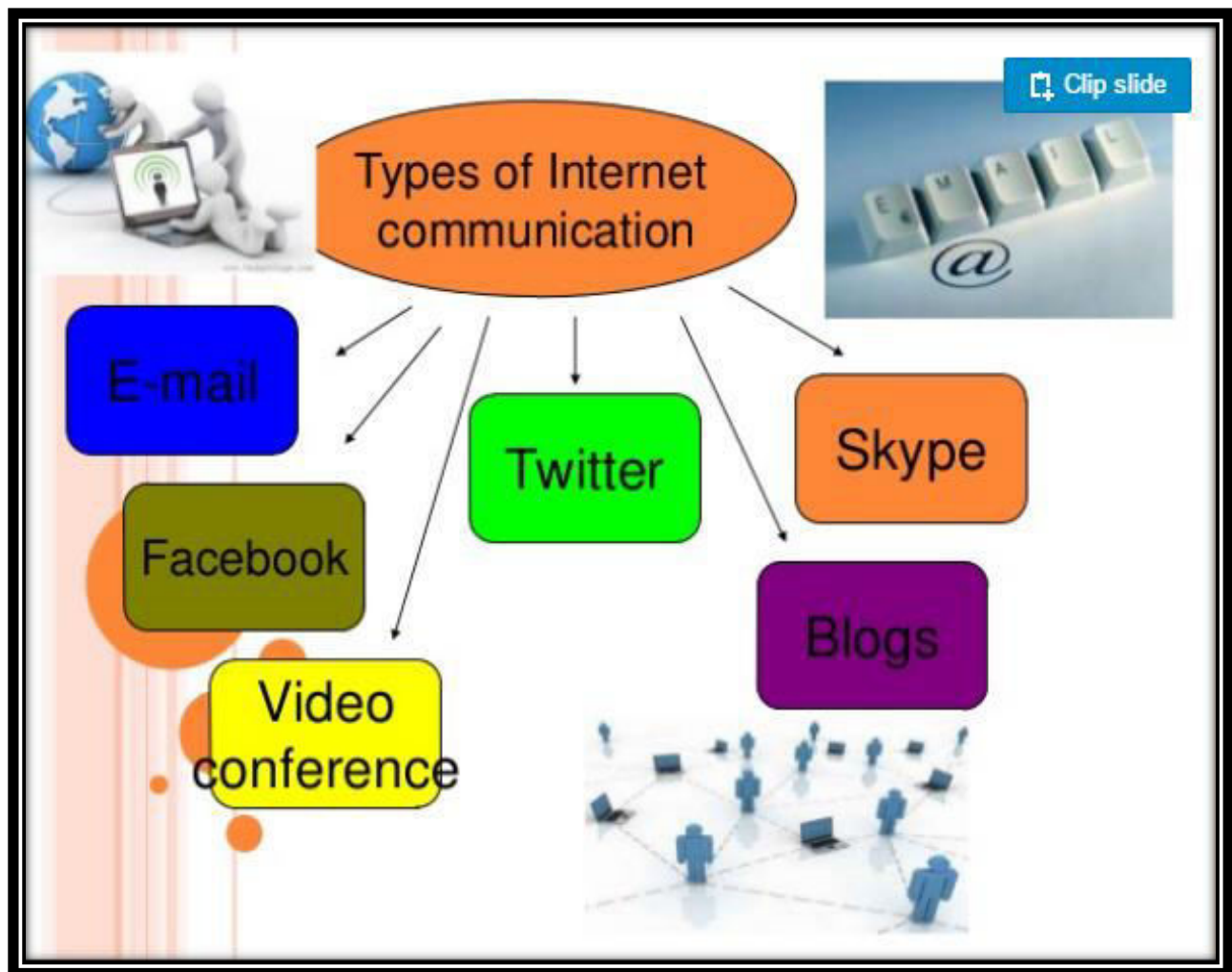
Application of Networks

A network is a collection or set of computing devices connected to one another to establish communication and also share available resources.

A network will comprise of software and hardware devices. You can have a network even if you are not connected to the internet.

Computer networks make it possible for people to transfer files from one place to another and to communicate taking the shortest time possible.

Computer network applications are network software applications that utilize the Internet or other network hardware infrastructure to perform useful functions for example file transfers within a network.

They help us to transfer data from one point to another within the network.

1. **Email programs**
They allow users to type messages at their local nodes and then send to someone on the network. It is a fast and easy way of transferring mail from one computer to another.

2. File transfer protocol (FTP)

This application facilities transfer of files from one computer to another e.g. from a client to a server. There are 2 common processes involved in FTP

Downloading: - This is the process of obtaining files from a server to a workstation or a client (for example when you download programs and music from a server).

Uploading:- This is obtaining of files from a workstation to a server (for instance when you attach documents and upload them to a server, a good example being when you upload photos to Facebook).

Examples of FTP programs are:-

➢ FTP in Unix

➢ FTP in Linux or

➢ FTP in Windows

3. Terminal Emulation (TELNET)

It allows a workstation to access the server for an application program. This enables you to control the server and communicate with other servers on the network. The workstation appears as a down terminal that is directly attached to the server. The user feels like he/she is using the server directly. **TELNET** enables PCs and workstations to function as dumb terminals in sessions with hosts on inter-networks.

4. Groupware

These applications are used to automate the administration functions of a modern office for instance **video conferencing** and **chatting**. They facilitate the work of groups and improve on their productivity; they can be used to communicate, co-operate, coordinate, solve problems, compete, negotiate among others.

4(i) Video Conferencing

- This is the process of conducting a ***conference*** between two or more participants at different sites by using computer networks to transmit audio and video data. For example, a *point-to-point* (two-person) video conferencing system works much like a video telephone.

- Each participant has a video camera, microphone, and speakers mounted on his or her computer. As the two participants speak to one another, their voices are carried over the network and delivered to the others speakers, and whatever images appear in front of the video camera appear in a window on the other participant's monitor.

4(ii) Chatting

It is a real-time communication between two users via computer. Once a chat has been initiated, either user can enter text by typing on the keyboard and the entered text will appear on the other user's monitor. The two must be online for a chat to be initiated. Most networks, cybers and online services offer a chat feature which enables computer users to chat as they go on with their work.

5. Newsgroup

A newsgroup is an Internet-based discussion around an individual, entity, organization or topic. Newsgroups enable remotely connected users to share, discuss and learn about their topic of interest by exchanging text messages, images, videos and other forms of digital content.

Newsgroups are also referred to as Usenet newsgroups.

6. Mailing Lists

Mailing lists use e-mail to keep groups informed on topics or events they wish to know about such as when a particular web site has been updated. Listserv and Major Domo are popular mailing list software programs. When placed on a server, they allow you to automatically subscribe to a mailing list. Most e-mail clients support mailing lists, which enables you to broadcast e-mail messages to groups that you define. In addition, there are mailing list servers that manage centralized mailing lists for groups of users.

Two common types of email mailing lists are announcement lists and 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.

Fax, Voice and Information Services

Fax

A fax machine is a device that is used to send documents electronically over a telephone network. The transmissions it sends are called "faxes" and these can be between two fax machines, or between a fax machine and computer or online fax service that is equipped to send and receive faxes.

A device that sends and receives printed pages or images over telephone lines by digitizing the material with an internal optical scanner and transmitting the information as electronic signals. Fax machines are used to transmit documents between locations.

Voice Mail

Voice Mail is a [feature](#) with new telephone systems, especially [VoIP](#)(Voice over Internet Protocol). It is a voice message that a caller leaves when the person called is absent or is taken up with another conversation. The voice mail feature acts in a way similar to the old answering machine, but with the main difference that instead of the voice message being stored on your answering machine, it is stored on the service provider's [server](#), in a space reserved for the user called a mailbox.

It is not very different from email, save that the messages are voices instead of text.

Someone calls you and you are not able to take the phone. Reasons are multiple: your phone is off, you are absent, or busy elsewhere, and a thousand other reasons. After a predetermined duration (or if you want, number of rings), the caller is informed about you not being available and about them having reached your voice mail. You can record a message of your choice in the language of your choice and have your voice and your words played to the caller each time. After that, a beep will sound, following which the system will capture anything said by the caller. This message is recorded and saved on your answering machine or server. You can retrieve it anytime you wish.

Voice Mail has evolved and improved and now is a rich service. Besides recording and playing sounds back, you can do the following:

- You can take voice mail messages from many callers at the same time.
- You can forward voice mail messages to other people's mailbox.
- You can add a voice introduction to the message you are forwarding.
- Broadcast voice messages, i.e. send to more than one person at the same time.
- Store voice messages for a long period of time.
- Be notified of the arrival of a voice mail through your mobile phone or pager.
- Present different greetings to different users.
- Transfer and save voice messages to storage media like your hard drive, which can also be sent as an attachment with email messages.

With new voice mail services now available, you can even play back your voicemail online or by email. This means you can check your voicemail without taking your phone. Now it's even possible to leave video voice mail.

Information Services

An online service refers to any information and services provided over the Internet. These services not only allow subscribers to communicate with each other, but they also provide unlimited access to information. Online services can range from simple to complex. A basic online service may help subscribers gain needed data through a search engine, while a complex one might be an online mortgage application from a bank. Online services may be free or paid. Online services were first introduced in 1979 through CompuServe and The Source. These organizations were generated to provide for the needs of personal computer subscribers, and they paved the way for data accessibility. These early services made use of text-based interfaces in order to

allow subscribers to browse through current events, join special interest groups and communicate with other subscribers. Soon after, more services popped up like America Online, Prodigy, DELPHI and many more. As the Internet became more popular, these organizations adapted to include Web access. Online services are now so common, prevalent and often even free that most subscribers do not even realize that they are using one.

Communication

Communication is the passage of information between one person to another person or between two groups. Communication involves the process of exchange of information between two persons. The word "Communication" has its origin from the Latin word "communis" which means to participate or to share. In communication one who sends the message is sender. One who receives the message is receiver. Other elements of communication process are channel, message, encoding, decoding, and feedback. Main purpose of communication is 'understanding'. That is message must be clearly understood by the receiver. If receiver doesn't understand the message sent by the sender then there will be no meaning for communication.

Inter-personal and group communication is the types of communication. Communication is very important for every human being in their day to day life. Without communication it's very difficult to exchange one's view with another. So we use verbal or non-verbal types for effective communication. Verbal means oral or written type of communication. Non-verbal means using signs, symbols, gestures, postures etc. So in inter-personal and group communication verbal and non-verbal types are very important. Many companies are still under developed because the main problem is less communication between management and workers. So there is a need for good communication inside an organization.

Inter-personal communication and group communication is essential in all the fields. Inter-personal means face to face communication and Group communication means communication between 3 or more individuals or communicating in a group. Whenever 2 or more people meet together there communication arises. It may be through words of mouth, expressions, gestures and postures etc. so every human being would like to communicate with other person. In other words human beings

want to share their feeling with others. So in our day to day life communication is a very important aspect. Communication plays an important part not only in our personal lives but also in the professional world.

Process of communication

1. **Sender:** Communication process starts from the communicator or sender.

2. **Encoding:** Encoding is the process by which sender communicates his message through words, pictures, action etc, to the communicate through a proper media

3. **Receiver:** Person who receives the information sent.

4. **Message:** Content of information sent by sender. The main topic of communication process.

5. **Channel or Medium:** Through which one message travel's from sender to the receiver.

6. **Decoding:** Receiver accepts the message and decodes the word, symbols into ideas.

7. **Feedback:** Response from receiver. This is a very important element of communication.

Interpersonal communication

Interpersonal communication is an exchange of information between two or more people. It is also an area of study and research that seeks to understand how humans use verbal and nonverbal cues to accomplish a number of personal and relational goals. Generally, interpersonal communication research has contributed to at least six distinct categories of inquiry: 1) how humans adjust and adapt their verbal and nonverbal communication during face-to-face communication, 2) the processes of message production, 3) how uncertainty influences our behavior and information-management strategies, 4) deceptive communication, 5) relational dialectics, and 6) social interaction that is mediated by technology.

Group Communication

Group communication is the exchange of information and ideas between individuals using interpersonal skills. There are several ways in which groups can communicate for example phone calls, emails, face-to face conversations, and memos. In group communication team member has to actively participate for an effective communication. So in group communication every member must

properly listen, deal with conflict, and respect others opinions. Communicating in groups is a skill that is learned at a young age that continues to develop as we grow up. The communication skills that are learned can be used in any group situation whether it is at school, work, and everyday life. Groups are an excellent way to make friends and establish relationships.

Group communication is important to solve problems because in a group there will be many people with different skills, so using those skills we can solve different problems easily. But in group communication scope for misunderstanding and conflict will be more than inter-personal communication. In inter-personal communication any doubts, conflicts, problems can be easily solved. But in group communication it will be difficult to solve conflicts between group members. Group communication is characterized by group. Therefore, in group communication there will be less personal contact. However, it provides better scope for quick and easy feedback and easy clarification. The group ranges in size from three to twelve or up to twenty. For example, communication in committees, workgroups, family and so on require communicating with the group.

Exchanging Files

One of the most convenient ways to transfer files is as attachments to email messages. How you use email to send binary files depends on whom you are sending them to.

If the person you are sending the file to is on the same network. You just attach the file to an email message and send it. The recipient can then easily open it at the other end. If you are sending it across the internet to a different network, the message will pass through other computers called gateways that may not be compatible. Sending a binary attachment to e-mail through these gateways often gives the recipient a very corrupt file. Then you first need to use a program to convert the binary file to an ASCII text file. This is called encoding. The recipient must use a similar program to convert it ASCII back to binary, decoding so the file in its original file format can be opened and manipulated on the recipient's system. There are currently two dominant encoding schemes in use:

- UUcoding(Binary to ASCII) and UUdecoding(ASCII back to binary)
- MIME(Multipurpose Internet Mail Extension)

Network

A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files, or allow electronic communications. The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams.

Some of the different networks based on size are:

- **Local area network, or LAN**
- **Metropolitan area network, or MAN**
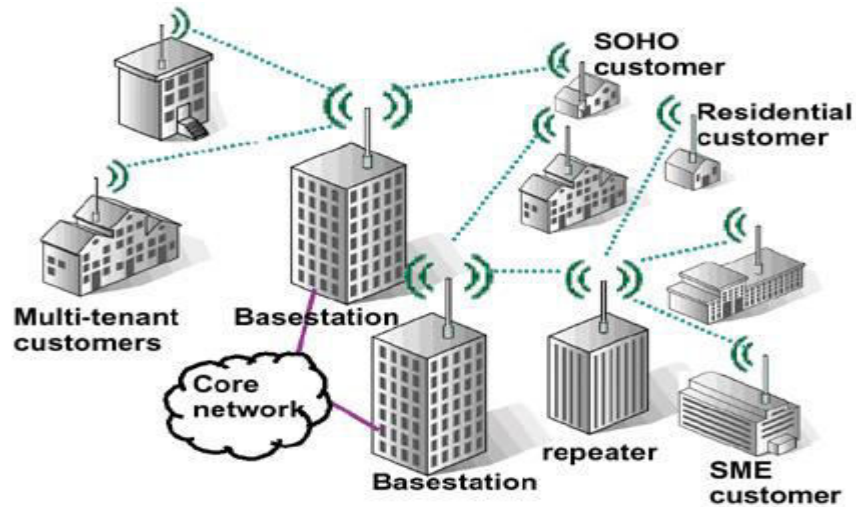- **Wide area network, or WAN**

Local Area Network (LAN)

This is one of the original categories of network, and one of the simplest. LAN networks connect computers together over relatively small distances, such as within a single building or within a small group of buildings.



Metropolitan Area Network

This is a network which is larger than a LAN but smaller than a WAN, and incorporates elements of both. It typically spans a town or city and is owned by a single person or company, such as a local council or a large company.

Wide Area Network (WAN)

This is another of the original categories of network, and slightly more complex in nature. WAN networks connect computers together over large physical distances, remotely connecting them over one huge network and allowing them to communicate even when far apart. The Internet is a WAN, and connects computers all around the world together.
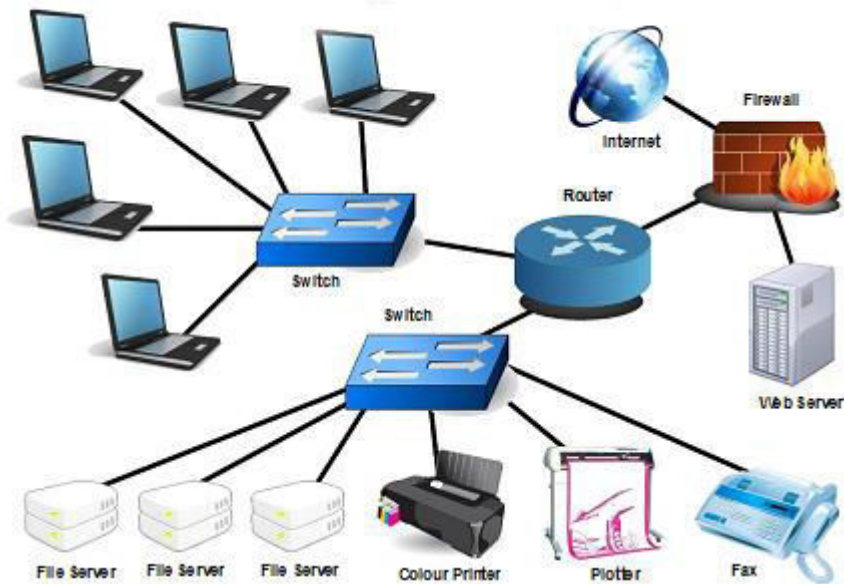
Protocol

Protocol, in computer science, a set of rules or procedures for transmitting data between electronic devices, such as computers. There are rules governing how data is transferred over networks, how they are compressed, how they are presented on the screen and so on. These set of rules are called protocols. Protocols are established by international or industry wide organizations. Perhaps the most important computer protocol is OSI (Open Systems Interconnection), a set of guidelines for implementing networking communications between computers. Among the most important sets of Internet protocols are TCP/IP, HTTPS, SMTP, and DNS. There are many protocols, each one governing the way a certain technology works. For example, the IP protocol defines a set of rules governing the way computers use IP packets to send data over the Internet or any other IP-based network. It also defines addressing in IP. Likewise, we have other protocols like:

TCP: Transmission Control Protocol, used for the reliable transmission of data over a network.

HTTP: Hypertext Transfer Protocol, used for transmitting and displaying information in the form of web pages on browsers.

FTP: File Transfer Protocol, used for file transfer (uploading and downloading) over the Internet.

POP: The most common protocol for receiving mail is Post Office Protocol (POP). It is now in version 3 so it is called POP3. Email clients such as Outlook Express require an address for a POP3 server before they can read mail. The SMTP and POP3 servers may or may not be the same address

SMTP: Simple Mail Transfer Protocol, used for email

Both SMTP and POP3 use TCP for managing the transmission and delivery of mail across the Internet.

Ethernet: Used for data transmission over a LAN.

Wi-Fi: One of the wireless protocols.

IP: Internet Protocol is the primary network protocol used on the Internet, developed in the 1970s. On the Internet and many other networks, IP is often used

together with the Transport Control Protocol (TCP) and referred to interchangeably as

TCP/IP: IP supports unique addressing for computers on a network. Most networks use the Internet Protocol version 4 (IPv4) standards that features IP addresses four bytes (32 bits) in length. The newer Internet Protocol version 6 (IPv6) standard features addresses 16 bytes (128 bits) in length.

Data on an Internet Protocol network is organized into packets. Each IP packet includes both a header (that specifies source, destination, and other information about the data) and the message data itself.IP functions at layer 3 of the OSI model. It can therefore run on top of different data link interfaces including Ethernet and Wi-Fi.

High Band Width(Broadband)

In telecommunications, broadband is wide bandwidth data transmission which transports multiple signals and traffic types. The medium can be coaxial cable, optical fiber, radio or twisted pair.

In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than traditional dial-up access.

The broadband technology you choose will depend on a number of factors. These may include whether you are located in an urban or rural area, how broadband Internet access is packaged with other services (such as voice telephone and home entertainment), price, and availability.

Types of Broadband Connections

Broadband includes several high-speed transmission technologies such as:

- Digital Subscriber Line (DSL)
- Cable Modem
- Fiber
- Wireless
- Satellite
- Broadband over Powerlines (BPL)

Computer Virus

A computer virus we can say is a small software program or a piece of code that is loaded on your computer system while using internet can spread from one computer to another and running without your knowledge. Computer viruses can also replicate and they are man-made. A simple virus that can make copy of itself over and over again and that would be easy to produce. A Computer Virus is a malicious software program "Malware" that can infect a computer by modifying or deleting data files, boot sector of a hard disk drive or causes a software program to work in an unexpected manner".

A computer virus resides on a host computer and can replicate itself when executed. Virus can steal user data, delete or modify files & documents, records keystrokes & web sessions of a user. It can also steal or damage hard disk space, it can slowdown CPU processing. A virus has a capacity to corrupt the files located in your system and it also has a capability to spread the virus via e-mail program and effect the system other email addresses in your online address book. A virus can also affect your system security.

Types of Computer Virus

Macro virus
Macro virus infect the file hat are created from some application or programs which are mainly contain macro files like doc, pps, xls, mdb. So basically such virus infect the files with the macros and also templates and document that are contained in the file. These virus hide in documents that are shared through network and e-mail. Macro virus are Relax, bablas, Melissa.A, 097M/Y2K.

Memory Resident Viruses
Resident viruses activated every time the OS runs and end up infecting other opened files. Such virus usually fix themselves inside the computer memory, hide in RAM. Resident viruses are CMJ, meve, randex, mrklunky.

Overwrite Viruses
Overwrite viruses delete the information from the file partially or completely once it infect a file. It infect only the file content may be change all the content but the file location and name remains the same, means doesn't infect the file name and the location. Overwrite viruses are Trj.Reboot, way, trivial.88.D.

Direct Action Viruses

Direct Action Virus activate when the file containing virus is executed. The virus takes no other action unless an infected file is executed again. Most viruses avoid this because this is not so productive, but such virus damage in the past. Direct Action viruses are Vienna Virus.

Directory Virus

Directory virus is also known by cluster virus and file system virus. This can infect the computer's directory by changing the path by indication the location. Such virus located into the hard disk but affect the entire directory. Directory viruses are die-2 virus.

Web Scripting Virus

Mostly web pages contain complex code to make their web page content interactive so that such code exploit that cause undesirable actions. Such virus originates from browser and web pages. Web Scripting viruses include JS.Fortnight that spread via malicious emails.

Multipartite Virus

This type of virus spread in multiple ways and the taken action depending upon the type of OS installed and presence of certain files. Most of the time this virus try to hide in computer's memory not to infect the hard disk. Multipartite Viruses are flip, invader and tequila.

Polymorphic Virus

Polymorphic virus encodes and encrypts themselves every time they are going to infect the computer system. For that they use different encryption methods and algorithms. Since they use different encryption method each time which is difficult for antivirus to locate and resolve them. Polymorphism viruses are Marburg, tuareg, Satan bug, elkern.

Worm

Worm is very similar to a virus having a capability to self-replicate which is leading to negative effect on your system. This consume too much system memory and also affect web servers and network servers. Worm viruses are lovgate.F, sobig.D, trile.C, PSWBugbear.B, Mapson.

Trojans horses

This name comes from software which is very useful software but later do damage you system after run once. This virus can track the login details of the users who is online. Example as we all knows E-banking is very common, so its vulnerability of tracing your login details whenever your PC is working without the support of strong antivirus.

Email Virus

This virus is spread via email, this will hide an email when recipient opens the mail.

Boot Infectors or Boot Sector Virus

As the name suggests a boot sector virus affects the boot section on your computer. Boot sector is the section which is accessed at the very first when the computer is turned on. This virus type will include boot sector and master boot record types. While all the viral codes are separated because they infect the hard disks or the floppy. It include the viruses like the brain virus which is very first wild virus is to be created.

Causes of Computer Virus

The following are the main causes of a Computer Virus.

Infected Flash Drives or Disks

Flash drives and disks are the main cause of spreading viruses. Flash drives and disks are used to transfer data from one computer to other. A virus can also be copied from one computer to other when the user copies infected files using flash drives and disks.

Email Attachments

Most of the viruses spread through emails. Email attachment is a file that is sent along with an email. An email may contain an infected file attachment. Virus can spread if the users open and download an email attachment. It may harm the computer when it is activated. It may destroy files on the hard disk or may send the virus automatically to all email addresses saved in the address book.

Infected / Pornography websites

Thousands of insecure websites can infect computer with viruses. Most of the websites with pornographic materials are infected, so by visiting these websites the user's computer also gets infected by virus. These websites are developed to spread viruses or other unethical material. The virus is transferred to the user's computer when this material is downloaded. These websites may access the computer automatically when the users visit them.

Networks

Virus can spread if an infected computer is connected to a network. The internet is an example of such network. When a user downloads a file infected with virus from the internet, the virus is copied to the computer. It may infect the files stored on the computer.

Pirated Software

An illegal copy of software is called pirated software. Virus can spread if user installs pirated software that contains a virus. A variety of pirated software is available in CDs and from the internet. Some companies intentionally add virus in the software. The virus is automatically activated if the user uses the software without purchasing license.

Protection from Computer Virus

Virus infects computer system if latest and updated version of an Antivirus program is not installed. Latest Antivirus software should be installed on Computer to protect it from viruses. A computer system can be protected from virus by following these precautions.

1. The latest and updated version of Anti-Virus and firewall should be installed on the computer.
2. The Anti-Virus software must be upgraded regularly.
3. USB drives should be scanned for viruses, and should not be used on infected computers.
4. Junk or unknown emails should not be opened and must be deleted straightaway.
5. Unauthorized or pirated software should not be installed on the computer.
6. An important way of protection against virus is the use of back up of data. The backup is used if the virus deletes data or modifies it. So back-up your data on regular basis. There are some great softwares that can back up your data automatically.
7. Freeware and shareware software from the internet normally contain viruses. It is important to check the software before using them.

8. Your best protection is your common sense. Never click on suspicious links, never download songs, videos or files from suspicious websites. Never share your personal data with people you don't know over the internet.

Email

Email is short for 'electronic mail'. Similar to a letter, it is sent via the internet to a recipient. An email address is required to receive email, and that address is unique to the user. Some people use internet-based applications and some use programs on their computer to access and store emails.

Key benefits and features of using email

- It's quick – your recipient receives your email as soon as they go online and collect their mail.
- It's secure.
- It's low cost.
- Photos, documents and other files can be attached to an email, so that more information can be shared.
- One email can be sent to more than one recipient at a time.

Working of an e-mail: Every internet mail user has a unique e-mail. This e-mail address is in the format username@domainname example: abc@yahoo.com. To send an e-mail you need to know the hardware and software specification of the recipient.

Steps:

1. The sender composes the mail message using his mail client software. A mail client allows a user to compose, edit and sends the mail message. There are number of mail client software available such as outlook express, Gmail, yahoo etc.

2. After composing the mail message the user sends it to the recipients e-mail address. The message propagates across the internet before it reaches the mail server of the recipient. The domain name in the recipient's e-mail address identifies his mail server and the user name identifies the recipient on that server.

3. The recipient connects to his e-mail account on his mail server to read the messages sent to him. The recipient also uses a mail client to receive, save and print mail messages.