

Computer:

The word "Computer" comes from the word "Compute", which means "to calculate". Hence, people usually consider a computer to be a calculating device that can perform arithmetical & logical operations at high speed. It accepts data as input, then processes it & finally gives desired output.

Computer is an electronic machine which converts our raw data into meaningful information.

Data & Information:

A set of facts, which can be alphabets, numbers & symbol is called as data. Data comes in various shapes and sizes depending upon the type of Computer applications. A computer can store, process and retrieve data as and when desired. The fact, that computer processes, data is so fundamental that many have started calling computer as a data processor.

A meaningful set of data is known as information.

Data: Unprocessed raw facts and figures are data e.g., a name (Rohan), some marks (78.5%), and year (2008) etc.

Information: It refers to the processed data that is meaningful e.g. above data can be converted into information as **"Rohan, who passed in 2008, secured 78.5% marks."**

A Computer Works in three steps:

1. Input of data
2. Process of data
3. Output of Information

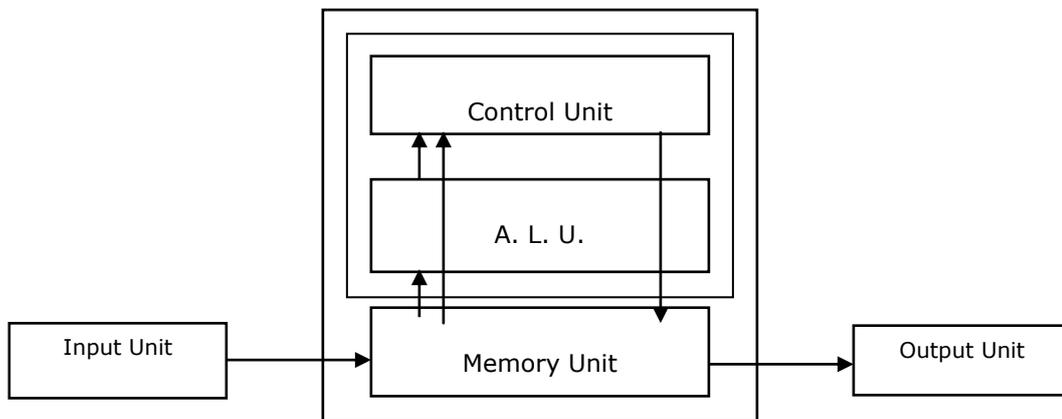


Fig 1.1 Schematic Diagram showing working of a computer

Computer Devices:**Input Device:**

An input device is an electromechanical device that accepts data from outside world and translates them into a form so that a computer can interpret. Several input devices are available today. They can be broadly classified into following categories:

- | | |
|----------------------------------|---------------------------------|
| 1. Keyboard | 2. Point and draw device |
| 3. Data Scanning Device | 4. Digitizer |
| 5. Electronic cards based | 6. Speech recognition |
| 7. Vision based device | |

1. Keyboard:

Keyboard devices are the most commonly input device. They allow data entry into a computer system by pressing a set of keys (labeled buttons) neatly mounted on a keyboard connected to a computer system. Mostly a normal keyboard contains 101-108 keys and a multimedia keyboard contains 120-130 keys.

The buttons of keyboard are divided into 4 categories:

1. *Function Keys* *F1, F2F12*
2. *Normal Keys* *A-Z (Alphabets)*
3. *Numerical Keys* *(0-9 & /; *, -; +)*
4. *Special Keys* *(Shift, Caps Lock, Alt, Tab, Ctrl etc.)*



Fig 1.2 Diagram showing Keypad of a Keyboard (Input Device)

2. Point & Draw Devices:

Interaction with computer was initially restricted mainly to text mode. But a GUI (Graphic User Interface) provides a screen with graphic icon (small images on the screen) or menu and allows a user to make rapid selection from them to give instruction to the computer. So we need to have point a draw devices which are described as below:

- I. Mouse:** Mouse is the most popular point and draw device. Mouse is a hand held device that fits in a user's palm comfortably. All movement of mouse is represented by the graphic cursor on the screen. A mouse has two buttons left for general works & Right for special works. The roll ball based mouse is now replaced with optical sensor based mouse.
- II. Track Ball:** A Trackball is a pointing device similar to a roller ball mouse. It has the roller ball also on the top along with the buttons.
- III. Joystick:** Joystick is a pointing device that works on the same principle as a trackball. To make the movement of the spherical ball easier, it is placed in a socket with a stick on it.
- IV. Electronic Pen:** It is a pen based point & draw device. A user holds the pen in his/her hand and points directly on the screen with it.
- V. Touch Screen:** Touch Screen is the most simple, intuitive and easiest to use among all input devices. A touch screen enables a user to choose from available option by touching the desired icon or menu item displayed on a computer's screen with his/her finger.

3. Data Scanning Devices:

Data scanning devices are input devices used for direct data entry into a computer system from source of documents.

- I. Image Scanner:** An image scanner device is an input device that translate paper document into an electronic format that can be stored in a computer. There are two types of Scanner
 1. Flatbed Scanner
 2. Hand-held-Scanner
- II. OCR (Optical Character Reader) -** This device is used for image scanning of input text document (typed or handwritten)
- III. OMR (Optical Mark Reader):** This device is used to check the answer sheets of examinations. These scanners are capable of recognizing a pre -specified type of marks made by pencil or pen.
- IV. Bar-Code-Rader (BCR):** Data coded in the form of lines (known as bars) are known as bar code. Bar code reader device is used for reading (decoding) bar coded data.
- V. MICR (Magnetic Ink Character Reader):** MICR is similar to OCR. It is used by banking industry for faster processing of large volume of cheques handled every day.

4. Digitizer:

A digitizer is an input device used for converting picture, maps and drawings into a digital format.

5. Electronic Card Reader:

Electronic cards are often issued by bank to their customers to be used for automatic teller machines (ATM). Electronic cards are small plastic cards having encoded appropriate data which can be used again and again.

6. Speech Recognition devices:

Speech recognition devices are input devices that allow a person to input data into a computer system by speaking into it.

7. Vision Input Devices:

A vision input system allows a computer to accept input by seeing an object. Input data in this case is normally an object's shape and features in the form of an image.

Output devices:

An output device is an electromechanical device that accepts data from a computer and translates them into a form suitable for use by outside world. Several Output devices are available today.

I. Monitors:

Monitor is the most common form of output device of a computer. It displays information in a similar the way a television shows on its screen. The picture on a monitor is made up of thousand of tiny coloured dots called Pixels.

Types of Monitors:

CRT (Cathode Ray Tube)

LCD (Liquid Crystal Display)

TFT (Thin Film Transistors)

II. Printers:

Printer is an output device used for creating paper copies of output from the computer. Printers can produce text and image on paper, Vinyl, cloths etc.

Types of Printers:

Dot Matrix Printer

Inkjet Printer

Drum Printer

Chain/Band/Line Printer

Laser Printer

Plotters (Drum Plotter, Flatbed Plotter)

Screen Image Projector

Voice Response System

Voice Reproduction System

Speech Synthesizer

III. Speakers:

Speakers receive the sound in form of electric current, from the sound card and then convert it into sound format. The speakers that are attached to the computer are similar to the ones that are connected to a stereo. The only difference is that the computer system's speakers are usually smaller and they contain their own small amplifier.

CPU (Central Processing Unit):

CPU is considered to be the brain of computer system. All major calculations and comparison performed by the computer are carried out inside its CPU. CPU is also

responsible for activating and controlling the operations of different units of a computer system.

Processor Speed:

The CPU and ALU perform operations at incredible speed. These operations are usually synchronize by a built-in electronic clock (known as *system clock*) that emits million of regularly spaced electric pulse per second (Known as *clock cycle*). The speed at which an instruction is executed is related directly to a computer's built in clock speed, which is the number of pulses produced per second. The clock speed measured in megahertz (MHz) 10^6 or Gigahertz (GHz) 10^9 . Most of today's popular personal computers have a clock speed in the range of 500 MHz (0.5 GHz) to 4000 MHz (4.0 GHz).

Type of Processors:

1. CISC Processor: (Complex Instruction Set Computer): On of the earlier goals of CPU.
2. RICS Processor: (Reduce Instruction Set Computer): In earlier 1980s
3. EPIC Processor (Explicitly Instruction Computing): These processor are mainly targeted to next generations, 64-Bit, high end server and workstation market.
4. Multicore Processor

The chip makers like Intel, AMD, IBM and Sun have already introduced Multicore chips for server, desktop and laptops. The current Multicore chips are dual core, Core 2 Duo (2 core per chip), Quad Core (4 core per chip), 8 core per chip, 16 core per chip.

Name of Some leaders in processor industry: Intel, AMD, IBM

Type of Processor currently in market:

Pentium IV, Celeron, Xeon, Centrino (Mobile Technology), Dual Core, Core 2 Duo, Quad Core, AMD Athelon etc. are the processors available in market.

Generation of Computers:

Now-a-days, the computers, that we see on tabletop is the improvement of many generations. We can divide the development of computer in to four generation.

| Generation (Period) | Key Hardware Technologies | Key Software Technologies | Key Characteristic | Some representative system |
|----------------------------|---|---|--|--|
| First (1942-1955) | Vacuum Tube; electromagnetic relay memory, punch card secondary storage | Machine & 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 (1956-1965) | Transistor; 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 system; commercial production was still difficult and costly | Honeywell 400, IBM 7030, CDC 1604, UNIVAC LACR |
| Third (1966-1975) | ICs with SSI and MSI technologies; larger magnetic core memory; larger capacity disks and tapes secondary storage; minicomputers | Timesharing operation system, standardization of high level programming languages; unbundling of software from hardware | Faster, smaller, more reliable, easier and cheaper to produce commercially, easier to upgrade than previous generation systems; scientific, commercial and interactive on-line applications | IBM 360/370, PDP-8, PDP-11, CDC 6600 |
| Fourth (1976-1989) | 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; spread of high speed computer networks | Operating system 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 |

First Generation: - The time period of 1942-55 is known as first generation of computers. In first generation computers, vacuum tubes, electro magnetic memory and punch card etc were used.

Second Generation:-The time period of 1956-65 is known as second generation of computers. In Second generation computer hardware and software technology were improved. In place of vacuum tube; transistors, magnetic memory magnetic tape and disk secondary storage device were used.

Third Generation:- The time period of 1966-75 is known as third generation of computers. In the third generation, large magnetic memory, large capacity disk and tape secondary storage were used in computer system. IC's were the key features in third generation computers.

Fourth Generation:- The time period of 1976-89 is known as fourth generation of computers. In this generation microprocessor with great technology, semiconductor, large capacity hard disk were used. VLSI and LSI are now-a-day used in fourth generation computers.

Memory Devices:

Every Computer has a storage space known as Primary Storage, main memory or simply memory. It is a temporary storage area built into the computer hardware. Instruction and data of a program resides mainly in this area when CPU is executing the program. Physically, this memory consists of some integrated circuits (ICs) chips either on the mother board or on a small circuit board attached to the motherboard of a computer system.

Units of memories:

| | | |
|------------------------|------------------|----------------------|
| 4 Bits | is equivalent to | 1 Nibble |
| 8 Bits | is equivalent to | 1 Byte |
| 2^{10} or 1024 Bytes | = | 1 Kilo bytes or 1 KB |
| 2^{10} or 1024 KB | = | 1 Mega bytes or 1MB |
| 2^{10} or 1024 MB | = | 1 Gega bytes or 1 GB |
| 2^{10} or 1024 GB | = | 1 Tera bytes or 1 TB |

Types of Memory Devices:

RAM (Random Access Memory):

This is a main memory used in a computer system. When we talk about the computer memory, it's usually meant the Volatile RAM. RAM is also considered as the working memory. Being volatile, it requires continuous supply of power. All the DATA in RAM is lost as the computer is switched off.

(Types: S-RAM, D-RAM, F-RAM, SD-RAM, DDR-RAM, DDR-2 RAM)

ROM (Read Only Memory):

A special type of memory is called read only memory. It is a non volatile memory chip in which data is stored permanently and can't be altered by usual programs. Data stored in ROM chip can only be read and used – they can not be changed. This is the reason why it is called ROM.

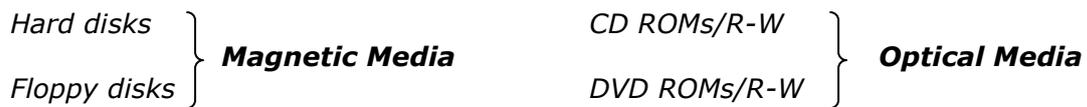
(Types: EROM, PROM, EPROM, EEPROM etc.)

Cache Memory:

It is an extremely fast, small memory between CPU and main memory whose access time is closer to the processing speed of CPU. It acts as a high speed buffer between CPU and main memory and is used to temporarily store very active data and instructions during processing. Since cache memory is faster than main memory, processing speed is improved by making the data and instruction needed for current processing available in the cache.

Storage Devices (Secondary Memory Devices):

Primary memory has a limited storage capacity and is not permanent, so secondary storage devices are used to store large amount of data permanently. There are various types of secondary devices available these days.



To specify the storage capacity of storage devices, same units of memory are used, which are used for measuring primary memory. That is, we can represent the storage capacity of storage devices in terms of kilo Bites (KBs), Mega Bytes (MBs), Giga Bites (GBs) and Terra Bytes (TBs) as we do for main memory.

Floppy Disks:

The floppy disk is one of the oldest types of portable storage devices generally not in use now-a-days. The floppy disks enable one to transfer small files between computers and also to store data / information as backup.

Hard Disks:

The hard disk memories store information on one or more circular platters (or disk) which is continually spinning. These rotating disks are coated with a magnetic material and stacked with space between them. Information is recorded on the surface of rotating disk by magnetic heads as tiny magnetic spots. These heads are mounted on access arms. Information is recorded in bands. Each band of information on a given disk is called a track.

Compact Disks (CDs):

The compact disks or CDs are optical media. The CDs are relatively cheap and have a storage capacity of up to 700 Mb. There are three main types of CDs:

- CD-ROM
- CD-R
- CD-RW

DVDs:

DVD (Digital Versatile Disk) is an optical storage device that looks the same as a compact disk but is able to hold about 15 times as much information and transfer it to the computer about 20 times as faster as CD-ROM. A DVD, also called a supper Density disk, can hold up to 17 gigabytes of data or four hours of movies on a side.

DVDs also come in three varieties:

- DVD-ROM
- DVD-R
- DVD-RW

Hardware: - Hardware represents all the electrical, electronics, mechanical and physical tangible components of the computer i.e. the components that can be seen and touched. Input devices, output devices, CPU, Floppy disk hard disk, CD Drive, DVD Drive etc. are examples of computer hardware.

Software:- Software represent the set of program that govern the operation of a computer system and make the hardware run. Software is a set of program (A program is a set of step by step instructions to computer to execute any given task) written in any of the computer languages, according to which a computer acts and generates output. Software can not be seen or touched but can be felt. Software can be classified broadly in to two categories.

System Software & Application Software

System Software: - A computer is merely a machine that knows nothing to itself. Rather it requires instruction for each and everything it performs. These instructions are provided to it through software. The software that controls internal computer operations is known as system software.

The system software can further be classified in to following categories:

- Operating System
- Language Processor
- Device Driver
- Utility Software

Application Software: - Application Software is a set of programs necessary to carry out operation for a specified application. Application software is basically of two types

- Packages (Readymade Software) General utilities software, mostly software suites
- Customized Software (Tailor made Software) according to a user's need.

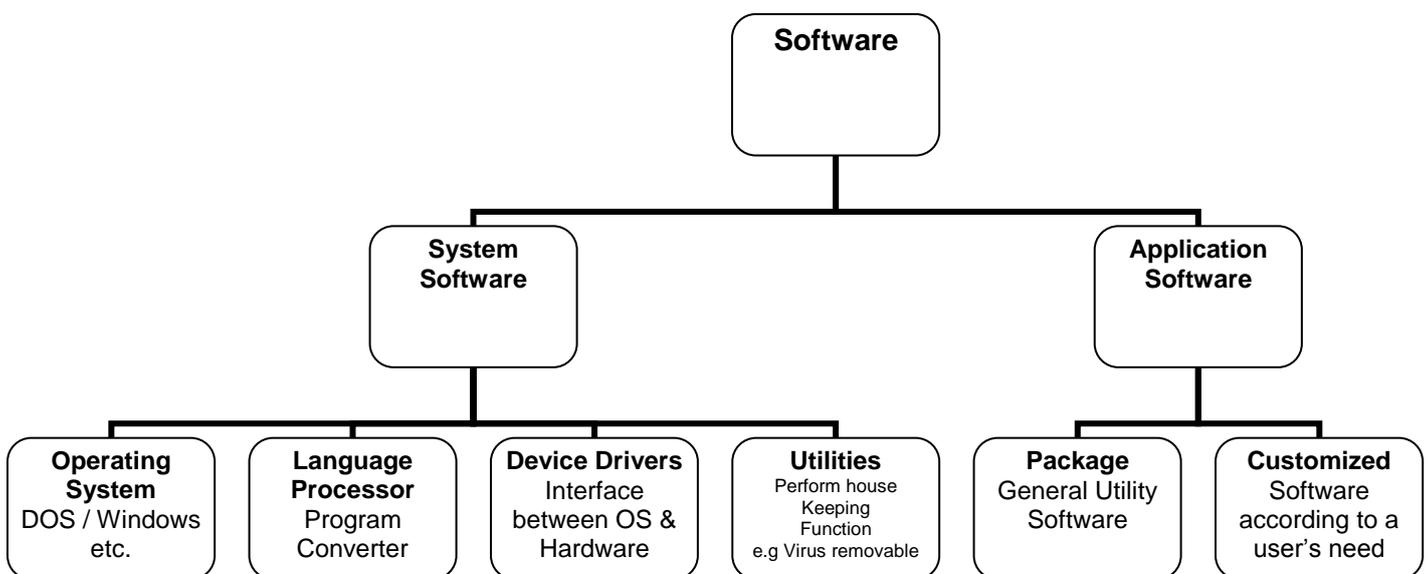


Fig. 1.3 Various Categories of Software

Operating System:

Operating system is a big collection of many system software and application software in the form of consolidated bundle. When the operating system is loaded on computer, the computer became alive, so we can say that an operating system is the soul of computer.

Operating System (OS), in computer science, is the basic software that controls a computer. The operating system has three major functions:

1. It provides a platform to run any external application software on computer.
2. It acts as a bridge between user and computer.
3. It coordinates and manipulates computer hardware.

Operating systems control different computer processes, such as running a spreadsheet program or accessing information from the computer's memory. One important process is interpreting commands, enabling the user to communicate with the computer. Some command interpreters are text oriented, requiring

commands to be typed in or to be selected via function keys on a keyboard. Other command interpreters use graphics and let the user communicate by pointing and clicking on an icon, an on-screen picture that represents a specific command. Beginners generally find graphically oriented interpreters easier to use, but many experienced computer users prefer text-oriented command interpreters.

Operating systems are either single-tasking or multitasking. The more primitive single-tasking operating systems can run only one process at a time. For instance, when the computer is printing a document, it cannot start another process or respond to new commands until the printing is completed.

All modern operating systems are multitasking and can run several processes simultaneously. In most computers, however, there is only one central processing unit (CPU; the computational and control unit of the computer), so a multitasking OS creates the illusion of several processes running simultaneously on the CPU. Operating systems can use a technique known as virtual memory to run processes that require more main memory than is actually available. To implement this technique, space on the hard drive is used to mimic the extra memory needed. Accessing the hard drive is more time-consuming than accessing main memory, however, so performance of the computer slows.

Time sharing and Multi User operating system refers to those operating systems which execute programs of several users in queue. When the processor executes a program of a user it takes up the program of other user in the time gap while executing the earlier program.

Types of Operating System:

C.U.I:- (Character User Interface) This is a type of operating system where only character are used in display. It's a very oldest type of operating system. DOS is an example of CUI type of operating system.

G.U.I:- (Graphical User Interface) It is a modern type of operating system. This type of operating system uses graphics and character both. GUI Operating systems are easy to learn and work upon, at the same time interesting too.

Some G.U.I. types of Operating systems:

- MS WINDOWS
- LINUX
- MACANTOSH
- APPLE MAC
- SOLARYS