

## Introduction to Computers

The present age may be termed as computer age because no other invention has revolutionized the world as much as the Electronic Digital Computers, commonly known as *computers*. Just in a short period of three decades, the computers have become indispensable in every sphere of human life.

The work area of computers is very exhaustive. There is hardly any area of development where computer applications have not set in. To illustrate a few, we can find their exhaustive use in organizations such as,

- ❖ Industries, business organizations
- ❖ Research establishments
- ❖ Educational institutions
- ❖ Government departments
- ❖ Hospitals
- ❖ Document centers
- ❖ Employment Exchanges.
- ❖ Police departments
- ❖ Communication departments
- ❖ Service Organizations

### What is a computer

A computer is a truly amazing machine that performs specified sequences of operations as per the set of instructions (known as ***programs***) given on a set of data (***input***) to generate desired information (***output***). Being a machine, it will not perform independently or creatively. It will do only, what is instructed to do, in specific terms. It is based on a complex technology, but works on a simple principle as follows:



## Characteristics of Computers

The interesting features of a computer are:

- ❖ Computers are built to carry out a small variety of instructions. It is not necessary to have more than about 100 distinct instructions even for a very powerful machine.
- ❖ Instructions are extremely simple; e.g. add, subtract, read a character write a character, compare numbers, characters, etc.
- ❖ Most instructions are carried out in less than a millionth of a second.
- ❖ Instructions are carried out obediently with no questions asked.
- ❖ Instructions are carried out without any mistakes.

A computer may thus be thought of as a servant who would carry out instructions obediently, uncritically, at a very high speed, and without exhibiting any emotions. A computer exhibits no emotions and has no commonsense.

## Types of Computers

**Digital** – A Digital computer uses digital technology. It processes digital quantities that attain discrete values. Most computers used for information processing are of this type.

**Analog** – An Analog computer is designed to process continuous physical quantities. Examples of analog computer usage include monitoring temperature, voltage and current reading in a power station. Each of these parameters can attain an infinite number of values, not just simple on and off.

## Generation of Computers

The evolution of computers has passed through a number of stages before it reached the present state. From the early 1950s, growth of the computers was very rapid but this development took distinct phases known as *generation of computers*. They represented

improvement in speed, memory, input and output devices and programming techniques. Different generations are characterized by their technology of basic computing elements.

### **First Generation**

The first generation computers were the voluminous computers. These computers used electronic valves (vacuum tubes) and had the main limitations of very large electric power consumption and very little reliability.

### **Second Generation**

The invention of transistor in 1948 (invented at Bell Laboratories, USA) led to the development of second-generation computers. Transistors replaced the valves (vacuum tubes) completely as they were far more superior in performance on account of their miniature size, smaller power consumption and less expensive.

### **Third Generation**

These computers use integrated circuits (ICs) in place of transistors and they were having higher speed, large storage capacities and less expensive. An integrated circuit arranges thousands of switches on circuit boards known as a *chip*. These machines used more versatile programmes like Multi Programming Techniques and Database Management.

### **Fourth Generation**

Due to development of large scale integrated chips known as *microprocessor chips* in 1971 by Intel Corporation, another breed became popular as fourth generation computers.

The fourth generation of computers is marked with the increased speed retrieval capabilities and facilities for communication. They can be connected with the satellite communication lines to transform information from one part of the world to the other part of the world at a very high speed. These machines used advanced software like process controllers, computer aided design, electronic spreadsheet etc.,

## **Fifth Generation**

These machines will use parallel processing techniques and artificial intelligence techniques. Therefore these computers will be able to think as human beings can think. These machines will be able to process non-numerical data such as pictures, graphs etc. They will use new types of integrated circuits for faster speed of operation. These machines are under development.

## **The revolution in computer technology**

Computers are also available in different sizes and in different capabilities. They may be categorized as Personal Computers, Micro Computers, Mini Computers, Mainframe Computers and Super Computers.

Personal Computers are being upgraded from time to time depending on the microprocessor configuration from Pentium to Pentium IV .



PC stands for Personal Computer

## **Components of a computer**

A computer system has mainly two components, namely *Hardware* and *Software*. Hardware refers to the physical units of computer, which includes all electronic and electric circuitry components and devices. Anything, which you see or touch, is considered as hardware. Software is a set of instructions that makes the hardware work to get desired results.

## **Hardware**

Hardware may be described under the following categories:

- ❖ Input devices
- ❖ Process unit
- ❖ Output devices
- ❖ Storage devices

## Input devices

Input devices accept data and instructions from the user. Examples are:

- ❖ Keyboard
- ❖ Mouse
- ❖ Joystick
- ❖ Light Pen
- ❖ Optical/magnetic Scanner
- ❖ Touch Screen
- ❖ Microphone for voice as input

**Keyboard:** A keyboard is the most common input device and is used for all kinds of computers – Main, Mini and Macros. Several kinds of keyboards are available but they resemble each other with minor variations. The keyboard in most common use is the QWERTY board. IBM and IBM compatible PCs use 101 keyboard, so called since they have 101 keys. The cursor control keys are duplicated to allow easier use of the numeric pad. Several attractive keyboards are available in the market with some additional keys for opening windows start menu, internet explorer etc.



## Keyboard Operations

**Tying keys** The part of the keyboard which is used to type letters, numbers and other characters. The alphabets layout resembles a standard typewriter keyboard exactly, however there are some extra keys for entering commands, e.g. *Ctrl* key, *Alt* key, *Shift* key, *Enter* key etc. On most keyboards these extra keys are gray in color whereas the alphabet, number, symbol and punctuation keys are white in color. The *Ctrl*, *Alt* and *Shift* key is always used in conjunction with some other key.

**Shift and Caps Lock key** The *Shift* key is used to type capital letters i.e. if you want to type the letter "F", you have to press the *Shift* key, keep it pressed with one finger and press "f" key with the other. However, if you want to type an entire word or a sentence in capital letters, use the *Caps Lock* key instead. Unlike the *Shift* key, *Caps Lock* key is a toggle key and does not need to be pressed continuously. Press it once and it becomes On (you will see the Caps Lock indicator on the keyboard lighting up when you do this) and thereafter whatever you type would be in capital letters, press it again and becomes Off.

**Function keys** The row of 10-12 keys-F1 to F12 above the typing keys are called the function keys and are used to execute special commands or as shortcut keys. The use of these keys varies program to program, however within MS Office some degree of standardization has been achieved. In Word, the function keys are used alone or together with the *Shift*, *Alt* and *Ctrl* keys to give commands.

**Cursors control keys** A group of special keys used to control and navigate the cursor – arrow keys (Up ↑, Down ↓, Left ←, Right →). *Home* and *End* are used to quickly place the cursor at the beginning or end of a line. To delete an alphabet to the left of the cursor press the *Backspace* key ← (normally above the *Enter* key), to delete an alphabet to the right of the cursor press the *Del* key.

**Numeric keypad** The keys on the extreme right of the keyboard (resembling a calculator's key board), which can be used both – to enter numbers (when the *Num Lock* is On) or to move the cursor (When the *Num Lock* is Off). The *Num Lock* is located above the number 7 (Home) key on the Numeric keypad and its On or Off status is displayed by the *Num Lock* indicator light on your keyboard. Since *Num Lock* is also a toggle key, pressing it once makes it On and pressing it again makes it Off.

**Note:** Press the keys briefly with a light pressure, unless you want repeated characters.

## **The Most Important Keys**

**Alt and Ctrl** The command keys are used in combination with another key or with the mouse. For example the Alt + F4 key combination (press down the Alt key, hold it down and press the F4 function key briefly and then release both) close the program.

**Shift** Like Alt and Ctrl, the Shift key is also used in commands in combination with other keys. In typing, it is used in the same way as on a typewriter – to produce capital letters.

**Enter** When typing text, press Enter when you want to produce a forced line feed ( e.g. at the end of a paragraph and to create blank lines). Enter is also used in combination with other keys to execute a few commands. On some keyboards, this key is named Return instead of Enter.

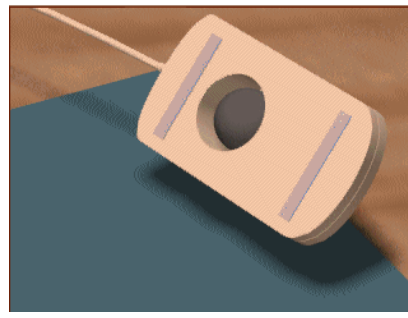
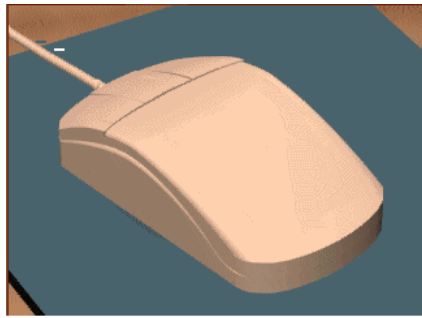
**Esc** The Esc key is located to the left of the function keys, in upper left corner of the keyboard. It can be used to make a Cancel selection in a menu.

**Backspace** Pressing this key deletes the character to the left of the cursor.

**Del (Delete)** This key deletes the character to the right of the cursor.

**Mouse:** A mouse is an electro-mechanical, hand-held device. It is used as a pointer to:

- ❖ Select menu commands
- ❖ Move icons
- ❖ Size windows
- ❖ Start programs, and
- ❖ Choose options.



The most common mouse uses an internal, magnetically coated ball to detect the movement of the mouse across a flat surface, usually a desktop. Movement of the mouse is maintained via an input port connected to the computer. Many programmes today are designed to work with a mouse. A mouse is used to replace hard-to-learn key combinations with easier “Point and Click” actions.

## **Mouse Operations**

**Pointing** Move the mouse pointer until the pointer is on the desired item.

**Clicking** Move the mouse pointer to the position you want, then press the mouse left button once.

**Double-clicking** Move the mouse pointer to the position you want, then press the mouse left button twice in rapid succession. Alternatively, if your mouse has been so installed, you can also click the middle button once, instead of pressing the left button twice.

**Right-clicking** In some cases like changing the properties of an object, or for correcting a misspell word, or even for cut, copy and past-the mouse right button can be used. In such cases, simply select the object and click once on the mouse right button.

**Dragging** Move the mouse pointer to the right place, highlight the desired text by clicking once in the beginning and releasing the left



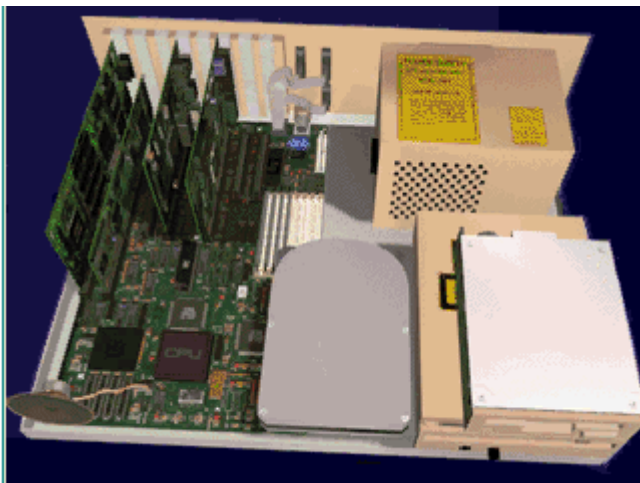
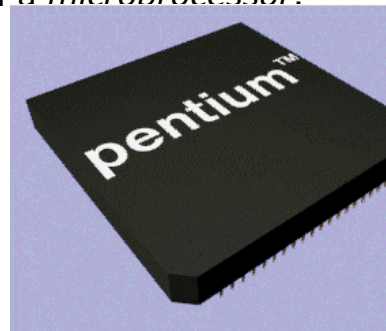
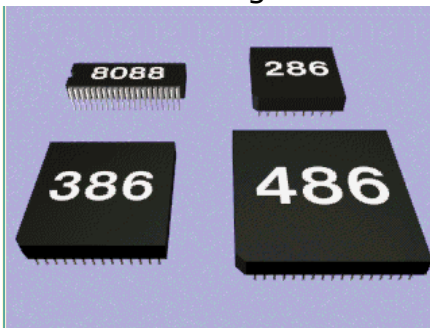
button at the end, then click once again in the highlighted block, keep the mouse left button pressed and roll the mouse to move the block to a new location by releasing the left button at the desired location.

At first, using the mouse may be difficult (particularly double-clicking and dragging). However, learning to use it is worth the trouble because many of the advanced tools in modern programs are only operated with the mouse. In any case most operations are much more simpler and faster to execute through the mouse rather than through the keyboard.

## Processor

The complex procedure that transforms raw input data into useful information for output is called **processing**. To perform this transform, the computer uses two components, the *processor* and *memory*.

The processor is the “brain” of the computer, the part that interprets and carries out instructions. In large computers, the processor often comprises a number of chips whereas in small computers called *Microcomputers* or *personal computers (PC's)*, the processor is a single silicon chip, called a *microprocessor*.



The term central processing unit (CPU) is used loosely to refer to a computer's processor whether it is a set of chips or a single microprocessor. Every CPU has two basic parts, the control unit (CU) and the Arithmetic Logic Unit (ALU). The control unit manages all

the computer resources and coordinates all the computer's activities. It contains the basic instructions (called firmware) for execution of programs. The instruction set, built into the circuitry of the control unit, is a list of all the operations that the CPU can perform. In fact, the Control Unit can be thought of as a traffic cop, directing the flow of data around the CPU and around the computer.

## Memory

The data fed to the computer stays stored in the memory, as and when the data is required to be processed or operated upon, it is transferred to the Arithmetic Logic Unit which does all the computation work like addition, subtraction etc. After processing, the data is again brought back and stored in the memory.

The unit of memory is byte which is combination of 8 bits.

1024 bytes	1 Kilo byte
1024 Kilo bytes	1 Mega byte
1024 Mega bytes	1 Giga byte
1024 Giga bytes	1 Terra byte

There are two types of memories:

- 1 **MAIN MEMORY (RAM)** – The main memory is Random Access Memory (RAM). The name derives from the fact that data can be stored in and retrieved at random, from anywhere. Main memory is in volatile state. When the computer is off, main memory is empty; when it is on, main memory is capable of receiving and holding a copy of the software instructions and data necessary for processing. Because main memory is a volatile form of storage and the users might lose any unsaved information, hence user often stores their work on devices such as floppy disks or hard disks.
- 2 **READ ONLY MEMORY (ROM)** – Instructions to perform such operations, which are critical to the operation of a computer are stored permanently on a read-only memory (ROM) chip installed by the manufacturer inside the computer. When the power in the computer is turned off, the instructions stored in ROM are not lost and the data cannot be changed.

## Arithmetic and Logic Unit:

All the calculations are performed and all comparisons (decisions) are made in the Arithmetic and Logic Unit (ALU) of the CPU. No processing occurs in the primary storage. Intermediate results generated are temporarily placed in a designated working storage area until needed at a later time. Data may thus move from one primary storage to the ALU and back again to store at many times before processing is finished. Once completed, the final results are released to an output storage section and from there to an output device. The type and number of Arithmetic Logic operations a computer can perform are determined by the design of the CPU.

## Control Unit

The Control Unit, as the very name implies, controls the movement and operates within the CPU. Based on the instructions given CPU ensures the operations as specified in the program are performed in the sequence. This operation may be receipt of data and storing them at specified locations, transfer of data from one address of memory to another, transfer of data from Memory to the Arithmetic Unit, controlling the Arithmetic Unit to memory from there on to the output.

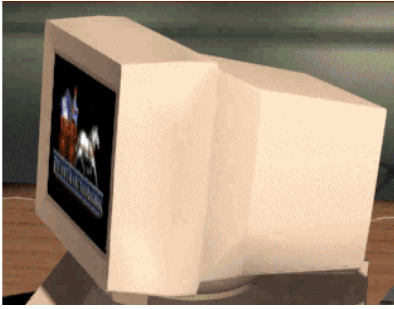
## Output Devices

After the computer has processed the data, the final result has to be brought out from the machine in some intelligent and readable form. The result that comes out of the machine is called **output** and the equipment which enables the results to be brought out are termed **output devices**.

The common output devices are:

- |                            |                                     |
|----------------------------|-------------------------------------|
| ❖ Monitor                  | Uses a large vacuum tube            |
| ❖ Magnetic tape drive unit | writes out results on magnetic tape |
| ❖ CD writers               | writes out results on compact disc  |
| ❖ Printer                  | Prints results on paper             |

## Monitor



Monitor is an output device with the help of which a user can see the results produced by the computer. It is also called as Visual Display Unit (VDU) available in different sizes. Color monitors are very popular these days. The quality of the display depends on the screen resolution.

## Printers

Printers are very useful in day-to-day life to take a hardcopy of our work. There are different types of printers based on the quality and printing speed at which they print.

The popular models are:

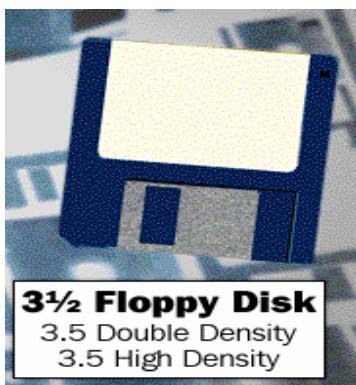
- ❖ Dot matrix
- ❖ Inkjet
- ❖ Laser
- ❖ Line



## External Storage Devices

Floppy diskettes, hard disks, external hard disks, Pen Drives, tapes come under the category of external storage devices or ancillary storage devices.

### Floppy Disk:



It is a magnetic storage media, using flat circular platters. Floppy disks are primarily used in PCs. Information on a floppy disk is recorded in the magnetized states of particles of iron oxides evenly placed upon concentric circles known as **tracks**. The most commonly used floppy diskette is of 3.5" size with a capacity to

store 1.44 MB data. Slowly the usage of floppies is coming down. The reason is that, the capacity of the floppy is very small and floppies are not so reliable.

### **USB Pen Drive :**



Most popular and commonly used storage device today. Very economical, portable and convenient to use on computers when you are on move. Available in various capacities viz. 1 GB, 2 GB, 4 GB and 8 GB. Popular Brands are Kingston, Transcend, Sony etc.

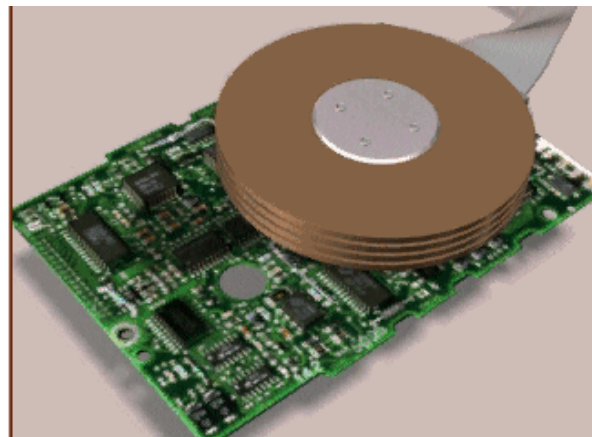
### **Compact Disc**

It is a magnetic storage media, with very high capacity of storage approximately 650 MB. Data on a CD is more reliable. CD Drives are different for reading and writing of a CD. While combo drives with DVD/CD RW/CD drives are storming the market at a very affordable price, storing data on CDs becoming common now a days.



### **Hard Disc**

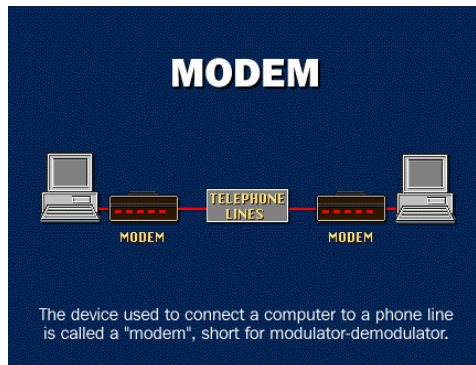
It is also a magnetic storage media, using flat, circular platters, which rotate at a very high speed. The high speed ensures that all areas of the disk appear under the read/write at frequently intervals. The physical size and storage capabilities of hard disk now available are 40 MB on a personal computer itself.



## Modem

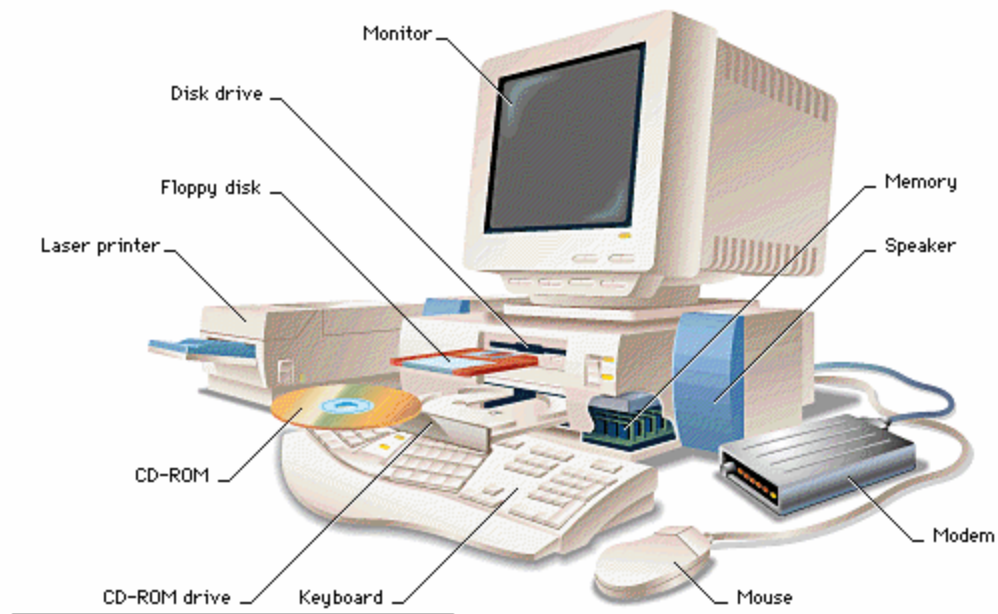
A modem enables your computer to receive/send data from/to remote places through telephone lines, provided each has a compatible modem. These are attached to serial port of the computer. Modems are used for:

- ❖ On-line services like electronic mail, banking and travel reservations
- ❖ file transfers
- ❖ fax services



A modem is controlled by using a communication programme.

## Personal Computer – the complete setup



## Software

Software is the set of instructions to make computer work in the way we like. Set of instructions is called **Programmes**. Software is a general term to describe all the forms of programs associated with computer.

Software is of two types:

- ❖ System Software
- ❖ Application Software

## System Software

Set of programs (consists of number of instructions) supplied by manufacturer to make the computer work. This software coordinates the functioning of different parts of the computer.

### Operation Systems:

These programmes are in-built into the computer resources such as processors, memory and input/output devices. They, in fact act as an interface between the user's programmes and the computer like a supervisor controlling the performance of the computer. Editor and other utilities help in creation and modification of information in the computer. There are many operating systems like Windows 98, Windows 2000, Windows XP, Windows NT, Sun Solaris, Mac OS, Linux are few to name.

## Application Software

Application programmes are user-written programmes to perform certain specific jobs. They are unique in their construction and can be used only for identical jobs. Many such application programmes have been made commercially available as **PACKAGES**. They can be changed marginally to fit individual needs and to meet the system requirements. Standard packages for application areas such as Payroll, Financial Accounting, Inventory Control, billing etc., are available. ERP (Enterprise Resource Planning) packages are playing very important role in large-scale industries or organizations which improve highly,



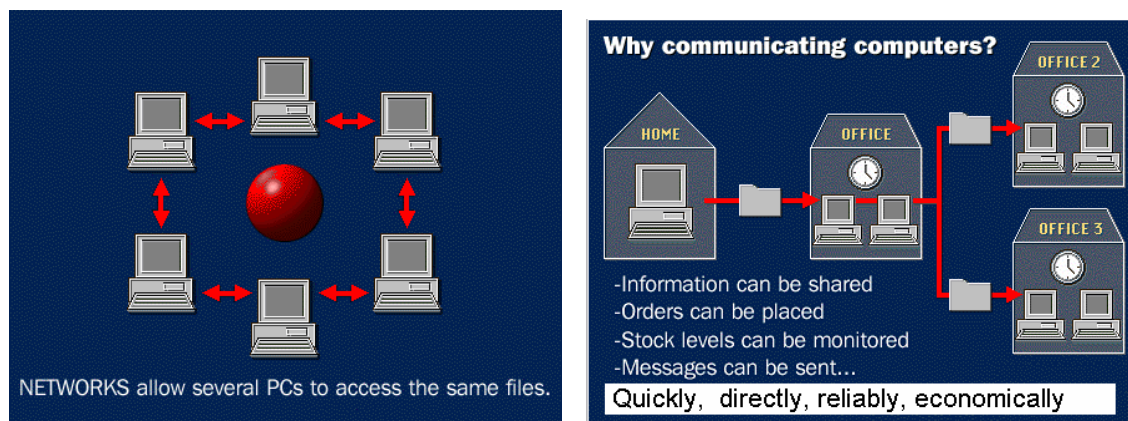
the quality of Administration, Production and Planning in inventory etc. Some of such packages are BAAN, People Soft, and Oracle Financials etc.

As we communicate in different languages like Telugu, Hindi, English etc. We have to communicate with the computer in the language, which it can understand. Through these computer understandable languages we tell the computer to perform various jobs.

Some of the commonly used languages are C, C++, Java etc,

These languages are similar to English and are easily understandable by all. The instructions look like *ADD*, *READ*, and *WRITE* etc. Because they are easily understandable they are called "**HIGH LEVEL LANGUAGES**". Instructions written in high level languages are converted into computer understandable form by a system programme known as *COMPILER*. These instructions are said to be in low-level languages.

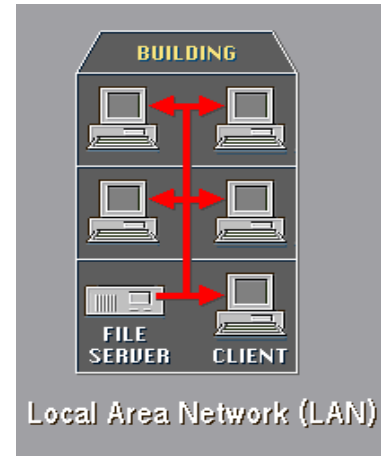
## NETWORKS



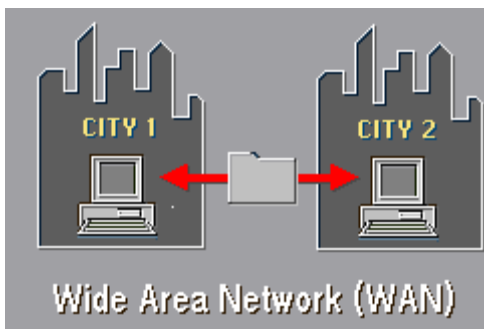
Computers can communicate with other computers through a series of connections and associated hardware called a network. The advantage of a network is that data can be exchanged rapidly, and software and hardware resources, such as hard-disk space or printers, can be shared.



One type of network, a local area network (LAN), consists of several PCs or workstations connected to a special computer called the server. The server stores and manages programs and data. A server often contains all of a networked group's data and enables LAN workstations to be set up without storage capabilities to reduce cost.



Mainframe computers and supercomputers commonly are networked. They may be connected to PCs, workstations, or terminals that have no computational abilities of their own. These "dumb" terminals are used only to enter data into, or receive output from, the central computer.



Wide area networks (WANs) are networks that span large geographical areas. Computers can connect to these networks to use facilities in another city or country.

A network has three layers of components: application software, network software, and network hardware. Application software consists of computer programs that interface with network users and permit the sharing of information, such as files, graphics, and video, and resources, such as printers and disks. One type of application software is called client-server. Client computers send requests for information or requests to use resources to other computers, called servers, that control data and applications. Another type of application software is called peer-to-

peer. In a peer-to-peer network, computers send messages and requests directly to one another without a server intermediary.

Network software consists of computer programs that establish protocols, or rules, for computers to talk to one another. These protocols are carried out by sending and receiving formatted instructions of data called packets. Protocols make logical connections between network applications, direct the movement of packets through the physical network, and minimize the possibility of collisions between packets sent at the same time.

Network hardware is made up of the physical components that connect computers. Two important components are the transmission media that carry the computer's signals, typically on wires or fiber-optic cables, and the network adapter, which accesses the physical media that link computers, receives packets from network software, and transmits instructions and requests to other computers. Transmitted information is in the form of binary digits, or bits (1s and 0s), which the computer's electronic circuitry can process.

A network has two types of connections: physical connections that let computers directly transmit and receive signals and logical, or virtual, connections that allow computer applications, such as word processors, to exchange information. Physical connections are defined by the medium used to carry the signal, the geometric arrangement of the computers (topology), and the method used to share information. Logical connections are created by network protocols and allow data sharing between applications on different types of computers, such as an Apple Macintosh and an International Business Machines Corporation (IBM) personal computer (PC), in a network. Some logical connections use client-server application software and are primarily for file and printer sharing. The

Transmission Control Protocol/Internet Protocol (TCP/IP) suite, originally developed by the United States Department of Defence, is the set of logical connections used by the Internet, the worldwide consortium of computer networks. TCP/IP, based on peer-to-peer application software, creates a connection between any two computers.

### **Media**

The medium used to transmit information limits the speed of the network, the effective distance between computers, and the network topology. Copper wires and coaxial cable provide transmission speeds of a few thousand bits per second for long distances and about 100 million bits per second (Mbps) for short distances. Optical fibers carry 100 million to 1 billion bits of information per second over long distances.

### **Topology**

Common topologies used to arrange computers in a network are point-to-point, bus, star, and ring. Point-to-point topology is the simplest, consisting of two connected computers. The bus topology is composed of a single link connected to many computers. All computers on this common connection receive all signals transmitted by any attached computer. The star topology connects many computers to a common hub computer. This hub can be passive, repeating any input to all computers similar to the bus topology, or it can be active, selectively switching inputs to specific destination computers. The ring topology uses multiple links to form a circle of computers. Each link carries information in one direction. Information moves around the ring in sequence from its source to its destination.

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