DIT University Dehradun
CSE Department
CST 101/201 – Fundamental of Computer & C Programming   **Unit 1**

1.1   Introduction to Computer System

What is a computer?
"A computer is an electronic device which is used to store, retrieve, and process data."

"A computer is an electronic device that executes the instructions in a program to process raw facts or figures known as data and convert them into information."

"A computer is a machine for manipulating data according to a list of instructions known as a program."

"A computer system is the synthesis of hardware and software. A typical computer system employs a computer that uses programmable devices to store, retrieve, and process data."

Computer is the most powerful tool, man has ever created. Computers have made a great impact on our everyday life. Their presence is felt almost every working place viz. Homes, College, office, industries, hospital, banks, retail, store, railways, research , design organization and so on. Computers are used now-a-days by all kinds of people for a variety of takes in a modern and industrialized society.

DATA: Data are the raw facts about some items, persons, objects, or anything living or dead. Data are represented by values. The values may be numbers, characters, or sequences of any symbol etc. E.g. marksheet of student, salary slip of employee, photograph ID card.

Information: data are raw facts and when it processed, becomes information. If the raw data is processed as per certain rules or policy, the result obtained is called Information. It means that when we process data to achieve meaningful results, it becomes information. E.g. Result summary of an examination, purchase/sale of any goods items, number of employee of an organization etc.

DATA	Process	INFORMATION
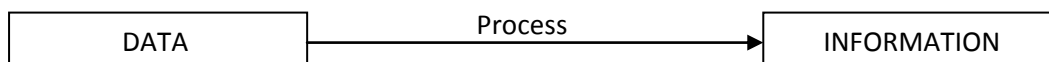
In order to process data , a set of instructions are required to be given to the computer. A sequence of instructions is called a **Program.**

Hardware: Hardware consists of existing components of a computer which are used to execute the software instruction.

Software: Software is a series of very simple computer instructions which are organized to complete complex tasks. These instructions are written in programming languages like C, C++, Java, DOTNET,… to help in simplifying the development of applications.

## Functional Components of a Computer

A computer has the following function.

Accept Data called **Input**,
Process Data called **Processing**
Produced output called **Output**
Store results called **Storage**

So a computer is a general purpose, user programmable (a program is a meaningful group of instructions written in a specific language aimed to do a specific task) , electronic gadget capable of doing the following tasks.

(a) Data Processing (Numeric & Non-numeric) with a high degree of accuracy at a pretty high speed.
(b) Storage of huge amount of information with reasonably high access speed (like Bank, Railways)
(c) Communication Gateway (Link to the world using Internet)

Architecture of Computer (Block Diagram)
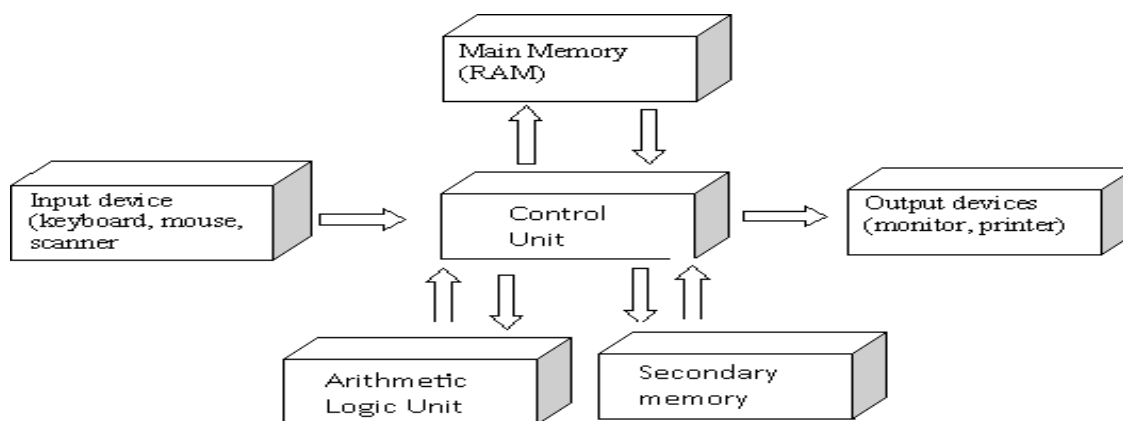
Computer consists of the following main components:

✓   Input devices
✓   Memory = Primary memory(RAM) + Secondary memory(Hard disk)
✓   Central Processing Unit (CPU)
✓   Output devices

The brain of computer is CPU.A CPU has mainly 3 components:
➢   Main memory (RAM)
➢   Arithmetic Logic Unit (ALU)
➢   Control Unit (CU)

The main memory is used to hold the data being processed and holds the instructions for doing the processing.

ALU is used to perform only arithmetic and logic operations. The arithmetic operations are addition, subtraction, multiplication, division and so on. Logic operations are OR, AND, NOT .

CONTROL UNIT is used to monitor and control all the operation of the computer. It also acts as a interface between main memory & ALU and main memory & secondary memory.

Main Components of a Computer

1. **Central Processing Unit (CPU)-** The microprocessor "brain" of the computer system is called CPU. Everything that a computer does is overseen by CPU.
2. **Memory** - This is very fast storage used to hold data. It has to be fast because it connects directly to the microprocessor. There are several specific types of memory like RAM,ROM in a computer.
3. **Random Access Memory (RAM)** – used to temporarily store information that the computer is currently working with. It's a volatile in nature.
4. **Read Only memory (ROM)** – A permanent type of memory storage used by the computer for important data that does not change. Hard disk is main example .
5. **Basic Input/output system (BIOS)** - A type of ROM that is used by the computer to establish basic communication when the computer is first turned on.
6. **Caching**- the storing of frequently used data in extremely fast RAM that connects directly to the CPU.
7. **Virtual memory**- space on hard disk used to temporarily store data and swap it in and out of RAM as needed.
8. **Motherboard**- this is the main circuit board that all of the other internal components connect to. The CPU and memory are usually on the motherboard. Other system may be found directly on the motherboard or connected to it through a secondary connection. For example- A sound card can be built into the motherboard or connected to PCI data card.
9. **Power Supply**- An electrical transformer regulates the electricity used by the computer.
10. **Hard Disk**- this is the large capacity permanent storage used to hold information such as programs , documents, files etc
11. **Operating System**- this is the basic software that allows the user to interface with computer.
12. **Integrated Drive Electronics (IDE) controller** – a primary interface for the hard drive, CD-ROM and floppy disk drive, PenDrive, USB port.
13. **Peripheral Component Interconnect (PCI) Bus**- the most common way to connect additional components to the computer, PCI uses a series of slots on the motherboard that PCI cards plug into.
14. **Accelerated Graphics Port (AGP)**- is a very high-speed connection used by the graphics card to interface with the computer.
15. **Sound Card**- this is used by the computer to record and play audio by converting analog sound into digital information and back again.
16. **Graphics card**- This translates image data from the computer into a format that can be displayed by the monitor.

Application of Computer

The new technology is being developed day by day due to needs of people are increasing regularly. The ability of computer has benefited the human life a lot. The application of computer is as follows:

(i) Weather forecasting   (vi) Entertainment/Media   (iii) office management
(ii) Database processing   (viii) Medical   (v)CAD/CAM, Email
(iii) Scientific and education works   (x) Sports activity   (vii) Advertisement

Computer technology still has an impact on your life. Computers have various impacts in society like:

1. **Education**. e.g. EduNext,3D image chemical bonding, maths lesson, animated nursery rhymes, Dictionary,encyclopedia, maps, etc
2. **Computer Games**. e.g. playing electronic golf, cricket, chess, kung-fu
3. **Computer in Edutainment**(Education+Entertainment) e.g. Jurassic park, anaconda, etc
4. **Computer in Business Application**. e.g. banking, supermarket, transaction payment.
5. **Computer in Bank** e.g. ATM,Cash withdrawal, online payment, Bill payment, transfer money etc
6. **Computer in Office Application e**.g. office automation, document typing & filing, making presentation, accounting
7. **Industrial application**. e.g. CAD/CAM, 3D image, gear, volt, nuts,wheels, building architect
8. **Computer in scientific application**. e.g. weather forecasting, computer model, simulation like train,planes,ships.

Characteristics of Computer

There are some characteristics of computer that are as:

(i) **High Speed:** A computer is fast information processing electronic device. It carries out all sorts of computations within a fraction of a second. It executes millions of instructions per second.

(ii) **Accuracy:** it gives accurate results for correct input data. Here accuracy means correctness of the processed data. If the input data is erroneous, then the output will not be the correct. This is known as GIGO (Garbage In Garbage Out) but you can make it "Good In Good out" also.

(iii) **Versatility:** its role is versatile. It is used for scientific calculations, business processing, computer games, teaching, training etc.

(iv) **Diligence:** it does not feel tired. It can be used for hours and hours. It can also be used for a number of days or months continuously. It will work satisfactorily without fatigue.

(v) **Reliability:** Computer is a electronic device built with integrated circuits that are more reliable. They have a low failure rate. Computers are most suitable to handle repetitive task because they don't take tea break and false leave like you, and they never complain. E.g. ATM runs 24x7 days but never fails.

(vi) **No IQ and no feelings:** Computer is a dumb machine and it cant take any decision. It depends upon the instructions given by the user. It gives the result with accuracy. And it does not have any feelings like human being and does not have any sense , emotions, taste, knowledge.

Classification of Computers

Computers are classified by the type of data they are designed to process. Data may be obtained either as a result of counting or through the use of same measuring instrument. Data that are obtained by counting are called <u>discrete data.</u> E.g. total number of student in a classroom. Data that must be obtained through measurement are call <u>continuous data.</u> e.g. speed of a vehicle, temperature of a patient.

A **Digital** computer is a counting device that operates on discrete data. It operates by directly counting members or digits that represent numerals, letters or other special symbols. Just as digital watches directly count off the seconds and minutes in an hour.

In contrast to digital, **Analog** computers may be accurate to within 0.1 percent of the correct value. It does not compute directly with numbers. They deal with variables that are measured along a continue scale and are recorded to some predetermined degree of accuracy. Just as Temperature may be measured to the nearest tenth of a degree on the Celsius scale, Voltage may be measured to the nearest hundredth of a volt. A service station petrol pump may contain analog processor.

Desirable features of analog and digital machine are sometimes combined to create a hybrid computing system in a hospital intensive-care unit (ICU). E.g. analog device may measure a patient heart function, temperature and other vital signs. These measurements may then be convicted into members and supplied to a digital component in a system.
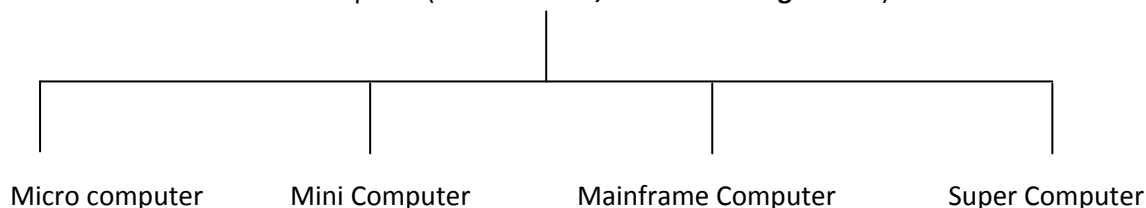
Digital Device

Analog Devices

Classification of Computer (based on **size, cost** and **configuration**)

| Micro computer | Mini Computer | Mainframe Computer | Super Computer |

Micro Computer: (Personal Computer- PC)

A micro computer is the smallest general-purpose processing system that can execute program instructions to perform a wide variety of tasks. The important features of micro computers are:

1. Micro computer are known as home computers, personal computers (PC), desktop computers and small business computers.
2. These are small, low-cost digital computer with a micro processor as its CPU, a memory unit, an input device and an output device.
3. The word length of a micro-computer lies in the range of 8-32 bits.
4. CPUs are in a single chip.
5. Storage capacity is small.
6. Applications include general-purpose calculations, industrial control, office automation etc.

Mini Computer:

The salient features are:
1. The word length is 32 bits and their processing speed lies in the range of 10-30 MIPS.
2. RAM capacity lies in the range 8 MB-96 MB (can be extended upto 128-256MB)
3. The hard disk capacity lies in the range 380MB – 2 GB (giga byte)
4. Most mini-computers use Motorola 68030/68040 CPU.

The mini-computers which are faster and more powerful that micro computer can support upto 64 or even 100 terminals . some mini-computers are uni-processor and some are multi processor system. These are used for payroll preparation and scientific computation, multi user and interactive application in college, universities , research organization, industries, sophisticated real time control, interactive engineering works etc.

Example of Mini-computer are:
- IBM AS/400/B60
- VAX8842
- WIPRO S-68030V
- WIPRO LANDMARK 860
- HP 9000 SERIES 800
- HCL MAGNUM

Mainframe Computer

The mainframe computers are faster and more powerful than mini computers. These computers are used where large amount of data are to be processed or very complex calculations are to be made and these tasks are beyond the computing capacity of minicomputer. The main features are:

1. The word length may be 48, 60 or 64 bits
2. Memory capacity range is 64 – 256 MB and hard disk capacity is 1000 MB – 10 GB or more.
3. Processing speed lies in the range 30 – 100 MIPS (millions instructions per second).

The mainframe computers are used in research organization, large industries, business organization, government organization, banks and airlines reservation,web-based program etc.

Example of Mainframe computer are:
- IBM 308X Series
- IBM 4300 Series
- IBM 3090 Series
- HP 9000 series 8705/400
- HP 9000 model 8705/300
- IBM 9000 Series

SuperComputers

Super computer are much faster, expensive and more powerful than mainframe computers. Super computers are specially designed to maximize the number of FLOPS (Floating point operation per second). It requires immense amounts of mathematical calculations. A super computer contains a number of CPUs which operate in parallel and make it faster. They are used for massive data processing & solving very sophisticated problems. The salient features are:

1. Their word length is 64 – 96 bits. Memory Capacity is 256 MB and more.
2. Hard disk capacity is 1000 MB or more.
3. Processing speed lies in the range of 400 MIPS – 1000 MIPS.

They are used for weather forecasting, weapons research and development , rocket launching, nuclear and plasma physics, atomic reactor, seismology, animated graphics, petroleum exploration etc
Example of Super Computer are: CRAY –X- MP/14, CRAY-MP,ETA 10,SX – 2,SX – 3R,HIT ACS – 300

Hardware and Software

Hardware:

> The physical components of a computer are called Hardware. A physical component can be electronic, mechanical, optical, magnetic etc. e.g. microprocessor, hard disk, keyboard, monitor, mouse, printer, CDROM etc.

Hardware Components

Input devices: Standard input devices are keyboard and mouse which are used to interact with the computer for how to tell it and what to do. Other devices include joystick and gamepads used primarily for games, punched card, optical mark reader.

Output devices: Standard output device is a monitor (the screen) through which the computer send information back to you , whether it be surfing the web or writing the memo. A printer and plotter are also output devices.

Storage Devices: Hard disk is a storage device which is used to save the data & programs. Hard disk drives are of internal and higher capacity drive which also stores the operating system which runs when you power on the system.

Memory: when you use a program, the computer loads a portion of the program from the device to the much faster memory (RAM). When you "save" your work or quit the program, the data gets written back to the hard drive.

Microprocessor: it is the brain of the computer. PCs primarily use microprocessors manufactured by different companies like Intel. The older Intel versions include the 386,486 and now Pentium series. Macintosh uses PowerPC processor by Motorola.

Hardware Accessories

Modems: Modems are used to communicate with other computers using a phone line. Its speed measured in bits per second.

CD-ROM Drives: CD-ROM drive is a storage device. It is a high capacity storage device which lets you read data from the disk, but does not write data back.

Printer: Printer is an output device which is used to take printout of any soft material. The different types of printers are available in the market like laser, inkjet, dot matrix.

Scanners: Scanner is an input device used to convert digitized printed material like photos, graphics and save it to a graphic file format (like .JPG, .GIF) to display on the computer screen.

Software:

A sequence of instructions given to a computer to perform a particular task is called a program. A set of program written for a computer is called Software.

Types of Software

There are two major categories of software: (i)Application Software(ii) System Software

(i) **Application Software:** Application software is a set of one or more programs designed to carry out operations for specific applications. We can also say that user interaction with this type of software.
   a. User application program e.g. Payroll, stock control
   b. Application Package e.g. games, fax software, office automation
   c. Other utilities e.g. utilityware, freeware, middleware, groupware

(ii) **System Software:** Software required to execute the user program is known as system software. System software is a asset of one or more programs designed to control the operations of a computer system. They are general programs written to human assets with the help of computer by performing task. The system software includes:
   a. **Operating system:** An operating system is an interaction between user and hardware. It is the collection of programs which controls the overall operations of computer**.**
   b. **Assemblers:** The assembler is a program which converts an assembly language program into machine code which may be executed by the processor.
   c. **Compilers:** The compiler converts the low level language into machine level language. It turns the whole program and generates the object code.
   d. **Translator:** A translator is a program which converts statement written in one language into statement in another language line by line. E.g. C language to machine language.

RAM vs ROM

	RAM	**ROM**
Stands for:	Random Access Memory	Read-only memory
Volatility:	RAM is volatile i.e. its contents are lost when the device is powered off.	It is non-volatile i.e. its contents are retained even when the device is powered off.
Types:	The two main types of RAM are static RAM and dynamic RAM.	The types of ROM include PROM, EPROM and EEPROM.
Use:	RAM allows the computer to read data quickly to run applications. It allows reading and writing.	ROM stores the program required to initially boot the computer. It only allows reading.
Definition:	Random Access Memory or RAM is a form of data storage that can be accessed randomly at any time, in any order and from any physical location.	Read-only memory or ROM is also a form of data storage that cannot be easily altered or reprogrammed.

Read Only Memory (ROM)

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

Random Access Memory (RAM)

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

Types of ROM

(i) Masked ROM   (ii) PROM   (iii) EPROM   (iv) EEPROM

Masked ROM: In this type of ROM bits are stored permanently by marking and metallization process. This is done by manufacturers. This type of ROM can be programmed only one-by the manufacture.

PROM (Programmable ROM):

Data are written into a ROM at the time of manufacture. However, a programmable ROM (PROM) allows the data to be loaded by the user, by connecting a fuse between the emitter and the bit-line. PROMs provide flexible and economical storage for fixed programs and data, where high production volumes are involved. Initially, if the PROM contains all 1s, then at the 'required location the user can insert 0's by burning out the fuses using high current pulses of course, this process is irreversible. However, the storing in ROMs will be very expensive when only a small number is required. Thus, PROMs provide a faster and less expensive approach for storing.

EPROM (Erasable PROM):

The Erasable PROM chip allows the stored data to erased and new data can be reprogrammed. It provides more flexibility during the development phase of digital system. With resemblance to the dynamic memory cell, information is stored in a capacitor is very well insulated and its rate of discharge is low. Hence it retains the stored information for more than a year. Due to high insulation, the process of writing new information into a cell involves the application of a higher voltage. The high voltage is used to cause a temporary breakdown in insulation, and allow charge to be stored in the capacitor. The contents of EPROM cells can be erased by increasing the discharge rate of the storage capacitors. This can be accomplished by exposing the chip to ultraviolet light. All cells in the chip are erased at the same time.

EEPROM (electrically erasable PROM):

In an electronically erasable PROM, the contents of cells can be erased by the application of a high voltage. Advantages with EEPROMs are: it need not be physically removed for reprogramming and the process can be made selective since electrical erasure is used.

The advantages of ROM are:

- They are non-volatile.
- They are cheaper than RAM.
- They are static and do not refreshing.
- They are more reliable than RAM as their circuit is simple.
- They are available in longer sizes than RAM.
- They are easier to interface than RAM.

Registers in CPU

Register is a special- purpose memory. This memory is vital for moving data in and out of the main memory and to process the data. When CPU executes the instructions, there is a transfer of information between various units of the computer system. CPU uses these registers to handle the process of execution effectively and efficiently. They are a part of the central processing unit but cannot be considered as a part of main memory. They can hold only one piece of data at a time. Registers receive the information, hold it temporarily and pass it on as directed by the control unit. The number of registers varies from computer to computer, each one designed to perform a specific function. Registers have a specific storage capacity normally 14 registers are present in a microcomputer. The most commonly used registers are:

- Program Counter (PC)
- Instruction register (IR)
- Accumulator
- Flag register
- General Purpose Register

Input/Output Devices

No matter how powerful the components inside your computer are, you need a way to interact with them. This interaction is called **Input/Output** (I/O). The I/O devices and secondary storage units of a computer are called **Peripherals Devices** . The term peripheral is used in a wider sense, it also includes interfacing devices such as I/O port.

An **input device** is any peripheral (piece of computer hardware equipment) used to provide data and control signals to an information processing system such as a computer or other information appliance.

An **output device** is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer) to the outside world.

In computing, input/output, or I/O, refers to the communication between an information processing system (such as a computer), and the outside world. Inputs are the signals or data sent to the system, and outputs are the signals or data sent by the system to the outside.

Input Devices	Output devices	Storage Medium
Keyboard	Monitor	Floppy Disk
Mouse, Joystick	TV Screen	Compact Disk (CD)
Digital Camera, Webcam	Speaker	Hard Disk
Mike, Synthesizer	Printer	Disk Cartridge
Electronic whiteboard	Plotter	CD-ROM
Thumb Impression Reader	Tracer	Optical Disk
Track Ball	Projector	Magnetic Tape
TouchScreen	LCD Projection panel	Reel Tape
Scanner	Audio Card	Smart Card
Pointing device – electronic pen	Facsimile (FAX)	Semi conductor
Webcam		

Operating System

An operating system is used to provide the interface between user and computer. It is a collection of system program which together control the operation of a computer system. All the OS are based on either Command User Interface (CUI) or Graphical User Interface (GUI).

An Operating System is an essential component of a computer system. The primary objective of an operating system is to make computer system convenient to use and utilize computer hardware in an efficient manner. An OS works as a mediator or interface between user and machine.
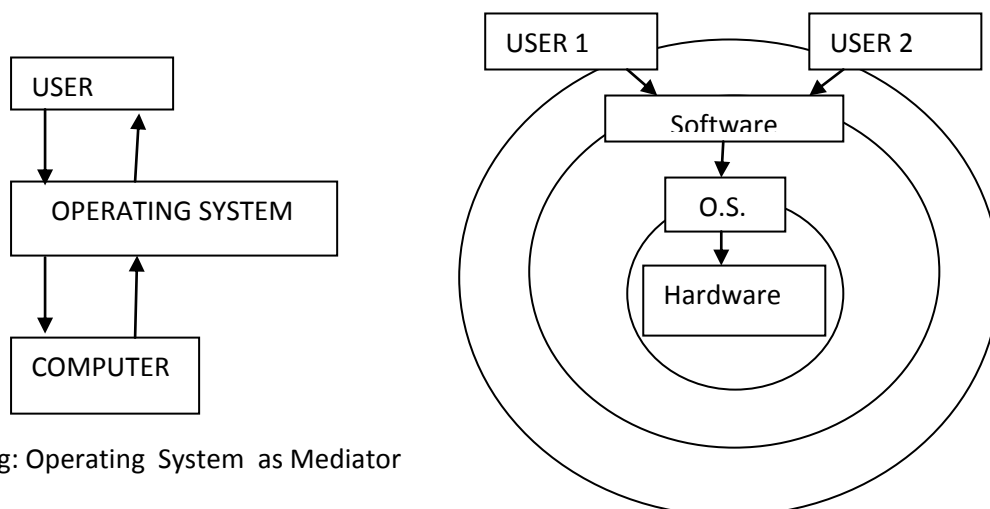
Fig: Operating System as Mediator

Fig: Computer System

An operating system can be imagine as a large collection of software, which manages resources of the computer system, such as memory, processor, file system, and I/O devices. It keeps track of the status of each resource and decides who will have a control over computer resources for how long and when. You can say Operating System works as a manager to control all the user activities and system activities in a computer system. Operating system directly controls the computer hardware resources. Other programs rely on facilities provided by the OS to gain access to computer system resources. Modern OS like MSDOS, UNIX, Linux, Windows or Solaris perform various functions to control a computer system.

Function of an Operating System

Operating system has to perform various functions for proper working of a computer system like

1. Providing a good user interface for human-machine interaction
2. Allocation of hardware and software component to user
3. Memory Management
4. Process Management
5. Secondary Storage or Disk Management
6. File System Management
7. Network Management
8. Security Management
9. Multitasking, multiprogramming, multi user, multi threading operations
10. Distributed Process management

Types of Operating System

There are various types of operating system, whose complexity depends upon the type of functions provided and the purpose for which the system is being used. Some systems are used for managing many users on a network. Other OS don't manage user program at all. These are used in hardware devices like petrol pump, airplanes, video recorders, washing machines and car engines etc.

1. **General-purpose OS:** Windows NT workstation is considered as a general-purpose operating system because it enables to run a number of different program viz games, video recorder, business application, and program development tools.
2. **Single user OS:** while working on a computer to perform some task viz. writing some document, we generally interact with one keyboard and one monitor. There is a single keyboard and mouse that accept input commands, and a single monitor to display information output. In an ordinary computer there may also be a printer for the printing of document and images. Only one person can use a single user OS at a time. If another users need to use the computer system, they will have to wait till the current user finishes his task and leaves the system.
3. **Multi user OS:** In a multiuser OS , more than one user can access the system simultaneously through network by using a terminal or other computer. There are various multi-user os like UNIX, Linux, and mainframe computer.
4. **Multi Tasking OS:** A multi-tasking OS provides facility to run more than one program at a time on the system. A user can run a word processing package; print a document, copy files to the CD/PD and backup selected files to a tape unit simultaneously. Each of these tasks, the user is doing, appears to be running at the same time. Though a multi-tasking operating system enhances the productivity but it requires large memory.
5. **Multi threading OS:** Multi-threading operating system allows to run different parts of a program at the same time. E.g. UNIX,Linux
6. **Batch OS:** Batch Operating system allows running only one program at a time in a batch. The entire tasks have been collected together in a job and job starts executing one by one task sequentially. We cannot modify any data while it is being run.
7. **Time sharing OS:** A time sharing operating system is basically a multi-programming, multi-user operating system. Each user having a separate terminal share the resources of centralized computer system .
8. **Real Time OS:** Real Time Operating system are those operating system which are used to control the machine such as ATM machine, Rocket Launching, nuclear reactor, guided missiles, medical imaging system and industrial robot etc. it works under will defined time constants i.e. it gives the response within the specified time limit.

9. **Distributed OS:** Distributed Operating System is used to share the resources in distributed environment. In this case, each processor has its own local memory and all processors communicates with each other through communication line i.e. all are able to access the resources of each other.

10. **MS DOS OS:** MS DOS (Microsoft Disk Operating System) was developed in 1981 from IBM computers. It is a command line user interface (CUI) i.e. it is based on various commands to perform the operations in MSDOS. It does not provide any graphical user interface (GUI) like icon, images, photograph to perform the operation. MS DOS provides two types to commands: **Internal** and **External** commands.

Internal DOS Command: stored in system memory and loaded from the command.com. These commands are used by users frequently.

(a) **copy con**: to create a file   c:\> copy con <filename> …contents…   then press ^z (to save)
(b) **type**: to see the content of a file   c:\> type <filename>
(c) **del**: to delete a existing file   c:\> del <filename>
(d) **ren**: to rename a file with other name   c:\>ren <old_file> <new_file>
(e) **md** or **mkdir**: to create a directory or folder   c:\>md <dir_name>
(f) **cd**: to change the current directory   c:\>cd <dir_name>
(g) **cd**: rush to root directory   c:\>cd\
(h) **cd..:** back to parent directory   c:\>cd..
(i) **rd**: to delete or remove the empty directory   c:\> rd <dir_name>
(j) **move**: to move a file from one location to another location c:\>move <old_path> <new_path>
(k) **copy:** to create one more file with same contents c:\>copy <source_path> <destination>
(l) **cls**: to clear the screen   c:\>cls
(m) **dir**: to list out all the files and folders   c:\>dir
(n) **date**: to see/set the system date   c:\>date
(o) **time**: to see/set the system time   c:\>time
(p) **ver**: to check the current version of DOS operating system   c:\>ver
(q) **exit:** exit from DOS command prompt   c:\>exit

External DOS Commands: Many external commands are located in window/system32 or winnt/system32 folders. These commands use large memory space.

(a) **find**: to find the string in the files   c:\>find "string" <filename>
(b) **edit**: to go to edit in editor   c:\>edit <filename>
(c) **doskey**: to store the history of commands   c:\>doskey
(d) **tree**: to display the files and folder in tree format c:\>tree
(e) **attrib**: change the view of attributes of file like Attrb,Hidden,System, c:\>attrib +H <filename>   it will hide the file
(f) **deltree**: to delete all files and sub-directories that it contains   c:\>deltree <dir_name>
(g) **format**: delete all files and folders i.e. format the hard drive   c:\>format <disk_name>
(h) **chkdsk**: check the disk status volume   c:\>chkdsk <disk_volume_name>
(i) **xcopy**: to copy the files and folders   c:\>xcopy <source_path> <destination_path>
(j) **fdisk**: manipulate hard disk partition table

   a.   create DOS partition   b. set active partition   c. delete partition
   d.   display partition info   f. change current fixed disk drive
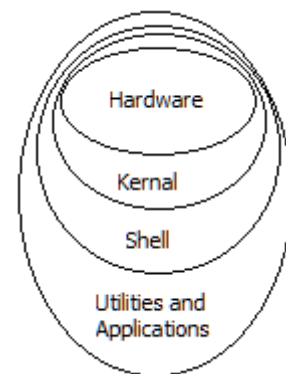

UNIX (Operating System)

UNIX is a multiuser, time sharing operating system. UNIX was developed in the early 1970's at Bell labs by Ken Thompson and dennis Ritchie for a PDP-II computer. It was the first operating system to be written in a high level language C. Before UNIX, it was to use assembly language for writing operating system due to which operating system were system independent. Therefore, they were usable only on a system for which they were developed. However since UNIX was written in C language, moving it to new machine. This property is known as Portability, which is much easier. This was an important reason for its popularity and availability on a wide variety of system.

Architecture of UNIX

The main principle of UNIX is time sharing. UNIX working in a file system which allows users to create their own sub-directories. UNIX is powerful, effective, multiuser and multitasking operating system. UNIX consists of

(i)   Kernal
(ii) Shell
(iii) Utilities and Applications

The kernel is the centre of the operating system which communicates with hardware directly. It is the part of the UNIX system that is loaded into memory when the system is booted. It manages the system resources; allocates time between users and processes, decides process priorities.

The shell provides the interface between users and kernel. The shell takes a command from the users, decipher it and communicate with kernel to see that the command is executed.

Commands

(a) **ls:** list all the files and folders $ls
(b) **cat**: to create a file $cat <filename>
(c) **more:** to see the content of a file $more <filename>
(d) **cp:** copy the file $cp <old_path> <new_path>
(e) **mv:** rename a file $mv <old_file> <new_file>
(f) **rm:** remove the file $rm <filename>
(g) **pwd:** present working directory $pwd
(h) **who am i:** terminal information and user detail
(i) **wc:** word count in a file $wc filename
(j) **mkdir:** to make a directory $mkdir <dir_name>
(k) **vi:** vi editor to edit the file in later stage
(l) **tty:** display terminal name

Android (operating system)

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, Android is designed primarily for touchscreen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touchscreen input, it also has been used in game consoles, digital cameras, and other electronics.

There are different versions of Android since 2005.

Version	Code name	Release date	Distribution
4.4	KitKat	October 31, 2013	20.9%
4.3		July 24, 2013	7.9%
4.2.x	Jelly Bean	November 13, 2012	19.8%
4.1.x		July 9, 2012	26.5%
4.0.3–4.0.4	Ice Cream Sandwich	December 16, 2011	10.6%
2.3.3–2.3.7	Gingerbread	February 9, 2011	13.6%
2.2	Froyo	May 20, 2010	0.7%

PROGRAM & PROGRAMMING LANGUAGE

A program is a setup instruction which is executed by computer. A Programming Language consists of all the symbol, characters and usage rules that permit the people to communicate with the computer. There are two major types of programming language.
(a)Low Level Langauge   (b)High Level Language

Low Level Language: A language in which each statement or an instruction in directly translated into a single machine code. Each mnemonics of an assembly language has a unique machine code. A **low-level programming language** is a programming language that provides little or no abstraction from a computer's instruction set architecture. Generally this refers to either machine code or assembly language. The word "low" refers to the small or nonexistent amount of abstraction between the language and machine language; because of this, low-level languages are sometimes described as being "close to the hardware." E.g. Machine language, Assembly language

Low-level languages can be converted to machine code without using a compiler or interpreter, and the resulting code runs directly on the processor. A program written in a low-level language can be made to run very fast, and with a very small memory footprint; an equivalent program in a high-level language will be more heavyweight. Low-level languages are simple, but are considered difficult to use, due to the numerous technical details which must be remembered.

(i) **Machine language:** It contains the strings of binary numbers (0's and 1's) and is machine dependent. It means that the machine language for every processor in different. The machine language is divided into two parts:

    (a) Operation code (opcode)   (b) Operands (binary data)

Advantage of machine language

a. Processing speed of programs written in this language is high.

b. No translator is required.

Disadvantage of machine language

a. Dependent on machine

b. Difficult in writing code

c. Difficult to make correction

d. Great chance of committing error

(ii) **Assembly language:** The program is written in terms of symbols represented by alphabets of English language which is converted into machine language by Assembler or translator. Assembly program written in symbols is called **source program** which on being converted into machine language is called **object program.**

High Level Language: High Level Languages are easier to learn and write. In this type of language, instructions are written in form of statement. A **high-level programming language** is a programming language with strong abstraction from the details of the computer. E.g. Pascal, COBOL, C, C++ etc.

To overcome the difficulties to low level language, the high level language were developed. Advantages are:

(a) Easier to learn than Low Level Language

(b) It requires less time to write and understand

(c) They provide better documentations

(d) Easier to maintain

(e) They are not machine oriented.

High Level Language is mainly known as human understandable language like English language. But to make machine understand, this programming language has to be converted into machine language or assembly language.

	High Level Language		**Low Level Language**
(i)	Program developed in high level language are most understandable.	(i)	Programs are less understandable than high level language.
(ii)	Programs are portable.	(ii)	Programs are not portable.
(iii)	Debugging is easier.	(iii)	Debugging is more complex.
(iv)	Programs are machine independent.	(iv)	Programs are machine dependent.
(v)	Most suited for software development.	(v)	Not good for large programs.
(vi)	Uses compiler and interpreter to generate object code.	(vi)	Uses assembler to generate object code.

Translator

The system software that are used to translate the language from one language to another language are called the translators. The main translator are: Assembler, Compiler, Interpreter, Preprocessor.

Assembler: The assembler is a program which converts an assembly language program into machine language. A computer program is to translate between lower-level representations of computer programs. An assembler converts basic computer instructions into a pattern of bits which can be easily understood by the computer and the processor can use it to perform its basic operations.

Compiler: The compiler converts the Low Level Language into machine language. A **compiler** is a computer program (or set of programs) that transforms source code written in a programming language (the *source language*) into another computer language (the *target language*, often having a binary form known as *object code*). The most common reason for wanting to transform source code is to create an executable program.

Interpreter: Interpreter executes the program takes as input as line-by-line. An **interpreter** normally means a computer program that executes, i.e. *performs*, instructions written in a programming language. An *interpreter* may be a program that either

1. executes the source code directly
2. translates source code into some efficient intermediate representation (code) and immediately executes this
3. explicitly executes stored precompiled code made by a compiler which is part of the interpreter system

Difference between Compiler and Interpreter

	Compiler	Interpreter
1	Complete source code is translated	Each line of instruction is translated
2	Object (or compiled) program is saved permanently.	Compete program is not translated into object program, cannot save permanently.
3.	Take less time in processing	Take more time in processing

Debugger: A **debugger** or **debugging tool** is a computer program that is used to test and debug other programs (the "target" program). The code to be examined might alternatively be running on an *instruction set simulator* (ISS), a technique that allows great power in its ability to halt when specific conditions are encountered but which will typically be somewhat slower than executing the code directly on the appropriate (or the same) processor. Some debuggers offer two modes of operation - full or partial simulation, to limit this impact.

Loaders and Linkers

Loader is used to move the program from magnetic storage to main memory at the time of execution of a program.

Linker is used to combine all related modules (function or procedure) or library function into a single machine language program. Like when the source program is compiled, the resultant program (i.e. machine code) is produced on a physical media such as memory disk.

If the translated program is using various function, procedure or library function etc. then before the program executes all related modules must be located and accurately linked together. After that all modules moves from memory storage to the main memory of compiler. All these process is done by linker and loader.

Compilation and Object Code

A compiler is a computer program (or set of program) that transforms source code written in a computer language (source language, .cpp file) into another computer language (target language, often having a binary form known as *Object code, .obj file*). The most common reason to transform source code is to create an executable program(.exe file).

Source code (myfile.cpp)	Alt+F9 →	object code(myfile.obj)	ctrl + F9 →	Executable code (myfile.exe)

The name "compiler" is primarily used for programs that translate source code from a high-level programming language to a low-level programming language (assembly language or machine code). A program that translates from a low-level language to a high-level language is called **Decompiler**. A program that translates between high-level languages is usually called a **Language translator (or language converter or source to source translator).** A language rewriter is usually a program that translates the form of expressions without a change of language.

Difference between CUI and GUI

• CUI and GUI are user interface used in connection with computers
• CUI is the precursor of GUI and stands for character user interface where user has to type on keyboard to proceed. On the other hand GUI stands for Graphical User Interface which makes it possible to use a mouse instead of keyboard
• GUI is much easier to navigate than CUI
• There is only text in case of CUI whereas there are graphics and other visual clues in case of GUI
• Most modern computers use GUI and not CUI
• DOS is an example of CUI whereas Windows is an example of GUI.