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WHAT IS COMPUTER?

"Computer is a term which is derived from word compute. To compute means to count or to calculate. But a computer can do much more than just counting or calculations. Now a day, it can be used as a multi-purpose device."

Computer can be defined as:

"Computer is an electronic machine which is capable of receiving the input, storing it and producing the desired output."

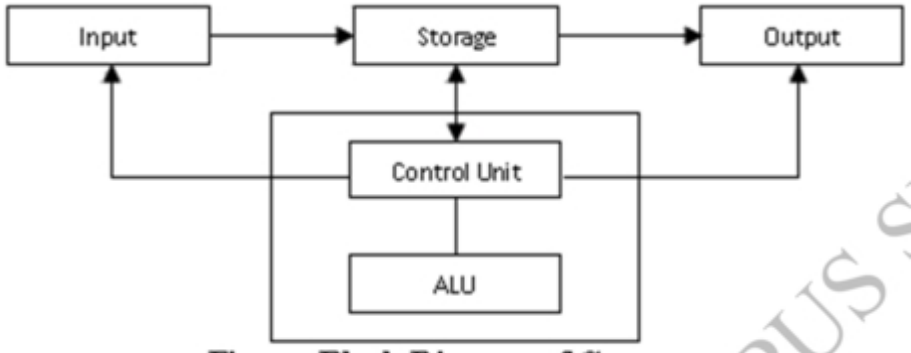


Figure: Block Diagram of Computer

Input Devices:

These devices are used to accept data from user. Input devices get data from user. Then they convert this data into machine format. Examples of Input devices are: keyboard, mouse, scanner etc.

Central Processing Unit:

Central Processing Unit is known as **CPU**. It is brain of Computer. Each job is processed by the CPU. There are two main parts of Processor/CPU: ALU (Arithmetic and Logic Unit) and CU (Control Unit). Generally, it performs the following functions:

a) It performs Arithmetic Operation.
b) It performs Logical Operations.
c) It controls Input/output operation.

The frequency/speed of computer is measured in hertz (Hz.). Speed of modern processors is in **Gigahertz** (GHz).

Arithmetic and Logic Unit (ALU):

An ALU is a digital circuit. It performs the actual arithmetic and logical operations. Modern CPUs contain very powerful and complex ALUs. Basic arithmetic operations of ALU include addition, subtraction, multiplication, and division. Comparison operations performed by ALU are less than (<), greater than (>), less than equal to (<=), greater than equal to (>=), equals to (=) and not equals to (!=) etc.

Control Unit:

This unit coordinates the operation of hardware. It also coordinates the flow of data and instructions. It reads instruction and data from memory. Then, it decodes them and sent them to ALU. The output from ALU is fetched by control unit. Then, this output is sent to output devices and/or memory.

Storage Unit:

Storage unit is used to store data and instruction. These data and instructions can be used by ALU. The Control Unit and internal storage is linked together. This link is made by a set of parallel wires. These wires are called **Buses**. They carry data and addresses for CPU.

Output Devices:

These devices are used to display information or result. Output devices receive machine format data from CPU. Then they convert this data into user understandable form. Examples of output devices are Monitor, Printer etc.

CHARACTERISTIC OF COMPUTER:

In modern life, computers play a very important role. They are used in almost every field of life due to their features. Some of the important features of a modern computer are: High speed, great accuracy, a large storage capacity, high reliability and versatility. These features make computer better than humans. These features are explained below:

1. **Accuracy:**

Computer works with very high accuracy. Computers never commit errors in processing. Computers calculate data with high accuracy. The errors in computer are due to human and inaccurate data.

2. **High Speed:**

Computer works with very high speed. The processing speed of computer is measured in microsecond, nanoseconds and picoseconds. A powerful computer can do millions of calculations per seconds.

3. **Versatility:**

A computer is a very versatile machine. It can be used in many fields of life. It can be used in the fields of education, banking, railway reservation, entertainment etc. But in all the fields, its working principle is same, i.e.

a) It takes input from user.
b) It processes given input.
c) It gives output to user.

4. **Diligence:**

A computer is free from tiredness, lack of concentration, fatigue, etc. It can work for hours without creating any error. This feature makes the computer different from humans.

5. Automation:

Computer works automatically without any supervision. When a program starts execution, computer does not require any user intervention.

6. **Storage:**

Computer can store large amount of data in its memory. Secondary storage devices are used to store data permanently. This stored data can be viewed or changed whenever required. Examples of storage devices are floppy disk, hard disks, CD etc.

7. Reliability:

Computers are highly reliable. Modern electronic components have long life. Most of the hardware components are in module forms. When a component fails, it can be replaced easily.

8. No IQ:

Computer is a dumb machine. It cannot do any work without instruction. A computer cannot take its own decision.

9. No Feelings:

A Computer does not have feelings or emotions. It does not get tired even after long hours of work.

GENERATIONS OF COMPUTERS

Generation is a time period. Computers can be classified into different time periods. These time periods are called Generations of Computers. Computers were developed in five distinct phases. These phases are known as five generations of computers. Each generation has its own features. These generations are explained below:

i. First Generation (1942-1952)
ii. Second Generation (1952-1964)
iii. Third Generation (1964-1975)
iv. Fourth Generation(1975-1989)
v. Fifth Generation (1989 onwards)

Generations (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	Vacuum tubes; electromagnetic relay memory; punched cards secondary storage	Machine and assembly languages; stored program concept; mostly scientific applications	Bulky in size; highly unreliable; limited commercial use; commercial production difficult and costly; difficult to use	ENIAC, EDVAC, EDSAC, UNIVAC I, IBM 701
Second (1955-1964)	Transistors; magnetic core memory; magnetic tapes and disks secondary storage	Batch operating system; high-level programming languages; scientific and commercial applications	Faster, smaller, more reliable and easier to program than previous generation systems; commercial production was still difficult and costly	Honeywell 400, IBM 7030, CDC 1604, UNIVAC LARC
Third (1964-1975)	ICs with SSI and MSI technologies; larger magnetic core memory; larger capacity magnetic disks and tapes secondary storage; minicomputers	Timesharing operating system; standardization of high-level programming languages; unbundling of software from hardware	Faster, smaller, more reliable, easier and cheaper to produce commercially, easier to use, and easier to upgrade than previous generation systems; scientific, commercial and interactive on-line applications	IBM 360/370, PDP-8, PDP-11, CDC 6600
Fourth (1975-1989)	ICs with VLSI technology; microprocessors; semiconductor memory; larger capacity hard disks as in-built secondary storage; magnetic tapes and floppy disks as portable storage media; personal computers; spread of high-speed computer networks	Operating systems for PCs; GUI; multiple windows on a single terminal screen; UNIX operating system; C programming language; PC-based applications; network-based applications	Small, affordable, reliable, and easy to use PCs; more powerful and reliable mainframe systems; general purpose machines; easier to produce commercially	IBM PC and its clones, Apple II, TRS-80, VAX 9000, CRAY-1, CRAY-2, CRAY-X/MP
Fifth (1989-Present)	ICs with ULSI technology; larger capacity main memory; larger capacity hard disks; optical disks as portable read-only storage media; notebook computers; powerful desktop PCs and workstations; very powerful mainframes; the Internet	World Wide Web; multimedia applications; Internet-based applications	Portable computers; more powerful, cheaper, reliable, and easier to use desktop machines; very powerful mainframes; very high uptime due to hot-pluggable components; general purpose machines; easier to produce commercially	IBM notebooks, Pentium PCs, SUN Workstations, IBM SP/2, SGI Origin 2000, PARAM 10000

Figure 1.2. Computer generations – A summary.

INPUT DEVICES

Input devices are used to accept data from user. Then, they convert this data into machine format. Thus, these devices creates link between user and computer. Examples of input devices are keyboard, mouse, scanner etc. The commonly used input devices are described below:

Keyboard:

Keyboard is the most common input device. It is a standard input device. It is generally used to enter text data into the computer. When we press a key from the keyboard, it generates an electric pulse. It is then fed into computer as input. Keyboards allow us to input letters, numbers, and other symbols.

There are two common layouts of keys on the keyboard. These are QWERTY layout and DVORAK layout. There are many keys on these keyboards. Generally, keyboards have 104 or more keys. Multimedia keyboards have many more keys. These keys can be classified into many types:

a) Alphanumeric keys
b) Function Keys
c) Special Keys
d) Arrows Keys
e) Numeric Key Pad Keys

The Alphanumeric Keys: These keys includes alphabets (A-Z or a-z), digits (0-9) and special symbol keys <, >, ?, *, #, :, ", | etc.

The Function Keys: A keyboard has 12 function keys From F1 to F12. Each key has a specific function. For Example: F1 function key is used to display window help.

The Special Keys: These keys include Enter Key, Backspace Key, Delete key, Caps Lock, Num Lock, Ctrl Key, Alt Key, Shift Key etc.

Arrows Keys: These keys are used to move the cursor

Numeric Key Pad Keys: These keys are used during numeric operations

Mouse:

Mouse is another most common used input device. It is a cursor-control device. It is used to control cursor (arrow) at the screen. Mouse can't be used to enter text. There are two or three buttons on the mouse. Pointer arrow moves on the screen when mouse is rolled over a flat surface.

A mouse can be optical or mechanical. **Optical mouse** is based on the laser technology. **Mechanical mouse** has a round ball at the bottom. Following operations can be performed with mouse:

- Click (Left Click),
- Right Click,
- Double Click and
- Click &Drag

Joystick:

A joystick is an input device. It is commonly used to play video games. Joysticks consist of a base and a stick. This stick can be moved in any direction. The stick can be moved slowly or quickly. Joysticks include many buttons. Most joysticks have at least one button on the top of the stick and another button in the front of the stick. Joystick connects with the computer using a USB (Universal Serial Bus) connection.

Scanner:

Scanner is an input device. It is used to scan images. These images are then stored in the computer memory. A scanner can read data from different sources. These sources may be a text document, image, graphs etc. Scanner connects with the computer using a USB (Universal Serial Bus) connection. The Scanner can be **flatbed or handheld**.

Flatbed scanner:
A flatbed scanner is like a photocopy machine. It consists of a box. This box has a glass plate on its top. A lid covers this glass plate. The document to be scanned is placed on this glass plate.

Handheld scanner:
These scanners are small hand-held devices. These scanners are moved across the paper. These scanners are usually used to scan small pictures and photos.

Trackball:

A trackball is an input device. It is a pointing device. It performs the function of a mouse. It is mostly used in notebook or laptop computers. It is a half inserted ball. To move the pointer arrow, we move the fingers on this ball. Trackballs also have buttons like mouse. A trackball has some advantages over mouse. These are:

- It is stationary
- It requires less space
- It's size is compact
- It is most suitable for portable computers

Touch screen:

Touch screen is the simplest input device. It is easiest to learn. Although touch screen is a display screen but it also serves as an input device. Touch screen has a touch-sensitive transparent panel. This panel covers the entire screen. A touch screen gets input when an object comes in contact with the screen. When some object is touched with the screen, the wave signals get interrupted. This interrupted location is recorded as input. Tablets, smart phones and ATMs are the good examples of Touch Screens.

Light Pen

Light Pen is another useful input device. It is a pointing device. It is used to select a displayed menu item. It can also be used to draw pictures on the screen. It consists of a photocell and an optical system34. These components are placed in a small tube. When its tip is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location. This location is then sent to CPU as input.

Digitizer

Digitizer is another useful input device. It is used for converting pictures, maps and drawing into digital form. The digitizer is an operator input device. It consists of a large smooth board and an electronic tracking device. The tracking device contains a switch. This switch is used to record the x and y coordinates positions. These coordinates are then stored in the computer.

Speech or Voice Recognition Devices

It is one of the newest input techniques. Speech recognition / Voice recognition is a computer software program or hardware device. It has the ability to decode the human voice. The user can input data by speaking. Microphone is used to input sound into computer system. A Microphone receives human voice.

Voice recognition is commonly used to operate a device. It can be used to perform commands. It can also be used to write without a keyboard. These systems work by matching input voice with set of words. These systems are mostly user dependent. Only those users are recognized by the system who gets the training with the system by speaking.

Advantages:

- These are more efficient input device
- These are easy to use
- Unauthorized speakers can be identified.
- Gift for blind and handicapped people

Disadvantages:

- These systems have very limited vocabulary.
- These systems are specific user-dependent.

OPTICAL RECOGNITION DEVICES:

These input devices are based on the optical systems. They use laser technology for data input. There are many optical reorganization devices. Commonly used are: OMR, OCR, OBR, MICR. These are explained below:

Optical Mark Reader (OMR):

It is an optical scanner input device. It is used to recognize a pre-specified type of marks. These marks are made by pencil or pen. OMR sheets are commonly used in the examination system. For example, in the objective type examination systems, students mark their answers on the OMR sheet. These OMR sheets are checked using OMR devices. In OMR system, a beam of light is directed onto the sheet. The beam is reflected from the surface to a light sensor. When a mark passes under the beam, light is reflected back. If light is reflected back then the presence of a mark is recorded.

Optical Character Recognition (OCR):

It is also an optical scanner input device. Most OCR systems are the combination of hardware and software. It is used to read a printed text. OCR scans printed text character by character. Then it converts them into a machine readable code. These codes are then stored in the computer memory.

OCR devices scan each character as a set of pixels. After scanning the character, it is compared with the standard fonts. If scanned character is matched, it is stored otherwise it is rejected.

Magnetic Ink Character Recognition (MICR):

It is also an optical scanner input device. These devices are mainly developed for banking industry. These devices are used for processing the cheques in banks. Some codes are printed on cheques using the special magnetic ink. These codes contain bank's identification code and the customer's account information. When the cheque is presented at the bank, it is processed using MICR.

Optical Bar-Code Reader (OBR or BCR):

It is also an optical scanner input device. It is used for reading bar-coded data. This code appears on almost all retail packages. These bars are decoded as 10 digits. The first five digits identify the supplier of the product. The last five digits identify the product details. This detail includes product code and price etc. The most widely known bar code is the Universal Product Code (UPC).

OUTPUT DEVICES

Output Devices are peripheral devices. They are used to display information or result. These devices receive processed data in machine format from the CPU. Then, they convert received data into user understandable form. Printer, monitor and speakers are the commonly used output devices.

TYPES OF OUTPUT DEVICES

Output can be viewed on a monitor. It can be printed on a printer, or it can be listened through speakers. All these types of output devices can be divided into two forms:

- Softcopy Output Devices
- Hardcopy Output Devices

Soft Copy Output Devices:

The **electronic version** of output is called soft copy. It usually **resides in computer memory**. Soft copy is **not a permanent form** of output. It is usually displayed on the screen. This kind of output **cannot be touched**. Soft copy output includes **audio and visual form** of output. So, those devices which produce soft copy of output are called Softcopy Output Devices. Monitor, projectors, speakers are the example of softcopy devices.

MONITOR:

Monitor is the most commonly used output device. It is the standard output device. It is used to display results. It has a TV like shape. It produces the softcopy of the output. It is also called **VDU (Visual Display Unit)**. It creates images from tiny dots. These tiny dots are called **pixels**. The sharpness of the image (screen resolution) depends upon the number of pixels.

There are two types of viewing screen used for monitors:

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

CRT monitor has a **phosphor coated screen**. A **beam of electron** is directed on to the phosphor coated screen to display output. This electron beam is called **Cathode Ray**. Therefore, these devices are called CRT Monitors. CRT shows the output in the form of small **pixels**. Image clarity of picture depends on the size of pixel. Smaller pixels make better quality of image. CRT has many limitations. Some of common limitations are:

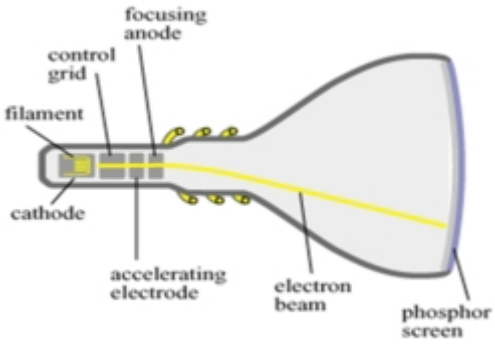


Fig: Cathode Ray Tube

- They are **larger in size**
- They have **high power consumption**

Flat-Panel Display Monitor:

The flat-panel display refers to a class of video devices. These devices have reduced volume, weight and power requirement as compared to the CRT. We can hang them on walls. Current uses for flat-panel displays include calculators, video games, monitors, laptop computer.

The flat-panel displays are divided into two categories:

Emissive Displays – These displays convert electrical energy into graphics pattern. Examples are: plasma panel and LED (Light-Emitting Diodes) etc.

Non-Emissive Displays - These displays convert sunlight or surrounding light into graphics patterns. Example is LCD (Liquid-Crystal Device)

Hard Copy Output Devices:

The **physical form of output** is known as hard copy. Hard copy output is **permanent**. So those devices which produce hard copy of output are called Hardcopy Output Devices. Output printed on paper is the good example of hardcopy. Printers and plotters are the examples of hardcopy output devices.

PRINTERS:

Printer is an important output device. They are the hardcopy output devices. They are used to print information on the paper. Printers are classified into two types:

- Impact Printers
- Non-Impact Printers

IMPACT PRINTERS:

Impact printers use the typewriter printing mechanism. They are based on the hammer technique. To print the characters, hammer strikes against the paper through ribbon. These printers produce noise during printing. Dot-matrix printers, character printers, line printers are the examples of these printers. Impact Printers have the following features:

- These printers have very low printing costs
- These printers are very noisy
- These printers are very useful for bulk printing due to low cost

These printers are of two types:

- Character printers
- Line printers

Character Printers:

These are the impact printers. They print one character at a time. These printers are based on the hammer technique. To print the characters, hammer strikes against the paper through the ribbon. These printers produce noise during printing. **Dot Matrix Printer (DMP) and Daisy Wheel printers** are the best examples of character printers. These printers are explained below:

Dot Matrix Printer (DMP):

These are the impact printers. These printers are very popular due to their low printing cost. These printers are character printers. Each character is printed in the form of dots. Its head consists of a Matrix of Pins. These pins are of different sizes, e.g. 5x7, 7x9, 9x7 or 9x9 etc. This matrix of pins forms a character. Therefore these printers are called Dot-Matrix Printer.

Printer head moves on a cartridge. To print the characters, head strikes against the paper through the ribbon. These printers are normally used to print text. They print the graphics in low quality. DMP are available in two sizes. They can be 80 columns or 132 columns wide. Printing speed is measured in cps (characters per-second).

Advantages:

- These printers are less costly
- They are still widely used
- These printers can also print characters of other language.
- These printers can be used to produce multiple printouts at a time.

Disadvantages:

- These printers have slow speed
- These printers produce noise during printing
- These printers have poor printing quality

Daisy Wheel Printer:

It is an **Impact Printer**. It prints one character at a time. Therefore, it is also called **Character Printer. These** printers use a metal or plastic disk/wheel. This disk/wheel contains letters, numbers, and other characters. When something is printed, the printer rotates the disk. Then, a hammer strikes the character onto an ink ribbon. In this way, ribbon ink is shifted to the paper to print the character. The wheel is like petals of Daisy (flower name). That is why it is called Daisy Wheel Printer. Daisy-wheel printers cannot print graphics. These printers are noisy and slow. Its speed is measured in cps (characters per second).

Advantages:

- These printers are more reliable than DMP's
- The characters of wheel can be easily changed.
- These printers can be used to produce multiple printouts at a time.

Disadvantages:

- These are slower than DMP's
- These printers produce noise during printing
- More expensive than DMP's

Line Printers:

These are Impact printers. They print one line at a time. Therefore these printers are also known as Line Printers. They are used for producing very large amount of print-outs. They are very fast. Their speed is measure in lpm (lines per minute). These are of further two types:

- Drum Printer
- Chain Printer

Drum Printer:

These printers are line printer. These printers use hammer technology for printing. This printer is like a drum in shape. So, it is called drum printer. The surface of drum is divided into number of tracks. Total tracks are equal to size of paper. One rotation of drum prints one line. Drum Printers are fast in speed. They print 300 to 2000 lines per minute.

Advantages

- These printers are faster than character printers.
- These printers can be used to produce multiple printouts at a time.

Disadvantages

- These printers were very expensive
- These printers produce noise during printing

Chain Printer:

These printers are line printer. These printers use hammer technology for printing. This printer uses a chain of character sets for printing. So, they are called Chain Printers. These printers are fast in speed.

Advantages

- Character can easily be changed.
- Symbols of different languages can be used with the same printer.
- These printers can be used to produce multiple printouts at a time.

Disadvantages

- These printers were very expensive
- These printers produce noise during printing

NON-IMPACT PRINTERS

Non-impact printers do not use hammer technique for printing. They do not touch the paper while printing. They use chemical, heat or electrical signals for printing. These printers print a complete page at a time. Therefore, these printers are also called Page printers. These printers are of two types:

- Laser Printers
- Inkjet Printers

DeskJet/Inkjet Printers:
These are non-impact printers. They make less noise. These printers do not use hamming technique for printing. They print characters by spraying small drops of ink. These printers produce high quality output. We can print in different colors using these printers. Special type of ink is used for printing. This ink contains high iron content.

Advantages:

- These printers are faster
- These printers are used for high quality printing
- These printers are used for colorful printing
- These printers support many fonts and different character size.

Disadvantages:

- Printing cost is high
- These are slower than laser printers
- These printers cannot be used to produce multiple printouts at a time.

Laser Printer:
These are non-impact printers. They make less noise. These printers do not use hamming technique for printing. Laser Printers can print one page at a time. They are fast printers. Their printing speed is measure in ppm (pages per minute). The printing quality is very high. The printing quality is measured in dpi (dots per inch). They are more expensive. These printers use laser technique for printing. Therefore, these printers are called as the laser printers.

Advantages:

- These printers are faster.
- These printers are used for high quality printing
- These printers support many fonts and different character size.

Disadvantages:

- These printers are expensive
- These printers cannot be used to produce multiple printouts at a time.

PLOTTER:
Plotters are hard copy output devices. Plotters are used to print high quality graphics. These devices are used in the field of engineering and scientific applications. Plotters are generally used to print charts, drawings, maps etc. There are two types of plotters:

1. **Flat Bed Plotters**:

These plotters print the graphics by moving the pen on stationary paper or cloth. They produce very accurate drawings.

2. **Drum Plotters**:

These plotters print graphics by moving both the pen and the drum having paper. They do not produce accurate drawings like flatbed plotters.

Plotters are more expensive than printers. These devices could print full-size engineering drawings. They are used for CAD (Computer-Aided Design) and CAM (Computer-Aided Manufacturing).

MEMORY

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in computer. The memory is divided into a large no. of small cells. These cells define the memory location of data. Each location has a unique number. This number is called its address. We can view the memory as shown in figure

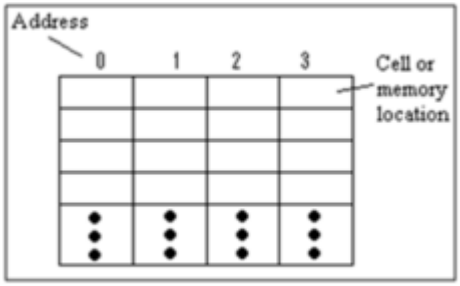


Figure: Cells of Memory

Memory Units:

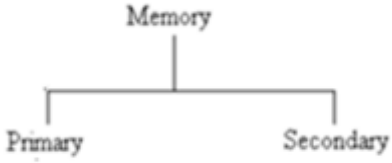
Memory units are used to measure the size of memory. Following units are used to measure the memory:

a. **Bit (Binary Digit)** : A binary digit: 0 or 1
b. **Nibble** : A group of four bits is called nibble (1010).
c. **Byte** : A group of 8 bits (11001010) is called byte.
d. **Kilobyte (KB)** 1KB = 1024 Bytes
e. **Megabyte (MB)** 1 MB = 1024 KB
f. **Gigabyte (GB)** 1GB = 1024 MB
g. **Terabyte(TB)** 1TB = 1024GB

TYPES OF MEMORY:

There are two basic types of computer memory:

1. Primary Memory
2. Secondary/Auxiliary Memory



PRIMARY/MAIN MEMORY

Primary is also known as **Main Memory**. This type of memory is also known as **internal memory**. Primary memory is an important memory for computer to work. Computer cannot start without this memory. It is very fast memory. But, it has a limited capacity. This memory consists of some **Integrated Circuit** (IC) chips. Modern Main Memories are semi-conductor memories. These memories use the flip-flops on a silicon chip. A Flip-flop can store either 1 or 0.

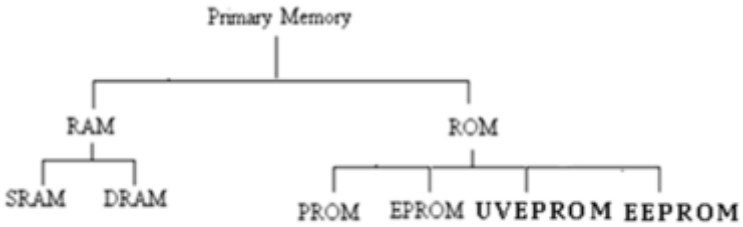


Fig: Types of Main Memories

Types of Main Memories:

Main Memories can be divided into two categories:

- Random Access Memory (RAM)
- Read Only Memory (ROM)

RANDOM ACCESS MEMORY (RAM):

RAM stands for Random Access Memory. When CPU executes the program, its instructions and data reside in this memory. It is used for storing data, program and result. It is a read/write memory. But, data cannot be stored permanently in this memory. It is a **volatile memory**. It means data stored in this memory is lost when we switch off the computer.

Types of RAM: There are two types of RAM. These are explained below:

a. DRAM:

It is the **Dynamic Random Access Memory**. In DRAM, each cell consists of one transistor and one capacitor. Transistor works as a switching device. It gives two states on and off. Capacitor is used to store charge in it. When transistor is on, current is passed and capacitor gets charged. But this charge gets reduced with time. So, the capacitor has to be charged again. This process is called **Regeneration of Charge**. This process happens again and again. So, it is called Dynamic RAM. The circuit of DRAM is simple and less costly.

b. SRAM:

It is the **Static Random Access Memory**. It contains more than one transistors and capacitors. Therefore, it is more expensive. But it does not lose its charge with time. So it is better than DRAM. But its circuit is complicated. So they are used for some special purpose.

ROM (READ ONLY MEMORY):

ROM stands for **Read Only Memory**. This memory contains instruction that helps computer to start. These instructions are referred to as **bootstrap program**. The combination of ROM chip and software is known as **Firmware**.

We can only read data from this memory. We cannot change the contents of this memory. It has factory made contents. This is a **non-volatile** memory. The information is stored permanently in this memory.

Types of ROM:

There are many types of ROM. These are explained below:

a. PROM (Programmable Read Only Memory):

The PROM is a Programmable Read Only Memory. The user buys a blank PROM. He can enter the software in this ROM using a PROM burner (software). It can be programmed only once. After that we cannot erase the contents of this memory.

b. **EPROM (Erasable Programmable-Read Only Memory)**:

This is another type of ROM. We can erase the contents of this type of ROM. So, we can make the ROM reusable.

c. UVEPROM (Ultra Violet Erasable and Programmable Read only memory):

This type of ROM can be erased by exposing it to ultra violet light. After erasing, we can program it.

d. EEPROM (Electrically Erasable and Programmable Read only Memory):

This type of ROM is erased electrically. After erasing, we can program it.

SECONDARY MEMORY:

This type of memory is also known as **external memory or non-volatile**. These are slower than main memory. These are used for storing data permanently. Secondary Memory has large storage capacity. CPU cannot access this type of memory directly. Contents of secondary memories are

first transferred to main memory, and then CPU can access it. Examples of secondary memory are: Magnetic Tape, Hard Disk, Floppy Disk, CD-ROM, DVD etc.

Types of Secondary Memory:

Secondary Memory can be classified into two types:

a. **Sequential Access Memory**: These storage devices allows only sequential access of data. For example: Magnetic Tape.

b. **Direct Access Memory**: These storage devices allows direct access of data also. For example: Floppy Disk, Hard Disk, Optical Disks etc.

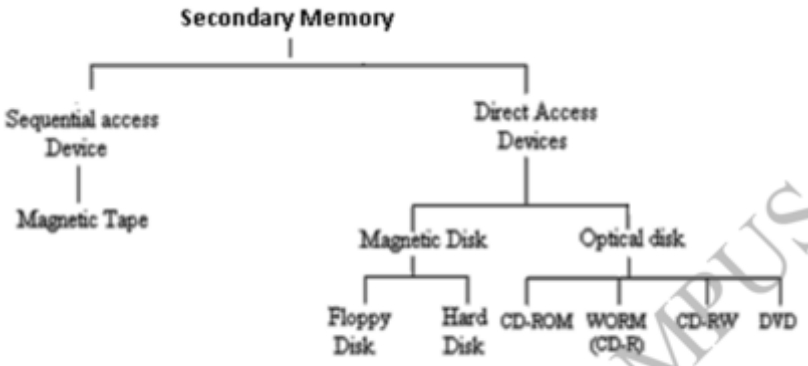


Fig: Different Tyopes of Secondary Memory

Commonly used Secondary storage devices are explained below:

HARD DISK:

Hard Disk is the secondary storage device. We can read, write and store data permanently in the hard disks. It allows direct access of data. It can store large amount of data. Its memory size is measured in Gigabytes (GB) and Terabytes (TB). It is fixed in CPU. It is faster than floppy disk.

Hard Disk is made up of aluminum material. Hard Disk consists of one or more metallic platters (rapidly rotating disks). These platters are coated with magnetic material. These platters are sealed inside a container. Sealed container has a motor for rotating disk. It also contains an access arm and read write head.

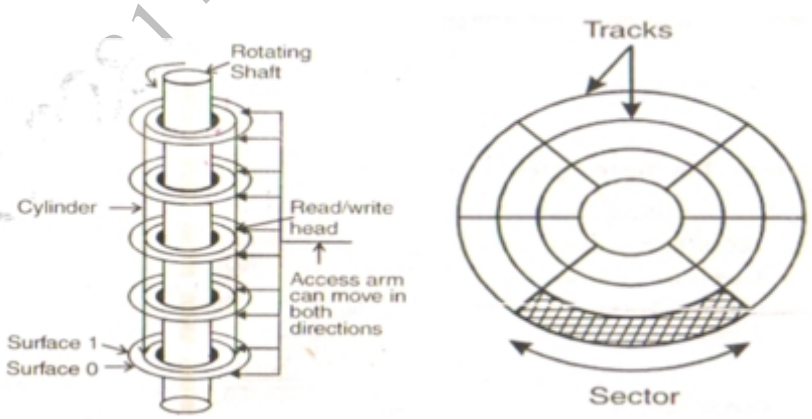


Fig: Internal View of Hard Disk

The platters are mounted on a spindle. This spindle is connected to a motor. Motor rotates it at a very fast speed. This speed is usually 7200 rpm (rotations per minute). Each disk/platter is divided into number of tracks (circular). Each track is further subdivided into sectors.

COMPACT DISK (CD):

CD is the secondary storage device. It is an Optical Disk. It is commonly known as Compact Disk Read Only Memory (CD-ROM). It allows direct access of data. It uses laser technology. It can store

large amount of data as compared to Floppy disk. It can be used to transfer data from one computer to another.

CDs are commonly used to store data, information and software. Its contents cannot be changed or erased. CD-ROM drive is used to read data from CD. Compact disks can store 700 MB of data. There are many variations of CDs. These are:

WORM (Write Once Read Many times) is a type of compact disk. It can be recorded only once. After that it cannot be erased.

CDRW (CD Read Write) is another type of compact disk. It can be recorded and erased many times.

Advantages of CD-ROM

1. It has large storage capacity as compared to floppy disk.
2. It has low price.
3. It is fast as compared to floppy
4. It is suitable for backup storage.

Disadvantages of CD-ROM

1. It is read-only and data cannot be changed.
2. It is slower than magnetic disk drives.

DVD

DVD stands for **Digital Versatile Disc** or **Digital Video Disk**. It is a secondary storage device. It is also an Optical Disk. It allows direct access of data. It allows storage of data in the form of many layers. It is mainly used to store and distribute movies. It becomes a very popular storage media. It has low price and large storage capacity.

There are two types of DVDs:

Single-layer DVD: It has storage capacity of approx. 4.7GB.

Double layer DVD: It has storage capacity of approx. 8.5GB.

FLOPPY DISK (DISKETTE):

Floppy disk is also known as **Diskette**. It is a secondary storage device. It allows direct access of data. Floppy Disk is a portable storage device. It was usually used to transfer data from one computer to other. It is a smaller and cheaper disk unit. It has a very small storage capacity (1.44MB).

COMPUTER LANGUAGES

Computer languages are used to develop programs or software. There are many types of computer languages. But a computer can understand only binary language. So, the programs written in other languages must be translated into the binary form for execution. Computer Languages can be classified as:

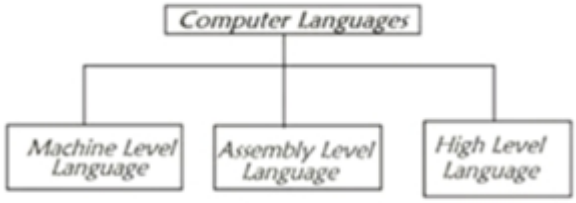


Figure: Types of Computer Languages

MACHINE LANGUAGE (BINARY LANGUAGE)

This is also called as the **First Generation Computer Language**. It is a fundamental language of computer. It is directly understood by the computer. It means it does not require any translation.

It consists of 0's and 1's. It is a low level programming language because low level technical hardware knowledge is required for the programming. Therefore, it is a machine dependent language. Normally, a machine language instruction consists of two parts.

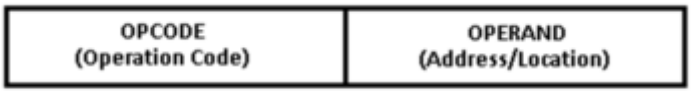


Fig: Machine Instruction Format

OPCODE: The first part is the operation code. This part tells the computer what function is to be performed.

OPERAND: The second part is the operation address. It tells the address of the data on which the operation will be performed.

Advantages of Machine language:

- It is faster in execution. It is because the computer understands it directly.
- There is no need of translation.

Disadvantages of machine languages:

- **Machine Dependent**: Programs written in Machine Language are not portable, i.e. they are machine-dependent.
- **Difficult to Program**: It is difficult to develop a program using machine language.
- **Difficult to modify**: It is difficult to modify a machine language program.
- Technical Low level hardware knowledge is required for the programming in Machine Language.
- Error Prone

ASSEMBLY LANGUAGE

This is also called as the **Second Generation Computer Language**. Assembly language uses symbols and mnemonic codes to represent instructions and address. Therefore this language is also known as **Symbolic Language**. It is a low level programming language because low level technical hardware knowledge is required for the programming. Therefore, it is a machine dependent language.

Mnemonic codes are English like codes. These codes are used to perform many types of operations. For example:

ADD mnemonic code is used for addition,
SUB is used for subtraction,
MUL for multiplication etc

Assembly language is not directly understood by computer. So, a translator is required to translate it into machine format. This translator is called **Assembler**. An assembler takes an assembly language program (source Code) as input. It produces machine language code (Object Code) as its output.

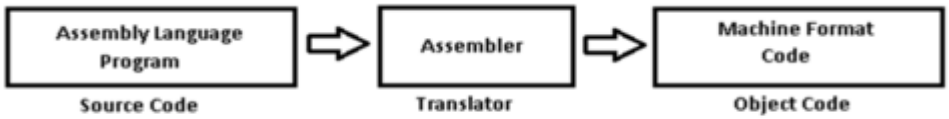


Fig: Assembler

Following example shows the assembly language program. This program shows the addition of two numbers A and B:

LD A, 7	Load register A with 7
LD B, 10	Load register B with 10
ADD A, B	A ←A+ B
LD (100), A	Save the result in the Memory location 100
HALT	Halt process

Advantages of Assembly Language:

- Easier to Understand and Use
- Easier to locate and correct errors
- Easier to modify
- Efficiency of Machine Language
- No need to keep track of storage locations of the data and instructions

Disadvantages of Assembly language:

- Low level technical hardware knowledge is required for the programming in Assembly language.
- Assembly language programs are machine dependent.

HIGH LEVEL LANGUAGES

These languages are also called as the **Third Generation Computer Languages.** These languages use **alphanumeric codes** to write programs. These languages are very close to English like languages. No low level technical hardware knowledge is required for the programming in these Languages. Therefore, these languages are **machine independent**. FORTRAN, COBOL, BASIC, PASCAL, C etc are the examples of High Level Languages.

High level language is **not directly understood** by computer. So, a **translator** is required to translate it into machine format. This translator is called **Compiler or Interpreter**. A Compiler takes a high level language program (source Code) as input. It produces machine language code (Object Code) as its output.

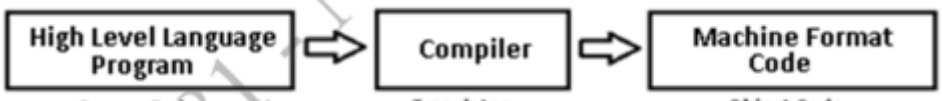


Fig: Compiler

Following example shows the high level language program written in C. This program shows the addition of two numbers A and B:

```
#include<stdio.h>
void main()
{
        int A,B,C;
        A=56;
        B=67;
        C=A+B;
        printf("%d",C);
}
```

Advantages of High Level Programming Language:

- Machine Independent programs
- Easy to learn and use
- Programs are more readable.

- Programs could be run on different machines with little or no modification. It means programs are portable.
- Finding and correcting errors is easy (Easy Debugging).
- High level languages provide better documentation (comments).
- Programs are easier to maintain.

Disadvantages of High Level Programming Languages:

- High level languages has lower efficiency than machine and assembly languages
- They are less flexible because they do not have the instructions to control computer hardware (CPU, memory, registers etc)

THE FOURTH GENERATION LANGUAGES (4GL) OR PROBLEM ORIENTED LANGUAGES

Fourth Generation Language has not been developed yet. The fourth generation languages are non-procedural languages. These languages are also known as Problem Oriented Languages. They are highly user friendly. The user has to define the problem, provide data and the output required. These languages call appropriate procedures to solve the problem and provide the required output.

Most of the 4GL's are menu driven languages. A menu is a list of facilities to solve a problem. Examples of these languages are: LOTUS 1-2-3, dBASE III plus, dBase IV, Fox Pro, Ingres, Oracle etc.

Section B

NUMBER SYSTEM

Number systems are used to count or measure something. In the daily life, we use decimal number system. There are two types of numbers systems:

- Non-positional number systems
- Positional number system

a. **Non-Positional Number Systems:** In these number systems, the value of a **numeral** symbol does not depend on its **position**. Example of a non-positional number system is: Roman number system. This system has symbols such as I for 1, II for 2, III for 3, IV for 4, V for 5 etc. But, there is no symbols corresponding to zero.

b. **Positional number systems:** In these number systems, the value of a **numeral** symbol depends on its **position**. Examples of positional number system are: decimal number system, binary number system, octal number system, hexadecimal number system. Every positional number system has a base or radix value. Base or radix of Decimal no System is 10, Binary no system is 2, Octal no system is 8, and hexadecimal no system is 16.

Concept of Bit and Byte:

Bit stands for Binary Digits. These digits are 0 and 1. Binary Number system uses these digits. A digital computer stores everything in the form of binary digits. Combination of 8 bits is called a Byte. In other words, a byte is equal to 8 bits. It is the smallest unit of memory.

Binary No System: A number system which consists of two different symbols 0 and 1 is called Binary no system. The base or radix value of this number system is 2. A decimal no can be converted into binary no system. This number system is used by the computer systems. This is a Positional number system.

Decimal No System: A number system which consists of 10 different symbols 0,1,2,3,4,5,6,7,8 and 9 is called Decimal no system. The base or radix value of this number system is 10. Any number in other number systems can be converted back into decimal no system. This number system is used by the human beings. This is a Positional number system.

Octal No System: A number system which consists of 8 different symbols 0,1,2,3,4,5,6 and 7 is called octal no system. The base or radix value of this number system is 8. A decimal no can be converted

into octal no system. This number system is used by the computer systems. This is a Positional number system.

Hexadecimal No System: A number system which consists of 16 different symbols 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E and F is called Binary no system. The base or radix value of this number system is 16. A decimal no can be converted into hexadecimal no system. This number system is used by the computer systems. This is a Positional number system.

1's Complement: It is a way to represent negative numbers. To represent any negative number into binary form using 1's complement, we have to invert all 0's into 1's and all 1's into 0's.

2's Complement: It is a way to represent negative numbers. To represent any negative number into binary form using 2's complement, we have to add 1 to 1's complement form. It means

2's complement = 1's complement + 1

Steps to do Binary subtraction using 1's Complement:

1. Convert the numbers into binary form
2. Equalize the no of bits in both the numbers
3. Perform 1's complement of negative no
4. Add both numbers
5. If carry bit occurs, add it

Steps to do Binary subtraction using 2's Complement:

1. Convert the numbers into binary form
2. Equalize the no of bits in both the numbers
3. Perform 2's complement of negative no
4. Add both numbers
5. If carry bit occurs, ignore it

COMPUTER NETWORK AND ITS TYPES:

A computer **network** is the interconnection of two or more computers. These computers are connected via some communication media. These computers are connected to share resources. There are many types of computer **networks. N**etworks can be classified according to the geographical area. They can be classified into three categories:

1. Local Area Network (LAN)
2. Metropolitan Area Network (MAN)
3. Wide Area Network (WAN)

1. Local Area Network:

A **local area network** (**LAN**) is a computer **network.** It interconnects computers within a limited area. This area can be a residence, school, library, or office building. LAN is relatively smaller than MAN and WAN. It is privately owned network. It provides local connectivity. In Offices, LAN is used to share resources. It can also be used to exchange information.

A LAN is made up of many **components**. These components are **Transmission channels** (twisted pair cable, coaxial cable, fiber-optic cable etc.), **Server** Computer, Work Station or **Client** Computers, **Network Interface Card** (NIC), Hub, and shared resources (printers etc.)

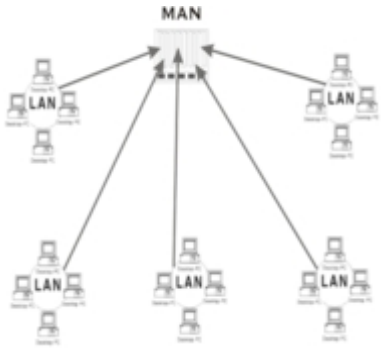
Features of LAN:

Following are some important feature of LAN.

- Local Area Network has a limited geographic area
- Local Area Network has a limited number of Users
- Local Area Networks are reliable and stable. Chances of errors are very few.
- Local Area Networks are Flexible. Different types of computers can be connected to it.
- Local Area Networks are easily expandable. More nodes (computers) can be added easily to it.
- Local Area Networks are secure. They can be supervised by the administrator.

2. Metropolitan Area network (MAN):

A **metropolitan area network** (**MAN**) is a computer network. It is larger than a local area network. It covers a large geographical area as compared to LAN. It can be the area of an entire city. MAN may be a single network like cable TV network. It may be interconnection of many LANs. For example, a company can use MAN to connect it's all office LANs in a city. MAN might be either private or public.



Feature of MAN:

- MAN network can share resources in city.
- MAN is slower than LAN but Faster than WAN.
- MAN has more error rates than LAN.

3. Wide Area networks (WAN):

Wide Area Network is a computer network. It has no limit of geographical distance. This geographical area can be a country, a continent or the whole world. Public networks can be used to connect computers in a wide-area network. For example, telephone network system is used to connect computers to WAN. WANs can also be connected through satellites. Internet is the best example of Wide Area Network. Many components are used in WAN. These components are Bridges, Routers, and Gateways etc. Railway, airlines and banks etc. are the main application areas of WAN.

Feature of WAN:

- It interconnects computer or LANs of distant places.
- It operates world wide web (internet)
- WAN is slower than LAN and MAN.
- WAN has more error rates than LAN and MAN.

Types of WAN:

There are two types of WAN.

I) **Public Networks**: These networks are managed by communication companies. These networks provide their services to their subscribers.

II) **Private networks:** These networks use private or leased lines to connect to other networks.

NETWORK TOPOLOGIES

Network topology is the **arrangement of the various elements** (links, nodes, etc.) of a computer **network**. Computers can be connected in different ways in a network. So there are different types of topologies. Commonly used topologies are discussed below:

Bus Topology:

A bus network is a local area network (LAN). It is the simplest network topology. In this topology, all the nodes (computers as well as servers) are connected to the single cable. This cable is called the Bus. This central cable is the backbone of the network. Every node communicates with the other nodes through this Bus. A terminator is added at ends of bus. It prevents bouncing of signals.

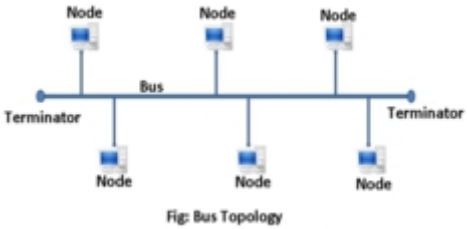


Fig: Bus Topology

Advantages:

- It is a reliable network topology.
- If one node fails, remaining nodes can communicate with each other.
- Bus networks are easy to expand. New nodes can be added easily.
- This network is not costly

Disadvantages:

- The length of the bus is limited.
- If there is some problem in the main cable, whole network breaks down.
- It is not suitable for networks with heavy traffic.

Star Topology

A star network is a local area network (LAN). In this topology, all the components (nodes) of network are connected to the central device. This central device is called **Hub.** The connection between nodes and central device is **point-to-point**. Every node is indirectly connected to every other node by the Hub. All the data passes through the central device. Unshielded Twisted Pair (UTP) Ethernet cable is used to connect workstations to the central node.

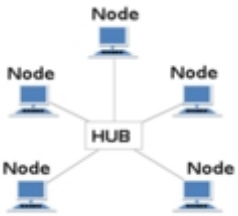


Fig: Star Toology

Advantages of Star Topology:

- It gives far much better performance than the bus topology.
- It is easy to connect new nodes or devices.
- It is easy to remove nodes or devices.
- It has a centralized management.
- If one node fails, other nodes don't affect.

Disadvantages of Star Topology

- If central device fails whole network goes down.
- Total number of nodes depends on the capacity of central device.

Ring Topology

A ring network is a local area network (LAN). In Ring Topology, all the nodes are connected to each-other like a closed loop. Each node is connected to two other nodes on both sides. A node can communicate with its neighboring nodes. In the network, data travels in one direction. Sending and receiving of data takes place with the help of TOKEN. A Token contains the information about the sender and receiver.

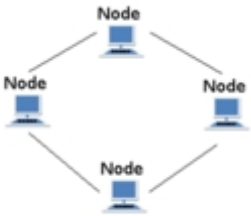


Fig: Ring Topology

Advantages of Ring Topology

- All the traffic flows in only one direction at very high speed.
- Its performance is better than that of Bus topology.
- There is no need for network server to control the nodes.

Disadvantages of Ring Topology

- It is slower than Star topology
- If one node goes down, the entire network gets affected.
- Network is highly dependent on the wire

Mesh Topology

A mesh network is a local area network (LAN). In this topology, all nodes are interconnected with one another. This type of topology is very expensive. It is commonly used in wireless networks. Flooding or routing technique is used in mesh topology.

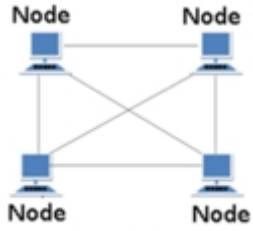


Fig: Mesh Topology

Advantages of Mesh topology:

- Data can be transmitted from many devices simultaneously.
- If any node fails there is always an alternative present.

Disadvantages of Mesh topology:

- Cost of this network is very high
- Set-up and maintenance of this topology is very difficult.
- Administration of the network is tough

Tree Topology

It combines the features of Star and Bus Topology. In Tree Topology, the numbers of Star networks are connected using Bus. This topology is also called **Expanded Star Topology**. Ethernet protocol is commonly used in this type of topology.

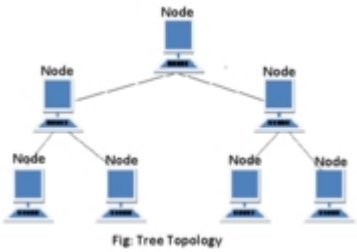


Fig: Tree Topology

Advantages of Tree Topology

- It is an extension of Star and bus Topologies
- It can be extended easily
- If one segment goes down, other segments are not affected.

Disadvantages of Tree Topology

- Its working depends heavily on the main bus cable
- Maintenance becomes difficult when segments exceeds.
- Extension depends on the type of cable used.

INTERNET:

Internet is a very large network of networks. These networks are joined together across the world. Computers in these networks can communicate with each other. They can also share data with each other. Internet is used in many fields of daily life. It has become an important part of our daily life. In daily life, it is used for information search, communications, entertainment, e-business, finance etc. Following are some common uses of internet:

- It is widely used for Communication (using emails)
- It is used for Job searches
- It is used for finding books and study material
- It is used for health and medicine
- It is used gets travelling related information
- It is used for Entertainment (play games, listen songs, watch videos)
- It is used for online Shopping
- It is used to get Stock market updates
- It is used for the Research work
- It is used for Business transactions

WORLD WIDE WEB (WWW):

The World Wide Web is also called www or web or W3. It is a system of web servers. In www, information is stored in the form of web-pages. Web pages are written in HTML (Hypertext Mark Language). HTML defines the structural elements of web page. A web-page contains text, picture, audio, animations etc. The collection of related web-pages is called a website. Websites are stored on the web-servers. The web-pages of a website are linked with each other. These links are called hyperlinks. By default, hyperlinks are shown in blue color with underline. The first web-page of a website is known as Homepage.

Each web-site/page has a unique address. This address is called URL (Uniform Resource Locater). Example of URL is: www.google.com. To use these web pages, we have to use Web browsers. Some popular web browsers are Google Chrome, Firefox and Microsoft's Internet Explorer.

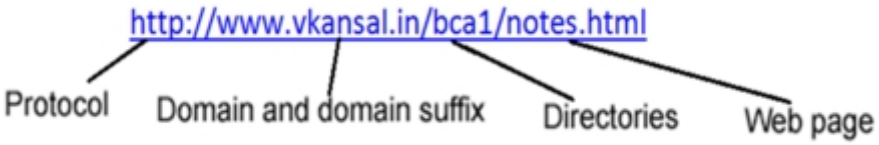
HYPERTEXT:

Hypertext is the text which contains links to other texts. The term was coined by Ted Nelson around 1965. A webpage consists of hypertext and hypermedia. The link in the text was shown in blue colour with underline.

When we click on these links, they take us to some new linked webpages. In HTML, Anchor tag <a> is used to make links in the webpages.

UNIFORM RESOURCE LOCATOR (URL):

Uniform Resource Locator is also called URL. It is the global address of documents/web pages and other resources on the World Wide Web. The URL contains the name of the protocol to be used to access the resource and a resource name. The first part of a URL identifies what protocol to use, for example: http, ftp, https etc. The second part identifies the IP address or domain name where the resource is located. Consider the following example of URL:



WEB BROWSER:

A web browser is application software. It helps us to search, view and read information on web sites. This information can be in many forms. It includes simple text, graphics images, animation, video, and audios. Internet Explorer (IE), Google Chrome, Firefox etc. are the most commonly used web browsers. To view the information, we have to type its address in the browser. This address is called the URL of web site.

The web browser requests a web page from a web server. Web server receives the request and processes it. After processing, server sends the response to web browser. The web browser then displays this information.

IP ADDRESS:

IP Address is called Internet Protocol address. It is a logical numeric address that is assigned to every single computer, printer, switch, router or any other device that is part of a TCP/IP-based network. No network exists without IP address. An IP address is used to uniquely identify every node in the network. Because IP addresses are logical, they can be changed. They are similar to addresses in a town or city. The IP address gives an address to the network node so that it can communicate with other nodes or networks, just like mail is sent to friends and relatives. An IP address consists of 32-bits. These bits are divided into 4 parts an each part is by dot. Value of each part can be 0 to 255. For example, 192.168.1.21 could be an IP address.

An IP address can be **static** or **dynamic**. A static IP address will never change and it is a permanent Internet address. A dynamic IP address is a temporary address that is assigned each time a computer or device accesses the Internet.

DOMAIN NAME:

A domain name is the name of the website. A domain name is the address which can be used to access our website. A domain name is used for finding and identifying computers on the Internet. Computers use IP addresses, which are a series of number. However, it is difficult for humans to remember numbers of IP addresses. Because of this, domain names were developed and they are used to identify computers or devices on the Internet rather than using IP addresses.

A domain name can be any combination of letters and numbers. The domain name must be registered before we can use it. Every domain name is unique. No two websites can have the same domain name. For example, in the URL *http://www.vkansal.in/index.html,* the domain name is *vkansal.in.*

Every domain name has a suffix. This suffix shows the top level domain to which website belongs to. There are only a limited number of such domains. For example:

- **gov** - Government agencies
- **edu** - Educational institutions
- **org** - Organizations (non-profitable)
- **mil** - Military
- **com** - commercial business
- **net** - Network organizations

Because the Internet is based on IP addresses, so every Web server requires a Domain Name System (DNS). This DNS system translates domain names into IP addresses.

INTERNET SERVICES PROVIDERS (ISP):

I*nternet* **S***ervice* **P***rovider* is also known as ISP. ISP refers to a company that provides Internet services. These services include personal and business access to the Internet. For a monthly fee, the service provider provides a

software package, username, password and access phone number. With the help of modem, we can then use the Internet and browse the World Wide Web, and send and receive e-mails. ISPs use fiber-optics, satellite, copper wire, and other forms to provide Internet access to its customers.

INTERNET SECURITY:

Internet security is a branch of computer security. It deals specifically with Internet-based threats. These threats include hacking, viruses and other malicious software (malware). The objective of internet security is to establish rules that can be used against attacks over the Internet. The Internet represents an insecure channel for exchanging information. It leads to a high risk of intrusion or fraud. Various methods have been used to prevent online attacks and improve internet security. Many methods are used to protect the data during data transmission. One of the commonly used methods is encryption. To protect data from the internet threats, many antiviruses, anti-malwares, firewalls, and many internet security software have been developed. Using these security tools, we can protect our data from many attacks through internet.

WEB SEARCH ENGINE:

Search engines are programs that search documents for specified keywords. After searching, search engine returns a list of the documents where the keywords were found. Commonly used search engines are Google, Bing and Yahoo! Search that enable users to search for documents on the World Wide Web. Generally there are three basic components of a search engine as listed below:

1. Web Crawler
2. Database
3. Search Interfaces

Web crawler

It is also known as spider or bots. It is a software component that traverses the web to gather information.

Database

All the information on the web is stored in database. It consists of huge web resources.

Search Interfaces

This component is an interface between user and the database. It helps the user to search through the database.

NET SURFING:

Net Surfing is also known as web surfing or just surfing. Surfing describes the act of browsing the Internet by going from one web page to another web page. For navigation from one page to another, hyperlinks are used in the web browser.

WEB PORTAL

A web portal is a specially designed website that often serves as the single point of access for information. It can also be considered a library of personalized and categorized content. A web portal helps in search navigation, personalization, notification and information integration. Web portals are also known as **portals**.

The information stored in web portals can be accessed from multiple platforms like personal computers, smartphones and other electronic devices. Web portal is capable of presenting information based on the user. It can also allow users to voluntarily personalize the information presented in the portal. Web portals can be classified based on their types, such as market space portals, public web portals, enterprise web portals, knowledge portals, etc. A web portal is capable of handling both structured and unstructured information.

WIKI

A wiki is a server program that allows users to collaborate in forming the content of a Web site. The term comes from the word "wikiwiki," which means "fast" in the Hawaiian language.

A wiki provides a simplified interface. It is not necessary to know HTML to edit contents of wiki. At any time, contributors can review the history of the page they are working on. The contributor can also preview the Web page before publishing it.

A wiki Web site operates on a principle of collaborative trust. The simplest wiki programs allow users to create and edit content. More advanced wikis have a management component. This component allows a designated person to accept or reject changes that were made to the contents of the wiki. The best known example of a wiki Web site is **Wikipedia**.

BLOG:

A blog is a frequently updated online personal journal or diary. It is a place to express our views to the world. In other words, BLOG is a place to share our thoughts and our passions. We can also say that a blog is our own

website that we are going to update on an on-going basis. Blog is a short form for the word **weblog** and the two words are used interchangeably.

A blog is a website consisting of entries. These entries are called posts. These posts appear in reverse chronological order. The most recent entry appears first in the Blogs. Typically, BLOG includes features such as comments and links to increase user interactivity. Blogs are created using specific publishing software. The person who posts at the blog is called Blogger. The act of writing a post for a blog is called Blogging.

ADVANCED TRENDS IN IT:

MOBILE INTERNET:

Mobile internet is an internet connection through 2G or 3G or 4G mobile phone networks. This is opposed to ADSL (phone line) or cable (fibre-optic) broadband. Thus we can say that Mobile internet uses mobile phone. No routers, cables or telephone lines are needed.

Mobile internet gives us access to our favourite social communities like Facebook mobile, Whatsapp etc. Besides these, we can also access to news, sports, and entertainment using internet mobile. We can also search with Yahoo! Search and Google, and access any type of information.

GPS:

The Global Positioning System (GPS) is a space-based radio-navigation system. Initially it was owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geo-location and time information to a GPS receiver anywhere.

The GPS system does not require the user to transmit any data. It operates independently of any telephonic or internet reception. The GPS system provides critical positioning capabilities to military, civil, and commercial users around the world. In simple words, GPS stands for Global Positioning System by which anyone can always obtain the position information anywhere in the world.

3G AND 4G

G in 2G, 3G and 4G stands for the "Generation" of the mobile network. Today, mobile operators have started offering 4G services in the country. A higher number before the 'G' means more power to send out and receive more information.

As the name would suggest, 1G was the first generation of mobile networks. Here basically, radio signals were transmitted in 'Analogue' form. Using it, we could send simple text messages and making voice calls. 2G networks were based on narrow band digital networks. Signals were transmitted in the digital format and it improved the quality of calls.

The 3G of mobile networks allow users to access the Internet over devices like mobiles and tablets. The speed of data transmission on a 3G network ranges between 384 KBPS to 2 MBPS. This means a 3G network actually allows for more data transmission. 3G networks enables us to do voice and video call, file transmission, internet surfing, online TV, view high definition videos, play games and much more.

4th Generation mobile networks provide us many value added features. In addition to all the 3G facilities, data transmission speed of 4G ranges between 100MBPs to 1GBPS.

WIFI

Wi-Fi is the name of a popular wireless networking technology. It uses radio waves to provide wireless high-speed Internet and network connections. WIFI devices are based on the IEEE 802.11 standards. Devices that can use Wi-Fi technology include personal computers, phones and tablets, smart TVs, and modern printers. Wi-Fi compatible devices can connect to the Internet via a WLAN and a wireless access point. Such an access point (or hotspot) has a range of about 20 meters (66 feet) indoors and a greater range outdoors.

BLUETOOTH

Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices. This data exchange takes place using short-wavelength UHF radio waves. Bluetooth technology was invented by telecom vendor Ericsson in 1994.

Bluetooth is one of the major wireless technologies developed to achieve WPAN (Wireless Private Area Network). Bluetooth technology is generally used to connect devices of different functions such as telephones, computers (laptop or desktop), notebooks, cameras, printers and so on.

CLOUD COMPUTING:

In the simplest terms, cloud computing means storing and accessing data and programs over the Internet instead of your computer's hard drive. The word Cloud in the term Cloud Computing is just a representation for the Internet. Following are a few of the things that we can do with the cloud:

- Create new apps and services
- Store, back up and recover data
- Host websites and blogs
- Stream audio and video
- Deliver software on demand
- Analyse data for patterns and make predictions

VIRTUAL - LAN:

A virtual local area network (VLAN) is a logical group of workstations, servers and network devices. They appear to be on the same LAN despite of their geographical distribution. A VLAN allows a network of computers and users to communicate in a simulated (virtual) environment as if they exist in a single LAN. VLANs are implemented to achieve scalability, security and ease of network management. VLAN can quickly adapt to changes in network requirements.

The purpose of implementing a VLAN is to improve the performance of a network or apply appropriate security features. Traffic patterns can also easily be controlled by using VLANs.

The **key benefits** of implementing VLANs are:

- Allowing network administrators to apply additional security to network communication
- Making expansion of a network easier
- Providing flexibility because administrators are able to configure in a centralized environment while the devices might be located in different geographical locations
- Offers increased performance

VLANs also have some **limitations** as listed below:

- High risk of virus issues because one infected system may spread a virus through the whole logical network
- In a very large networks, additional routers might be needed to control the workload

FIREWALL

A firewall is a network security device. It monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic. This decision is taken based on a defined set of security rules. Firewalls have been a first line of defence in network security for over 25 years. They establish a barrier between secured and trusted internal networks and untrusted outside networks, such as the Internet.

We could think of a firewall as a security guard that decides who enters or exits a building. Firewalls are commonly used to prevent unauthorized access. A firewall can be hardware, software, or both.

E-COMMERCE:

E-Commerce is buying and selling of goods and services on the internet. E-Commerce is the act of doing business electronically. This means that all our transactions are paperless. All operations are done electronically such as EDI (Electronic Data Interchange), electronic mail, electronic fund transfers (EFT). Thus, e-commerce allows the company to do its business electronically, in essence having an electronic shop. Products can be advertised, sold and paid for electronically.

E-Commerce allows visitors to access our website. Visitor can go through virtual catalogue of our product and services online. When the visitors want to buy something they can add it to their virtual shopping basket. These items can be added or deleted any time. Finally customer can move to the virtual checkout counter. Now it will ask customer for name, address etc. Then it will ask methods of payments such as credit cards, debit cards, internet banking etc. Once all the information is entered, the buying and selling procedure is completed.

The concept of E-Commerce is suited to only those products or services that appear more suitable for online sales such as digital products, music, movies, education, communication, software etc.

M COMMERCE

M-Commerce stands for Mobile Commerce. It can be defined as the sales of goods and services via mobile devices such as Smart Phones and Personal Digital Assistants (PDAs). It is also known as a next-generation e-commerce. M-Commerce enables users to access the Internet without needing to find a place to plug in. M-

Commerce technology is based on the Wireless Application Protocol (WAP). However, mobile commerce can be seen as a part of ecommerce. It is still about doing transactions via digital means.

NANOTECHNOLOGY

Nano-technology is science, engineering, and technology conducted at the Nano-scale, which is about 1 to 100 Nano-meters. In other words, it is the study and application of extremely small things. This technology can be used across all the other science fields, such as chemistry, biology, physics, materials science, and engineering.

The ability to see Nano-sized materials has opened up a world of possibilities in many industries and scientific activities. Nanotechnology is essentially a set of techniques that allow manipulation of properties at a very small scale. It can have many applications, such as Drug delivery, Fabrics, Reactivity of Materials, Micro/Nano Electro-Mechanical Systems, and Molecular Manufacturing etc.

VIRTUAL REALITY:

Virtual reality is an artificial environment. It is created with software and presented to the user in such a way that the user suspense belief and accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound. The simplest form of virtual reality is a 3-D image. Virtual reality can be applied for:

- The simulation of a real environment for training and education. For example, for pilot and battle training.
- The development of an imagined environment. For example, for a game or interactive story.

The Virtual Reality Modelling Language (VRML) can be used to develop Virtual Reality Systems.

BPO AND KPO:

BPO stands for **Business Processing Outsourcing**. BPO means getting a business process implemented using the channel of outsourcing. BPO is the business that focuses on business tasks. These tasks range from manufacturing products to providing customer care. It usually consists of the back office or front office operations. It is a process where a number of people are working for a specific business. Data entry, call centres are some examples of BPO operations. Following is the list of common services that are provided by BPO industry:

- Customer Support Services
- Technical Support Services
- Telemarketing Services
- Employee IT Help-desk Services
- Insurance
- Processing Data Entry Services
- Data Conversion Services Scanning,
- Book Keeping and Accounting

KPO stands for **Knowledge Process Outsourcing**. KPO means outsourcing a process which requires processing of knowledge. KPO is the latest outsourcing process. It involves the application of training and expertise to research, data analysis, and other information-based activities. KPOs are usually more specialized and knowledge based. It requires a lot of R&D (Research and Development) services. The services like capital and insurance market services, legal services, biotechnology, etc., are also the usual activities in KPOs.

India and Eastern Europe Countries are particularly famous in Knowledge Process Outsourcing. KPO provides great quality work. It also delivers everything on-time with uninterrupted services. Some of common KPO services are listed below:

- Analytics
- Business Research
- Design & Animation
- Engineering Service Outsourcing (ESO)
- Financial Research Outsourcing (FRO)
- Legal Process Outsourcing (LPO)
- Marketing Services
- Market Research Outsourcing (MRO)
- Publishing Outsourcing

Both, BPO and KPO, help businesses to streamline their operations. These services make businesses very cost effective.

ONLINE SHOPPING:

The process of purchasing goods and services over the Internet through the use of a web browser is referred to as **online shopping**. Consumers can purchase items without going to market. Today, almost anything can be purchased through online shopping.

Now a day, online shopping has become a popular shopping method. There are many advantages of online shopping. Following are some of the common advantages of online shopping:

Advantages of Online Shopping

- **Save Time - it saves customers time** as there is no need to go to market for purchasing goods.
- **Save Fuel –** there is no need for vehicles, so no purchase of fuel necessary.
- **Save Energy –** In online shopping, we do not need to waste our valuable energy when buying.
- **Comparison of Prices –** We can easily check prices and compare with just a few clicks.
- **24/7 Availability –** We can purchase things any time of the day. Online shopping stores are open round the clock of 24/7, 7 days a week and 365 days.
- **Easy to search merchandise we want to buy**

SOCIAL MEDIA

Social Media is an internet-based media. It is used to create and share ideas and information. We can also collaborate with people with the help of Social Media. It is a platform where people come close virtually and the world looks connected within no time.

A Social Media website must have a few characteristics like User accounts, Participation, Profile Pages, Friends or followers, Community, Notifications, Ways to review the contents, etc. Examples of some Social Media of present times include – Facebook, Twitter, LinkedIn, Pinterest, Instagram, Youtube, Google+ etc. Now a days, Social Media has become a medium for self-express.

Here are some examples of social media:

- **Facebook** is a popular free social networking website. It allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues.
- **Twitter** is a free micro-blogging service. It allows registered members to broadcast short posts. These posts are called tweets. Twitter members can broadcast tweets and follow other users' tweets.
- **Google+** is Google's social networking project. It is designed to replicate the way people interact offline more closely. The project's slogan is "Real-life sharing rethought for the web."
- **LinkedIn** is a social networking site. It is designed specifically for the business community. The goal of the site is to allow registered members to establish and document networks of people.
- **YouTube is a video sharing service where users can watch, like, share, comment and upload their own videos.** The video service can be accessed on PCs, laptops, tablets and via mobile phones.
  The main functions of YouTube are:
  - Users can search for and watch videos
  - Create a personal YouTube channel
  - Upload videos to your channel
  - Like/Comment/share other YouTube videos
  - Users can subscribe/follow other YouTube channels and users
  - Create playlists to organize videos and group videos together

APPLICATIONS OF INFORMATION TECHNOLOGY

We can simply define Information Technology as: *"Any technology through which we get information is called **Information Technology**"*. The term Information Technology is always referred to computers & computer networks. But, it also includes Telephones, Television and other communication devices etc. Information technology has become an important part of modern life. Computers are used in many fields of our daily life. Computers have made our life easier. Specially, it has become an important part in the fields of business, science, engineering, education, entertainment etc. The use of IT in various fields is explained below:

Application of IT in Business & **Commerce**:

One of largest use of IT is in the field of Business and Commerce. It is helpful to keep and manage business records. Companies keep their workers information in the databases. These databases are managed by computer programs. Many different types of program are used to perform business related functions. For

example: billing information, payments received, expenditures, items produced and sold etc. All these business related functions are managed by the computers.

All the financial transactions are also done using the IT. Online financial transactions are possible due to internet banking. Newer technologies like m-commerce etc are growing rapidly. These technologies are very helpful in various business related functions.

Computers also help them to reduce the overall cost of their business. In Business, IT is also helpful in marketing and stock exchange

Application of IT in Science and Engineering:

Scientific and engineering fields are entirely dependent on computers. Microprocessor-controlled devices are heavily used in the field of biotechnology. Supercomputers are used to process a large amount of data in the science. They can be used to predict future weather. Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) programs have improved products in many fields. These softwares are specially used for creating complex designs. To analyze complex designs structures, engineers use computers. For example: to analyze power plants, space stations etc scientists and engineers use many types of programs.

Application of IT in Education:

Information Technology has changed the meaning of the term "literate". Computer literacy has become an important part of life. Computer education is provided as essential course at schools levels. Students are relying on electronic sources of information. Instruction methodology has also changed. Many audio visual aids are used in education for teaching. A new concept of e-learning has developed due to information technology. People can find any type of information on the internet. Educational websites are available to download books, tutorials etc.

Computer Based Tutorials (CBT) programs are used for teaching. These programs include text, graphics and sound. Audio and Video lectures are recorded on the CDs. CBT is a low cost solution for educating people. We can train a large number of people easily.

Application of IT in Entertainment:

IT has changed our lifestyle. IT is heavily being used for various types of entertainment. Internet is most widely used for entertainment. We can watch movies, listen to songs, and watch videos using internet. People can chat with friends and family on the internet. We can interact with friends over social media websites like Facebook, Twitter etc. We can also share photos and videos with friends using internet.

Multimedia applications are also an important source of entertainment. IT provides many other options for entertainment. These options include games, music and video, digital tv broadcasts, satellite radio, animated movies etc.

CURRENT TRENDS IN IT APPLICATION

Virtual reality (VR)

It is a term that applies to computer-simulated environments. It can simulate (imitate/copy) physical presence. Most current virtual reality environments are primarily visual experiences. The simulated environment can be similar to the real world. Simulation provides a lifelike experience. For example, for pilot, simulation provides battle training.

Artificial intelligence (AI)

It is the intelligence of machines. It is the branch of computer science. John McCarthy coined this term in 1955. He defines AI as "the science and engineering of making intelligent machines."

AI is deeply divided into subfields. The central problems of AI include reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects.

Robotics

A robot is a mechanical or virtual artificial agent. It is usually an electro-mechanical machine. It is guided by a computer program . Robots can be autonomous (self-directed), semi-autonomous or remotely controlled. The branch of technology that deals with robots is called robotics.

This machinery was initially used for repetitive functions. With technological advancements, more complex machines were developed.

Robots have replaced humans in many application areas. They are used for performing those repetitive and dangerous tasks which humans do not prefer to do.

Speech Recognition

In computer science, speech recognition (SR) is the translation of spoken words into text. It is one of the newest input techniques. Speech recognition / Voice recognition is a computer software program or hardware device. It has the ability to decode the human voice. The user can input data by speaking. Microphone is used to input sound into computer system. A Microphone receives human voice.

Voice recognition is commonly used to operate a device. It can be used to perform commands. It can also be used to write without a keyboard. These systems work by matching input voice with set of words. These systems are mostly user dependent. Only those users are recognized by the system who gets the training with the system by speaking.

Advantages:

- These are more efficient input device
- These are easy to use
- Unauthorized speakers can be identified.
- Gift for blind and handicapped people

Disadvantages:

- These systems have very limited vocabulary.
- These systems are specific user-dependent.

Multimedia Technology

Multimedia is the integration of multiple forms of media. This includes text, graphics, audio, video, and animation. For example, a presentation involving audio and video clips is called "multimedia presentation". Educational software that involves animations, sound, and text is called "multimedia software". Multimedia can be accessed through computers or electronic devices. Animated movies, computer based learning (CAL) CDs are the good examples of multimedia contents.

Section A

CATEGORIES OF COMPUTERS:

There are different kinds of computers available today. These computers differ in processing capability, storage capability, looks and sizes. That is why these computers perform different types of jobs from one another. In general, basic function of all the computers is same i.e. Computers accept data as input, perform operations on this data and generates the output to the user. These different types of computers are explained below:

Supercomputers:

These computers are most expensive in price. These are the biggest and fastest machines today. These computers are used when billions or trillions of calculations are needed. Supercomputers are ultra-fast computers. These computers are designed to process large amounts of scientific data. Super Computers are used for highly calculation-intensive tasks, for example: molecular modelling, climate research, weather forecasting, quantum physics, physical simulations etc. Different industries also use these huge computers for designing their products. It is also used for animation purpose. The PARAM supercomputer is one of the supercomputer developed by India. It is developed by the Centre for Development of Advanced Computing(C-DAC). Its processing speed is up to 1 trillion (10^{12}) instructions per second. Since October 2010, the Tianhe-1A supercomputer is considered as the fastest supercomputer in the world. This computer is located in China. Some other examples of Supercomputer are: IBM Blue Gene/L, IBM Roadrunner, Cray Jaguar etc.

Mainframe Computers:

Mainframes are large computers. These computers are multi-user systems. They are designed to process millions (10^6) of instructions per second. They are also capable of accessing billions (10^9) of data. These computers are commonly used in big hospitals, airline reservation companies and many other huge companies. Mainframe computers allow its user to maintain large information storage at a centralized location. We can then access and process this centralized data from different computers from different locations. Mainframe computers are normally too expensive. Mainframe is the second largest computer in capability and size of computer family.

Network Server:

A network server is a powerful computer connected to our business network. They are usually used for shared file storage, email management and to run centralised applications. A server can improve file management and security. Some of the common examples of network servers are FTP servers and web servers. Network Servers have many more features as compared to common computers. These features are as follows:

Features of network servers:

- Network Server Computers have more memory and storage capacity.
- Network server computers can handle the different processing requests from client computers.
- Network server computers can also act as a central file storage unit.
- Authentication and user control can be set on another workstation computer using a network server.
- Security control measures can be implemented using a network server computer.
- Network server is also capable of running an intranet.

Workstation

A workstation is a high-performance computer. It is used for scientific and technical tasks such as computer graphics, Computer-Aided-Design (CAD), image processing, engineering calculations etc. It is generally used in such applications which require a moderate amount of computing power. UNIX and Windows NT are the most common Operating System for workstations. Workstations are generally single user system, however they can be connected together to form a LAN. In networked workstation, system administrator tracks and controls the activities of the user. The term *workstation* is also used for high capacity mainframe computer connected to a network. A workstation has superior processing and storage capabilities than a normal PC.

Desktop Computers

Desktop computer is popularly known as personal computer (PC). As the name suggest, it is generally small in size and these are fitted on the top of a desk. Most of modern desktop computer has separate screens and keyboards. Common operating systems in these PCs are Microsoft Windows, LINUX and Mac OS. Desktop computers are available in many different forms. These computers are generally used for day to day computational and internet communication activities etc. Power consumption of a PC is not very high. Many brands of PCs are available in market that includes HP, HCL, Wipro, Compaq etc.

Notebook Computers:

A notebook computer is a battery powered personal computer. It is generally smaller than a briefcase. It can easily be transported. It can be conveniently used in temporary spaces such as on airplanes, in libraries, temporary offices, and at meetings etc. A notebook computer sometimes called a laptop computer. Common brands of notebook and laptop computers are IBM, Apple, Compaq, Dell, Toshiba, and Hewlett-Packard. Notebook computers are generally costlier than desktop computers.

Notebooks usually come with displays that use thin-screen technology. Notebooks use several different ways for integrating a mouse into the keyboard, including the touch pad, the trackball, and the pointing stick.

Tablet PC

A tablet PC is similar to a personal computer. It is a portable device. It has a touch screen for inputting of the data. A tablet computer can connect to the internet and local computer network through wireless medium. In general terms, tablet PC refers to a slate shaped mobile computer device. These PCs also has Global Positioning System (GPS) System. It has generally an office suits such as Word, Excel etc., web browsers, computer games and other similar applications that generally can be run on a PC. Tablet PC can also use handwriting recognition and virtual keyboards for input of data. In, tablet PCs Microsoft Windows; Linux and Apple operating system are used. There are many brands of Tablet PC available in Indian market such as Acer, Lenovo, Panasonic, and Toshiba etc.

Handheld PC:

A handheld PC is smaller than any standard laptop computer. It is sometimes referred to as a palmtop computer. A handheld PC (HPC) is a lightweight, compact computer that runs on Microsoft's Windows CE (WinCE). Its larger screen and keyboard differentiate it from other small devices, such as the Palm PC, Pocket PC and smartphone. The following are some special features of a HPC:

- A screen supporting at least 480×240 resolution
- A keyboard
- Wireless or wired connectivity options
- The device must be bundled with integrated original equipment manufacturer (OEM) applications.

Smart Phone:

A smartphone is a mobile personal computer. It has a mobile operating system. It has many features that are useful for mobile or handheld use. Smartphones are typically pocket-sized. They have the ability to place and receive voice/video calls and create and receive text messages. They also have personal digital assistants, an event calendar, a media player, video games, GPS navigation, digital camera and digital video camera. Smartphones can access the

Internet through cellular frequencies or Wi-Fi. They can also run a variety of third-party software components called "apps". These apps can be downloaded and installed in smartphone from app stores such Google Play Store or Apple App Store. They typically have a colour display with a graphical user interface. The display of these devices has a touchscreen which make user to use them easily. The first smartphone was IBM's Simon. It was presented as a concept device at the 1992 COMDEX computer industry trade show.

CACHE MEMORY:

It is a high speed memory. It is an intermediate buffer between the CPU and the main memory. Its capacity is small and it is very expensive. Therefore, frequently needed items are copied from main memory to cache memory.

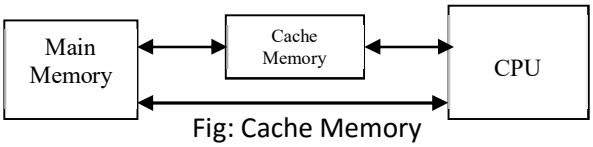


Fig: Cache Memory

Whenever memory read or writes operation is performed by CPU, data is first checked in the cache memory. If the desired data is available in cache memory (called hit), it is supplied to CPU. If the data is not found in the cache (called miss), it is brought into cache memory from the main memory.

The cache memory can be of two types:

- Unified (common) cache memory: this memory stores both the instructions and data.
- Separate instruction cache and data cache.

The reference to memory at any given interval of time tends to be confined within a few localized areas in memory. This phenomenon is known as the property of **locality of reference**.

The performance of cache memory is measured in terms of a quantity called **Hit Ratio**. It is the ratio of number of hits divided by the total CPU references to memory.

$$\text{Hit Ratio} = \frac{total\ no.of\ hits}{total\ CPU\ references}$$

The transfer of data from main memory to cache memory is referred to as a **mapping process**.

There are three types of mapping procedures:

- Associative Mapping
- Direct Mapping
- Set-Associative Mapping

MEMORY HIERARCHY:

The memory hierarchy consists of all storage devices used in computer systems. Their range can be from slow auxiliary devices to faster registers. Following diagram shows the memory hierarchy for computer systems:

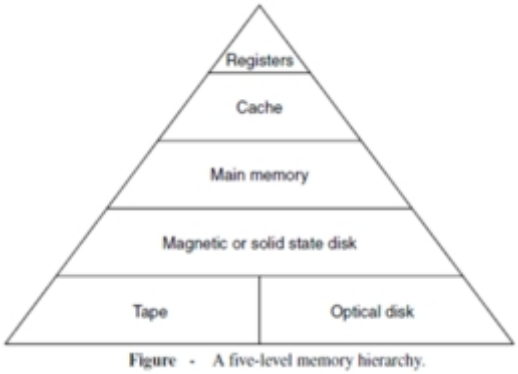


Figure - A five-level memory hierarchy.

- At the top of the hierarchy are the **CPU registers**. They are the fastest memory elements. They can be accessed at full CPU speed. Next comes the **cache memory**. It is the fastest memory component between Main Memory and CPU. Its capacity is few megabytes. This memory is used to increase the processing speed of CPU. This memory contains the program and frequently used data required by the CPU.
- Next is the **Main memory** in the memory hierarchy. It is at a central place in this hierarchy. It can communicate directly with the CPU and auxiliary memory. Programs from auxiliary memory are brought into this memory for execution.

- After that come **solid-state and magnetic disks**. These are used for permanent storage. Finally, we have magnetic tape and optical disks for archival storage. These are removable storage devices.
- As we move down the hierarchy, the **access time** gets bigger. Registers have a smaller access time and the magnetic tape and optical disk have the longest access time. The storage capacity also increases as we go downward in the hierarchy.

SOFTWARE

A computer system works on instruction given by user. A set of instruction is called as **program** and set of programs is called as **software**. These software are developed to perform specific tasks. So software makes the computer to do work. Software is of two types:

(i) System Software (ii) Application Software

SYSTEM SOFTWARE

The system software is collection of system programs. These software are designed to operate, control the computer. System software are generally developed by computer manufacturers. These software perform a many types of functions. For example: file management, storage management, resource management, I/O management etc. There are many types of system software. These are explained below:

Types of System Software:

System Control Software: These software control the execution of other programs, manage the storage, processing resources and perform other management and monitoring functions. Example of System Control Programs is Operating System.

System Support Software: These software provide routine service functions to other programs. Examples are Utility Programs. The common tasks performed by the utility programs are: Formatting the disk, Backing up of data, Antivirus programs etc.

System Development Software: These software help in the development of programs. Examples are: Language Translator like Interpreters, Compilers and Assemblers etc.

OPERATING SYSTEM:

Operating system is System Software. It is used to operate or control the computer system. It provides the platform to execute user programs. It acts as an interface between the user and the computer hardware. Operating system is also called the resource manager. It manages the many resources of the computer system such as hardware and software. DOS, UNIX, WINDOWS etc. are the example of Operating system. It provides an environment in which a user can execute programs in an easy and efficient way.

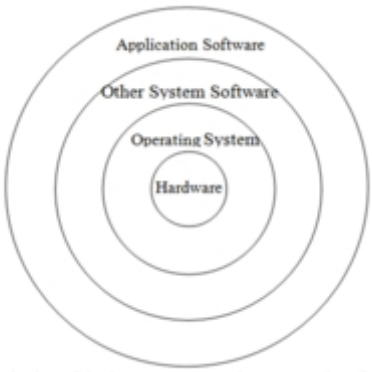


Fig: Relationship between Hardware and Software

Operating system is the first program that gets loader in the main-memory of computer system. This process is called **booting**. Operating system is also known as supervisor, kernel, and resource manager. Operating System manages many hardware resources such as processors, memory, I/O devices, communication devices etc. examples of operating system are: Windows XP, Windows Vista, Windows 7, Windows 8, UNIX, Linux etc. The basic services or functions of operating system are given below:

1. Memory Management
2. Processor Management
3. Device Management
4. File Management

LANUGAGE TRANSLATORS:

A language translator is also known as programming language processor. It is a computer program. It performs the translation of a program written in a programming language into an equivalent program in the target language. We know that computer understands only machine language which consists of 0 and 1only. But most of the computer programs are written using high level and assembly languages. These computer languages are not be directly understood by the computer systems. So, programs written in these languages must be translated into machine language format. Such translations are carried out by the different translators. Such translators are called Language Translators. Commonly used language translators are: Compilers, Interpreters, and Assemblers. These translators are explained below:

Compiler:

Compiler is a language translator. It converts High Level language program into machine format program. Each High Level language has its own compiler. We cannot compile the source code of one language with the compiler of another language. For example FORTRAN compiler cannot compile the source code written in COBOL language.

Fig: Compiler

The input to compiler is High level language program. This program is called **Source Program**. Compiler produces the output as the machine language program. This program is called **Object Program**. During translation, the compiler reads the whole source program and translates it into Object Code. During compilation it checks the source code for syntax errors. If there is any error, the compiler generates **Syntax Errors**.

Interpreter:

It is also a language translator. It is used to convert high-level languages into machine format. It takes one statement of High Level Language and translates it into a machine instruction. It is then immediately executed. Interpreter does not save object code for future use.

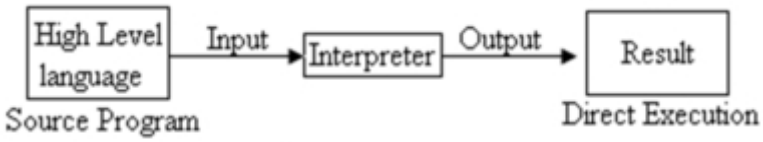


Fig: Interpreter

Interpreters are easy to write. They do not require large memory. But, interpreter is a time consuming translation method. It is because each statement must be translated every time it is executed.

Assembler:

It is also a language translator. It converts assembly language program into machine- format. The input to Assembler is Assembly Language program. This program is called **Source Program**. Assembler produces the output as the machine language program. This program is called **Object Program**.

Fig: Assembler

UTILITY PROGRAMS:

These programs provide routine service functions to other programs. These programs perform a very specific task, usually related to managing system resources. Operating systems contain a number of utilities for managing disk drives, printers, etc. Utilities are sometimes installed as memory-resident programs. Typically a utility is smaller than a program in size. Utility programs may be included with an operating system or installed separately. The common tasks performed by the utility programs are: Formatting the disk, Backing up of data, Antivirus programs etc.

COMMUNICATION SOFTWARE:

Those Software that makes it possible to send and receive data over telephone lines through modems, are called Communication Software. These software forms a part of communication systems. The best examples of communication software are file transfer protocol (FTP), messaging software and email.

APPLICATION SOFTWARE

Application software is the set of application programs. These software are designed to solve specific problems. These software can be developed in the computer labs. Examples of Application software are: payroll system, student information management system, inventory control software, Railway reservation software, Income tax software, Word processors, Spreadsheets, dBase etc.

Types of Application Software:

There are two types of application software:

General purpose Application Software:

Examples of General purpose Application software are: Word Processors, Spread sheets, Database Management Packages etc.

Special purpose Application software:

Examples of special purpose application software are: Account Management, Inventory Management, Student Information Management, Library Management etc.

WORD PROCESSOR APPLICATION SOFTWARE:

Word Processor is general purpose application software. Word processor software is capable of creating, storing, and printing typed documents. Today, the word processor is one of the most frequently used software programs on a computer. Microsoft Word is the most popular word processor software. Abiword, Google docs, writer etc. are other examples of word processor software. Most common features of a word-processor are:

- We can format text using word-processor
- We can insert clip art, charts, images, pictures, and video into a document.
- We can check spelling and grammatical errors in the document.
- We can modify the margins and layout of a document.
- We can add tables to a document.
- We can add header and footers in a document.
- Word Processor can automatically correct common errors

SPREADSHEET APPLICATION SOFTWARE:

Spreadsheet is general purpose application software. Spreadsheet software is capable of organizing, storing and analyzing data in tabular form. Spreadsheet is a file made of rows and columns. It helps us to sort data, arrange data easily, and calculate numerical data. It has the ability to calculate values using mathematical formulas. A good example of spreadsheet software is Microsoft Excel. Google sheets, Lotus 1-2-3 etc. are other examples of spreadsheet software. Some popular uses of spreadsheets are:

- Spreadsheets are commonly used to handle financial data
- Teachers can use spreadsheets to prepare results, time tables etc.
- Salary of employees can be managed using spreadsheets
- Spreadsheets can be used to managing different types of list

DATABASE APPLICATION SOFTWARE:

These software are also called as Database Management Systems (DBMS). Database software is designed for creating, editing and maintaining database files and records. This type of software allows users to store data in the form of structured fields, tables and columns. This data can be retrieved later at any time. Database software is used for a number of reasons in any industry. Some of the most popular database software are Microsoft Access, dbase, MySQL, Microsoft SQL Server and Oracle.

EDUCATIONAL AND ENTERTAINMENT SOFTWARE:

Education and entertainment software is a powerful tool for educational agencies. These types of software are very useful especially for educating young children. There is a wide range of entertainment software such as computer games, educational games, translation software, and mapping software, among others. There is a large inventory of education and entertainment software. The top manufacturers in this field are Leapfrog, Encore Software, and Electronic Arts etc.

Educational software are developed for the purpose of teaching and learning. Many educational-software are designed to teach preschooler children. Some educational programs introduce mathematical concepts. Some programs teach professionals, which describe the details of their jobs, for example: flight simulators. Still other programs, called Learning Management Systems (LMSs), are designed for use by certain grades in entire school districts for teaching.