# Subject: Computer Fundamentals

## UNIT-1

**Compute** means *to calculate*. A *computer* is an electronic machine that accepts data from the user, processes the data by performing calculations and operations on it, and generates the desired output results. Computer performs both simple and complex operations, with speed and accuracy.

### CHARACTERISTICS OF COMPUTER

Speed, accuracy, diligence, storage capability and versatility are some of the key characteristics of a computer. A brief overview of these characteristics is given as:

- ***Speed:*** The computer can process data very fast, at the rate of millions of instructions per second. Some calculations that would have taken hours and days to complete otherwise, can be completed in a few seconds using the computer. For example, calculation and generation of salary slips of thousands of employees of an organization, weather forecasting that requires analysis of a large amount of data related to temperature, pressure and humidity of various places, etc.

- ***Accuracy:*** Computer provides a high degree of accuracy. For example, the computer can accurately give the result of division of any two numbers up to 10 decimal places.

- ***Diligence:*** When used for a longer period of time, the computer does not get tired or fatigued. It can perform long and complex calculations with the same speed and accuracy from the start till the end.

- ***Storage Capability:*** Large volumes of data and information can be stored in the computer and also retrieved whenever required. A limited amount of data can be stored, temporarily, in the primary memory. Secondary storage devices like floppy disk and compact disk can store a large amount of data permanently.

### BLOCK DIAGRAM OF COMPUTER

Hardware is a term which refers to the physical components of a computer system which are used for processing data. Computers perform following five basic operations for converting raw input data into information useful to users.

1. **Inputting:** The process of entering data and instructions into computer system is called Inputting.
2. **Storing:** Saving data and instructions so that they are available for future use whenever required.
3. **Processing:** Performing arithmetic operations (Add, Subtract, Multiply, Divide etc.) or logical operations (Comparisons like equal to, less than, greater than etc.) on data in order to convert them into useful information.
4. **Outputting:** The process of obtaining useful information or results to user such as printed report or visual display.
5. **Controlling:** Detecting the manner and sequence in which all above operations are performed.

Any computer system have essentially four important parts normally input unit, central processing unit, storage unit and output unit. The block diagram is shown in Figure.

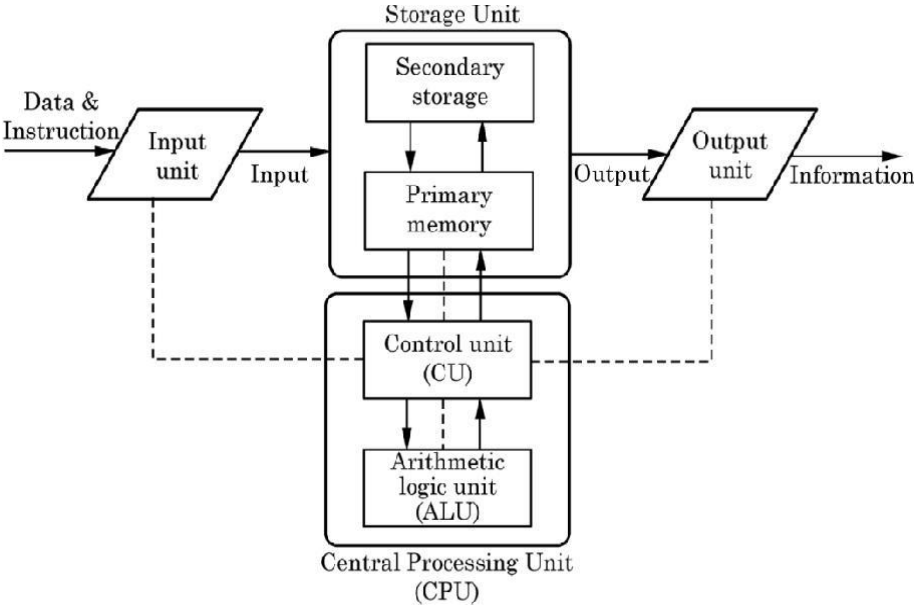



***Fig.: Block Diagram of Computer***

In the Figure, the solid lines are used to indicate the flow of instruction and data and the dotted lines represent the control exercised by the control unit.

## INTERACTION OF VARIOUS COMPONENTS OF COMPUTER

***Input/Output Unit*** The user interacts with the computer via the I/O unit. The Input unit accepts data from the user and the Output unit provides the processed data i.e. the information to the user. The Input unit converts the data that it accepts from the user, into a form that is understandable by the computer. Similarly, the Output unit provides the output in a form that is understandable by the user. The input is provided to the computer using input devices like keyboard, trackball and mouse. Some of the commonly used output devices are monitor and printer.

***Central Processing Unit*** CPU controls, coordinates and supervises the operations of the computer. It is responsible for processing of the input data. CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU).
ALU performs all the arithmetic and logic operations on the input data. CU controls the overall operations of the computer i.e. it checks the sequence of execution of instructions, and, controls and coordinates the overall functioning of the units of computer.
Additionally, CPU also has a set of *registers* for temporary storage of data, instructions, addresses and intermediate results of calculation.

***Memory Unit*** Memory unit stores the data, instructions, intermediate results and output, *temporarily*, during the processing of data. This memory is also called the *main memory or primary memory* of the computer. The input data that is to be processed is brought into the main memory before processing. The instructions required for processing of data and any intermediate results are also stored in the main memory. The output is stored in memory before being transferred to the output device. CPU can work with the information stored in the main memory. Another kind of storage unit is also referred to as the *secondary memory* of the computer. The data, the programs and the output are stored *permanently* in the storage unit of the computer. Magnetic disks, optical disks and magnetic tapes are examples of secondary memory.

## Applications of Computers

Computers are widely used in number of fields as given below:

### *1. Business*

A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which has made it an integrated part in all business organizations.

Computer is used in business organizations for Payroll calculations, Budgeting, Managing employee database and Maintenance of stocks, etc.

### *2. Banking*

Today, banking is almost totally dependent on computers. Banks provide the following facilities:

- Online accounting facility, which includes checking current balance, making deposits, checking interest charges and shares etc.
- ATM machines which are completely automated are making it even easier for customers to deal with banks.

### *3. Insurance*

Insurance companies are keeping all records up-to-date with the help of computers. Insurance companies, finance houses, and stock broking firms are widely using computers for their concerns. Insurance companies are maintaining a database of all clients with information showing:

- Starting date of the policies, Next due installment of a policy
- Maturity date, Interests due, Bonus

### *4. Education*

The computer helps in providing a lot of facilities in the education system.

- The computer provides a tool in the education system known as CBE (Computer Based Education), CBE involves control, delivery, and evaluation of learning.
- Computer education is rapidly increasing the graph of number of computer students.
- It is used to prepare a database about performance of a student and analysis is carried out on this basis.

### *5. Marketing*

In marketing, uses of the computer are following −

- **Advertising** − With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
- **Home Shopping** − Home shopping has been made possible through the use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

### *6. Healthcare*

Computers have become an important part in hospitals, labs, and dispensaries. They are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, ultrasounds and CT scans, etc. are also done by computerized machines.

### *7. Military*

Computers are largely used in defence. Modern tanks, missiles, weapons, etc. Military also employs computerized control systems. Some military areas where a computer has been used are

- Military Operation and Planning, Missile Control
- Smart Weapons, Military Communication

### 8. Communication

Communication is a way to convey a message, an idea, a picture, or speech that is received and understood clearly and correctly by the person for whom it is meant. Some main areas in this category are −

- E-mail, Chatting
- FTP, Telnet
- Video-conferencing

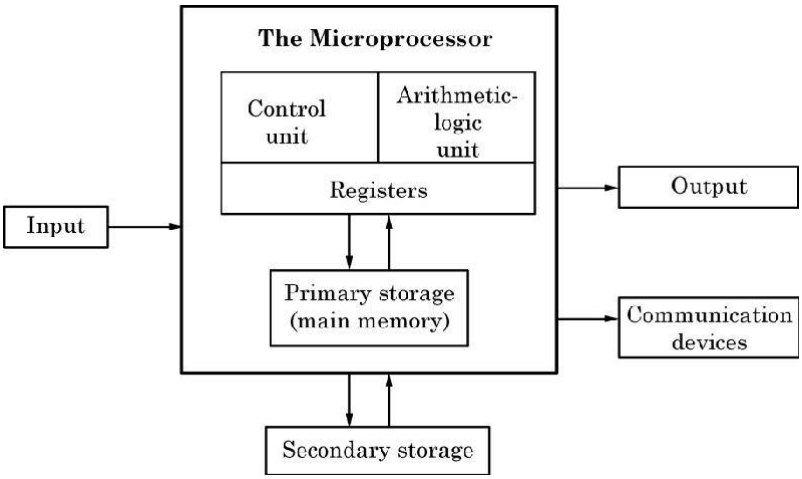
### *9. Government*

Computers play an important role in government services. Some major fields in this category are:

- Budgets, Sales tax department, Income tax department
- Computation of male/female ratio, Computerization of voters lists
- Computerization of PAN card, Weather forecasting

## CENTRAL PROCESSING UNIT

The central processing unit is responsible for actual processing of inputs to generate the output. The central processing unit (CPU) is considered as the brain of the computer. It's main component is Microprocessor. This device converts all the supplied input into output as per the instructions supplied by the user.




**Central Processing Unit**

The CPU of a computer is the device on which the speed and efficiency of the computer mainly depends on. The CPU is divided into arithmetical & logical unit (ALU) and Control Unit (CU). The ALU performs arithmetical and logical calculations and CU supervises the working of ALU.

**(a) Control Unit:** The control unit acts as supervisor on the working of ALU. At a time, there are many programs to be executed by CPU. They must be executed in a proper sequence. This sequence is decided by CU. The control unit takes instructions stored in memory and issues signals to ALU depending on these instructions. It also coordinates the functioning of various input output devices attached to computer.

**(b) Arithmetic and Logic Unit:** The arithmetic and logical unit is the part of CPU where actual computation is performed. It is the place where all the arithmetical calculations and logical comparisons are performed. The arithmetical calculations involve the use of basic arithmetic operations like addition and subtractions.

The logical calculations involves checking numbers and letters for equality (=), less than (<) and greater than (>) conditions. Other conditions can be greater than or equal to (>=), less than or equal to (<=) and not equal to (!=). These calculations are performed on data that is stored in internal storage areas of CPU, called registers.

The actual processing of data occurs in the ALU.

**(c) Registers:** Registers are internal storage locations inside the CPU that are used to store instructions or data. The registers are used by ALU and CU for storing intermediate results and control information. Different models of CPU are different in number and size of registers. As these locations are internal to CPU, they can be rapidly accessed by it. There are many types of registers.

- The **Program Counter** is used to keep the address of the next instruction to be fetched.
- The **Instruction Register** is used to store the address of the current instruction that is being processed.
- The **Address Registers** are used by instructions for indirectly accessing the contents of memory by its address.

## FUNCTIONS OF INPUT/OUTPUT DEVICES

### Input Devices

Data and instructions must enter a computer system before the computer can perform any computation on the supplied data. The input unit that links a computer with its external environment performs this task. Data and instructions enter a computer through an input unit in a form that depends upon the input device used. For example, data can be entered using a keyboard in a manner similar to typing and this differs from the way in which data is entered through a scanner, another type of input device. However, a computer's memory is designed to accept input in binary code and hence, all input devices must transform input signals to binary codes.

In short, an input unit performs following functions:

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

Various Input Devices are:

Keyboard, Mouse, Magnetic Ink Character Reader (MICR), Optical Mark Reader (OMR), Touch Screen, Light Pen, Card Readers, Scanners, Joystick etc.

**Output Devices**

An output unit performs the reverse operation of that of an input unit. It supplies information obtained from data processing to outside world. Hence, it links a computer with its external environment. As computers work with binary code, results produced are also in binary form. Therefore, before supplying the results to outside world, the system must convert them to human acceptable (readable) form. In short, an output unit performs following functions:

1. It accepts the results produced by a computer, which are in coded form and hence, we cannot easily understand them.
2. It converts these coded results to human acceptable (readable) form.
3. It supplies the converted results to outside world.

There are two broad categories of outputs from computers.

1.Soft Copy Output
2.Hard Copy Output

**1) Soft Copy Output**: Soft copy output is the temporary form of output that can be seen till the computer is powered on. This output is not available when the computer is powered off. For example, the data displayed on the screen of our monitor is available till the computer is switched on.

**2) Hard Copy Output**: We cannot only work with soft copy output. Such output is temporary and we need output for record keeping purpose also. This type of output is printed on paper and can be referred at any point of time. Hard copy output is the permanent type of output that can be referred at any point of time. For example, you can see the printed sales report of the month even when your computer is switched off.

## MEMORY

The memory unit is one of the most important sections of computer. It is responsible for storing the data and instructions either temporarily or permanently. This is the section due to which the computer can store and remember thousands of different files of various types. The memory is the storage area where all the inputs are stored before processing and the outputs are stored after processing of inputs.

**Units of Memory**

Following are the units of memory:

- **1 bit**: It is the space required to store one binary digit (0 or 1) in the memory.
- **1 byte**: It is the space required to store one character of the keyboard into the memory. It is equal to 8 bits. One character (“a” or “b” or “c” …) takes 8 bits to get stored in memory. All the symbols or numbers also take the same space when stored as text in the memory.
- **1 KiloByte** (KB): 1KiloByte is the space required to store 1024 bytes in the memory. Therefore, 1 KB=1024 bytes
- **1 MegaByte** (MB): One Mega Byte is the space required to store 1024 kilobytes in memory. Therefore, 1MB= 1024 x 1024 bytes.
- **1 GigaByte** (GB): One GB is the space required to store 1024 megabytes in the memory. Therefore, 1GB= 1024 x 1024 x 1024 bytes

- **1 Terra Byte** (TB): One Terra Byte is the space required to store 1024 GB in the memory. Therefore, 1Tb= 1024 × 1024 × 1024 × 1024 bytes.

**Functions of Memory**

The data and instructions that are entered into the computer system through input units have to be stored inside the computer before actual processing starts. Also the results produced after processing must be kept somewhere inside the computer before being passed on to the output unit. Moreover the intermediate results produced by the computer must also be preserved for on-going procession. The memory of a computer system is designed to cater all these needs. It provides space for storing instructions and data, space for intermediate results and space for final results. The functions of memory are as follows:

i) Stores the data and instructions to be processed.
ii) Stores intermediate results of processing.
iii) Stores the final results of processing before these are released to an output device.

## Types of Memory

Computer memory can be classified into two types; primary memory and secondary memory Primary Memory can be further classified as RAM and ROM.

**RAM** or Random Access Memory is the unit in a computer system. It is the place in a computer where the operating system, application programs and the data in current use are kept temporarily so that they can be accessed by the computer's processor. It is said to be 'volatile' since its contents are accessible only as long as the computer is on. The contents of RAM are no more available once the computer is turned off.

**ROM** or Read Only Memory is a special type of memory which can only be read and contents of which are not lost even when the computer is switched off. It typically contains manufacturer's instructions. Among other things, ROM also stores an initial program called the 'bootstrap loader' whose function is to start the operation of computer system once the power is turned on.

## Secondary Memory

RAM is volatile memory having a limited storage capacity. Secondary/ auxiliary memory is storage other than the RAM. These include devices that are peripheral and are connected and controlled by the computer to enable permanent storage of programs and data. Secondary storage devices are of two types:

- Magnetic
- Optical.

Magnetic devices include hard disks and optical storage devices are CDs, DVDs, Pen drive, Zip drive etc.

Hard Disk

***Fig.: Hard Disk***

Hard disks are made up of rigid material and are usually a stack of metal disks sealed in a box. The hard disk and the hard disk drive exist together as a unit and is a permanent part of the computer where data and programs are saved. These disks have storage capacities ranging from 1GB to 80 GB and more. Hard disks are rewritable.

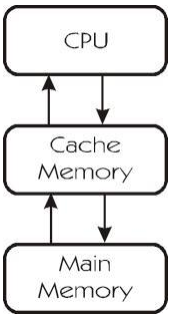
Compact Disk

Compact Disk (CD) is portable disk having data storage capacity between 650-700 MB. It can hold large amount of information such as music, full-motion videos, and text etc. CDs can be either read only or read write type.

Digital Video Disk

Digital Video Disk (DVD) is similar to a CD but has larger storage capacity and enormous clarity. Depending upon the disk type it can store several Gigabytes of data. DVDs are primarily used to store music or movies and can be played back on your television or the computer too. These are not rewritable.

## CACHE MEMORY




The speed of microprocessors is much high as compared to the speed of input, output and storage devices. The microprocessor works at rapid rate and it has been found that most of the time, it sits idle in waiting for input output and memory operations to complete. It has been found that on an average, 80% time of execution, the processor sits idle. A new type of high-speed memory was invented to compensate the difference in It is called *Cache Memory* Cache memory is a very high-speed memory, which is placed between the processor and main memory, to adjust the difference of their working speeds.

The frequently used instructions are stored in cache. So, the processor does not have to access them again and again from random access memory because, they are made available to it from the cache memory. This improves the overall efficiency of computer. Increasing the volume of cache memory directly increases the efficiency of the computer. The static high speed memory is used as cache memory.

## CPU PERFORMANCE FACTORS

The performance of a computer is highly dependent upon the way its processor works. It is very important for the processor to work efficiently, so that the computer is able to deliver its true potential for a long period of time. CPU performance is dependent on two main factors:

- **Clock Speed**
- **Word Length**

CPU **clock speed**, or clock rate, measured in Hertz (generally in GigaHertz, or GHz) indicates that how fast a CPU can work. It corresponds to how many instructions cycles the CPU can deal within a second. For example, one Hertz means that one cycle can be completed in one second. A 1 MHz (1 MegaHertz) means that one million cycles can be completed within a second.

A 2 GHz CPU performs two billion instructions cycles in a second. The faster the clock speed, faster would be the processing of the data by the computer.

**Word length** is expressed in terms of bits, and corresponds to the maximum number of bits of information that a computer can process at one time. It affects the efficiency of arithmetic performed on large numbers. If a sum cannot be handled by single CPU operation, it must be performed less efficiently by sequence of instructions, which split the number into parts, do the operation, and reassemble them. The larger the word length is, the faster the computer.

## PROCESSORS FAMILY

The processors here are grouped by "families", where we consider a family of processors to be a group of processors that vary only in clock speed, not in architecture. Before coming to the current family of processors, let us have a brief look at processor generations.

- **First generation** processors were used on the earliest of machines, the original IBM PC and XT, and the first clones. The first chip used in PCs was the manufacturer Intel's 8088.
- The only chip generally considered **second generation** is the 80286. Intel also made a chip between the 8088 and the 80286, called the 80186.
- In **third generation**, Intel started with the generation of chips to create "subfamilies" of related chips with different capabilities, using the "DX" and "SX" designations. The Intel 80386DX was the first true 32-bit processor used on the PC platform. The 80386SX is a "lite" version of the 80386DX chip.
- The **fourth generation** of processors saw rapid growth in the CPUs' power and capabilities, and the introduction of several new technologies as well. It was here that the manufacturers AMD and Cyrix had their first real early successes. Some fourth Generation Processors are:- INTEL80486DX, INTEL 80486SX, INTEL 80486DX2 & INTEL 80486DX2 overdrive, INTEL 80486DX4 & INTEL 80486DX4 overdrive, AMD 5x86, Cyrix 5x86.
- The **fifth generation** of processors saw several changes from earlier CPU families and several trends continue as well. Chips continued to get faster and faster, and architectural changes were made to increase overall system speed as well. AMD and Cyrix developed their own compatible processors instead of just trying to clone Intel's, leading to more variety and choice in the marketplace. The Pentium and the compatibles that followed it opened up the world of computers for millions of users and propelled computing to the next level. Some examples are Intel Pentium(“P5”/“P54C”), Intel Pentium over drive, Intel Pentium with MMX technology, Intel Pentium with MMX technology over drive, Cyrix 6x86, AMD K5.
- In **sixth generation**, new and innovative architectural designs are employed in the CPUs, as the easy performance improvements such as widening buses and increasing clock speeds get harder to continue. Some of the processors of this generation are Intel Pentium Pro(“p6”), Intel Pentium II (“Klamath”), AMD K6, Cyrix 6x86MX(“M2”).
- Currently, the **seventh generation** processors' family is into place. Multicore processors are gaining a huge space in market. A **multi-core** processor (or **chip-level multiprocessor**, **CMP**) combines two or more independent cores into a single package composed of a single integrated circuit (IC), called a die, or more dies packaged together. The individual core is normally a CPU.

**A dual-core** processor contains two cores, and a **quad-core** processor contains four cores. A multi-core microprocessor implements multiprocessing in a single physical package.

***The current family of processors are referred here as under:***

Intel Core i3, Core i5, and Core i7 CPUs have been around for a few years now. The more cores there are, the more tasks (known as threads) can be served at the same time. The lowest number of cores can be found in Core i3 CPUs, i.e., which have only two cores. Currently, all Core i3 are dual-core processors.

Currently all Core i5 processors, except for the i5-4570T, are quad cores. The Core i5-4570T is only a dual-core processor with a standard clock speed of 2.9GHz. Remember that all Core i3s are also dual cores. Furthermore, the i3-4130T is also 2.9GHz, yet a lot cheaper.

| PARAMETER | PROCESS | | |
|---|---|---|---|
| | i3 | i5 | i7 |
| 1. Varient | Basic | Mid-Range | Advance |
| 2. Number of Core | 2 | 2 & 4 | 2, 4 & 8 |
| 3. Clock Speed | 2.1 to 2.5 GHz | 2.4 GHz to 3 GHz | 2.9 GHz to 4.2 GHz |
| 4. Hyper-Threading | Yes | 2 Core - Yes<br>4 Core - No | Yes |
| 5. Cache Memory | 3-4 MB | 4 to 6 MB | 8 MB |
| 6. Task | Basic | Mid-Range | Advance |

**Intel Core i3, i5 & i7**

**CLASSIFICATION OF COMPUTERS**

***Computers are broadly classified into two categories depending upon the logic used in their design as:***

**Analog computers:**
In analog computers, data is recognized as a continuous measurement of a physical property like voltage, speed, pressure etc. Readings on a dial or graphs are obtained as the output, ex. Voltage, temperature; pressure can be measured in this way.

**Digital Computers:**
These are high speed electronic devices. These devices are programmable. They process data by way of mathematical calculations, comparison, sorting etc. They accept input and produce output as discrete signals representing high (on) or low (off) voltage state of electricity. Numbers, alphabets, symbols are all represented as a series of 1s and 0s.

Digital Computers are further classified as General Purpose Digital Computers and Special Purpose Digital Computers. General Purpose computers can be used for any applications like accounts, payroll, data processing etc. Special purpose computers are used for a specific job like those used in automobiles, microwaves etc.

***Another classification of digital computers is done on the basis of their capacity to access memory and size like:***

**Microcomputers:** Microcomputers are generally referred to as **Personal Computers (PCs).** They have smallest memory and less power. They are widely used in day to day applications like office automation, and professional applications, ex. PC- AT, Pentium etc.

**Note Book and Laptop Computers:** These are portable in nature and are battery operated. Storage devices like CDs, floppies etc. and output devices like printers can be connected to these computers. Notebook computers are smaller in physical size than lap top computers. However, both have powerful processors, support graphics, and can accept mouse driven input.

**Hand Held Computers:**
These types of computers are mainly used in applications like collection of field data. They are even smaller than the note book computers.

***Fig.: Microcomputer***

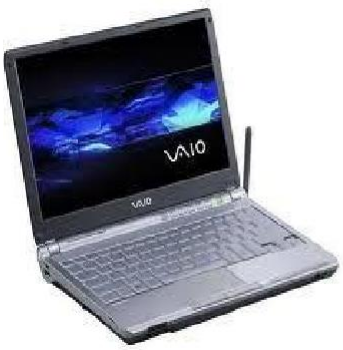



**Fig.: Notebook or Laptop**

**Fig.: Handheld Computer**

**Mini Computers**: Mini computers are more powerful than the micro computers. They have higher memory capacity and more storage capacity with higher speeds. These computers are mainly used in process control systems. They are mainly used in applications like payrolls, financial accounting, Computer aided design etc. ex. VAX, PDP-11

**Mainframe Computers**: Main frame computers are very large computers which process data at very high speeds of the order of several million instructions per second. They can be linked into a network with smaller computers, micro computers and with each other. They are typically used in large organizations, government departments etc. ex. IBM4381, CDC

**Super Computers**: A super computer is the fastest, most powerful and most expensive computer which is used for complex tasks that require a lot of computational power. Super computers have multiple processors which process multiple instructions at the same time. This is known as parallel processing. These computers are widely used in very advanced applications like weather forecasting, processing geological data etc. ex. CRAY-2, NEC - 500, PARAM.

## GENERATIONS OF COMPUTER

The computer has evolved from a large sized simple calculating machine to a smaller but much more powerful machine. The evolution of computer to the current state is defined in terms of the generations of computer. Each generation of computer is designed based on a new technological development, resulting in better, cheaper and smaller computers that are more powerful, faster and efficient than their predecessors. Currently, there are five generations of computer. In the following subsections, we will discuss the generations of computer in terms of:

### First Generation (1940 to 1956): Using Vacuum Tubes

- ***Hardware Technology*** The first generation of computers used vacuum tubes circuitry and magnetic drums for memory. The input to the computer was through punched cards and paper tapes. The output was displayed as printouts.

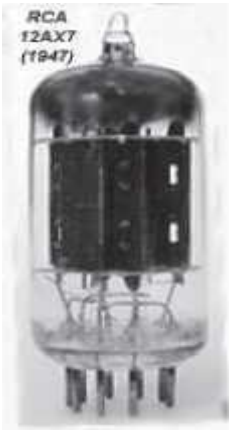



***Fig.1.1: Vacuum tube***

- ***Software Technology*** The instructions were written in machine language. Machine language uses 0s and 1s for coding of the instructions. The first generation computers could solve one problem at a time.
- ***Computing Characteristics*** The computation time was in milliseconds.
- ***Physical Appearance*** These computers were enormous in size and required a large room for installation.
- ***Application*** They were used for scientific applications as they were the fastest computing device of their time.
- ***Examples*** UNIVersal Automatic Computer (UNIVAC), Electronic Numerical Integrator And Calculator (ENIAC), and Electronic Discrete Variable Automatic Computer (EDVAC).

The first generation computers used a large number of vacuum tubes and thus generated a lot of heat. They consumed a great deal of electricity and were expensive to operate. The machines were prone to frequent malfunctioning and required constant maintenance. Since first generation computers used machine language, they were difficult to program.

**Second Generation (1956 to 1963): Using Transistors**

- ***Hardware Technology*** Transistors replaced the vacuum tubes of the first generation of computers. Transistors allowed computers to become smaller, faster, cheaper, energy efficient and reliable. The second generation computers used *magnetic core technology* for primary memory. They used magnetic tapes and magnetic disks for secondary storage. The input was still through punched cards and the output using printouts. They used the concept of a stored program, where instructions were stored in the memory of computer.


***Fig.1.2: Transistors***

- ***Software Technology*** The instructions were written using the *assembly language*. Assembly language uses mnemonics like ADD for addition and SUB for subtraction for coding of the instructions. It is easier to write instructions in assembly language, as compared to writing instructions in machine language.
- ***Computing Characteristics*** The computation time was in microseconds.
- ***Physical Appearance*** Transistors are smaller in size compared to vacuum tubes, thus, the size of the computer was also reduced.
- ***Application*** The cost of commercial production of these computers was very high, though less than the first generation computers. The transistors had to be assembled manually in second generation computers.
- ***Examples*** PDP-8, IBM 1401 and CDC 1604.

Second generation computers generated a lot of heat but much less than the first generation computers. They required less maintenance than the first generation computers.

**Third Generation (1964 to 1971): Using Integrated Circuits**

- ***Hardware Technology*** The third generation computers used the *Integrated Circuit (IC)* chips. In an IC chip, multiple transistors are placed on a silicon chip. Silicon is a type of

semiconductor. The use of IC chip increased the speed and the efficiency of computer, manifold. The keyboard and monitor were used to interact with the third generation computer, instead of the punched card and printouts.

- ***Software Technology*** The keyboard and the monitor were interfaced through the *operating system*. Operating system allowed different applications to run at the same time. *High-level languages* were used extensively for programming, instead of machine language and assembly language.

***Fig. 1.3: IC chips***

- ***Computing Characteristics*** The computation time was in nanoseconds.
- ***Physical Appearance*** The size of these computers was quite small compared to the second generation computers.
- ***Application*** Computers became accessible to mass audience. Computers were produced commercially, and were smaller and cheaper than their predecessors.
- ***Examples*** IBM 370, PDP 11.

The third generation computers used less power and generated less heat than the second generation computers. The cost of the computer reduced significantly, as individual components of the computer were not required to be assembled manually. The maintenance cost of the computers was also less compared to their predecessors.

**Fourth Generation (1971 to present): Using Microprocessors**

- ***Hardware Technology*** They use the *Large Scale Integration (LSI)* and the *Very Large Scale Integration (VLSI)* technology. Thousands of transistors are integrated on a small silicon chip using LSI technology. VLSI allows hundreds of thousands of components to be integrated in a small chip. This era is marked by the development of microprocessor.

  *Microprocessor* is a chip containing millions of transistors and components, and designed using LSI and VLSI technology. This generation of computers gave rise to Personal Computer (PC). Semiconductor memory replaced the earlier magnetic core memory, resulting in fast random access to memory. Secondary storage device like magnetic disks became smaller in physical size and larger in capacity.

  The *linking of computers* is another key development of this era. The computers were linked to form networks that led to the emergence of the Internet. This generation also saw the development of pointing devices like mouse, and handheld devices.

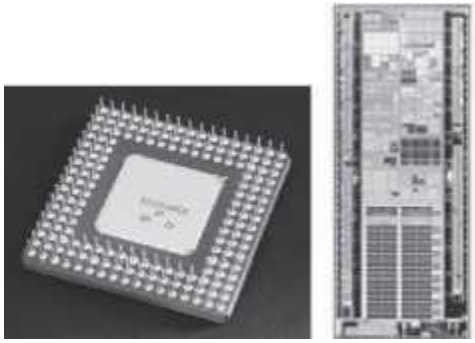


***Fig. 1.4: Microprocessors***

- ***Software Technology*** Several new operating systems like the MS-DOS and MS- Windows developed during this time. This generation of computers supported *Graphical User Interface (GUI)*. GUI is a user-friendly interface that allows user to interact with the computer via menus and icons. High-level programming languages are used for the writing of programs.
- ***Computing Characteristics*** The computation time is in picoseconds.
- ***Physical Appearance*** They are smaller than the computers of the previous generation. Some can even fit into the palm of the hand.
- ***Application*** They became widely available for commercial purposes. Personal computers became available to the home user.
- ***Examples*** The Intel 4004 chip was the first microprocessor. The components of the computer like Central Processing Unit (CPU) and memory were located on a single chip. In 1981, IBM introduced the first computer for home use. In 1984, Apple introduced the Macintosh.

The microprocessor has resulted in the fourth generation computers being smaller and cheaper than their predecessors. The fourth generation computers are also portable and more reliable. They generate much lesser heat and require less maintenance compared to their predecessors. GUI and pointing devices facilitate easy use and learning on the computer. Networking has resulted in resource sharing and communication among different computers.

**Fifth Generation (Present and Next): Using Artificial Intelligence**

The goal of fifth generation computing is to develop computers that are capable of learning and self-organization. The fifth generation computers use *Super Large Scale Integrated (SLSI)* chips that are able to store millions of components on a single chip. These computers have large memory requirements.

The fifth generation computers are based on *Artificial Intelligence (AI)*. They try to simulate the human way of thinking and reasoning. Artificial Intelligence includes areas like Expert System (ES), Natural Language Processing (NLP), speech recognition, voice recognition, robotics, etc.

## NUMBER SYSTEM AND ITS TYPES

Number system is a collection of symbols and rules that are used to represent quantities and perform calculations on these quantities. Various systems can be used to express same quantity. Each system has its own rules of representing and working with quantities.

The number systems can be broadly classified into two sub types :

1. Non-Positional Number System
2. Positional Number System

**(A) Non Positional Number System:** It is the type of number system in which the position of characters is of no importance. This type of number system was used in the early days of computing when things were counted using fingers. For example, in the number system shown below, the individual position of each character is of no importance in the number.

1 I
2 II
3 III
4 IIII
5 IIIII
.
.
10 IIIIIIIII

**(B) Positional Number System**

It is type of number system in which a set of digits are used to form different numbers by varying the position of digits in a number. For example, 12 is different from 21 because of the position of individual character. Following are the types of positional number systems :

1. Decimal Number System
2. Binary Number System
3. Octal Number System
4. Hexadecimal Number System

**(i) Decimal Number System:** Decimal number system is the number system that is most commonly used in general life for counting and calculations. Decimal number system uses digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 to create different numbers by varying the position of digits. The base of this number system is 10. For example, 56523 represents fifty six thousand five hundred and twenty three.

**(ii) Binary Number System:** It is the number system that is used by all two state devices like computer hardware and electronic devices. This number system uses two numbers i.e. 0 and 1 for creating various numbers through combinations of these two digits. The base of binary numbers is 2. For example, 0010 represents a decimal 2 and 1001 represents a decimal 9.

**(iii) Octal Number System:** Octal number system uses 8 digits to create various numbers. The digits used by this system are 0, 1, 2, 3, 4, 5, 6, 7. The base of octal numbers is 8. For example, 7 in octal represents 7 in decimal and 10 in octal represents 8 in decimal.

**(iv) Hexadecimal Number System:** Hexadecimal number system uses 16 digits to create various numbers. The digits used by this system are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F. The base of octal numbers is 16. For example, 7 in hexadecimal represents 7 in decimal and B in octal represents 11 in decimal.

| Decimal | Binary | Octal | Hexadecimal |
|---|---|---|---|
| 0 | 0000 | 0 | 1 |
| 1 | 0001 | 1 | 1 |
| 2 | 0010 | 2 | 2 |
| 3 | 0011 | 3 | 3 |
| 4 | 0100 | 4 | 4 |
| 5 | 0101 | 5 | 5 |
| 6 | 0110 | 6 | 6 |
| 7 | 0111 | 7 | 7 |
| 8 | 1000 | 10 | 8 |
| 9 | 1001 | 11 | 9 |
| 10 | 1010 | 12 | A |
| 11 | 1011 | 13 | B |
| 12 | 1100 | 14 | C |
| 13 | 1101 | 15 | D |
| 14 | 1110 | 16 | E |
| 15 | 1111 | 17 | F |

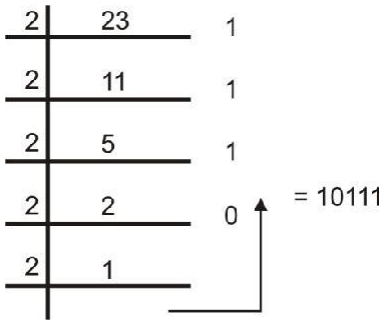
## DECIMAL TO BINARY CONVERSION

To convert a decimal number to equivalent binary number, follow these steps:

1. Divide the number by 2 and store the remainder.
2. Divide the quotient by 2 and store the remainder.
3. Repeat these steps till quotient becomes 0.
4. Write the remainders from bottom to top order. This arrangement of remainder digits will be the binary equivalent of the number.

The following figure describes this conversion process with decimal number 23.

$(23)_{10}$ = $(10111)_2$




**Shortcut Method:**

The following figure converts 167 into binary by using this method.

167= 128 + 32 + 4 + 2 + 1. Put 1 under these digits and 0s under the rest. The result will be binary equivalent of 167.

$(167)_{10}$ = $(10100111)_2$

## BINARY TO DECIMAL CONVERSION

To convert binary number into decimal number system each digit is multiplied by its weight and then added to get the number equivalent into decimal system.

**For example:** Convert $(10110101)_2$ into decimal number system.

$(10110101)_2$

$= 1 \times 27 + 0 \times 26 + 1 \times 25 + 1 \times 24 + 0 \times 23 + 1 \times 22 + 0 \times 21 + 1 \times 20$

$= 128+0+32+16+0+4+0+1$

$= (181)_{10}$

Thus $(10110101)_2 = (181)_{10}$

## HEXADECIMAL TO BINARY CONVERSION

1. Convert every digit of hexadecimal number to decimal equivalent.
2. Convert every decimal number to equivalent binary digit
3. Combine all the binary groups to form a single binary number For Example,

$(35)_{16} = (?)_2$

$3 = (0011)_2$

$5 = (0101)_2$

$(35)_{16} = (110101)_2$

## HEXADECIMAL TO BINARY CONVERSION

To convert a number from hexadecimal to binary, each digit is converted into equivalent binary code of length 4. For example if we convert $(3A7)_{16}$ into binary we proceed as follows. The four bit equivalent of

3 = 0011, A = 1011, 7 = 0111

Combining them we get $(3A7)_{16} = (0011\ 1011\ 0111)_2$

## BINARY TO HEXADECIMAL CONVERSION

1. Divide the binary digit into groups of four bits each beginning from right side.
2. Add 0s to the left, if last group is incomplete.
3. Convert each group into hexadecimals. For example, consider the following

$(110101)_2 = (?)_{16}$

0011 = 3, 0101 = 5

$= (35)_{16}$

## OCTAL TO BINARY CONVERSION

To convert a number from octal to binary, each digit is converted into equivalent binary code of length 3. For example if we convert $(37)_8$ into binary we proceed as follows. The four bit equivalent of

3 = 011, 7 = 111

Combining them we get $(37)_8 = (011111)_2$

## BINARY TO OCTAL CONVERSION

a. Divide the binary digit into groups of three bits each beginning from right side.
b. Add 0s to the left, if last group is incomplete.
c. Convert each group into octals. For example, consider the following

$(10101)_2 = (?)_8$

010 = 2, 101 = 5

$= (25)_8$

## BINARY CODING SCHEMES

The alphabetic data, numeric data, alphanumeric data, symbols, sound data and video data, are represented as combination of bits in the computer. The bits are grouped in a fixed size, such as 8 bits, 6 bits or 4 bits. A code is made by combining bits of definite size.

*Binary Coding schemes* represent the data such as alphabets, digits 0−9, and symbols in a standard code. A combination of bits represents a unique symbol in the data. The standard code enables any programmer to use the same combination of bits to represent a symbol in the data. The binary coding schemes that are most commonly used are—

- Extended Binary Coded Decimal Interchange Code (EBCDIC)
- American Standard Code for Information Interchange (ASCII)

***EBCDIC:***

- The Extended Binary Coded Decimal Interchange Code (EBCDIC) uses 8 bits (4 bits for zone, 4 bits for digit) to represent a symbol in the data.
- EBCDIC allows $2^8 = 256$ combinations of bits.
- 256 unique symbols are represented using EBCDIC code. It represents decimal numbers (0−9), lower case letters (a−z), uppercase letters (A−Z), Special characters, and Control characters (printable and non−printable, e.g., for cursor movement, printer vertical spacing, etc.).
- EBCDIC codes are mainly used in the mainframe computers.

***ASCII:***

- The American Standard Code for Information Interchange (ASCII) is widely used in computers of all types. ASCII codes are of two types—ASCII−7 and ASCII−8.

***ASCII-7*** is a 7-bit standard ASCII code. In ASCII-7, the first 3 bits are the zone bits and the next 4 bits are for the digits. ASCII-7 allows $2^7 = 128$ combinations. 128 unique symbols are represented using ASCII-7. ASCII-7 has been modified by IBM to ASCII-8.

***ASCII-8*** is an extended version of ASCII-7. ASCII-8 is an 8-bit code having 4 bits for zone and 4 bits for the digit. ASCII-8 allows $2^8 = 256$ combinations. ASCII-8 represents 256 unique symbols. ASCII is used widely to represent data in computers.

- Codes 0 to 31 represent control characters (non−printable), because they are used for actions like, Carriage return (CR), Bell (BEL), etc.
- Codes 48 to 57 stand for numeric 0−9.
- Codes 65 to 90 stand for uppercase letters A−Z.
- Codes 97 to 122 stand for lowercase letters a−z.
- Codes 128 to 255 are the extended ASCII codes.

# UNIT-2

## OPERATING SYSTEM

**Definition**: An operating system is a program that acts as an intermediary between user of a computer and the computer hardware. The purpose of an operating system is to provide an environment in which a user can execute programs.

The primary goal of an operating system is thus to make the computer system convenient to use. A secondary goal is to use the computer hardware in an efficient manner. Some examples of operating systems are MS-DOS, MS-Windows, UNIX and LINUX.

### Goals of Operating System:

1. Simplify the execution of user programs and make solving user problems easier.
2. Use computer hardware efficiently.
3. Allow sharing of hardware and software resources.
4. Make application software portable and versatile.
5. Provide isolation, security and protection among user programs.
6. Improve overall system reliability
7. Error confinement, fault tolerance, reconfiguration.

### Functions of Operating System:

1. **Memory (storage) Management**
   (a) It keeps tracks of primary memory *i.e.* what part of it are in use by whom, what part are not in use etc.
   (b) In multiprogramming it decides which process will get memory when and how much.
   (c) Allocates the memory when the process or program makes request to do so.
   (d) Declaims (deallocate) the memory when the process no longer needs it or has been terminated.
2. **Processor Management**
   (a) Keep tracks of processor and status of process. Program that does this is called traffic controller.
   (b) In multiprogramming it decides which process gets the processor when & how much time. This function is called process scheduling.
   (c) Allocate the processor (CPU) to a process.
   (d) Deallocates processor when processor is no longer required.

**3. Device Management**

(a) Keeps tracks of all devices (Peripherals). This is also typically called the I/O controller.

(b) Decides which process gets the device when & for how much time.

(c) Allocates the device in the efficient way.

(d) Deallocates various devices.

**Need of Operating System:**

In earlier days user had to design the application according to the internal structure of the hardware. Operating System was needed to enable the user to design the application without concerning the details of the computer‘s internal structure. In general the boundary between the hardware & software is transparent to the user.

**Usage of Operating System:**

1. Easy interaction between the human & computer.
2. Starting computer operation automatically when power in turned on.
3. Loading & scheduling users program.
4. Controlling input & output.
5. Controlling program execution.
6. Managing use of main memory.
7. Providing security to users program.

**Commonly Used Operating System**

There are various types of Operating Systems being in use throughout the world and this depends mainly on the type of operations performed. These Operating Systems are manufactured by large multi-national companies like Microsoft, Apple etc. Let’s look at the few most commonly used OS in the real world:

- Windows
- UNIX
- LINUX
- BOSS
- SOLARIS

**WINDOWS**

Generally referred to as the Microsoft Windows, these OS are manufactured and developed by the tech-giant Microsoft and are the most commonly used OS for personal computers and to some extent in mobile phones or the Windows phone. Microsoft Windows is a collection of many graphics oriented operating system, first developed and launched in 1985 by the name

Windows 1.0. When it started it had the aim to provide a graphical shell to the then famous MS-DOS which had a character user interface, but it didn't gained much popularity then. Slowly with the implementation of innovative features, the OS gained popularity and soon dominated the market of Computer Industry, owing to its freedom of use and user-friendly environment. Let's look at the advantages and disadvantages of using Microsoft Windows.

**Advantages:**

- *Hardware compatibility:* Almost every computer hardware manufacturing industry supports Microsoft Windows. This makes the users buy any random computer manufacturing brand and get the latest version of pre-loaded Microsoft Windows 10 in it.
- *Pre-loaded and available Softwares:* Windows comes with much user-friendly software to make the everyday task easier and if the software is not available then one can easily get it from the Internet and run it.
- *Ease of Use:* Microsoft Windows has developed by far the most user-friendly OS in the market, keeping in mind that it serves the purpose of most types of market in the world. It is the most preferred OS for personal computers.
- *Game Runner:* Windows supports a plethora of games manufactured till date and comes with all the supporting base software to drive the game engine. So it is the most popular OS among the game lovers.

**Disadvantages:**

- *Expensive:* Microsoft is a closed source OS and the license cost is really high. It's not possible for every class of society to buy new license every time one is expired. The latest Windows 10 costs around 6000 to 8000 INR.
- *Poor Security:* Windows is much more prone to virus and malware in comparison to other OS like Linux or Mac in the market.
- *Not reliable:* Windows starts to lag with time and eventually needs booting every time and now to get back the initial speed.

There are many versions of Windows that has been developed since 1985, but few that revolutionised the industry of Operating System are:

Windows 95, Windows 98, Windows NT, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10(Latest)

According to Net Applications, that tracks use based on web use, Windows is the most-used operating system family for personal computers as of July 2017 with close to 90% usage share and rising.

**UNIX**

Developed in 1970 in the Bell Lab research centre UNIX became a multitasking and multiuser operating system, reaching numerous platforms for use. It was developed by Ken Thompson, Dennis Ritchie, and few others and later AT&T licensed UNIX to the development of many variants of Unix, serving academic and business purpose at the University of California, Berkley Software Distribution, IBM, Microsoft and Sun Microsystem. The OS is totally written in C language allowing it to serve in various platforms. It provides a set of simple and dedicated tools to perform a well-defined task using basic functions, shell scripting and command languages. As of 2014, the Unix version with the largest installed base is Apple's macOS.

**Advantages:**

- The OS is available on a wide variety of machines that are the most truly portable operating system.
- It has a Very efficient virtual memory system, which allows many programs to run simultaneously with a modest amount of physical memory and time.
- The OS was primarily built to serve the complete multitasking purpose without crashing of data, and it served well along with the protected memory.
- Has a high-level authentication system along with a fully secured environment.

**Disadvantages:**

- This OS was primarily designed for the programmers and techies and not for personal and casual use.
- It is a command-driven OS with commands being supplied by the shell kernel and often has cryptic names which the normal users find difficult to keep up with.
- To work comfortably with the UNIX system, one needs to understand the main design features and how to command and interact with the OS.

**LINUX**

Primarily derived from the concept of Unix, Linux became the most-prominent free and open-source OS available to everyone in the world. It is built around the Linux kernel and served for both the desktop and server use. Linux was originally developed for personal computers based on the Intel x86 architecture but since then it was ported to more platforms than any other operating system. Linux has the largest installed base of all general-purpose operating systems. It is also the leading operating system on servers and other big iron systems such as mainframe computers, and the only OS used on TOP 500 Supercomputers. The top Linux OS are Ubuntu, Fedora, RedHat and many more.

**Advantages:**

- The OS is open-source and available free of cost to every computer user. There are large repositories from which anyone can freely download high quality software for almost any task.
- Linux provides high performance for a longer time and does not require a periodic reboot to maintain the system.
- It is one of the most secured OS and does not permit any unwanted malware and virus into the system.
- It is designed to multitask and can perform multiple processes at the same time, without hampering the performance of the OS.
- The OS is highly compatible and flexible to run on all modern PC's and network.
- It is not as user-friendly as Windows and users need to struggle for a few days before adapting to the behaviour of OS.

**SOLARIS**

This OS was originally developed by Sun Microsystems and is a type of Unix OS. Solaris was developed as proprietary software. Solaris is known for its scalability, especially on SPARC systems, and for originating many innovative features such as DTrace, ZFS and Time Slider. It is registered as compliant with the Single UNIX Specification. As of today, Solaris is supported by HP, Dell, Intel and Fujitsu Siemens architecture. OpenSolaris is the available open source version of Solaris OS. Oracle Solaris 10 is the latest versionof Solaris OS.

**Advantages:**

- It provides good and high performance.
- It provides complete protection against virus and malware.
- It is a multitasking OS and allows multiple tasks at the same time.
- Known for its good and powerful backup tools.
- Although the OS provides a graphic interface, it is not as good as other graphical user interfaces.
- The OS is available free of cost but the updates are not available for free, so not completely open-source.
- The OS is not user-friendly.

**BOSS**

It stands for *Bharat Operating System Solutions* designed specifically by India for Indians. It was developed by C-DAC(Centre for Development of Advanced Computing), Chennai, to benefit the

Free/Open Source Softwares in India. It has enhanced Desktop Environment integrated with multiple Indian language support and other software. This project has been approved, supported and endorsed by Government of India. The OS is the product of Linux Distribution and has been derived from Debian Linux. BOSS Linux provides advanced features such as web server, proxy server, database server, mail server, network server, file and print server, SMS Service and many more. The latest versions are called *BOSS 5.0 (ANOKHA)* and *BOSS 6.0 (ANOOP)*.

**Advantages:**

- It is easily available and free to install and use.
- It is a very stable OS and provides free access to many software.
- It supports multiple Indian languages, so user-friendly at least for Indian society.
- Since it is linux OS, it does not support Windows programs and shares the same disadvantages as other Linux based OS.

**MS-DOS**

MS-DOS (Microsoft Disk Operating System) is a single-user, single-tasking computer operating system that uses a **command line interface**. In spite of its very small size and relative simplicity, it is one of the most successful operating systems.

**MS-DOS 1.0**: It was the first version and used by IBM PC when IBM launched first 16 bit personal computer system. MS-DOS 1.0 was actually a renamed version of QDOS (Quick and Dirty Operating System) or 86 DOS, which Microsoft bought from Seattle Computer Products Company designed by Tim Patterson in order to provide compatibility with the popular business applications of the day such as WordStar and dBase. Subsequent versions of MS-DOS featured improved performance and additional functions.

**Version 1.25:** Released in 1982, added support for double-sided disks.

**Version 2.0:** Released the 1983, added support for directories, for IBM‟s 10MB hard disk drive (HDD) and for 360KB, 5.25-inch floppy disks.

**Version 2.11:** Later in the same year, which added support for foreign and extended characters.

**Version 3.0:** Launched in 1984, added support for 1.2MB floppy disks and 32MB HDDs. This was soon followed by version 3.1, which added support for networks.

Additions and improvements in subsequent versions included support for multiple HDD partitions, disk compression, disk-checking utility, enhanced memory management, a disk defragmenter and an improved text editor.

The final major version was 7.0, which was released in 1995 as part of Microsoft Windows 95.

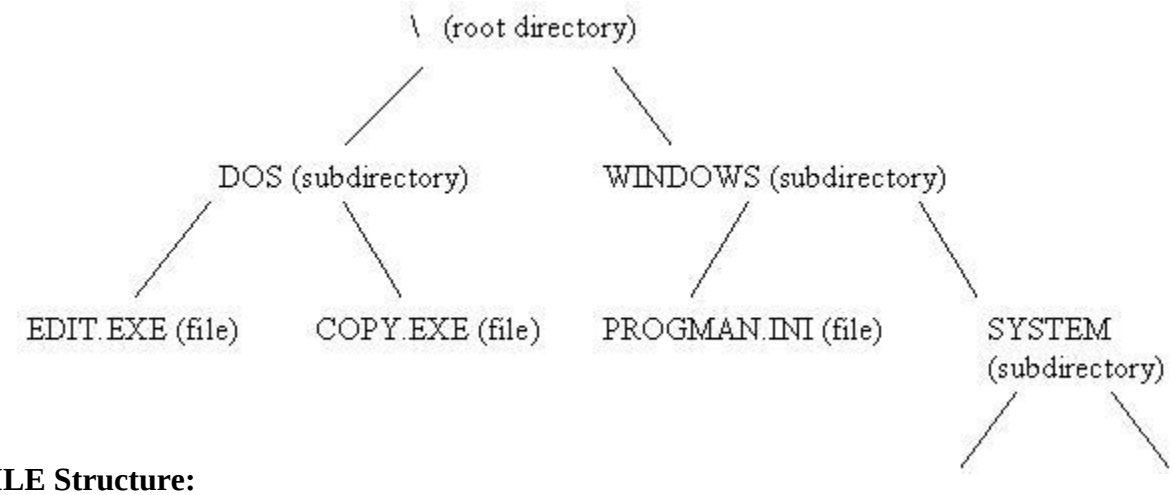
**Essential Components of DOS**

DOS is composed of a number of files. However at a minimum there are three system files which you must have. These are IO.SYS, MSDOS.SYS and COMMAND.COM, COMMAND.COM, the command processor (or shell) is the part of DOS that executes (or processes) the commands. These commands are either internal to the command processor (i.e. part of it), or external to it.

**Directory Structure of DOS**

It is possible to store hundreds of files on a disk and it is a difficult task to find a particular file if they are not categorized in any way. Therefore DOS allows you to group related files together in directories. The main directory on a disk is called the ROOT directory, which is represented by \ (a back slash). We can create sub directories in the ROOT directory and

within each other and they can each contain a number of files. The directory structure is often thought of as an inverted tree structure with the root at the top branching down into lower layer directories and subdirectories. For example -




**FILE Structure:**

Work is stored on disk in FILES. Each file will have a filename and (usually) an extension. The filename can be up to 8 characters and the File extension up to three. The name and extension are separated by a full stop. Windows 95 will allow longer filenames under certain circumstances.

**DOS has certain rules governing the naming of files -**

Filenames are not case sensitive.

Maximum length allowed for a filename is 8 characters.

Maximum length allowed for the extension to a file name is 3 characters.

The file name and extension are separated by a. (period).

Characters not permitted in naming files are

**. " / \ [ ] : | <> + = ; , ? ^ * and Spaces**

These characters have special meaning when used with a file name.

File extensions can have special meaning to DOS or other programs and are often used to indicate the type of a file. Here are some commonly used extensions and the type of file they indicate

BAK Backup file

BAS Basic program

BAT Batch file; it contains a group of DOS commands the user wants to run

COM Command file

DOC Document

EXE Executable file,

Similar to COM file PRN Print file

SYS System file

$$$ Temporary file

Other extensions are conventionally used for specific purposes although not demanded by DOS.

Some of the more common are:

DOC - a document file created by a word processing package

TXT - an ASCII text file

**Directory Names**

These follow the same rules as ordinary file names except that extensions are not allowed in version 5 and earlier versions of MS-DOS. Remember that a directory is just a special kind of file - i.e. a file which can contain other files.

**Booting:** Process that starts up a computer is called booting. It checks for proper functioning ofall the peripheral devices attached with the system. It searches for the operating system and, when located, loads it into the main memory.

**Cold Booting** is done by turning on the computer.

**Warm Booting** is performed by pressing **Ctrl+Alt+Del** keys simultaneously.

**DOS Commands:**

**C :\>** is known as command prompt, where we give the commands.

DOS command divided into 2 parts.

1. **Internal Commands or Memory-Resident Commands**
2. **External Command or Disk-Residence Commands**

**INTERNAL COMMANDS**

There are also called memory-resident commands. These commands are automatically loaded into the computer's memory during the booting process. They actually included in the Command.com file. So these commands are executable immediately after getting the DOS prompt. A few internal commands are

1. VER
2. VOL
3 DATE
4. TIME
5. CLS
6. DIR
7. MD
8. CD
9. PATH
10. RD
11. COPY CON
12. TYPE
13. COPY
14. DEL
15. REN
16. PROMPT

1. **VER**: - All OS has its own edition number or release or version number. The version number indicates which edition of O/S you are working on. Syntax: VER <Enter>

Example: C:\>Ver<Enter>

Result will be: - Microsoft Windows XP [Version 5.1.2600]

02. **VOL**: - It is used to display volume label and serial number of the current drive

Syntax: Vol [drive:]

Example: C:\> VOL

3. **DATE: -** Used to display the current system date and prompt for entering new date.

Syntax: Date <Enter>

Example: C:\> date <Enter>

4. **TIME: -** Displays the current system Time and prompt for entering new time.

Syntax: Time <Enter>

Example: C:\> Time <Enter>

5. **CLS**: - Clears the cluster screen.

6. **DIR**: - This command displays the list of directories and files with details like date of creation whether it is directory or file etc.

Syntax: DIR <Enter>

Switches:

/p : To view one screen of files at a time.

/w : Displays only five column of filenames and directories.(width wise)

/b : Display only file and directory.

/l : Display all the information in lower case letters.

**Example**:

DIR *.txt : Display all the files with extension .txt

DIR D???.* : Display all the files starting with D and having less than or equal to four characters in the file name and any extension. Here "**?**" and "*****" are called **"wild card character"**.

**"*"** Stand for any number of the character and **"?"** Stands for any one character.

7. **MD** OR **MKDIR**: -Used to create a new Directory or nested Directories. Syntax:

MKDIR OR MD [DRIVE:] PATH DIRECTORY NAME

Example: C:\> MD SAMS <Enter>

8. **CD OR CHDIR**: - This command allows you to change present directory to anotherdirectory.

Syntax: CD [DRIVE:] PATH

Example: C:\> CD SAMS and press <Enter>

9. **PATH**: - This command defines a list of directories DOS Searches for external commands.

Syntax: PATH pathname

10. **RD**: - To delete the empty directory**.** Syntax:

RD [DRIVE:] PATH

**NOTE**: -The directory must be empty when we use RD.

Example: C:\> RD SAMS and press <Enter>

Switches: - 1. /s – Remove with subdirectories and files.

2. /q – Don't ask to confirm.

11. **COPY CON**: -We use this command to create a new file. Syntax:

COPY CON <FILENAME>

Example: C:\> Copy Con sams.txt <Enter>

**Note: -** Typing here and when you are done, press **Ctr+Z** or **F6** key followed by Enter to save the current document.

12. **TYPE**: - This command allows you to see the contents of an existing file on thescreen.

SYNTAX: TYPE <file name>

Example: C:\> TYPE SAMS

13. **COPY**: - Using this command you can make duplicate files of an existing file from onelocation to another or one directory to another with different name or exiting name.

SYNTAX: COPY < SOURCE FILE NAME><TARGET FILENAME>

Example: C:\> COPY SAMS.TXT D:\TAJ

You can also have the option to change the name of files as you copy it. Example: C:\> COPYold.TXT C:\dos\new.txt And Then Press Enter

14. **DEL/ERASE**: This command removes one or more files from the disk or current working directories.

SYNTAX: DEL filespec

Example: C:\> DEL C:*.BAK /P And Then Press Enter

Example: C:\> DEL abc And Then Press Enter

Example: C:\> DEL ????.COM And Then Press Enter

15. **REN**: Used to change the name of the file or directory.

SYNTAX: REN <file name>

Example: REN sams sams1 <Enter>

16 **PROMPT**: This command allows you to customize the dos prompt.

SYNTAX: 1. PROMPT

SOME SPECIAL $ PARAMETERS ARE GIVEN BELOW:

| *CHARACTER* | *EXAMPLE* | *DESCRIPTION* |
|---|---|---|
| *$Q* | *=* | *Equal Sign* |
| *$$* | *$* | *Dollar Sign* |
| *$t* | *12:30:06:92* | *Display current time* |
| *$d* | *tue 09-07-2007* | *Display current date* |
| *$v* | *msdos version 6.2* | *show dos version number* |
| *$g* | *>* | *Greater than sign* |
| *$L* | *<* | *Less than sign* |

**DOS EXTERNAL COMMANDS**

These are also called Disk-Resident Commands. These commands are meant for Special purpose. These are found in separate files on Hard Disk or Floppy Disk.

**XCOPY**: This command is faster than Copy Command and allows you to copy entire directories including all the sub directories and files to destination.

Syntax: XCOPY Source [ Target][/Y][-Y] [/P][/E]

SWITCHES :

/-Y : Prompts before copying over existing files.

/y : Overwrites existing files without prompting.

/p : Ask before copying each file.

/e : Copying empty directory also.

/s : Copying subfolders.

EXAMPLE: XCOPY C:\SAMS D:\SAMS /S/E

**MOVE**: This command moves a file or group of files from one directory to another and also one disk to another disk.

SYNTAX: Move [Path File Name] [Destination file name path]

EXAMPLE: move c:\sams\fo.txt to d:\ new_sams

**DOSKEY**: Dos can remember only the last command you had entered. But in order to make DOS remember all the commands you enter you will have to load a DOSKEY utility.

Syntax: DOSKEY and Press <Enter>

Display message on the screen DOSKEY Installed.

Now when you want the same command to be done you can use right arrow key or F1.

**MEM:**

This command displays amount of total available memory (low, Expanded and Extended) and all currently programs.

Syntax: MEM [/f][/p][/m]

Switches:

/f : Using this switch MEM display all the areas of memory that are free.

/p : Use this option to display the information one screen at a time.

/m : Display information about how a specified program is using memory.

Example: MEM/p and then press <Enter>

**FILTER:**

A Powerful feature of DOS is its use of filters to process data directly. There are three FILTERS include in DOS.

A) MORE: More command used to pause vertical Scrolling on the display screen, after each screenful, The display pauses and the message - - More - - appears.

Pressing any key display the next screen.

EXAMPLE: C:\> MORE < TYPE FILE.TXT and then press <Enter>

B) SORT: Reads, Sorts in Order and sends the data to the screen, file or to another device. Sort to arrange data in an order. SYNTAX: SORT [drive:][Path][filename][/r][+n]

Switches: [drive:][Path][filename] : Specifies the name and location of the file to be searches. It must be preceded by the redirection character (<).

EXAMPLE: C:\> SORT < NAME .TXT and then press <Enter>

C) FIND: The find Filter is used to search a file one or more designated character (called a text string). The text string is always typed within quotes ( “Text Sring”).

EXAMPLE: C:\> FIND “Rajni” my.txt per.txt and then press <Enter>

**ATTRIB:** Every File on the Disk has its own description like size, space occupied, the type, the date it was created, etc. Likewise, every file has few attributes. The attributes of a file indicates whether it is a

i) Read-Only File: r (ii) Archive File a (iii) Hidden File: h (iv) System File s

With the ATTRIB command you can check the attributes of a file.

SYNTAX: ATTRIB [+r][+a][+h][/+s] [filename]

Switches: +r, -r : +r Read-Only attribute or, -r turn of Read-Only attribute

+a,-a : +a archive attribute, or -a turn of archive attribute

+h,-h : +h hidden attribute, or –h turn of hidden attribute

+s, -s : +s system attribute and it should not be used generally.

EXAMPLE: C:\> ATTRIB my.txt +R and then press <Enter>

**DELTREE**: This command used for deleting an entire directory whether in that directory contains files or subdirectories and also it will delete hidden files.

EXAMPLE: C:\> DELTREE my.txt and then press <Enter>

**EDIT**: This is the DOS Editor, which you can use to edit the text file and also creating new file.

EXAMPLE: C:\> EDIT c:\sams\FO.TXT and then press <Enter>

**Main features of MS-DOS:**

1. It is a single user operating system. It means it allows only one task to be executed at one time and CPU is used by only one user.
2. It provides command line interface and does not display graphical format on the screen.
3. It contains two types of commands i.e. internal commands and external commands.
4. It has its own command language and user can write small programs in batch files.

**MICROSOFT WINDOWS**

Microsoft Windows operating system was developed by Microsoft to overcome the limitations of its own MS-DOS operating system. First successful version of this operating system was Windows 3.0, released in 1990. Subsequently released versions were Windows 95, Windows 98, Windows 2000, Windows XP, Windows XP Professional, and Windows Vista. The numbers associated with some of these released versions indicate their year of release. ***Main features of Microsoft Windows are as follows:***

1. Its native interface is a GUI (Graphical User Interface). Hence, for a new user it is easier to learn and use a computer system.
2. Microsoft Windows was designed to be not just an operating system but also a complete operating environment. That is, all its programs confirm to a standard way of working. For example, a Microsoft Windows word processor works similarly the way a Microsoft Windows spreadsheet (or any other type of Windows program) works. This means that experience gained by learning one Windows program is useful while using any other Microsoft Windows program.
3. It is a single-user, multitasking operating system. That is, a user may run more than one program at a time. For example, while editing a file in foreground, a sorting job can be run in background. Monitor's screen can be partitioned into multiple windows and progress of different programs can be viewed on different windows.

**Parts of Windows Desktop:**

1. **Icons:** An icon is a small graphic lying on the desktop which is actually an application or utility at rest. You can simply double click the icon to run the associated application. The icons can be further classified into application icons, shortcuts and document icons. There is no limit to the number and type of icons you can place on your windows desktop.
2. **Wallpaper:** A large graphic file that spreads over entire screen of your monitor is called wallpaper. Windows enables you to change your desktop wallpaper according to your choice. Many readymade wallpapers are inbuilt to windows. You can also download images

from the Internet and set them as wallpaper. You can also transfer images from digital camera and set them as wallpaper. You can even create your own paintings in Paintbrush and set them as wallpaper.

3. **Taskbar:** Taskbar is a horizontal bar situated at the bottom of Windows desktop. It enables you to manage multiple applications which are running simultaneously. As Windows is a multitasking operating system, multiple applications may be running at one time. Just click on the application name on the taskbar to activate the application.
4. **Start Button:** Start button is a small button present on the left of taskbar. You can click it to display a popup menu that contains many options like programs, documents, settings, help, run, find and shutdown. Each of these options has a specific functionality.

## APPLICATION WINDOW:

An application window is the rectangular area that contains an application. For example, when you open paintbrush from **Start** □**Programs** □**Accessories** □**Paint**, it is opened in an application window. The application window that is currently receiving the user input is called **Active Window**. Multiple application windows may be opened at a time but only one widow can be the active window. This means, you can supply input to only one window at one time. The application window can contain multiple instances of application at one time. Just click on the window to make it active.

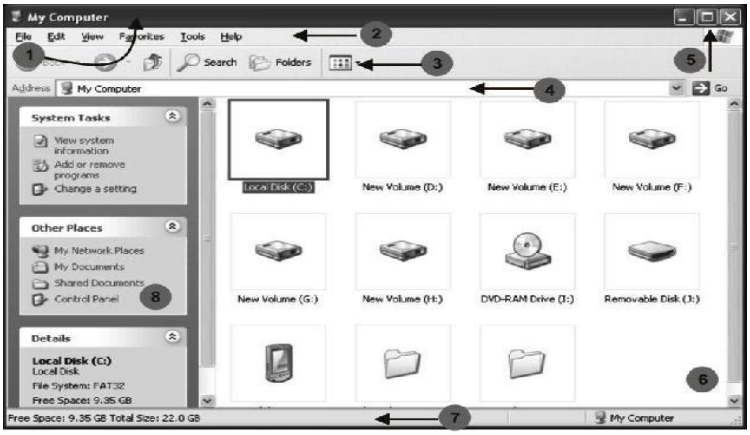
### Parts of Application Window:

Each application window has a Title Bar, Menu Bar, Tool Bar, Minimize button, Restore button and Maximize button. The figure 2.7.1 displays an example of **My Computer** window. The application window has the following main parts:

1. **Title Bar:** It is a horizontal bar on the top of the window. It displays the title of the window. In the figure, the dark strip containing the title **My Computer** is title bar. Title Bar also contains window buttons and it also shows control menu when you click its icon on the title bar.
2. **Menu Bar:** The menu bar contains different menus with different options to perform different commands. A drop down list of options is displayed when you click on a menu item. Each of these options represents a command.
3. **Toolbar:** Toolbar is a horizontal bar with various command buttons. These buttons provide a shortcut to access to commonly used menu commands. A click on the particular button is

required to trigger the command associated with it. For example, clicking on the Open icon will bring **Open** dialog box.

4. **Address Bar:** It is a horizontal bar under the toolbar that displays the path or name of the current folder. It is present in some special type of applications. In figure, **My Computer** has been displayed in the address bar. If you are working in a folder **Windows** under **C** drive, the address bar will show C:\Windows.
5. **Minimize Button:** It is the first out of the three buttons displayed on the right end of title bar. A click on this button will deactivate the current window and place it on taskbar. The minimized application will display its name. The figure displays a taskbar having notepad application in minimized form.



1. Title Bar 2. Menu Bar 3. Tool Bar 4.Address Bar 5. Control Buttons
6. Scrollbar 7. Status Bar 8. Related Options

**Fig. 2.7.1 : Parts of Application Window**

6. **Restore (Maximized) Button:** It is the second button out of three buttons displayed on the right end of title bar. On clicking this button the size of current window is restored (reduced) from maximized state and maximized from reduced state. The figure displays the application name on the taskbar of a maximized window.

**7. Close Button:** It is the third button out of three buttons displayed on the right end of title bar. A click on this button will close the current window. The keyboard shortcut for this command is **ALT + F4**.

**8. Status Bar:** The status bar is displayed at the bottom of the window. It provides additional details about the window. The contents of status bar may be different for different windows.

**9. Scroll Bars:** Scroll bars are displayed on the right as well as bottom end of screen. The scroll bars are displayed depending upon the size of the window. These bars display the contents of the current window when the size of the window is small and the contents are more. In this case, the

contents are slided by using scrollbars. The vertical scrollbar moves the contents in up and down direction and horizontal scrollbar moves the contents to right or left direction.

**10. Window Borders and Corners:** Every application window has a well defined size and border. The size of the window can be increased by stretching it from any of the four corners or border walls. Widows are generally resized from their corner points because the height and width of the window increases or decreases in equal proportion.

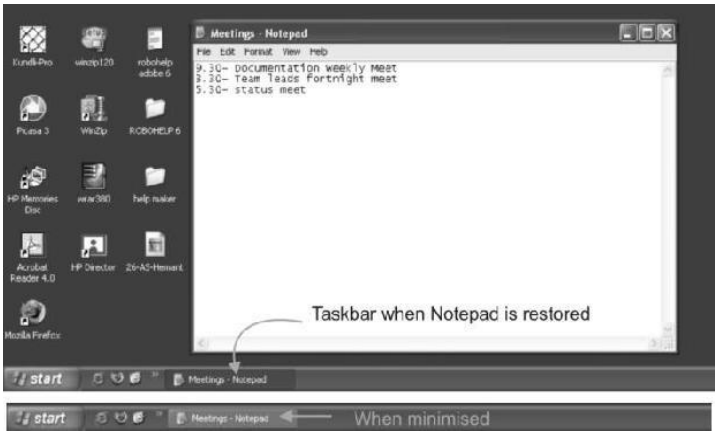



**Fig. 2.7.2: Taskbar States with Minimized and Restored Application**

**PARTS OF START MENU:**

The Start menu of Windows XP has a dynamic icon area. This area lists the shortcuts to frequently used applications. Windows automatically changes the contents of this area, depending on the applications used by the user. Refer to figure 2.8.1 which displays Calculator, Command Prompt, Notepad etc in the dynamic area.

**1. All Programs:** Displays a list of programs or applications installed on your computer. This list may vary from one to other computer depending on the number of software installed. The Accessories menu contains submenus for accessibility, entertainment, communication and system tools. These submenus further contain application shortcuts.

**2. My Recent Documents:** Displays a list of last 15 accessed files. This provides an easy access to frequently used files. To open any of them, just point and click on its entry in this menu. The associated file will be opened.

**3. Control Panel:** This option opens **Control Panel** of windows. The Control Panel contains options to define settings for windows based computer. You can add or remove programs, add or remove hardware, change the appearance, configure audio devices and security and manage users and regional settings through control panel.

4. **Search:** The **Search** utility of windows enables you to **search** for a particular **file** or a group of files stored in secondary storage of computer. It has various types of options to search for various different types of files in Windows. For example, you can search printers, computers, music files, documents or all files. Windows support wildcards to specify the search criterion.

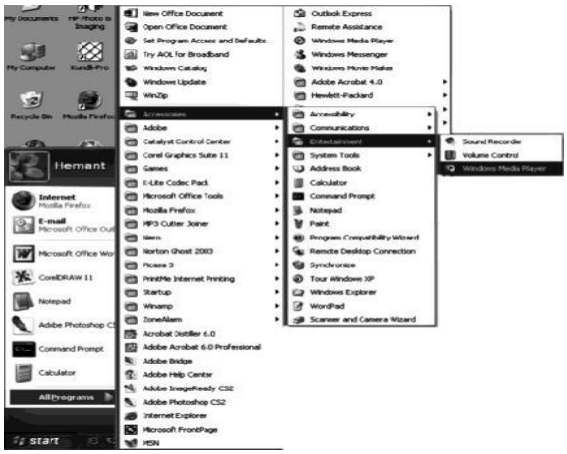



**Fig. 2.8.1: Start Menu**

5. **Help and Support:** The Help and Support option takes you to complete online help for the users. We can search the help database to find answers to our queries about working in windows, different applications, utilities and troubleshooting devices etc. Just type your query in the text area and click Search button to search for the relevant topics. You can also select a topic from **Pick a Help topic**. You can even get support from windows support site through Internet.

**STARTING A PROGRAM:**

This enables us to run a particular application from its associated executable file. For example, if you type WINWORD in the run dialog box and click **OK.** MS Word will be started. This is because winword.exe is the name of executable file required to run MS Word. You can select the desired executable file by clicking the **Browse** button.

You can also use **Run** dialog box to directly open a particular folder of a drive. Type the path of folder and click **OK** to view the contents of the folder. For example, if you type C:\Windows and click **OK**, the contents of Windows folder under C drive will be displayed.

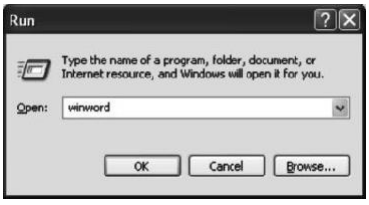



**Fig. 2.8.2: Run Dialog box**

**Shutdown:** This option displays a dialog box that is used to turn off the computer, restart the computer or put it on standby mode. Shutdown is very important for any windows (95 or later version) based computer as it makes sure that no data remains unsaved and every application has been properly closed.

**Standby** option will put your computer on standby mode. This mode is used when the computer is idle. In this mode, the monitor and hard disks are powered off and the computer consumes less power. On pressing a key from the keyboard or moving a mouse, the computer switches back to normal mode.

**Shutdown** option will turn off your computer.

**Restart** option will restart the computer after shutting down.

**Log Off** option enables you to login with another username and password.

**FILE:** Information on a computer is stored in the form of files. A file may include pictures, data and even songs. It is similar to a physical file that you use for storing relevant information. A computer represents files with icons. By looking at the file's icon, we can immediately tell what kind of file it is.

**FOLDER:** A folder is like a container in which you can store similar types of files. It helps in arranging the files into organized groups which makes it easy for the user to locate any particular file.


**Fig. 2.8.3: Folders**

## VIEWING THE CONTENTS OF A HARD DRIVE:

Viewing the contents of a hard drive is possible using Windows Explorer, a tool integrated into Windows operating systems since Windows 95. The procedure to view contents of a drive is:

1. Click "Start" and select "Computer" to open Windows Explorer.
2. Click "Tools" from the toolbar and select "Folder Options."
3. Click the "View" tab.
4. Click "Show Hidden Files, Folders, and Drives" from the Hidden Files and folders list as shown below:

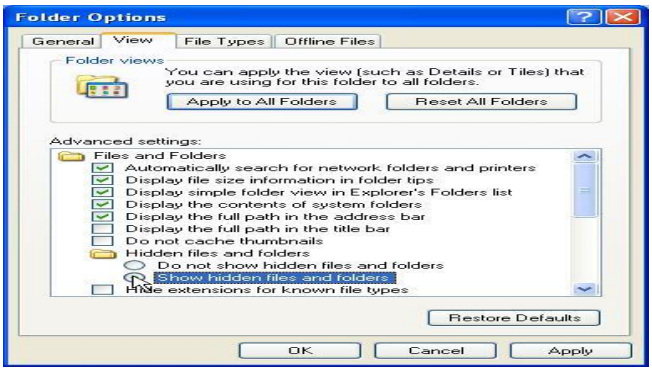



**Fig. 2.9.1: Viewing the contents of a drive**

5. Click "Apply", then "OK" to apply the setting changes and exit the window respectively.

6. Double-click the hard drive under the right panel's Hard Disk Drives list to view its contents. To view files within folders, double-click the folder.

## SEARCHING FILES AND FOLDERS:

Windows offers a number of ways to find files and folders. **Search Box** offers the most direct way to locate a file. Use 'Search Box' if :

- You are looking for common file types.
- You remember all or part of the name of the file or folder you want to find.
- You know the date when you last modified a file.

Click on **Start** button. You will find the **Search Box** located at bottom of left pane. Type either a part or complete name of the file or folder, or type a word or phrase that is present in the file.

As you type, the items that match your text will appear on the **Start** menu. Click on the desired file/folder, it will open in a new window. Click on **See More Results** link to get a detailed list of searched file/folders. The **Search Results** window will open. Now, just click on a search result to open it.

In case you know only a part of the file name, you can use wildcard characters to locate all files or folders that contain that part in their name. '*' and '?' are two wildcard characters commonly used in searching information.


**Fig. 2.9.2: Search Box**

**'*' means any type and number of characters in its place. For Example:**

- L*.* will search all files whose names start with 'L' followed by any number of characters and has any extension. E.g., Letter.doc, Lottery.ppt, Locality.txt etc.
- *.doc will search for all the files whose extension is.doc (Word files).
- L*.doc will search for all the files whose extension is.doc and their names begin with the letter 'L'.

**'?' means any one character in its place. For Example:**

- ?.*will search all files whose names contain only one character. e.g., L.doc, R.pps, E.txt etc.
- Kips?.doc will search for all the files whose names begin with 'Kips' followed by any one character and extension is doc. e.g., Kips1.doc, Kips2.doc, etc.

  **Tip :** You can also find a file/folder by clicking the Search box at the top of every window and typing the relevant keyword or text.

## SEARCHING A FILE:

The step by step method to find a file in Windows XP system is:

1. Click Start, and then click Search.
2. Click All files and folders.

***Important:*** *If you do not see* ***All files and folders****, you have probably changed your default search behavior.*

   *a. Click Change preferences.*
   *b. Click Change files and folders search behavior.*
   *c. Click Standard, and then click OK.*
   *d. Click All files and folders.*

3. Type part or all of the name of the file or folder, or type a word or phrase that is in the file.
4. If you do not know either piece of information or want to narrow your search further, select one or more of the remaining options:
   - In Look in, click the drive, folder, or network you want to search.
   - Click When was it modified? to look for files that were created or modified on or between specific dates.
   - Click What size is it? to look for files of a specific size.
   - Click More advanced options to specify additional search criteria.
5. Click Search.

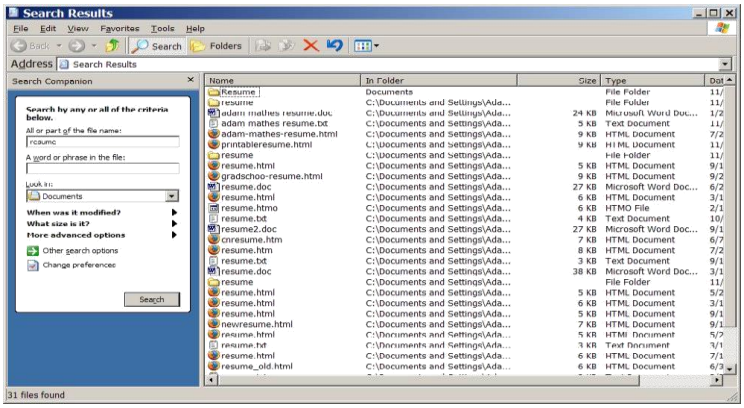



**Fig. 2.9.3: Search Results Window**

## FORMATTING A FLOPPY DISK:

Floppy disks usually need to be formatted before you can use them, although some blank floppy disks do come pre-formatted, at some point in the future the user may want to format on his own. The Windows XP operating system makes it easy to format floppy disks. The straightforward process is as follows:

1. Insert the floppy disk.
   - Ensure that the disk is inserted rightside-up.
   - Make sure that the disk lock is not engaged before inserting the disk.
   - When formatting a disk, all the information contained on it will be erased, so make sure you've backed up anything you need to save.
2. Click on the **START** button, then click on **My Computer** on the start menu.
3. Right-click on the disk.
4. Left click on the **Format** option from the menu that appears. A format dialog box will open up.
5. Click Start. A warning, informing that all data on the floppy disk will be deleted, will be presented assuming there is no data on the floppy that you need, click **OK**.
6. The floppy disk will start formatting. When finished click **Close**.

The floppy disk is now formatted and can be used to store files.

## ADD OR REMOVE PROGRAMS IN CONTROL PANEL:

By using Add or Remove Programs in Control Panel, you can perform a number of tasks--primarily, the task of installing an application from local media, such as a CD-ROM or floppy disk or the Internet. You can also use Add or Remove Programs to remove or modify an existing application or to repair a damaged application.

### Installing a Program:

The following steps need to be taken to install a software/program:

1. Click **Start**, click **Control Panel**, and then click **Add or Remove Programs**.


**Fig. 2.10.1: Installing a Program**

2. Click **Add New Programs**, and then click **CD or Floppy** (To add a program from a CD or floppy disk).

Or

Select the program you want to add, and then click **Add** (To add a program from a network).

3. As the installer program continues to run and display dialog boxes, click the Next or Continue button.
4. Click the Finish or Close button in the last step of the installer program to complete the process.

**Uninstalling a Program**

The following steps need to be taken to uninstall/update a software/program:

1. Click **Start**, click **Control Panel**, and then click **Add or Remove Programs**.
2. Click **Change or Remove Programs.**
3. Click the program you want to change or remove.
4. To change a program, click **Change/Remove** or **Change**.

Or

To remove a program, click **Change/Remove** or **Remove**.

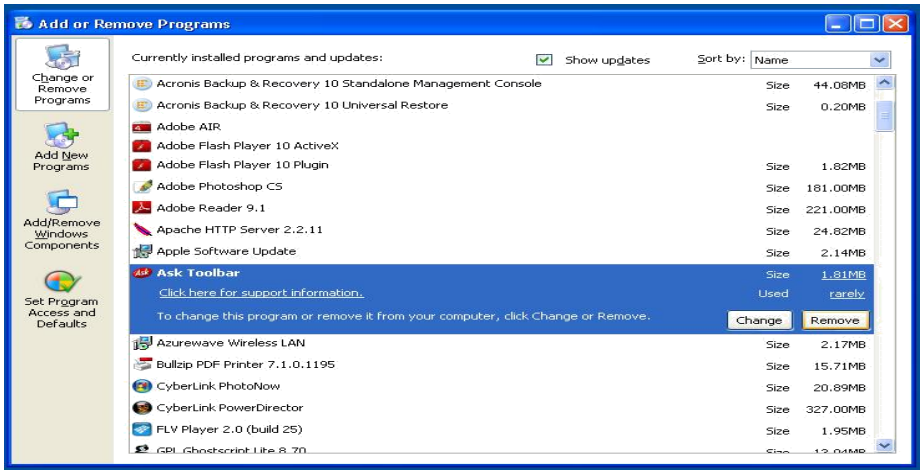



**Fig. 2.10.2: Uninstalling a program**

## HARDWARE INSTALLATION:

It is possible to add new physical components to our computer like a modem or a new monitor, just to name a few examples. For the new component to work, our operating system needs to detect it. Usually, Windows will detect the new hardware automatically, but in the event that it does not, Windows provides us with the tool **Printers and Other Hardware** in **Control Panel** that lets us install the new hardware correctly.

The following steps need to be taken to install a hardware:

1. Click **Start**, click **Control Panel**, and then click **Printers and Other Hardware** and a screen like the one below will appear:

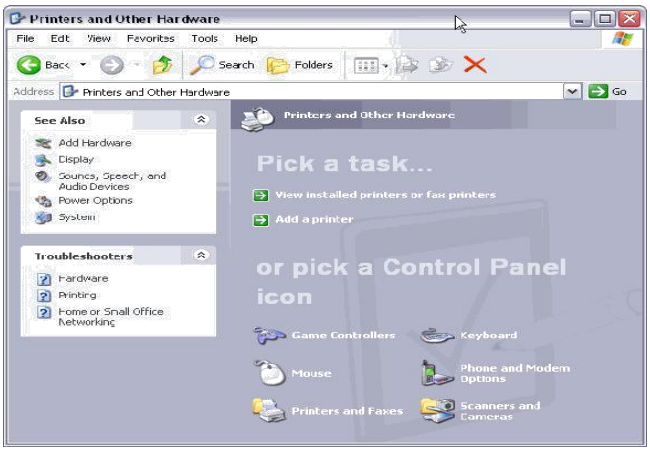



**Fig. 2.10.3: Hardware installation**

2. Now click on **Add hardware**. A dialog box **Add Hardware Wizard** will get opened.
3. Click the Next button each time as asked by the dialog box until the hardware is installed.

4. Click the Finish button or press Enter to finish installing the new hardware.

## HARDWARE UNINSTALLATION

1. Click **Start**, and then click **Control Panel**.
2. Click **Performance and Maintenance**, and then click **System**.
3. On the **Hardware** tab, click **Device Manager**. Device Manager window will open up as shown below:


**Fig.2.10.4: Device manager window**

4. Once in Device Manager click the '+' symbol or arrow next to the device type you want to remove. For example, If you are looking for the video card you would click the '+' next to Display adapters to view each of the video cards installed in the computer.
5. Finally, highlight the device you want to remove and press the delete key on your keyboard or click **Action** from the File Menu and then **Uninstall**.

## SYSTEM TOOLS:

It's important to perform some basic maintenance from time to time to keep Windows XP running smoothly. Windows XP provides you with some basic tools to make the maintenance process as painless as possible. You can access these tools via the **System Tools menu**.
To open the System Tools menu:

1. Choose **Start – All Programs – Accessories – System Tools**.
2. A cascading **System Tools** menu opens.

**Finding Drive Space**

To find the drive space through system tools:

1. Go to **Computer** in **System Tools**. Explorer window will get opened.
2. Right Click the **C:** or **D:** Drive and select Properties.
3. Under the **General Tab**, used and free space is shown clearly.

## DISK DEFRAGMENTATION:

All Windows XP computers have at least one **hard disk**. The hard disk acts as the computer's storage area. Almost everything installed on the computer i.e. applications, files, folders, and the operating system are stored here.
With general use (creating new files, deleting files, or installing new software), the hard disk can become **fragmented**. This means parts of the same disk file become scattered over different areas of the disk. A fragmented hard disk slows down your computer and hinders its performance. To keep the hard disk running smoothly, the user must routinely **defragment,** or **"defrag"** the hard disk. The **Disk Defragmenter** tool can help you do this.

To use Disk Defragmenter:

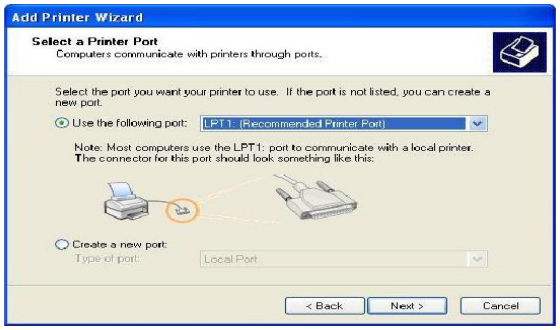
1. Close all programs that are running. This includes background programs such as scanners.
2. Click **Start**, **Programs** or **All Programs**, **Accessories**, and then click **System Tools**.
3. Click **Disk Defragmenter** and follow the on-screen instructions.

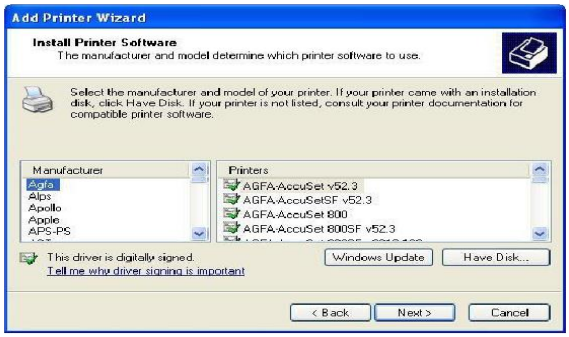
If Disk Defragmenter starts repeatedly, a hidden background program is still accessing the hard drive. Restart the computer in Safe mode and try again.

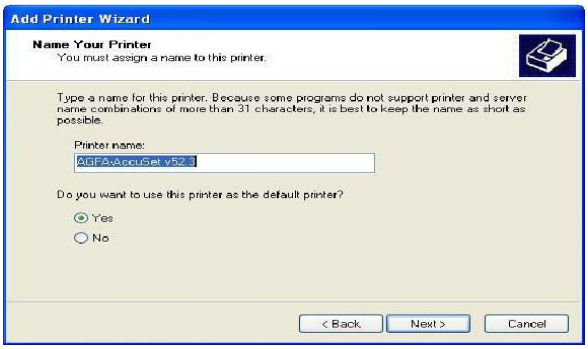
## PRINTER INSTALLATION:

Adding a printer to your computer involves two steps: making the connection from the computer to the printer using either a parallel or USB cable, and installing the software needed to allow your computer to communicate with the specific printer you want to use. This software is often supplied on a disk by the printer‘s manufacturer, but most printers will work with the drivers supplied with Windows XP. The driver software provided by the manufacturer may add extra features, such as giving you information about the ink levels.

To install a new printer with Windows XP‘s Add Printer Wizard, follow these steps:


1. Click the **Start** button on the Windows taskbar and then click **Control Panel**.
2. Click the **Printers and Other Hardware** hyperlink if the Control Panel window is in Category View. Otherwise, double-click the **Printers and Faxes** icon if the Control Panel window is in Classic View.

3. Click on the **Add a Printer** hyperlink in the **Printers and Other Hardware** window to start the **Add Printer Wizard** and then click the **Next** button or press **Enter** to advance to the Local Printer or Printer Connection dialog box. If you are in Classic View, start the wizard by clicking on the **Add a Printer** option on the left, under **Printer Tasks**.

4. Make sure that the **Add Printer Wizard** selects the Local Printer radio button, and that the **Automatically Detect and Install my Plug and Play Printer** check box beneath this radio button is also selected before you click the Next button.

5. Follow the instructions on the screen to finish setting up the printer by selecting a printer port, selecting the manufacturer and model of your printer, and typing a name for your printer.

## CHANGING THE DESKTOP BACKGROUND:

You enjoy working with Windows as it is user friendly. You can change the appearance of the desktop background according to your choice.

- Right-click anywhere on the desktop.
- You will find the list of options.
- Select the **Personalize** option.
- The **Personalization** dialog box will appear.
- Click on **Desktop Background.**
- A new window with multiple images will appear.

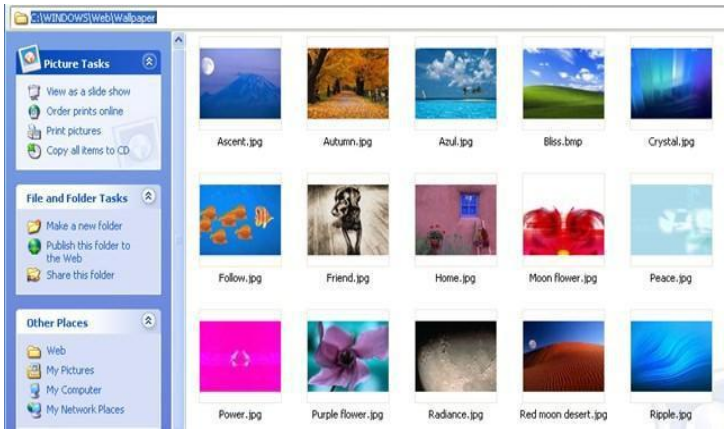



**Fig. 2.11.1: Changing Wallpaper**

- Select any background from the displayed list.

**Tip :** Under **Choose your desktop background** option, you can select one picture for Desktop Background or select more than one picture to create a Slide Show.

- A preview of the selected background will appear on the monitor.
- After selecting the background, click on **Save changes** button, and close the dialog box.

## CHANGING THE SCREEN SAVER:

**Screen Saver** is an image which pops up on the computer screen whenever the computer remains idle for a short time. By pressing any key, you can get back to the normal screen again. To change the screen saver, follow these steps:

- Right-click on the blank area of the desktop.
- Click on the **Personalize** option from the Shortcut menu.
- The **Personalization** dialog box will appear.
- Click on the **Screen Saver** option. The 'Screen Saver Settings' dialog box will appear.

- Click on the drop-down arrow in **Screen saver** section, and select screen saver of your choice.
- A mini preview of the screen saver will be displayed in the Preview box.
- To watch the preview on full screen, click on the **Preview** button. Wait for a few seconds and you will get the preview on the full screen of the selected screen saver.
- Move the mouse to come back to the **Screen Saver Setting** window dialog box.
- Change the time in **Wait** box as per your need. Use up arrow to increase the time and down arrow to decrease.
- Click on **Apply,** and then **OK** button.


**Fig. 2.12.1: Changing the Screen Saver**

## CUSTOMIZING THE DESKTOP:

Windows is quite flexible and provides options to change the settings of Desktop according to your choice. Follow the steps to change the colour scheme of the computer screen:

- Right-click on the blank area of desktop and select the **Personalize** option. The **Personalization** dialog box will appear.

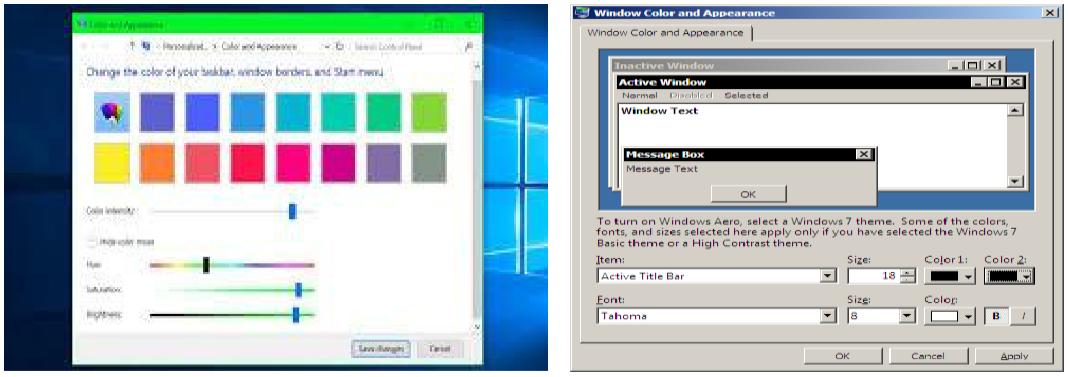



**Fig. 2.12.2: Changing Desktop Appearance**

• Click on the **Window Color** option**,** located at the bottom of the dialog box. Select any colour to change the window borders, Start menu and taskbar.

• Select **Enable transparency** option, the windows glass borders, Start menu and taksbar will become transparent.

• Set the **Color intensity** option, it will effect on window glass borders, Start menu and taskbar's colour strength.

• Click on **Show color mixer** option to set the **Hue, Saturation** and **Brightness** option to give colour effect.

• Click on the **Advanced appearance setting** option. **Window Color and Appearance** dialog box will open.

• Click on the drop-down arrow at **Item** list box and select **Active Title Bar** option from the list. Now, click on the **Color** list box and select any colour of your choice.

• Similarly, click on **Font** list box and change the font settings. Click on **OK** button.

• You will find a change in the appearance of window. Click on **Apply** button, and then click on **OK.**

## CHANGING DATE AND TIME:

This option allows you to change the computer's date and time.

• Click on the **Date and Time** option in, **Control Panel.** The **Date and Time** dialog box will appear.

• By default, the **Date and Time** tab is selected.

• Click on **Change date and time** tab. The **Date and Time Settings** dialog box will appear.

• Select the current day in the displayed calendar. You can change the month using the forward/backward arrow buttons **present** in the calender. Click on **OK** button.

### To Change Time

• To change the hour, select the hour in the text box, and then click on the arrows to increase or decrease the hours accordingly.

• Similarly, you can change the minutes and seconds.

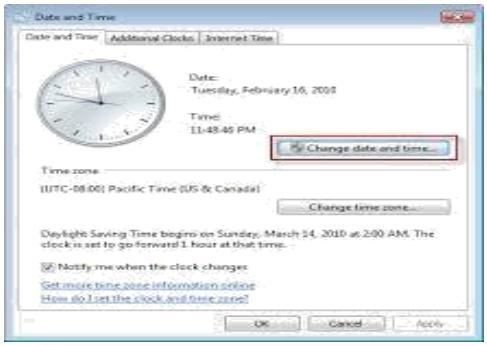



**Fig. 2.12.3: Date and Time Settings**

# UNIT - 3

## Computer Network

A computer network is a system in which multiple computers are connected to each other to share information and resources.

The physical connection between networked computing devices is established using either cable media or wireless media.

The best-known computer network is the Internet.

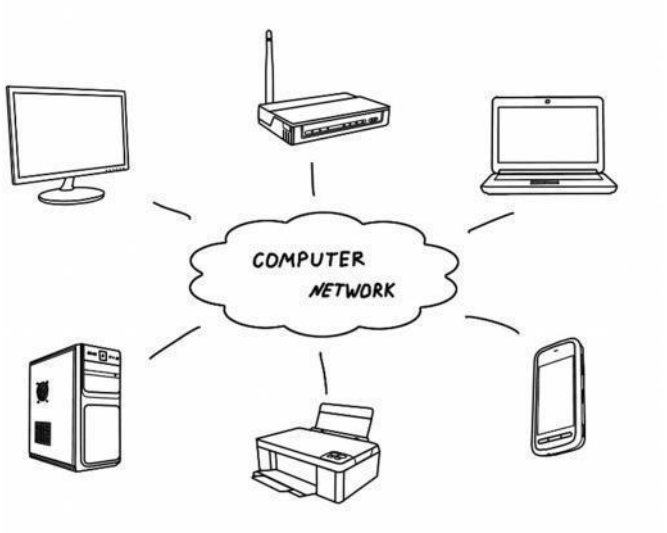



***Fig. 1: Computer Network***

### Advantages of Computer Networks

1. File sharing

The major advantage of a computer network is that is allows file sharing and remote file access. A person sitting at one workstation that is connected to a network can easily see files present on another workstation, provided he is authorized to do so.

2. Resource sharing

All computers in the network can share resources such as printers, fax machines, modems, and scanners.

3. Better connectivity and communications

It allows users to connect and communicate with each other easily. Various communication applications including e-mail and groupware are used. Through e-mail, members of a network can send message and ensure safe delivery of data to other members, even in their absence.

4. Internet access

Computer networks provide internet service over the entire network. Every single computer attached to the network can experience the high speed internet.

5. Entertainment

Many games and other means of entertainment are easily available on the internet. Furthermore, Local Area Networks (LANs) offers and facilitates other ways of enjoyments, such as many players are connected through LAN and play a particular game with each other from remote location.

6. Inexpensive system

Shared resources mean reduction in hardware costs. Shared files mean reduction in memory requirement, which indirectly means reduction in file storage expenses. A particular software can be

installed only once on the server and made available across all connected computers at once. This saves the expense of buying and installing the same software as many times for as many users.

7. Flexible access

A user can log on to a computer anywhere on the network and access his files. This offers flexibility to the user as to where he should be during the course of his routine.

8. Instant and multiple access

Computer networks are multiply processed .many of users can access the same information at the same time. Immediate commands such as printing commands can be made with the help of computer networks.

## Disadvantages of Computer Networks

1. Lack of data security and privacy

Because there would be a huge number of people who would be using a computer network to get and share some of their files and resources, a certain user‘s security would be always at risk. There might even be illegal activities that would occur, which you need to be careful about and aware of.

2. Presence of computer viruses and malwares

If even one computer on a network gets affected by a virus, there is a possible threat for the other systems getting affected too. Viruses can spread on a network easily, because of the inter-connectivity of workstations. Moreover, multiple systems with common resources are the perfect breeding ground for viruses that multiply.

3. Lack of Independence

Since most networks have a centralized server and dependent clients, the client users lack any freedom whatsoever. Centralized decision making can sometimes hinder how a client user wants to use his own computer.

4. Lack of Robustness

As previously stated, if a computer network‘s main server breaks down, the entire system would become useless. Also, if it has a bridging device or a central linking server that fails, the entire network would also come to a standstill.

5. Need an efficient handler

For a computer network to work efficiently and optimally, it requires high technical skills and know-how of its operations and administration. A person just having basic skills cannot do this job. Take note that the responsibility to handle such a system is high, as allotting permissions and passwords can be daunting. Similarly, network configuration and connection is very tedious and cannot be done by an average technician who does not have advanced knowledge.

## Applications of Computer Networks

1. Financial services

Nowadays, almost all the financial services depend on the computer network. You can access the financial services across the world. For example, a user can transfer money from one place to another by using the electronic fund transfer feature. You can use networking in various financial areas such as ATM, foreign exchange and credit history search.

2. Business

Nowadays, most of the works of businesses are done over the computers. To exchange the data and ideas, you need an effective data and resources sharing features. To do this, you need to connect the computer with each other through a network. For example, a person of one department of an organization can share or access the electronic data of other department through network.

3. Email services

A computer network provides you the facility to send or receive mails across the globe in few seconds.

4. Mobile applications

By using the mobile applications, such as cellular or wireless phones, you can communicate (exchange your views and ideas) with one other.

5. Directory services

It provides you the facility to store files on a centralized location to increase the speed of search operation worldwide.

6. Teleconferencing

It contains voice conferencing and video conferencing which are based in networking. In teleconferencing the participants need not to be presented at the same location.

## Types of Computer Networks (LAN (Local Area Network)

- It is privately-owned networks within a single building or campus of up to a few kilometres in size.
- They are widely used to connect personal computers and workstations in company offices and factories to share resources (e.g., printers) and exchange information.
- LANs are easy to design and troubleshoot.
- In LAN, all the machines are connected to a single cable.
- Different types of topologies such as Bus, Ring, Star and Tree are used.
- The data transfer rates for LAN is up to 10 Gbits/s.
- They transfer data at high speeds. High transmission rate are possible in LAN because of the short distance between various computer networks.
- They exist in a limited geographical area.

### Advantages:

- LAN transfers data at high speed.
- LAN technology is generally less expensive.

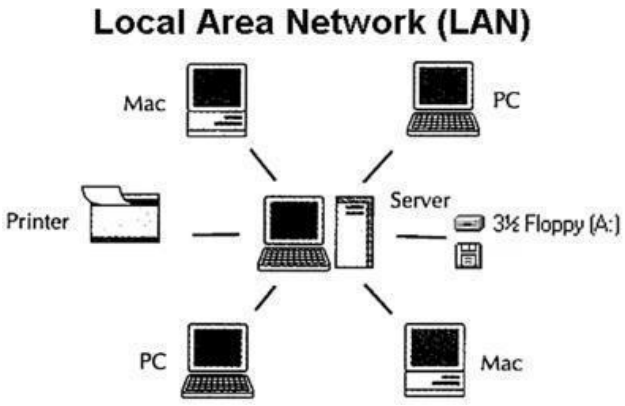



**Fig. 1: Local Area Network**

## MAN (Metropolitan Area Network)

- MAN is a larger version of LAN which covers an area that is larger than the covered by LAN but smaller than the area covered by WAN.
- A metropolitan area network or MAN covers a city. The best-known example of a MAN is the cable television network available in many cities.
- MAN connects two or more LANs.
- At first, the companies began jumping into the business, getting contracts from city governments to wire up an entire city.
- The next step was television programming and even entire channels designed for cable only.

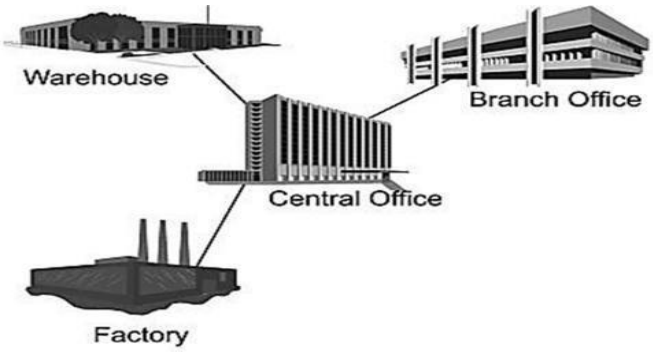



**Fig. 2: Metropolitan Area Network**

## WAN (Wide Area Network)

- WAN spans a large geographical area, often a country or region.
- WAN links different metropolitan countries and national boundaries for communication.
- It may be located entirely within a state or a country or interconnected around the world.
- It contains a collection of machines intended for running user (i.e., application) programs. We will follow traditional usage and call these machines hosts.
- The communication between different users of WAN is established using leased telephone lines or satellite links and similar channels.

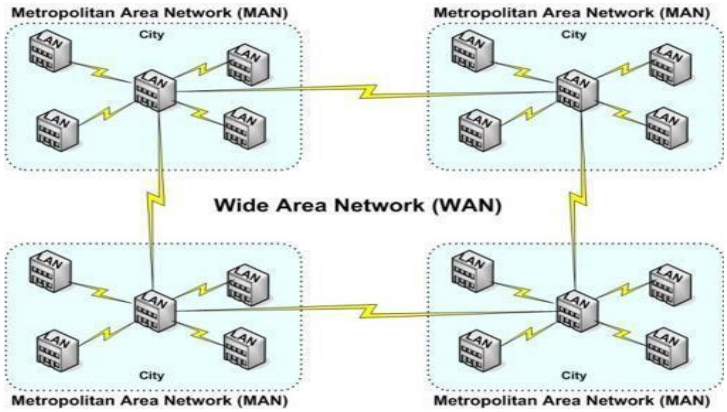



**Fig. 3: Wide Area Network**

## Difference between LAN, MAN and WAN

| Parameter | LAN | MAN | WAN |
|---|---|---|---|
| **Area covered** | Covers small area. i.e. within building | Covers larger than LAN, but smaller than WAN | Covers large area |
| **Error rates** | Lowest | Moderate | Highest |
| **Transmission speed** | High speed | Moderate speed | Low speed |
| **Equipment cost** | Inexpensive | Moderate expensive | Most expensive |
| **Design & maintenance** | Easy | Moderate | Difficult |

## DETAILS OF INTERNET

### INTRODUCTION

In the present age of information Technology, use of Internet is becoming quite popular for accessing information on any topic of your interest. It also provides tremendous opportunities to students; researchers and professionals for getting information on matters related to academic and professional topics and lot more. In the present world, most of the people who have computers around themselves use Internet to access information from the World Wide Web, exchange messages & documents and e-services.

### WHAT IS INTERNET?

The Internet or simply the Net is a worldwide network of computer networks. It is an interconnection of large and small networks around the globe.

### APPLICATIONS OF INTERNET

With the help of Internet you can:

- Exchange messages using e-mail (Electronic mail).
- Transfer files as well as software.
- Browse through information on any topic on web.
- Communicate in real time (chat) with others connected to the Internet.
- Search databases of government, individuals and organizations.
- Read news available from leading news groups.

- Send or receive animation and picture files from distant places.
- Set up a site with information about your company's products and services.

**GETTING INTERNET CONNECTION ON YOUR COMPUTER**

Any terminal to activate internet services on it requires an internet connection from an ISP. To have a connection one needs to contact the ISPs. There are several ISPs in each locality. There are some nominal charges that you need to pay to the ISP for the installation of the connection and for the rent (either monthly or annually). Depending on the requirement you can choose any one of the available options. If you need a high speed dedicated network then you can opt for a high bandwidth broadband or leased line connection.

If you need to have connection on a single PC then you choose a low bandwidth or dialup connection. For small services at your hand you can even have mobile phones connected to your Internet. There are many ways to get connected to the Internet. You can get internet connection in any of the following ways:-

***1. Through dial-up connection***: user is supposed to get connected to the internet after dialing up the number used for connection. This is useful if your network is either confined to small group of computers or for a single PC.

2. ***Through leased lines***: in this a dedicated line is laid specifically for connection.
3. ***Though broadband***: in this you can get a broadband connection which provides a high bandwidth for the internet connection. This also provides a good speed.

These days even wireless connections are available. For this you need to have a W*i Fi* card attached to your computer which can be useful if you do not have proper place to lay down the wires.

To connect to the Internet you need a PC (personal computer) with requisite software including a browser, a telephone connection or a leased line, and a modem, which allows the PC to communicate with other computers.

## Types of Internet Connections

***(a) Dial-up***

This is the most common basic type of connection available from ISPs (Internet Server Providers). In Dial-up connection, you use your computer, dial a phone number (provider by ISP) to get connected to server at Providers end through which you access Internet. It means you are not directly connected to Internet; you access the Internet through an Internet Service Provider.

***(b) ISDN (Integrated Services Digital Network)***

The process of connecting to server to access Internet is almost same as Dial-up, but it offers connectivity through the use of *digital phone lines* instead of Analog. It offers Internet connectivity at *speeds of up to 128 Kbps,* allows the user to receive or make calls simultaneously on the same line. ISDN comes through a regular telephone wire from the telephone pole on the street. The line combines two 64 Kbps channels to offer 128 Kbps bandwidth broken into three bands: One band for the ringing signal of your phone, one band for your telephone conversation, and one band for data transfer.

***(c) Leased Line Connection (Direct Internet Access)***

It is a permanent connection between a computer system (single CPU or LAN, and the Internet). It is generally used by larger institutions, corporate and government agencies. It involves establishing your own Internet gateway (connection) and payment to have a direct full time line with the network. Your computers, in effect, become part of the Net. The main advantage of this connection is that: it is *on line – 24 hrs a day, seven days a week, (24x7)* and provides faster access.

*Dedicated links* are established through an internet service provider who places a computer-controlled router (message director) at your site. A router is used to connect your local network to the Internet, allow all the members of network to have complete access to Internet.

(d) ***DSL (Digital Subscriber Line or Dedicated Service Line)***

Broadband Connection DSL, an always-on data connection is becoming widely available these days. It can provide an excellent Internet connection. It connects your home or office to the Internet through the same telephone wire that comes from telephone pole on the street. Like ISDN, with DSL, user can *make and receive telephone calls* while connected to the Internet. The difference between DSL and dial- up / ISDN is that a DSL Internet connection uses a high-speed dedicated circuit filtering out standard phone calls and Internet signals.

## HOW DOES INTERNET WORK?

The thing that characterizes the Internet is how data are transferred from one computer to another. Did you ever wonder what magical things go on behind the scenes that results in a web page being displayed on your screen seconds after you request it? How does the data moves from one side of the world to the other?

***Here is what happens to a piece of data (e.g. a Web page) when it is transferred over the Internet:***

- It is broken into a lot of same-sized pieces (called packets).
- A header is added to each packet that explains where it came from, where it should end up and how it fits in with the rest of the packets.

- Each packet is sent from computer to computer until it finds its way to its destination. Each computer along the way decides where next to send the packet. This could depend on things like how busy the other computers are when the packet was received. The packets may not all take the same route.
- At the destination, the packets are examined. If there is any packet missing or damaged, a message is sent asking for that packet to be resent. This continues until all the packets have been received intact.
- The packets are reassembled into their original form. Each computer connected up to the Internet has a software Called TCP/IP (Transmission Control Protocol/Internet Protocol), which is responsible for receiving, sending and checking packets. TCP/ IP is the 'glue' of the Internet.

## FREQUENTLY USED TERMS IN INTERNET

In this section we will discuss common internet terms to help you understand the relationship of various Internet technologies.

***World Wide Web (WWW)***: The World Wide Web or simply the web is a collection of electronic documents (called web pages) that are linked together like a spider web. These documents are stored on computers called servers located around the world.

***Web Server***: A Web Server is a computer that stores web pages. It is responsible for accepting request(s) from users and serves them with web pages.Two important web server programs are: IIS (Internet Information server) and Apache, etc. Web servers are connected to the Internet 24 hours a day, seven days a week.

***Hyperlink***: It is an element in an electronic document that links to another place in the same document or to an entirely different document or other resource. Hyperlinks usually appear as underlined text and in a different color, but they may also appear as graphics, such as buttons to click. Hyperlinks may be used to link another place in the same page, or another page, to play an audio or video file, to download a file, to set up a message to an e-mail address, and to link to other Internet resources.

***HTML(Hypertext Markup Language)***: It is a language that consists of certain key words called 'Tags' used for writing the documents on the web.

***Web Page***: A web page (such as the one you are looking at now) is an electronic document written in a computer language called HTML (Hypertext Markup Language).Web pages can contain text, graphics, video, animation, and sound, as well as interactive features, such as data entry forms. Each page has a unique address known as a URL (Uniform Resource Locator) that identifies its location on the server. Web pages usually contain hyperlinks to other web pages.

***Website***: A website (often shortened to just site) is one or more web pages, belonging to a particular company, institute, government or an individual. The first page is called the home page, which acts like an index, indicating the content on the site. By default the home page is named as index.htm. From the home page, you can click hyperlinks to access other web pages.

***URL (Uniform Resource Locator)***: Every page on the web has a unique address, called Uniform Resource Locator, URL. A URL indicates where the web page is stored on the Internet. A sample URL might look like the following:

**http://www.learnthenet.com/english/glossary/url.htm**

- **http** is Hypertext Transfer Protocol used to access HTML document
- **learthenet.com is Domain Name**: The server where the page is located
- **English/glossary is Directory**: Where the page is located
- **url.htm is File Name**: of page web page

***IP (Internet Protocol) Address***: Computers do not understand letters or symbols that humans use to communicate effectively. Computers understand numbers-specifically, 1s and 0s. Thus every *host* (a computer linked to the Internet) on the Internet has a unique host number. This number is called the *Internet Protocol address*, or *IP address.*

The IP address is a unique address, generally written in the format xxx.xxx.xxx.xxx, where xxx represents a 3 digit number that varies between 0 and 255. For Example: 192.100.8.56

***DNS (Domain Name System)***: Every host (computer linked to Internet) has a unique host number called *IP address*. You can connect to any host through IP address only, but it is difficult to remember the 4-digit number of hosts. To resolve this, domain- name is the only solution. Domain name, a unique name of the individual host computer on the Internet. Every computer on the Internet now have both a domain name and an IP address. To connect to any host through domain name requires some mechanism that will convert the domain name IP address. DNS, Domain Name System is the standard for resolving names to addresses. It is used mostly to translate between domain names and IP addresses.

## UNDERSTANDING INTERNET ADDRESS

Addresses are just what they sound like a way to identify uniquely an area of the Net or an individual on the Net. The most accurate analogy would be to your home address. This address, when provide fully, uniquely identifies where you live. If someone wants to either send you something or visit you, they must know your address. It is the same way on the Internet. If someone wants to send you something, such as e-mail, they must know your address. If someone wants to retrieve something from a computer on the Internet, they must know the Domain name (unique name to identify a host on the Internet) or the IP address of the computer.

For instance **www.nios.ac.in** is the domain name of a host computer named nios in the academic area (.ac) belongs to geographical domain India (.in):

- **www** denotes world wide web
- **nios** denotes name of the host computer
- **ac** denotes academic, the type of organization
- **in** denotes India the country code

Another example is www.yahoo.com (.com – commercial organization)

***Various Organizational and Geographical domains are as follows:***

1. Organizational Domains:

Typically, the highest level (rightmost) part of the full domain is a code indicating the *type of organization* to which domain belongs. There are different organizational domains indicated below:

- **ac** -> academic institutions
- **com** -> commercial entities
- **edu** -> educational institutions
- **gov** -> government institutions
- **net** -> network resources
- **org** -> non-profit organizations

2. Geographical Domains:

This represents to which country the domain belongs. This code consists of only two characters, which represent the international country codes. A few common ones are:

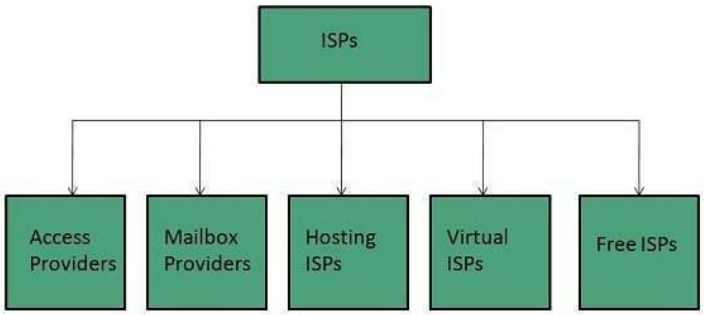
| Domain | Country |
|---|---|
| au | Australia |
| **in** | **India** |
| jp | Japan |
| uk | United Kingdom |
| us | United States |

**Internet Service Providers (ISP)**

**Internet Service Provider (ISP)** is a company offering access to internet that offers various services namely:

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

**ISP Types:** ISPs can broadly be classified into five categories as shown in the following diagram:



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

***MAILBOX PROVIDER***
Such providers offer mailbox hosting services.

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

***VIRTUAL ISPS***
Such ISPs offer internet access via other ISP services.

***FREE ISPS***
Free ISPs do not charge for internet services.

## MODEMS

A modem is a hardware device that allows a computer to send and receive data over a telephone line or a cable or satellite connection. In the case of transmission over an analog telephone line, which was once the most popular way to access the internet, the modem converts data between analog and digital formats in real time for two-way network communication. In the case of the high-speed digital modems popular today, the signal is much simpler and doesn't require the analog-to-digital conversion.

### History of Modems

The first devices called modems converted digital data for transmission over analog telephone lines. The speed of these modems was historically measured in baud (a unit of measurement named after Emile Baudot), although as computer technology developed, these measures were converted into bits per second. The first commercial modems supported a speed of 110 bps and were used by the U.S. Department of Defense, news services, and some large businesses.

Modems gradually became familiar to consumers in the late '70s through the '80s as public message boards and news services like CompuServe were built on early internet infrastructure. Then, with the explosion of the World Wide Web in the mid and late 1990s, dial-up modems emerged as the primary form of internet access in many households around the world.

### Dial-Up Modems

Traditional modems used on dial-up networks convert data between the analog form used on telephone lines and the digital form used on computers. An external dial-up modem plugs into a computer at one end and a telephone line on the other end. In the past, some computer makers integrated internal dial-up modems into their computer designs.

Modern dial-up network modems transmit data at a maximum rate of 56,000 bits per second. However, inherent limitations of public telephone networks often limit modem data rates to 33.6 Kbps or lower in practice.

When connecting to a network via a dial-up modem, the devices customarily relay through a speaker the distinctive sounds created by sending digital data over the voice line. Because the

connection process and data patterns are similar each time, hearing the sound pattern helps a user verify whether the connection process is working.

**Broadband Modems**

A broadband modem like those used for DSL or cable internet access uses advanced signaling techniques to achieve dramatically higher network speeds than traditional dial-up modems. Broadband modems are often referred to as high-speed modems. Cellular modems are a type of digital modem that establishes internet connectivity between a mobile device and a cell phone network.

External broadband modems plug into a home broadband router or other home gateway device on one end and the external internet interface such as a cable line on the other. The router or gateway directs the signal to all the devices in the business or home as needed. Some broadband routers include an integrated modem as a single hardware unit.

Many broadband internet providers supply suitable modem hardware to their customers at no charge or for a monthly fee. However, standard modems can be purchased through retail outlets.

## INTERNET

It is a worldwide/global system of interconnected computer networks. It uses the standard Internet Protocol (TCP/IP). Every computer in Internet is identified by a unique IP address. IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer's location.

A special computer DNS (Domain Name Server) is used to provide a name to the IP Address so that the user locates a computer by a name. For example, a DNS server will resolve a name https://gphisar.ac.in to a particular IP address to uniquely identify the computer on which this website is hosted. Internet is accessible to every user all over the world.


## INTRANET

Intranet is the system in which multiple PCs are connected to each other. PCs in intranet are not available to the world outside the intranet. Usually each organization has its own Intranet network and members/employees of that organization can access the computers in their intranet.

Each computer in Intranet is also identified by an IP Address which is unique among the computers in that Intranet.

**Similarities between Internet and Intranet**

- Intranet uses the internet protocols such as TCP/IP and FTP.
- Intranet sites are accessible via the web browser in a similar way as websites in the internet. However, only members of Intranet network can access intranet hosted sites.
- In Intranet, own instant messengers can be used as similar to yahoo messenger/gtalk over the internet.

**Differences between Internet and Intranet**

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

## WEB BROWSER

A web browser is the software program, used to access the World Wide Web. A browser (also known as client software) retrieves data from remote web servers and displays a web page. Through this tool the *user sends his request* to Internet server to access the information, *Server processes the request* and *responds with required information as a web page* to the user.

The most popular browsers are Google Chrome, Internet Explorer, Firefox and Netscape Navigator.

The steps for connecting to a website are shown in Fig. 1 and explained further.

1. Types a URL for a website in browser say www.nios.ac.in.
2. Your browser attempts to make a connection and sends the request to Web Server.
3. The Web Server receives and processes the request.
4. The Web Server responds to the request with the home page of the website.
5. The webpage is displayed by your browser and the connection between the server and your browser is closed

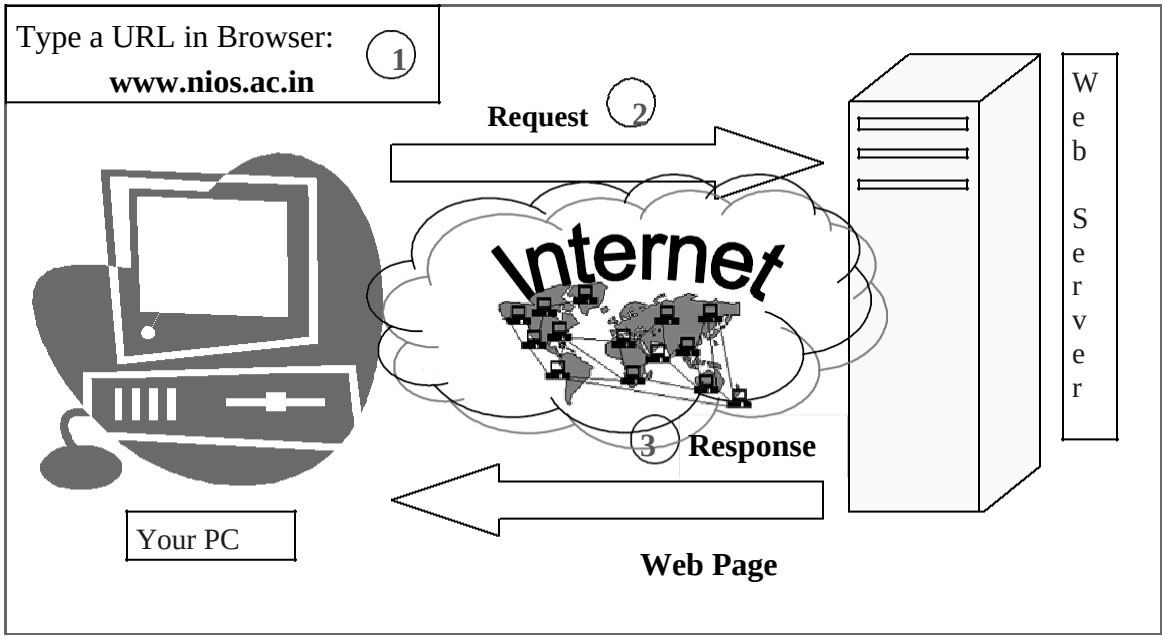



***Fig. 1: Interaction between a Web browser and a Web Server***

## Saving a Web Page

When saving a local copy of a webpage, the web browser usually allows a choice to save file as *type*:

- Text File: Saving the rendered text without formatting or images, and without indicating which words are links or what their destination is.
- Webpage, HTML only: Saving the HTML-file, changing relative links to absolute ones, without images.
- Webpage, Complete: Saving the HTML-file, changing relative links to absolute ones, saving the images and adjusting the references to them accordingly; a separate folder is made in the case of Internet Explorer.
- Web Archive, Single file: Saving the HTML-file including all images, stylesheets, scripts etc. to a single .MHT file. This is supported by Internet Explorer.

## INTERNET SERVICES

### Search Engine

The Internet is an amazing resource that provides quick access to all sorts of information. The amount of information, however, is so vast that being able to find what you are looking for is a difficult task. Search engines are the answer.

A search engine is a program designed to help find information stored on a computer system such as the World Wide Web, or a personal computer. The search engine allows one to ask for specific

criteria (typically those containing a given word or phrase) and retrieving a list of references that match those criteria.

Some of the important search engines are:

Google (http://www.google.com), Yahoo (http:// www.yahoo.com), MSN Search (http://search.msn.com), AltaVista (http:// www.altavista.com)

## E-Mail (Electronic Mail)

E-Mail or Electronic Mail is a paperless method of sending messages, letters, video and graphics from one person to another or many people at the same time via Internet. E-mail is very fast, easy and much cheaper than the using the post office, takes only few seconds to arrive at the destination. It works 24 hours a day and seven days a week. There are many free web-based e-mail services available on the Internet. A few among them are:

YAHOO! Mail (http://www.mail.yahoo.com),
Hotmail (http:// www.hotmail.com),
Gmail (http://www.gmail.com),
Rediffmail (http://www.rediffmail.com) etc.

### How does the E-mail work?

Just as a letter makes stops at different postal stations along the way to its final destination, e-mail passes from one computer known as ***mail server***, to another as it travels over the Internet. Once it arrives at the destination mail server, it is stored in an electronic mailbox until the recipient retrieves it. This whole process can take seconds, allowing you to quickly communicate with people around the world at any time of the day or night.

### Sending and Receiving Messages

To receive e-mail, you need an account on a mail server. This is similar to having a street address where you receive letters. One advantage over regular mail is that you can retrieve your e-mail from any location in the world, provided that you have Internet access. Once you connect to your mail server, just download your messages to your computer or wireless device.

To send e-mail, you need a connection to the Internet and access to a mail server that forwards your mail. The standard protocol used for sending Internet e-mail is called ***SMTP (Simple Mail Transfer Protocol)***. It works in conjunction with ***POP (Post Office Protocol)*** servers.

When you send an e-mail message, your computer routes it to an SMTP server. The server looks at the e-mail address (similar to the address on an envelope), and then forwards it to the recipient‘s mail server, where it is stored until the addressee retrieves it. You can send e-mail anywhere in the world to anyone who has an e-mail address.

### Components of an E-Mail Address

Internet e-mail addresses typically have two main parts: ***gphisar@yahoo.com***

First part is the User ID (***gphisar***) that refers to the recipient's mailbox. Then there is at sign (@). Next comes the host name (***yahoo***), also called the domain name. This refers to the mail server, the computer where the recipient has an electronic mailbox. It is usually the name of a company or organization.

The end of the domain name consists of a dot (.) followed by three or more letters (such as .com and .gov) that indicate the ***top-level domain (TLD)***. This part of the domain name indicates the type of organization or the country where the host server is located.

**Setting up an E-mail account**

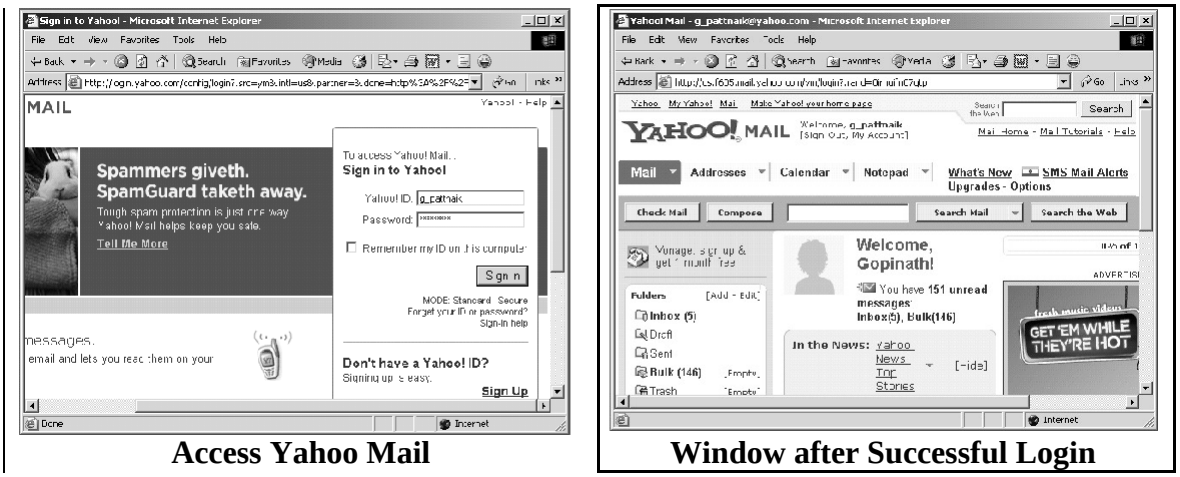
Creating a new e-mail account takes only a few minutes. You have to provide information about yourself and choose an account name and password. Your account name or ID becomes part of your e-mail address. If you open a Yahoo account and choose ***gphisar*** as your ID, your address becomes ***gphisar@yahoo.com.*** Account names can use letters and numbers, such as pkp2006, it does not contain any spaces in between.

**How to send, read and reply to E-Mails**

- Type the web address of your mail provider e.g. www.mail.yaoo.com - then login by using your user ID and password.

1. Sending a message:

- Click on Compose button, it follows the screen:




**Access Yahoo Mail** **Window after Successful Login**

***Fig. 1***

E-mail messages are similar to letters, with two main parts:

- The header contains the name and address of the recipient, the address of anyone who is being sent a copy (cc) and the subject of the message.
- The body contains the message itself.

In header section:

Type the e-mail address of the recipient in the "To:" field. For more than one person, e-mail id should be separated by commas. At least one e-mail ID is a must.

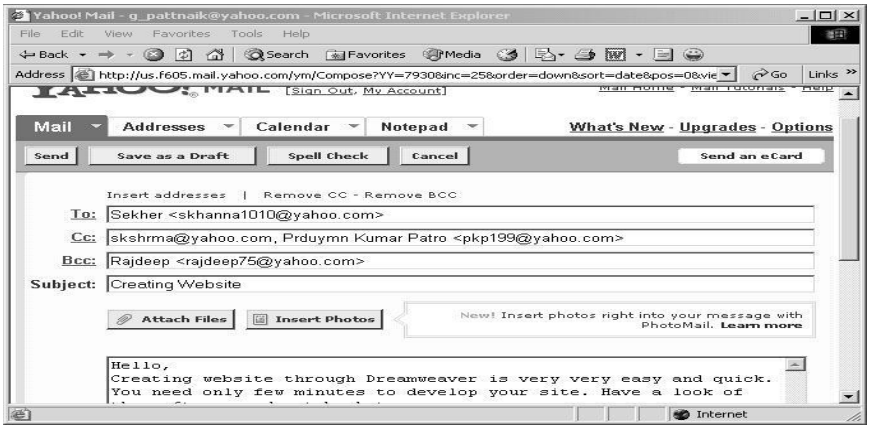



***Fig. 2***

Type subject of your message in the "Subject:" field.

Use the large text box to enter the contents of your message.

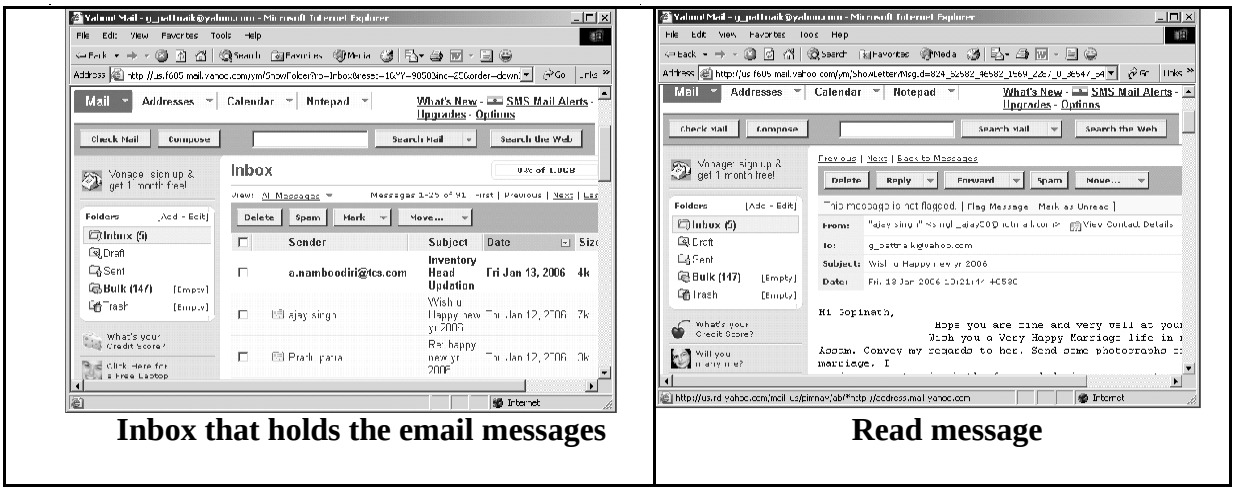
In the "Cc:" field, enter the email address of those to whom you would like to send a "***carbon copy***" of your message. All recipients of the message will be able to see that the person you designated as a "Cc:" has received a copy of the message.

In the "Bcc:" field, enter the e-mail address of those to whom you would like to send a "***blind carbon copy***" of your message. This is nearly identical to the "Cc:" feature, except that Bcc recipients are invisible to the To: and Cc: recipients of the message as well as to each other.

- Click on Attach files to attach file(s) and insert photos to attach photos, if required.
- Click on send button to send the message.

2. <u>Reading, Replying/ Forwarding a message:</u>

- Click on Check Mail or Inbox to Read/Reply a message, it follows the screen:




**Inbox that holds the email messages** | **Read message**

***Fig. 3***

- Click on the subject of the message to read.

- One can Reply/ Forward the message by clicking appropriate button.

**DETAILS OF DNS**

The Domain Name System (DNS) is a distributed directory that resolves human-readable hostnames, such as www.dyn.com, into machine-readable IP addresses like 50.16.85.103. DNS is also a directory of crucial information about domain names, such as email servers and sending verification of domain ownership.

**Why is DNS important?**

DNS is like a phone book for the internet. If you know a person's name but don't know their telephone number, you can simply look it up in a phone book. DNS provides this same service to the internet.

When you visit https://dyn.com in a browser, your computer uses DNS to retrieve the website's IP address of 50.16.85.103. Without DNS, you would only be able to visit our website (or any website) by visiting its IP address directly, such as http://50.16.85.103.

**How does DNS work?**

When you visit a domain such as dyn.com, your computer follows a series of steps to turn the human-readable web address into a machine-readable IP address. This happens every time you use a domain name, whether you are viewing websites, sending email or listening to internet radio stations such as Pandora.

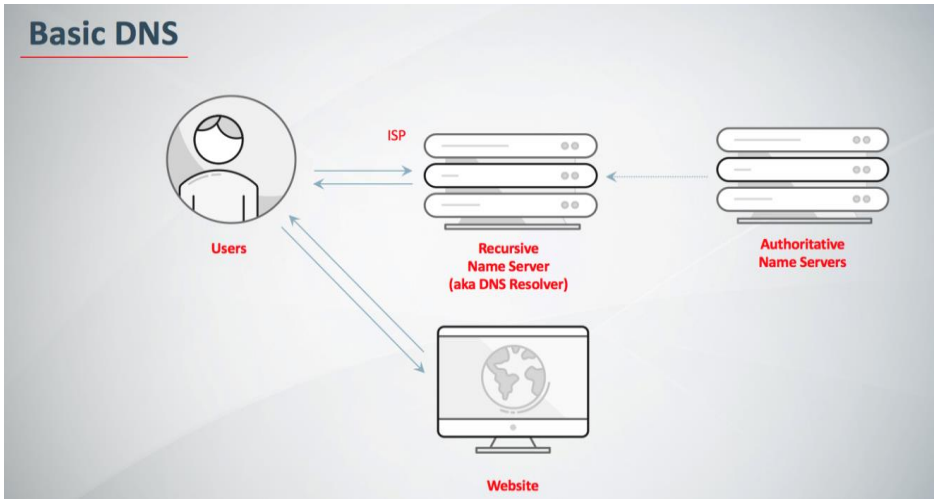



***Fig.: Working of DNS***

**Step 1: Request information**

The process begins when you ask your computer to resolve a hostname, such as visiting https://dyn.com. The first place your computer looks for the corresponding IP address is its local DNS cache, which stores information that your computer has recently retrieved.

If your computer doesn't already know the answer, it needs to perform a DNS query to find out.

**Step 2: Ask the recursive DNS servers**

If the information is not stored locally, your computer queries (contacts) the recursive DNS servers (resolvers) from your internet service provider (ISP). These specialized computers perform the work of a DNS query on your behalf.

**Step 3: Ask the root name servers**

If the recursive servers don't have the answer, they query the root name servers. A name server is a computer that answers questions about domain names, such as IP addresses. These 13 servers act as a kind of telephone switchboard for DNS. They don't know the answer, but they can direct DNS queries to someone that knows where to find it.

**Step 4: Ask the TLD name servers**

The root name servers will look at the first part of our request, reading from right to left — www.dyn.com — and in our case, direct our query to the top-level domain (TLD) name servers for .com. Each TLD, such as those for .com, .org, and .us, has its own set of name servers, which act like a receptionist for each TLD.

**Step 5: Ask the authoritative DNS servers**

The TLD name servers review the next part of our request - www.dyn.com - and direct our query to the name servers responsible for this specific domain. These authoritative name servers are responsible for knowing all the information about a specific domain, which is stored in DNS records. In this example, we want to know the IP address for www.dyn.com, so we ask the authoritative name server for the address record(A record).

**Step 6: Retrieve the record**

The recursive server retrieves the A record for dyn.com from the authoritative name servers and stores the record in its local cache. If anyone else requests the host record for dyn.com, the recursive server will already have the answer and will not need to go through the lookup process again.

**Step 7: Receive the answer**

Armed with the answer, recursive server returns the A record back to your computer. Your computer stores the record in its cache, reads the IP address from the record, then passes this information to your browser. The browser then opens a connection to the web server and receives the website.

This entire process, from start to finish, takes only milliseconds to complete.

## PROTOCOL

A protocol is a standard set of rules that allow electronic devices to communicate with each other. These rules include what type of data may be transmitted, what commands are used to send and receive data, and how data transfers are confirmed.

You can think of a protocol as a spoken language. Each language has its own rules and vocabulary. If two people share the same language, they can communicate effectively. Similarly, if two hardware devices support the same protocol, they can communicate with each other, regardless of the manufacturer or type of device. For example, an Apple iPhone can send an email to an Android device using a standard mail protocol. A Windows-based PC can load a webpage from a Unix-based web server using a standard web protocol.

Protocols exist for several different applications. Examples include wired networking (e.g. Ethernet), wireless networking (e.g. 802.11), and Internet communication (e.g. IP). The Internet protocol suite, which is used for transmitting data over the Internet, contains dozens of protocols.

## TELNET

Telnet is a network protocol used on the Internet or local area network LAN connections.

The Telnet program runs on your computer and connects your PC to a server on the network. You can then enter commands through the Telnet program and they will be executed as if you are entering them directly on the server console. This enables you to control the server and communicate with other servers on the network. To start a Telnet session, you must log in to a server by entering a valid username and password. Telnet is a common way to remotely controlled Web servers.

## FTP (File Transfer Protocol)

FTP or File Transfer Protocol is a commonly used protocol for exchanging files over any network that supports the TCP/IP protocol (such as the Internet or an Intranet).

There are two computers involved in an FTP transfer. The first computer is an FTP server (*host computer*). This computer listens on the network for connection requests from other computers. Another computer (called the client) can make a connection to the FTP server by using FTP client software. Once connected, the client can do a number of file manipulation operations such as uploading files to the server, download files from the server, rename or delete files on the server and so on. FTP is used:

- To promote sharing of files (computer programs and/or data).
- To encourage indirect or implicit use of remote computers.
- To transfer data reliably and efficiently.

# Search Engines

Search engines are answer machines. They exist to discover, understand, and organize the internet's content in order to offer the most relevant results to the questions searchers are asking.

**How do search engines work?**

Search engines have three primary functions:

1. **Crawl:** Search the Internet for content, looking over the code/content for each URL they find.
2. **Index:** Store and organize the content found during the crawling process. Once a page is in the index, it's in the running to be displayed as a result to relevant queries.
3. **Rank:** Provide the pieces of content that will best answer a searcher's query, which means that results are ordered by most relevant to least relevant.

**What is search engine crawling?**

Crawling is the discovery process in which search engines send out a team of robots (known as crawlers or spiders) to find new and updated content. Content can vary - it could be a webpage, an image, a video, a PDF, etc. - but regardless of the format, content is discovered by links.

It starts out by fetching a few web pages, and then follows the links on those web pages to find new URLs. By hopping along this path of links, the crawler is able to find new content and add it to their index called ***Caffeine*** - a massive database of discovered URLs - to later be retrieved when a searcher is seeking information that the content on that URL is a good match for.

**What is a search engine index?**

Search engines process and store information they find in an index, a huge database of all the content they've discovered and deem good enough to serve up to searchers.

**Search engine ranking**

When someone performs a search, search engines search their index for highly relevant content and then orders that content in the hopes of solving the searcher's query. This ordering of search results by relevance is known as ranking. In general, you can assume that the higher a website is ranked, the more relevant the search engine believes that site is to the query.

## Search Engine/Web Directory

"Search engine" and "Web directory" are two different search services available to the Web community; although they are often mistakenly confused. ***Search engines*** have indices that are built up by robots or crawlers; whereas ***Web directories*** build up their indices through human editors. Many search engines and directories contain both a computer-generated index and a human generated index, and are referred to as hybrids.

***Search Engines:***

Google, AltaVista, AlltheWeb and the like are all forms of search engines. These search engines write programs known as robots, crawlers and/or spiders that have the following functions:
(1) to locate Web pages,
(2) to read the contents of the Web pages
(3) report its findings back to the search engine's indices or databases.

When Web searchers use a search engine to locate Web sites that are relevant to the keyword search, they are searching the search engine's index. A search engine with a larger and more up-to-date index is a better representation of the information available in the Web.

***Web Directories:***

Yahoo!, Open Directory Project (dmoz.org), Gipsy and the like are all forms of Web directories. These directories use human editors to review sites that are submitted for submission to the directory. Directories, unlike search engines, use a hierarchical tree structure to organize their database. Another common distinction is that a directory tends to list Web sites (root directory of a site or homepage) whereas a search engine will list Web pages (individual pages of a Web site). Due to the manual process of adding sites to a directory, directories often have to supplement their search results with a search engine partner to increase the relevancy of the produced search results.
Most users tend to use search engines by typing in keywords into a search box. It is a quick and easy way to find specific information. I use search engines to locate technical information quickly, and Web directories to locate a listing of sites that offer similar services. For example, I was in need of an office sign for my company. I went to the Yahoo! directory and located the most appropriate category for sign manufacturers and contacted a handful for quotes.

### *Difference between Search Engines and Web Directories*

| ***Parameter*** | ***Search Engines*** | ***Web Directories*** |
|---|---|---|
| Indices | Built up through robots or crawlers | Build up through human editors |
| Database | Use Non-hierarchical tree structure | use hierarchical tree structure to organize their database. |
| Listing of information | list Web pages (individual pages of a Web site) | list Web sites (root directory of a site or homepage) |
| Algorithms | Use own confidential algorithms to display the web pages | No algorithms are used |
| Access of information | locate technical information quickly | locate a listing of sites that offer similar services |
| Fee | No inclusion fee to search the data | Often charge inclusion fee in order to list a website link |

**SOCIAL NETWORKING SITES**

A **social networking service** (also **social networking site** or **social media**) is an online platform which people use to build social networks or social relationship with other people who share similar personal or career interests, activities, backgrounds or real-life connections.

Social networking services vary in format and the number of features. They can incorporate a range of new information and communication tools, operating on desktops and on laptops, on mobile devices such as tablet computers and smart phones. They may feature digital photo/video/sharing and diary entries online (blogging). Social networking sites provide a space for interaction to continue beyond in person interactions.

Social networking sites allow users to share ideas, digital photos and videos, posts, and to inform others about online or real-world activities and events with people in their network. While in-person social networking – such as gathering in a village market to talk about events – has existed since the earliest development of towns, the web enables people to connect with others who live in different locations, ranging from across a city to across the world. Depending on the social media platform, members may be able to contact any other member.

One can categorize social-network services into four types:

- socializing social network services used primarily for socializing with existing friends (e.g., Facebook)
- online social networks are decentralized and distributed computer networks where users communicate with each other through internet services.
- networking social network services used primarily for non-social interpersonal communication (e.g., LinkedIn, a career- and employment-oriented site)
- social navigation social network services used primarily for helping users to find specific information or resources (e.g., Goodreads for books)

**Popular social sites include:**

Facebook, Twitter, Instagram, WhatsApp, WeChat, Skype, Snapchat, LinkedIn

## Internet Security

Internet security refers to securing communication over the internet. It includes specific security protocols such as:

- Internet Security Protocol (IPSec)
- Secure Socket Layer (SSL)

***Internet Security Protocol (IPSec):***

It consists of a set of protocols designed by Internet Engineering Task Force (IETF). It provides security at network level and helps to create authenticated and confidential packets for IP layer.

***Secure Socket Layer (SSL):***

It is a security protocol developed by Netscape Communications Corporation. It provides security at transport layer. It addresses the following security issues:

- Privacy
- Integrity
- Authentication

***Threats***

Internet security threats impact the network, data security and other internet connected systems. Cyber criminals have evolved several techniques to threat privacy and integrity of bank accounts, businesses, and organizations.

Following are some of the internet security threats:

- Mobile worms
- Malware
- PC and Mobile ransomware
- Hacking as a Service
- Spam
- Phishing

**Email phishing** is an activity of sending emails to a user claiming to be a legitimate enterprise. Its main purpose is to steal sensitive information such as usernames, passwords, and credit card details. Such emails contains link to websites that are infected with malware and direct the user to enter details at a fake website whose look and feels are same to legitimate one.

*Following are the symptoms of a phishing email:*

- Spelling and bad grammar
- Most often such emails contain grammatically incorrect text. Ignore such emails, since it can be a spam.
- Beware of links in email
- Don't click on any links in suspicious emails.

*Threats:*

Such emails contain threat like "your account will be closed if you didn't respond to an email message".

*Spoofing popular websites or companies:*

These emails contain graphics that appear to be connected to legitimate website but they actually are connected to fake websites.

# UNIT – 4

## PROGRAM DEVELOPMENT PROCESS

While writing a computer program, it is absolutely necessary to write .each and every instruction in the correct sequence. The logical control of element within the computer program is the most important aspect of programming.

The various stages in the development of a computer program are:

1. Problem Definition
2. Program Design
3. Coding
4. Debugging
5. Testing
6. Documentation
7. Maintenance

### *1. Problem Definition:*

The first step in the process of program development is the thorough understanding and identification of the problem for which is the program or software is to be developed. In this step the problem has to be defined formally. All the factors like Input/output, processing requirement, memory requirements, error handling, interfacing with other programs have to be taken into consideration in this stage.

### *2. Program Design:*

The next stage is the program design. The software developer makes use of tools like algorithms and flowcharts to develop the design of the program.

#### *A) Algorithm:*

An algorithm represents the logic of the processing to be performed. It is a sequence of instructions which are designed in such a way that if they are executed in the specified sequence, the desired goal is achieved. It is imperative that the result be obtained after execution of a finite number of steps. **The features of an algorithm are**:

- Each and every instruction has to be precise and clear.
- The instruction has to be executed in a finite time.
- W hen the algorithm terminates the desired result should be achieved.

#### *B) Flowchart :*

A flowchart is a pictorial representation of the algorithm. It represents the steps involved in the procedure and shows the logical sequence of processing using boxes of different shapes. The instruction to be executed is mentioned in the boxes. These boxes are connected together by solid lines with arrows, which indicate the flow of operation.

The first step in the design of a program is the algorithm. The algorithm is then represented in the form of a flowchart and the flowchart is then expressed in the computer language to actually prepare the computer program.

***Other techniques which can be useful in designing of the program are:***

#### *C) Modular Programming:*

Using this method the entire program is divided into smaller manageable modules so that the smaller modules can be designed, coded and debugged separately.

### *D )Top-Down Design:*

Here the overall problem is first defined in terms of general subtask. These subtasks are divided into further sub tasks.

### *3) Coding:*

Once the design process is complete, the actual computer program is written, i.e. the instructions are written in a computer language. Coding is generally a very small part of the entire program development process and also a less time consuming activity in reality. In this process all the syntax errors i.e. errors related to spelling, missing commas, undefined labels etc. are eliminated.

**For effective coding some of the guidelines which are applied are:**

- Use of meaningful names and labels of variables,
- Simple and clear expressions,
- Modularity with emphasis on making modules generalized,
- Making use of comments and indenting the code properly,
- Avoiding jumps in the program to transfer control.

### *4) Debugging:*

At this stage the errors in the programs are detected and corrected. This stage of program development is an important process. Debugging is also known as program validation. Some common errors which might occur in the programs include:

- Un initialization of variables,
- Reversing of order of operands,
- Confusion of numbers and characters,
- Inverting of conditions e.g. jumping on zero instead of one.

### *5) Testing (Validation):*

The program is tested on a number of suitable test cases. A test plan of the program has to be done at the stage of the program design itself. This ensures a thorough understanding of the specifications. The most trivial and the most special cases should be identified and tested. It is always useful to include the maximum and minimum values of all variables as test data.

### *6) Documentation:*

Documentation is a very essential step in the program development. Documentation helps the users and the people who maintain the software. This ensures that future modification if required can be done easily. Also it is required during redesigning and maintenance.

### *7) Maintenance:*

Updating and correction of the program for changed conditions and field experience is accounted for in maintenance. Maintenance becomes essential in following situations:

- Change in specification,
- Change in equipment,
- Errors which are found during the actual execution of the program. Modularity, structured programming, thorough testing and debugging and proper documentation greatly reduce the time and cost of maintenance of the software.

## ALGORITHMS

An algorithm is a set of well-defined instructions in sequence to solve a problem. An algorithm represents the logic of the processing to be performed. It is a sequence of instructions which are designed in such a way that if they are executed in the specified sequence, the desired goal is achieved. It is imperative that the result be obtained after execution of a finite number of steps.

**Features of an algorithm are:**

- Each and every instruction has to be precise and clear.
- The instruction has to be executed in a finite time.
- W hen the algorithm terminates the desired result should be achieved.

**Qualities of a good algorithm:**

1. Input and output should be defined precisely.
2. Each step in the algorithm should be clear and unambiguous.
3. Algorithms should be most effective among many different ways to solve a problem.
4. An algorithm shouldn't have computer code. Instead, the algorithm should be written in such a way that, it can be used in different programming languages.

**Ex.1: Algorithm to add two numbers entered by the user.**

Step 1: Start
Step 2: Declare variables num1, num2 and sum.
Step 3: Read values num1 and num2.
Step 4: Add num1 and num2 and assign the result to sum.
sum←num1+num2
Step 5: Display sum
Step 6: Stop

**Ex.2: Algorithm to find the largest among three different numbers entered by the user.**

Step 1: Start
Step 2: Declare variables a, b and c.
Step 3: Read variables a, b and c.
Step 4: If a > b
If a > c
Display a is the largest number.
Else
Display c is the largest number.
Else
If b > c
Display b is the largest number.
Else
Display c is the greatest number.
Step 5: Stop

**Ex.3: Algorithm to find all roots of a quadratic equation $ax^2+bx+c=0$.**

Step 1: Start
Step 2: Declare variables a, b, c, D, r1, r2, rp and ip;
Step 3: Calculate discriminant
$D \leftarrow b^2 - 4ac$

Step 4: If D ≥ 0
r1 ← (-b+√D)/2a
r2 ← (-b-√D)/2a
Display r1 and r2 as roots.
Else
Calculate real part and imaginary part
rp ← b/2a
ip ← √(-D)/2a
Display rp+j(ip) and rp-j(ip) as roots
Step 5: Stop

**Ex.4: Algorithm to find the factorial of a number entered by the user.**
Step 1: Start
Step 2: Declare variables n, factorial and i.
Step 3: Initialize variables
factorial ← 1
i ← 1
Step 4: Read value of n
Step 5: Repeat the steps until i = n
5.1: factorial ← factorial*i
5.2: i ← i+1
Step 6: Display factorial
Step 7: Stop

**Ex.5: Write an algorithm to check whether a number entered by the user is prime or not. (prime number is divisible by 1 or itself only)**
Step 1: Start
Step 2: Declare variables n, i, flag.
Step 3: Initialize variables
flag ← 1
i ← 2
Step 4: Read n from user.
Step 5: Repeat the steps until i<(n/2)
5.1 If remainder of n÷i equals 0
flag ← 0
Go to step 6
5.2 i ← i+1
Step 6: If flag = 0
Display n is not prime
else
Display n is prime
Step 7: Stop

**Ex.6: Write an algorithm to find the Fibonacci series till term≤1000. (Fibonacci series is 0,1,1,2,3,5,8,13,21,34 i.e. sum of previous 2 numbers)**
Step 1: Start
Step 2: Declare variables first_term,second_term and temp.
Step 3: Initialize variables first_term ← 0 second_term ← 1
Step 4: Display first_term and second_term
Step 5: Repeat the steps until second_term ≤ 1000

5.1: temp ← second_term
5.2: second_term ← second_term + first_term
5.3: first_term ← temp
5.4: Display second_term
Step 6: Stop

**Ex.7: Write an algorithm to convert the temperature input in Celsius scale to Fahrenheit scale.**

**Step 1:** Start.
**Step 2:** Input temperature in Celsius (C).
**Step 3:** Convert to Fahrenheit (F) using the formula F = 9/5 * C + 32.
**Step 4**: Print the temperature in Fahrenheit (F).
**Step 5:** Stop.

**Ex.8: Write an algorithm to read two numbers A and B and compare them. If A is greater than B, print A is greater than B else print B is greater than A.**

**Step 1:** Start.
**Step 2:** Input values of A and B.
**Step 3:** Compare values of A and B (Is A > B?).
**Step 4:** If yes then print A is greater than B.
**Step 5:** If no, the print B is greater than A.

**Ex.9: Write algorithm to input the marks of five subjects of a student. Calculate the percentage and print the grades as follows: Grade A for 90% and above, grade B for percentage greater than or equal to 75 and less than 90 and grade C for percentage less than 75.**

**Step 1 :** Start,
**Step 2 :** Input marks of five subjects (ml,m2,m3,m4,m5).
**Step 3** : Calculate percentage (p = (ml + m2 + m3 + m4 + m5)/5).
**Step 4 :** Check if percentage (p) >= 90.
**Step 5 :** If yes, print —A grade
**Step 6 :** If no, check if percentage (p) >= 75.
**Step 7 :** If yes, print —B grade.
**Step 8** : If no, print —C grade.
**Step 9:** Stop.

**Ex.10: Write algorithm to find the area and perimeter of a rectangle given the sides s1 & s2.**

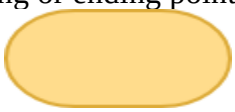
**Step 1 :** Start.
**Step 2 :** Enter the sides of the rectangle s1 and s2.
**Step 3 :** Calculate area (A) = s1 x s2.
**Step 4 :** Calculate perimeter (P) = 2 * (s1 + s2).
**Step 5 :** Output area (A) and perimeter (P).
**Step 6 :** Stop.

## FLOWCHART

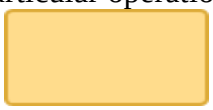
A flowchart is a graphical representation of steps. It was originated from computer science as a tool for representing algorithms and programming logic but had extended to use in all other kinds of processes. Nowadays, flowcharts play an extremely important role in displaying information and assisting reasoning. A flowchart can also be used to define a process or project to be implemented.

## Flowchart Symbols

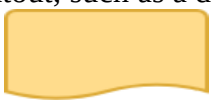
1. Terminator: Represents the starting or ending point of the system.



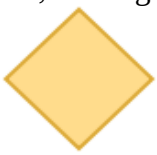
2. Process: A box indicates some particular operation.



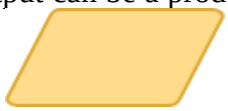
3. Document: This represents a printout, such as a document or a report.



4. Decision: It represents a decision or branching point. Lines coming out from the diamond indicate different possible situations, leading to different sub-processes.



5. Data (Input/Output): It represents information entering or leaving the system. An input might be an order from a customer. Output can be a product to be delivered.

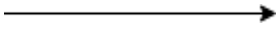


6. On-Page Reference: It would contain a letter inside. It indicates that the flow continues on a matching symbol containing the same letter somewhere else on the same page.

7. Off-Page Reference: It would contain a letter inside. It indicates that the flow continues on a matching symbol containing the same letter somewhere else on a different page.

8. Delay or Bottleneck: Identifies a delay or a bottleneck.

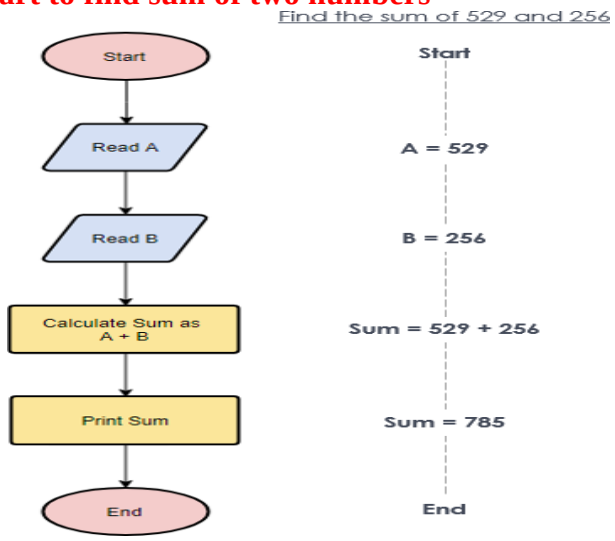
9. Flow: Lines represent the flow of the sequence and direction of a process.



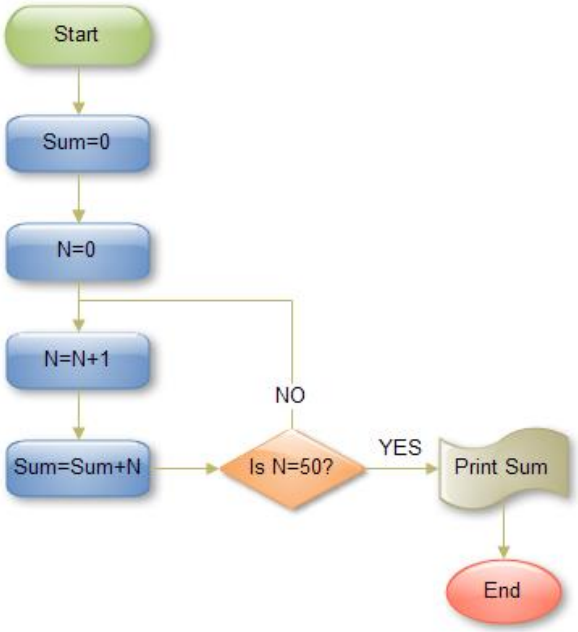
## Advantages of flowchart:

- It helps to clarify complex processes.
- It identifies steps that do not add value to the internal or external customer, including delays; needless storage and transportation; unnecessary work, duplication.
- It helps team members gain a shared understanding of the process and use this knowledge to collect data, identify problems, focus discussions, and identify resources.
- It serves as a basis for designing new processes.

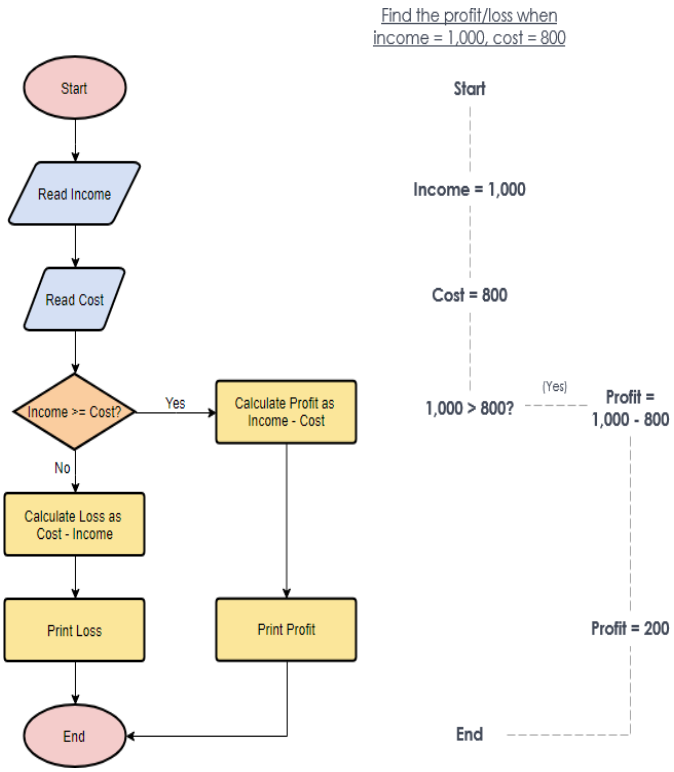
## Ex.1: Draw a flowchart to find sum of two numbers



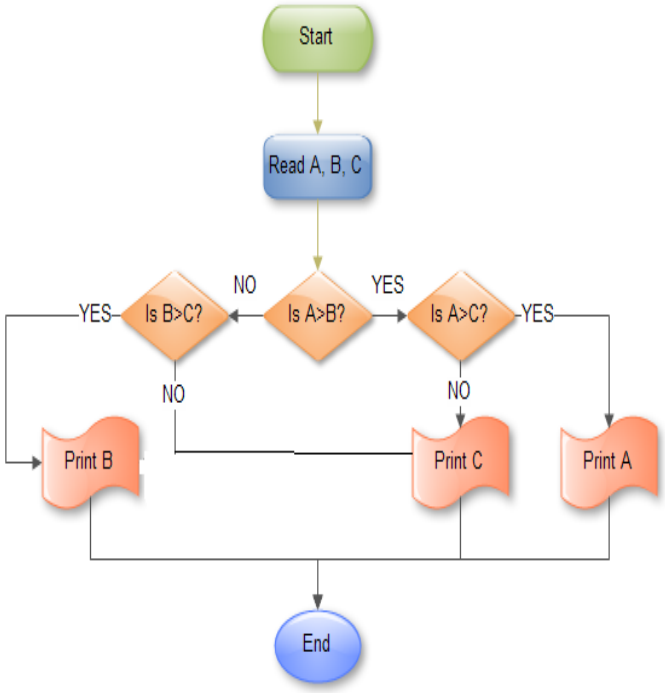

## Ex.2: Draw a flowchart to calculate Sum of first 50 natural numbers



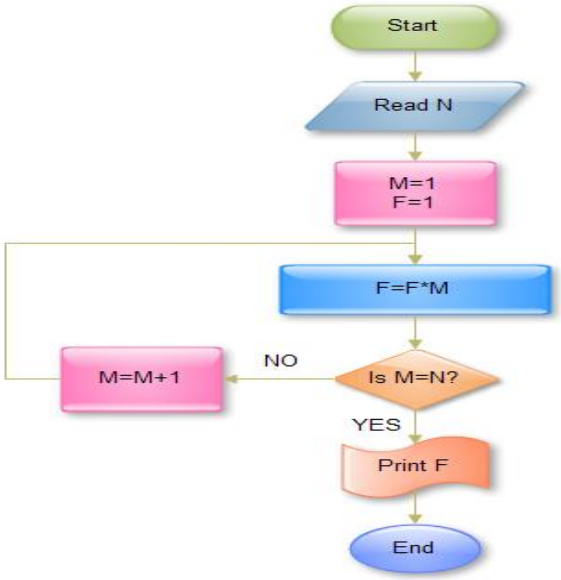
## Ex. 3: Draw a flowchart to calculate Profit and Loss



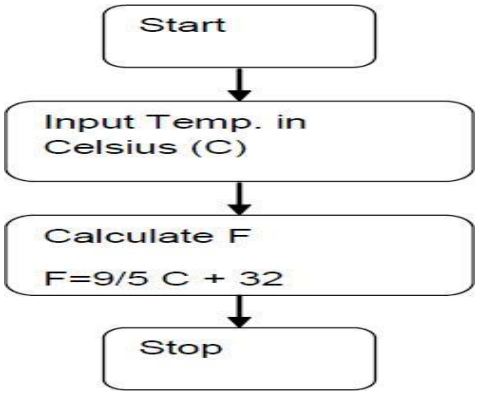

## Ex. 4: Draw a flowchart to find the largest of three numbers A, B, and C.



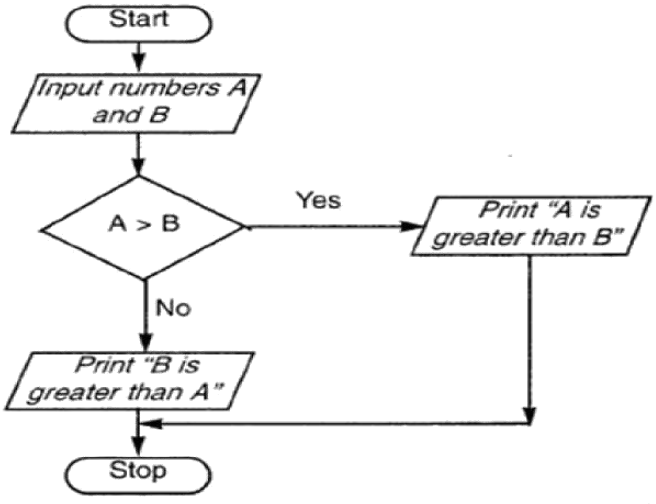
**Ex. 5: Draw a flowchart for computing factorial N (N!)**



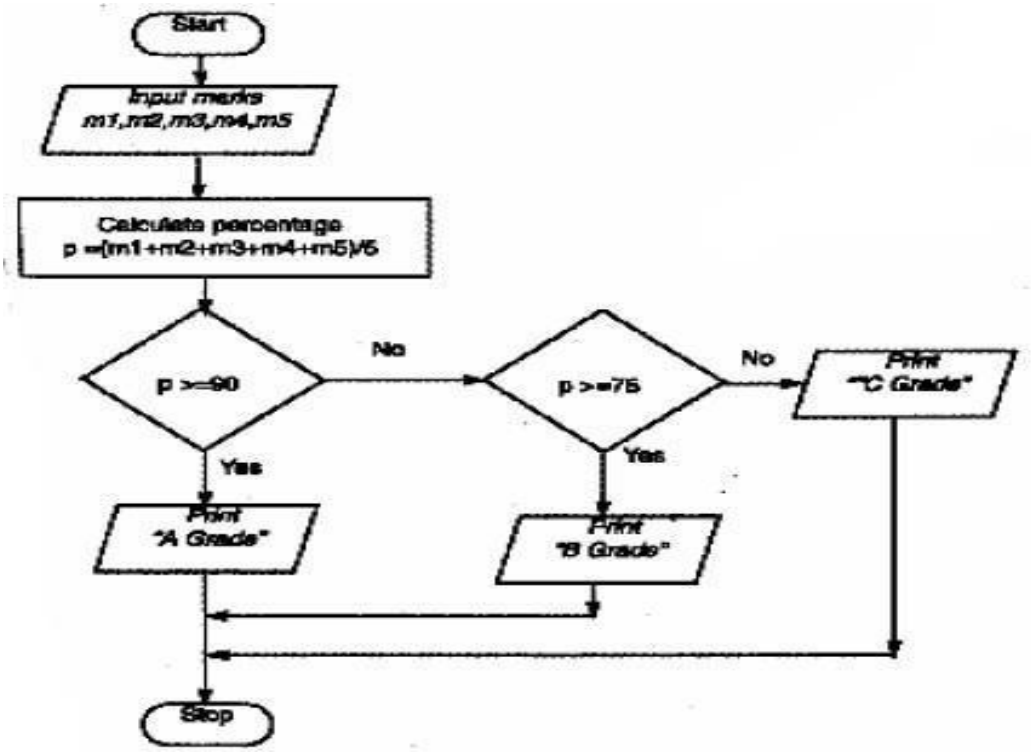

**Ex.6: Draw a flowchart to convert the temperature input in Celsius scale to Fahrenheit scale.**



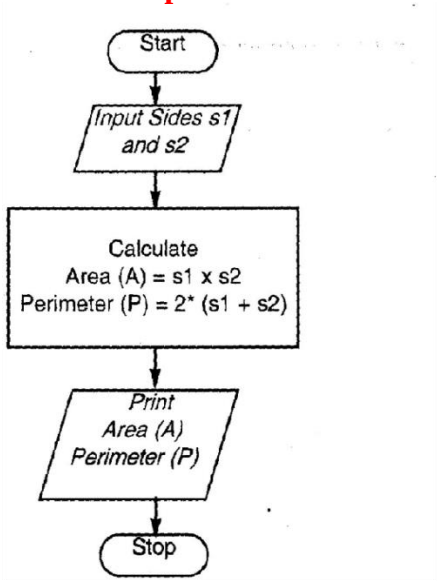

**Ex.7: Draw a flowchart to read 2 numbers A and B and compare them. If A is greater than B, print A is greater than B else print B is greater than A.**



**Ex.8: Draw a flowchart to input marks of 5 subjects of a student. Calculate the percentage & print the grades as follows: Grade A for 90% & above, grade B for percentage greater than or equal to 75 & less than 90 & grade C for percentage less than 75.**




**Ex.9: Draw a flowchart to find the area & perimeter of a rectangle given the sides s1 & s2.**



**Differences between Flowchart and Algorithm**

| Flowchart | Algorithm |
|---|---|
| Block by block information diagram representing the data flow. | Step by step instruction representing the process of any solution. |
| It is a pictorial representation of a process. | It is step wise analysis of the work to be done. |
| Solution is shown in graphical format. | Solution is shown in non computer language like English. |
| Easy to understand as compared to algorithm. | It is somewhat difficult to understand. |
| Easy to show branching and looping. | Difficult to show branching and looping |
| Flowchart for big problem is impractical | Algorithm can be written for any problem |
| Difficult to debug errors. | Easy to debug errors. |
| It is easy to make flowchart. | It is difficult to write algorithm as compared to flowchart. |

## DEBUGGING TOOLS

**Simulator** -This is a computer program which simulates the execution of the program on another computer.

**Logic Analyzers:** This test instrument detects the states of digital signals during each clock cycle and stores them in memory. It then displays this data on the monitor.

**Breakpoints:** This is introduced in the program to halt the execution at some intermediate point. At this point, the values of the various inputs, outputs, variables etc. can be checked.

**Software interrupts:** This is an instruction which saves the current value of the program counter and then branches to a specific memory location. At this location there is the debugging program which displays the status information.

**Memory dump:** This gives a listing of the current contents of a section of the memory. Memory dumps are common in most simulator programs, and microcomputer systems.

**Trace routine:** This program prints the current status of the processor at specified intervals.