# UNIT:1 COMPUTING DEVICES, SOFTWARE &OPERATING SYSTEM

## 1. COMPUTER INTRODUCTION:

Computer is an electronic device. It is also called an amplifier which can do arithmetic calculations faster. For a person who knows much about it, computer is a machine capable of solving problems and manipulating data. It accepts data from the user processes the data by doing some mathematical and logical operations and gives the desired output to the user according their instructions. Therefore, we may define computer as a device that transforms data. Data can be anything like marks obtained by you in various subjects. It can also be name, age, sex, weight, height, etc. of all the students in your class or income, savings, investments, etc., of a country. Computer can be defined in terms of its functions. It can accept data, store data, process data as desired, and retrieve the stored data as and when required and print the result in desired format. Computer requires two types of inputs: the raw data and set of instructions containing the methodology to process the data (program). Computer is sometimes descriptively called an Electronic and Data Processing Device also. It is sometimes referred as information processing machine (IPM). Sometimes Computer is defined as a commonly operating machine particularly used to technical and educational research. Sometimes it defined as an electronic device which stores, reads and processes the data or information to produce the meaningful result /output to the user according user request. It is an intelligent amplifier that performs burdensome chores (various tasks) such as selecting, copying, moving, editing and performing other operations like alphabetic, numeric and other symbolic data. So, it is frees humans to use their time in matters involving creativity and judgment .It can performs various calculations quickly, easily and without mistake.

"Commonly Operating Machine Particularly Used for Technical & Educational Research"

**CHARACTERESTICS OF COMPUTER:**

The major characteristics that make the computer such a powerful machine can be enumerated as speed, storage, accuracy, ability to operate automatically, diligence, scientific approach and versatility.

- **Speed and Accuracy:** Computer processes the data in a high speed. Computers are 100% accurate. The data and instructions in the form of binary digits (ON OR OFF state of electricity) flow in the circuitry of a computer at a speed of light. So, computer is very fast and can process a huge amount of data in a fraction of seconds. A computer can perform millions of instructions and even more per second. If the mistake occurs it is due to the wrong input which named as the term GIGO (Garbage-In Garbage-Out). It is only a machine and does not make errors on its own so sometimes it called reliable machine also. Computer can do a Job in a few minutes that would take a man in his entire lifetime. The speed of computer is measured in terms of instructions per second such as Kilo instructions Per Second (KIPS) and Million Instructions Per Second (MIPS), Million Floating Point Operation Per Second (MFLOPS), Trillion Floating Point Operation Per Second (Teraflops) are measure units.

- **Comparison and Calculation:** Computers are the basic electronic calculators, which are used to process complex type of mathematical data. It can perform high range of data calculations in a short period of time.

- **High Storage Capacity:** Computers can store the data for the future use. It can be kept permanently. The devices, which are used to store data, are hard disk, floppy disk and so on. In computer the terminology in regard to storage capacity applies to both primary and secondary storage. It is normally measured in terms of Nibble, Byte, Kilobyte (1KB), Mega Byte (MB), Giga Byte (GB), Tera Byte (TB) etc. The table below shows the different units of storage capacity of a computer.

| | | | |
|---|---|---|---|
| **1 or 0** | **= bit** | **1024 GB** | **= 1 Tera Byte** |
| **4bits** | **= 1 Nibble** | **1024 TB** | **= 1 Peta Byte** |
| **8 bits** | **= 1 Byte =1 Character** | **1024 PB** | **= 1 Exa Byte** |
| **1024 Bytes** | **= 1 Kilo Byte (KB)** | **1024 EB** | **= 1 Zetta Byte** |
| **1024 KB** | **= 1 Mega Byte(MB)** | **1024 ZB** | **= 1 Yotta Byte** |
| **1024 MB** | **= 1 Giga Byte (GB)** | | |

- **Automatic:** Computers are automatic machines because once started on a job, they carry out the job without any human intervention until it is finished. The Computers are easy to handle since this machine does all the processing. We need to instruct a computer to perform any job. Once the instruction is given to a computer, we do not need to give the instructions again and again.

- **Communication Media:** Computers are now days mostly used in Information Technology sectors for the communication purpose. Computers are used to provide the easiest type of communication like e-mail, chatting, video conferencing and online telephony.



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- **Multi Processing Nature:** Computers can process two distinct data's at a time with the same accuracy. It can perform any kind of operation at enormous speed. The wide use of computers in so many areas such as scientific, commercial, application, Educational, Industrial areas in day-to-day life there is an ample evidence of its versatility. Computer can perform word processing, Spreadsheet calculations, data processing etc. It can process any kind of data at a great speed.

- **Diligence:** Man suffers from physical and mental fatigue, lack of concentration and laziness which do not permit him/her to carry on his/her task at the same level of speed and accuracy through the entire day. The computer on the other hand is capable of operating at exactly the same level of speed and accuracy even if it has to carry out the most voluminous and complex operations for a long period of time. Computer has a capacity of performing repeated operations. It does not get tired easily. This capacity of the computer makes it useful for repetitive jobs like process control and quality control.

- **Remembering power:** Computer has the power of storing any amount of information or data. Any information can be stored and recalled as long as you require it, for any numbers of years. It depends entirely upon you how much data you want to store in a computer and when to lose or retrieve these data.

**LIMITATIONS OF COMPTUER:**

- No Intelligence Quality
- No Feeling
- Needs Electricity Power
- Needs Human to use
- No Decision-Making power
- Expensive
- Causes Depersonalization
- Medium of E-crimes

## 2. APPLICATION AREAS OF COMPTUER:

- **Computer Application in offices:** Various important works performed in the offices such as preparation of letters, reports, memorandum, copy of advertisement, publicity, contracts, forms, notes etc. Today these all tasks are efficiently performed by computers. Computer consists of various word processing package programs. It helps to prepare and maintain different official works easily. In offices accounting, billing, preparation of pay rolls, data analysis etc are also done using computers.

- **Use of computer in Books Publication:** Nowadays conventional letters composition in press for book for book publishing has become obsolete. The manuscripts of books are now prepared using computers. Text of the manuscript is entered into a computer. Various sketches, illustrations, diagrams, well graphical designs etc. are also prepared on the computes using suitable software.

- **Use of computer in Desktop Publishing System:** Desktop Publishing system includes computer and a number of peripherals with powerful software that can produce page layouts complete with pictures and text printed in a variety of attractive ways. This contains an art library with over one thousand pictures which can be used by the programmer in his documents.

- **Use of computers for Data Analysis:** Computers are widely used for data analysis. There is special software like spreadsheet program for data analysis. Statistical packages are also available for analysis of data. They have functions to calculate average, maximum, minimum, percentage, Sum etc. They can facilitate to access data from other files and sort, merge and manipulate data as needed. These types of spreadsheet programs are used for accounting, sale analysis, inventory control, financial aspect of business, preparation of budgets etc.

- **Use of computers in Graphics:** Computers are being used to draw drawings, graphics and high resolute pictures. Presentation of drawing us a time consuming task but computers can draw sophisticated drawings in multicolor in minutes. It can produce two-dimensional, Three-dimensional pictorial views. Graphics packages are often integrated with spreadsheet, investment analysis and statistical analysis. Corel draw, presentation packages, design packages etc. are some graphical packages used to prepare the drawings.

- **Use of computers in Database Management:** Nowadays computers extensively used to store and retrieve information. Various organizations and departments are using computers to handle files and data processing which store a variety of information. To handle files database management packages are widely used. The database package not only stores and supplies information but also makes computations on data to supply certain information. A database management system are widely used to overcome the problems of manual data processing system so, it can provide various features of relational form of database. Some database



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management systems are MS-Access, Oracle, and Sybase, Fox Pro etc. which are used to store data and computation with stored data in a specific manner.

- **Use of computers in Education Field:** In educational institutions computers are used as teaching aid, information resource and computing and research tool. When computer is used as a teaching aid it is referred to as computer-assisted instructions (CAI). The various computer programming languages such as BASIC, C, C++, Visual Basic etc. can be used for the programming logic learning purpose. Teacher can use computers to maintain student's grade, to analyze student performance, student assignments and other activities. Various video classes and project classes can be used to teach different subjects by the teacher.

- **Use of computers in Medical Field:** Computers are widely used in hospitals to help doctors in diagnosis, getting information of patients, diseases, treatments, drugs etc. They are also used in administration and in keeping patient records. Using various medical database doctors supply the detailed information such as symptoms, medical history, test results and reports etc to the patient and their relatives. Using medical dictionary the doctor can read the disease symptoms, related medicines. Examples Computerized Axial Tomography (CAT), Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI) etc. are some computer technological devices that take images and diagnose the diseases.

- **Use of computers in Industrial control and instrumentation:** Computers are extremely used in industry for automatic control of machines, process, measurement and display of electrical and physical quantities. Microprocessor-based system or single-chip microprocessors have been developed for industrial control and instrumentation. For instance, automatic control of temperature of a furnace, speed of a motor, generator's voltage and power, boiler's pressure, testing of products etc.

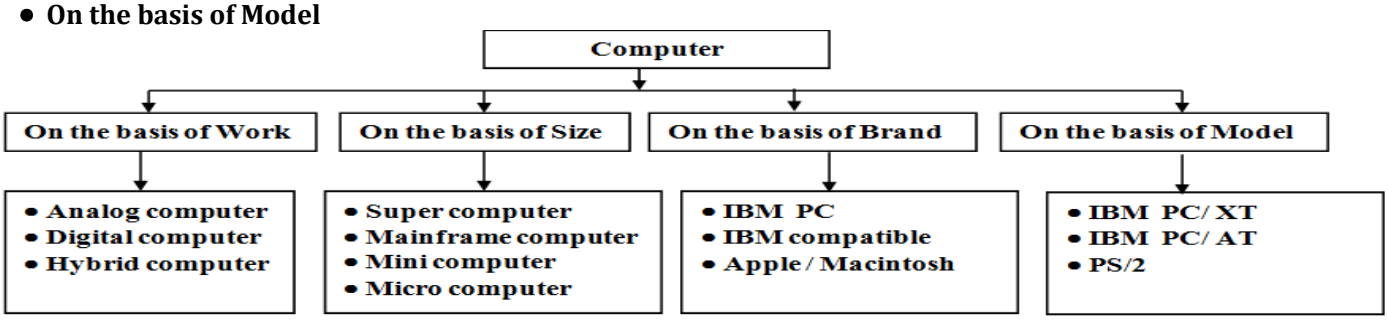
- **Use of computers in Communication Field:** Computers are extensively used in sending and receiving information. The information transfer may take place either between two points or throughout a computer networks that connects a number of computers. Computer communications are being used to send and receive electronic mail, engage in online conferencing such as computer conferencing, video conferencing, teleconferencing etc to view and post news on computer bulletin boards, for electronic shopping, banking and brokerage and to get information services. Information service include of communication include online information given by some organizations which maintain database for such purpose.

Similarly, computer has importance in several fields. Now a days they are used in car control system, computer based security systems, using in home for playing games, communicating with database services , for word processing, home management, accounting ,entertainments, on-line shopping etc.

## 3. TYPES OF COMPUTERS:

There are different types of computers developed till today. Today computers are classified on the basic of their capabilities, sides, model and uses. Computers can be classified on the following basis:

- **On the basis of work**
- **On the basis of Size**
- **On the basis of Brand**
- **On the basis of Model**




- **Analog Computers:** These computers are used to measure temperature, pressure, physical values etc. These values are also called continuous values. This computer is faster in speed because calculations are performed in parallel but it's not as accurate. They are used widely operation rooms in the hospital to check the respiration and blood circulation of a percent. The analog computer used in Hetaunda cement factory is a Process Control used to check the quality of the cement. Slide Rule, Speedometer, Plesley, Seismograph, thermometer, voltmeter, a gasoline measuring meter in petrol pump etc. are the examples of analog devices.

- **Digital Computers:** A digital computers works with discrete values or discontinuous values or binary



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digits 0s and 1s. Basically, these computers work counting numbers, letters and symbols. Digital computers are best suite for statistical data and numerical problems of business and science. The accuracy of this computer is very high. It has large memory capacity. It is a multipurpose machine. IBM PC , IBM compatible, Apple/Macintosh are Example in this computers.

| S.N. | Analog Computer | Digital Computer |
|---|---|---|
| 1. | Analog Computers work with natural or physical values. | Digital Computers work with digits. |
| 2. | These computers work with continuous data like voltage, pressure, temperature etc. | These computers work with the discrete data like characters, symbols, numbers etc. |
| 3. | These computers are special purpose computers. | These computers are general purpose computers. |
| 4. | Accuracy of Analog computer is low. | Accuracy of Digital computer is low. |
| 5. | These computers have low storage and memory. | These computers have high storage and memory. |
| 6. | These computers cannot be re-programmed. For any new functions the total circuitry system and hardware parts are to be replaced with new ones. | These computers are totally flexible and can be re-programmed. |

- **Hybrid Computers:** Hybrid computers are a data processing device which combination of the best feature of both analog and digital computer. They have the speed of analog computer and accuracy of the digital computer. In hybrid computer, a converter is fixed to convert the analog signals into digital signals and digital signals to analog signals. These machines are generally used in scientific applications, airplanes and Industrial control process. The computers used in hospital like CT-Scan machine, ECG (Electrocardiogram) machine, ECHO (Echocardiogram) ,Ultrasound machine, computers used in jet planes (Flight Management Computers) are the examples of Hybrid computer.

- **Supercomputer:** They are the special purpose fastest and most expensive machines. They have high processing speed compared to other computers. They have also multiprocessing technique. One of the ways in which supercomputers are built is by interconnecting hundreds of microprocessors. Supercomputers are mainly being used for weather forecasting, biomedical research, remote sensing, aircraft design and other areas of science and technology. Examples of supercomputers are CRAY YMP, CRAY2, NEC SX-3, CRAY XMP and PARAM from India.
- **Mainframes:** These types of computers are generally 32-bit microprocessors. Mainframe computers are high level business purpose computers which can handle 1000 users at a time. They operate at very high speed, have very large storage capacity and can handle the work load of many users. They are generally used in centralized databases. They are also used as controlling nodes in Wide Area Networks (WAN). Example of mainframes are DEC, ICL and IBM 3000 series.

**Differences between Super computer and Mainframe computer:**

| SN. | Super Computer | Mainframe Computer |
|---|---|---|
| 1. | Super computer is special purpose computer. | Mainframe computer is high level business purpose computer. |
| 2. | Super computer is high processing speed (multiprocessing) computer than compared to mainframe computer. | Mainframe computer is multiuser computer. |
| 3. | It is expensive computer than mainframe computer. | It is less expensive computer than super computer. |
| 4. | It is used for the larger data processing purpose. | It is used for the multi-user operating purpose. |
| 5. | Examples: CRAY-I,PARAM,NEC etc. | Examples: IBM 1401,ICL-2050/10,IBM-3000 etc. |

- **Mini Computer**: This is designed to support more than one user at a time. Mini computers are medium level business propose computers which can handle 100 uses at a time. It possesses large storage capacity and operates at a higher speed. The mini computer is used in multi-user system in which various users can work at the same time. This type of computer is generally used for processing large volume of data in an organization. They are also used as servers in Local Area Networks (LAN). Examples: **DEC** (Digital Equipment corporation), **IBM** (International Business Machine) corporation AS/400 designed the mini computers. Examples of Mini computers are: MAI Basic4, DEC, PDP and VAX Series
- **Microcomputer:** Microcomputer is at the lowest end of the computer range in terms of speed and storage capacity. Its CPU is a microprocessor. The first microcomputers were built of 8-bit microprocessor chips. The most common application of personal computers (PC) is in this category. The PC supports a number of input and output devices. An improvement of 8-bit chip is 16-bit and 32-bit chips. Examples of microcomputer are IBM PC, PC-AT , Desktops, Laptops etc.



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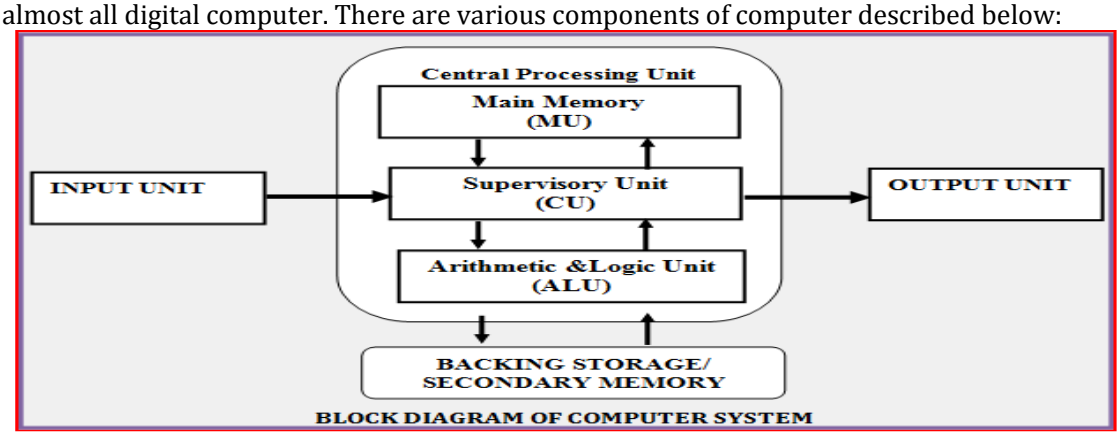
- **IBM PC:** IBM PC stands for Internal Business Machine Personal Computer. The IBM is one of the largest computers and other electric equipment's manufacturing company in the world. It was established in USA in 1924. IBM sells mainframes, mini computers and microcomputers. These computers are known as IBM computers. IBM PC is a microcomputer produced by IBM Company. The computers produced by this company are reliable, durable and have high processing capability.
- **IBM Compatible:** Many companies make clones of IBM's Personal Computer, which are often called Compatible. IBM compatible can use hardware and software designed for the IBM PC. The internal architecture of IBM compatible is similar to IBM PC. They are also called duplicate computers. It can perform all the tasks that an IBM computer does. They are less expensive than original (IBM) computers.
- **Apple/Macintosh:** Apple/Macintosh Company is one of the largest personal computer manufacturers, located in California. This company was established in 1976. The internal architecture of this computer is totally different from that IBM. They have their own software. They are specially used in Desktop-Designing. They are quite expensive than IBM and IBM Compatible. The operating system and other peripherals are completely different then IBM and IBM Compatibles.

- **IBM PC/XT:** XT stands for Extended Technology. It is an IBM PC with slow hard disk. XT was released in 1983. It had an Intel 8088 CPU, 128 of RAM, 10MB HDD drive and eight-bit bus. These computers were slow processing.
- **IBM PC/AT :** AT stands for Advance Technology. It was released in 1984 with an Intel 80286 processor and 16-bit bus. It has a medium speed hard disk and also floppy disk. The microprocessor used in AT computers is 80386SX, 80386DX, 80486DX and 80586. It has an additional co-processor, which helps to process complex mathematical problems.
- **PS/2 :** IBM's second generation of personal computer is called PS/2 (Personal System-2). This computer released in early 1990. It uses refined architecture making the computer faster than AT computer. It uses 3.5" micro floppy disk with capacity of 1.44MB, VGA display and OS/2 operating system.

## 4. COMPUTER SYSTEM ARCHITECTURE:

The computer, there are various device used to enter information and instruction in to a computer or storage or processing and to deliver the processing data to a human operator. Computer peripherals can be installed internal and external. All the peripherals of the computer are connected to the ports. An input device converts incoming data and instructions into a pattern of electronic signals in binary code. The output device reserves the process translating the digital signals into a form understandable to be user. The style of construction and organization of many parts of a computer system are its "Architecture". Although the basic element of the computer essential the same for almost all digital computer. There are various components of computer described below:



BLOCK DIAGRAM OF COMPUTER SYSTEM

### 1. Input devices:

It is an action of collecting raw data at the beginning of the computer base information system into a form that is useable by the computer for processing. The raw data and program are entering into the computer through input device. It reads the raw data prepared by the user and send them in to the computer as a series of electronic pulse. The input device established the communication link between user and the computer system.

Some functions of input devices are:

- Accepting data from the user
- Converting accepted into the machine understandable form.
- Sending converted data to the memory unit for further processing.

Some of the input devices (accessories) are :

| | | |
|---|---|---|
| 1. Keyboard | 2. Mouse | 3. Light Pen |
| 4. Joystick | 5. Touch Screen | 6. Scanner |
| 7. Voice recognition Device | 8. Digital Camera | 9. Web Cam |

- **Keyboard:** The electronic keyboard is one of the widely use input device of the computer. It has a set of typewriter keys that enables you to enter data into a computer for processing. Computer keyboards are



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similar to electronic typewriter keyboards but contain additional keys. It has a code connected to it that plug into the system unit. There are three different types of keyboard:

- ❖ XT (Extended Technology)- 83 keys
- ❖ AT (Advance Technology)- 101 keys
- ❖ Enhance Keyboard - 103 keys

- **Mouse:** The mouse is an input pointing device. The mouse is one of the greatest breaks through in the computer. The mouse is important for GUI (graphical user interface) environment. A mouse is a handhold input device that a computer user. The mouse is also useful for graphics program that allows you to draw pictures just as the way we use pen, pencil or paintbrush. There are two types of mouse: i) Serial Mouse ii) PS/2

- **Light Pen:** Light pen is use in a pointing device, which is very sensitive to light. Light pen uses a photoelectric cell to communicate the screen position on the computer. Light pen is also used for graphics work. A user can draw directly on the screen in Computer aided design.

- **Joystick:** Joystick is a pointing device, one of the input devices that use to move cursor on the screen. It has a stick with balls as its upper and lower ends. Joystick is mostly used while playing computers game.

- **Touch Screen:** It allows the user to operate a computer by simply touching the display screen. The simplest type of touch screen is made up of a grid of sensing lines, which determine the location of a touch by matching vertical and horizontal contacts. Touch screens are, however, immensely popular in applications such as information kiosks and automatic teller machines because they offer pointing control without requiring any movable hardware and because touching the screen is intuitive.

- **Scanner:** It is used to input pictures and images into your computer. It converts images to digital form so that it can be fed into the computer. It is Input device capable to convert the image directly into electrical signals and import inside the CPU. Scanner is mostly used to scan Maps, Photos, and other pictures especially for DTP.

- **Voice Recognition Device:** Voice recognition device is an input device that allows a person to input data to a computer by speaking to is (inputs data i.e. in form of voice).In voice recognition device, the voice signals are sent to the processor for processing. Example: Microphone.

## 2. Output devices:

Output is the action of getting information from the computer. Once the CPU has executed the program instruction, may ask that information be communicated to on output device. The output device translates the data process in the computer from machine code to human code. Some functions of output devices:

- Accepting processed data from the memory unit.
- Converting accepted data into the human understandable form.
- Producing converted data on the screen or by spoken or through printed format.

The output can have two forms:

- ❖ Softcopy output device :Monitor, Speaker
- ❖ Hardcopy output device :Printer, Plotter

| SN. | Softcopy Output devices | Hardcopy Output Devices |
|---|---|---|
| 1. | Produced result through softcopy output devices is temporary in nature. | Produced result through hardcopy output devices is Permanent in nature. |
| 2. | Softcopy output devices produce result on the monitor screen or spoken out by the speaker. | Hard copy output devices produce result as printed material. |
| 3. | The output produced through softcopy output devices is not printed on the paper. | The output produced through hardcopy output devices is printed on the paper. |
| 4. | The output produced through softcopy output devices can be changed and modified easily. | The output produced through hardcopy output devices can not be changed and modified. |
| 5. | Softcopy output material can also be saved into electronic medium like hard disk, pen drive etc. for future use. | Hardcopy output material can not be saved into electronic medium. |
| 6. | Softcopy output can be produced through devices are faster than hardcopy output. | Hard copy output can be produced through devices are slower than softcopy output. |
| 7. | Examples: Monitor, Speaker, Projector etc. | Examples: Printer, Plotter etc. |

- **Monitor (VDU):** Monitor is a television like screen use to display text and graphics allows user to view the result of processing. It is used for producing soft-copy output. A monitor associated with a keyboard and together



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they form a video display terminal (VDT). Monitor (computer) is a device connected to a computer that displays information on a screen. Modern computer monitors can display a wide variety of information, including text, icons (pictures representing commands), photographs, computer rendered graphics, video, and animation.

**Generally monitors are two types:** i) Monochrome ii) Color

The color monitors display anywhere from 16 to 1 million different colors. The monochrome monitor can display only two black & white colors. Color monitors sometimes called RGB because they accept three separate colors red, green and blue.

- **Liquid crystal display (LCD):** LCD monitor is a thinner, lighter and is commonly used with portable computer systems like notebook computers. Many flat panel TVs use liquid-crystal display (LCD) screens that make use of a special substance that changes properties when a small electric current is applied to it. LCD technology has already been used extensively in laptop computers. LCD television screens are flat, use very little electricity, and work well for small, portable television sets. LCD has not been as successful, however, for larger television screens.
- **Cathode Ray Tube:** CRT operates much like a television set. The CRT was developed for use in television during the 1930s by the American electrical engineer **Allen B. DuMont.** Cathode-ray tubes are used as picture tubes in television receivers and as visual display screens in radar-receiving equipment, computer installations.

- **Printer:** Printer is an output device for producing text and image on paper. These copies can be kept for future use. Produced information of printer is in a permanent and readable form. Printer is a computer peripheral that puts text or a computer-generated image on paper or on another medium, such as a transparency. Printers can be categorized in any of several ways. Printers are classified as the following basis:
  i) Quality ii) Speed iii) Graphics iv) Size

**Impact printer** is similar to a typewriter in which characters in which characters are printed by physical striking of type device over an inked ribbon. It is a noisy printer. The most Impact printers physically strike on the paper and are exemplified by pin Dot-matrix printers, Daisy wheel printers, Drum printers etc. fall under the category of impact printer.

| SN | Impact Printer | Non-Impact Printer |
|---|---|---|
| 1. | Text or image is formed in contact of paper and the printer head. | Text or image is formed without any physical contact of the paper and the printer head. |
| 2. | Produces noisy, slow and poor quality output. | Produces noiseless, fast and high quality output. |
| 3. | Cheaper and less operation cost. | Expensive and more operation cost. |
| 4. | It can only prints text but cannot print graphics better. | It can print text as well as graphics better. |
| 5. | Print quality is low comparatively non-impact printer. | Print quality is very high comparatively impact printer. |
| 6. | Examples: Dot matrix printer, Drum printer, Daisy wheel printer, Line printer. | Examples: Laser printer, Ink-Jet printer, Thermal printer. |

**A non-impact printer** is a quiet printer because it doesn't strike on the paper to form characters. Rather, characters are formed by using heat (in thermal printers), light (in laser printer) and ink-spray (in ink-jet printers). These printers are faster and more reliable than impact printer but they are expensive.

**Ink Jet Printers**

These are non-impact printers. They print characters by spraying small drops of ink into paper. Ink jet printers produce high quality output because the characters are formed by dozens of tiny ink dots. They provide the resolution of at least 360 dots per inch (dpi).

**Laser Printer**

A laser printer can produce higher quality output of text or graphics. It looks like a photocopier. The laser printer uses a laser beam to create images. Speed and quality are distinguishing features of laser printers. The common laser printers provide resolutions of 300 or 600 dpi. And, they can print several pages per minute. But, laser printers are more expensive compared to other types of printers.

- **Plotter:** Plotter is a specialized output device which designed to produce high –quality graphics in a variety of colors. Plotter is sometimes referred as graph plotter. Plotter is especially useful for creating maps and architectural drawings, although they may also produced less complicated charts and graphs. Plotter produces high graphical and resolute images and drawings under computer's control. It uses ink pen or inkjet mechanism to draw graphics or drawings. Plotter is much expensive than printers. The different types of plotters are drum plotter, Micro grip plotter, flat bed plotter, and inkjet plotter.

- **Speaker:** A speaker is an audio response device that produces audio output. Produced output through speaker is temporary and softcopy in nature.



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**3. Processing Unit:** Processing Unit is more commonly known as Central Processing Unit (CPU) . It is the computing part on any digital computer system; generally composed of the main memory, control unit and arithmetic and logic unit. It is linked with various peripheral equipments, including input/output devices and auxiliary storage units. The CPU is usually mounted on the main circuit board, called the motherboard in a microcomputer. The CPU serves as a "brain" of the computer.

The functions of the processor are:

- To control the use of main storage to store data and instructions.
- To control the sequence of operations.
- To give commands to all parts of the computer system.
- To carry out-processing.

**Main components of CPU:**

1. Arithmetic and Logic Unit (ALU)
2. Control Unit (CU)
3. Memory Unit

- **Arithmetic and Logic Unit:**

The arithmetic and Logic unit can perform the arithmetic operations and integer (whole number) and real number (decimal point) including addition, subtraction, multiplication and division. It can also perform simple logical tests for equality, greater than and less than between two data items. There is one such register called accumulator, which is used to store intermediate results obtained during any arithmetical computations.

- Performs logical operations on data
- Performs arithmetic operations on data
- Sends data to memory unit after process

- **Control Unit:**

The control unit co-ordinate and control all the other parts of the computer. So that it is responsible for execution of instructions. Under the direction of a program, the control unit manages and controls all hardware operations, those of the peripheral, main memory and the processor itself. The control unit consists of several registers like address register, instruction register, sequence register, decoder etc. Control unit acts as a nervous system. It maintains the order and directs the operations of entire system by selecting and interpreting for execution of program instructions. When a program is executed, a number of steps are to be followed by the computer system.

- The instruction is selected by the sequence register and sends to the instruction register.
- The operation part of the instruction is send to the decoder and address part to the address register.
- The control unit issues order to extract the contents from the address and transfer them to ALU.
- The sequence register moves on the next instruction.

- **Memory Unit:**

Memory unit is another main part of CPU that consists of various memory elements like registers, cache memory to store the data for the processing and during the processing. It is sometimes called Primary memory or internal memory which directly attached with the system board.

**Registers:** Registers are electronic devices made from transistor flip-flops, which serve as temporary storage device in the CPU. Registers quickly accept, store and transfer the data and instructions that are being used immediately. When the executing instruction, the control unit of the CPU retrieves it from main memory and places it into a register. Registers are very fast compared to memory address.

## 4. Storage Unit:

Storage Unit of computer also called Memory unit which is the main part of the computer which performs the storage function in the computer system. Mostly two types of memories can be seen in computer system. Memory unit or storage unit stores data, instructions and programs temporarily and permanently. It has two main functions: storing processed data for future use permanently and providing data to the memory unit when required. It has two types: Primary memory and secondary memory. Sometimes optional memory also counts as another type of memory.

### 4.1 Main Memory (Primary Memory):

Main Memory is the principal internal memory system of the computer. The primary memory is the working space used by the computer to hold the program that is currently running, along with data it needs and to run programs process data. Primary memory is a fast, expensive memory, which allows the computer to access data very quickly. Primary memory is necessary for the computer because it stores all the data, files and programs for the processing, during the processing and after the processing. Main memory is attached to the processor with its address and data buses. It has limited capacity to store data and information. Each bus consists of a number of electrical circuits or bits. There are two types of memory which listed below:

- RAM (Random access Memory)



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- ROM (Read Only Memory)

➢ ***RAM:*** The RAM is the temporary memory in a computer. When electric power is failure then data will be lost in computer. So it is also known as Volatile non-permanent memory. RAM is a high-speed memory that holds a copy of the operating system currently running programs and other information being processed. It can be written to and read from at any time. There are two types of RAM such as DRAM (Dynamic Random Access Memory), SRAM (Static Random Access Memory). DRAM is a main primary storage device. It is very popular memory technology because of its high density and low price. The SRAM has a low bit density, high power consumption and it is more expensive.

**Differences between SRAM and DRAM:**

| SN | SRAM | DRAM |
|---|---|---|
| **1.** | SRAM stands for Static RAM. it holds information in a flip flop circuit consisting six transistors which is needed in each memory chip. | DRAM stands for Dynamic RAM. It holds information in stray capacitors. Less numbers of transistors requires per memory cell. |
| **2.** | It is expensive. | It is less expensive. |
| **3.** | It s speed is high. | Its speed is slower than SRAM. |
| **4.** | It occupies large space. | It occupies less space. |
| **5.** | High power consumption | Less power consumption |
| **6.** | Refresh circuit is not required. | Refresh circuit is required. |
| **7.** | It has long data lifetime | It has short data lifetime |

➢ ***ROM:*** ROM is the permanent Memory of computer. The user cannot write ROM. In other words, a user can only read information stored in it. The combination of hardware and programs written permanently in the ROM chips is called firmware. So, It is not core (volatile) memory. When a computer switches on, a sequence of operations is carried out automatically.

**Advantages of ROM**

- Non-volatile in nature
- These cannot be accidentally changed
- Cheaper than RAMs
- Easy to test
- More Reliable than RAMs
- These are static and do not require refreshing
- Its contents are always known and can be verified

**ROM is mainly of three types:**

- **MROM (Masked ROM) :**The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are known as masked ROMs. It is inexpensive ROM.

- **PROM (Programmable Read Only Memory)**

Programmable read only Memory is a memory that can be modified once by a user. Once the operations are written into a PROM chip, they cannot be changed. Inside the PROM chip, there are small fuses, which are burnt open during programming. The user buys a blank PROM and enters the desired contents using a PROM programmer. It can be programmed only once and is not erasable.

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

Erasable Programmable read only Memory is a memory that can be erased and re-use. It is designed to overcome the problem of PROM and ROM. All the storage cells must be erased to the same initial state. Information stored in EPROM exposing the chip for some time ultraviolet light and it erases chip is reprogrammed using a special programming facility. When the EPROM is in use information can only be read. This type of memory is used in product development and experimental projects. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than ten years because the charge has no leakage path.

- **EEPROM (Electrically Erasable Programmable Read Only Memory)**

EEPROM is a user modifiable read only memory that can be erased and written to repeat with special electrical pulse. It has a limit life number of times i.e. it can be written ten, hundreds or thousands of times or reprogrammed about ten thousand times. The EEPROM is a kind of EPROM chip which doesn't have to be removed and sent back to the manufacturer to be reprogrammed. It scan be reprogrammed while in circuit using a software program designed specially for that purpose. Both erasing and programming take about 4 to 10 ms (milli second). EEPROMs can be erased one byte at a time, rather than erasing the entire chip.



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| Sr. | RAM | ROM |
|---|---|---|
| 1. | RAM stands for Random Access Memory. | ROM stands for Read only memory. |
| 2. | It is read and write memory. | It is a read only memory. |
| 3. | It stores data temporarily. | It stores data permanently. |
| 4. | The contents of RAM can be lost if electricity power is off so called volatile memory. | The contents of ROM cannot be lost if electricity power is off so called non-volatile memory. |
| 5. | The instructions of RAM can be written and modified by the user. | The instructions of ROM can only be written by manufacturer company. |
| 6. | It is expensive than ROM. | It is cheaper than RAM. |

- **CACHE MEMORY:**

The cache (pronounced as 'cash') memory is placed in between CPU and main memory. It is a semiconductor memory. It consists of static RAM. It is a special and very high speed memory called a cache is used to increase the speed of processing by making current program and data available to the CPU at a rapid rate. It stores instruction codes and data, which are to be currently executed by the CPU. It acts as a buffer between the CPU and main memory. It is used to hold those parts of data and program which are most frequently used by CPU. The parts of data and programs are transferred from disk to cache memory by operating system, from where CPU can access them. The advantage of cache memory is that the CPU does not have to use the motherboard's system bus for data transfer. It is used to reduce the average access time for instructions and data, which normally stored in main memory. The cache memory is employed in computer systems to balance for the speed difference between main memory access time and processor logic.

**Advantage**

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

**Disadvantage:**

- Cache memory has limited capacity.
- It is very expensive.

- **VIRTUAL MEMORY:**

Virtual memory is a technique that allows execution of processes that may not be entirely in memory. Virtual memory is primary storage that does not actually exist. The computer system itself maintains illusion through a combination of hardware and software technique. Virtual memory allows mapping of a large virtual address space on to a smaller physical memory. Before program can be executed, each of its instructions must be resident in the real primary memory. Essentially, virtual memory involves storing in primary only those instructions of program are currently executing, and executing reminder on less expensive secondary storage. Virtual memory allows the computer to execute a program even though only a part of program (which called pages) is in primary memory. Virtual memory has two major advantages:

- CPU is utilized more fully. Pages of many different programs can reside in main storage at any time.
- Programmers no longer need to concern themselves about primary memory size constraints when writing programs.

- **FLASH MEMORY:**

The flash memory is used in battery driven digital devices such as handheld computers, Cell phones, Digital Cameras, MP3 Players etc. Due to low power consumption, it is electrically erasable and programmable permanent type memory. It is Just unlike EEPROM. It has the features of the pulse programming. The entire unit or the block is erased and reprogrammed as a whole at a time. It is suitable for storing firmware or codes. Flash memory chip up to 1 GB has been also developed.

### 4.2 Secondary Memory

All the computers require some kind of machine to store and retrieve data. The internal primary memory of the computer may not be large enough to hold all the required instructions and data, primary memory storage capacity is temporary in nature, so we require additional storage facilities to store the information and retrieve. This is possible through the use of secondary storage. Secondary storage units are an internal part of a computer's peripheral equipment. It is a long-term storage for data, instructions and programs. Storage media facilitates the storage of large volume of data on a more permanent basis for future reference. Modern removable storage media can be categorized into two types: Magnetic, optical storage devices. **Magnetic storage devices** are Magnetic tape, Hard disk, Floppy disk etc.

- **Magnetic Tape:** Magnetic tape is 0.5 inch wide made of plastic ribbon coated on one side with an iron oxide material. Magnetic tape is a cheaper means for storing large amounts of data but access to any particular portion

is slow. A magnetic tape unit typically has a single read/write head, but many have separate heads for reading and writing. A tape is suitable for storing large amount of data, such as backups of disks or scanned image.

- **Hard disk:** Hard disk is storage medium within the computer that stores and provides relatively quick access to large amount of data on an Electro-magnetically charges surface. A hard disk is made up of aluminum material that is coated with iron oxide on both sides, which allows data to be magnetically recorded.
- **Floppy Disk:** A floppy disk is coated of ferric oxide. The floppy disk allows you to install new programs, increase hard drive space by saving information to the floppy and backup files on them. A floppy is media of computer because we can transfer data from one computer to another. According to size and capacities there are two types of floppy disks: Mini floppy disk and Micro floppy disk.
    - **Mini floppy disk 5.25 inch :** MD-2DD Mini disk double side double density-360 kb, MD- 2HD MD-2DD Mini disk double side High density-1.2MB
    - **Micro floppy disk 3.5 inch :**MF- 2DD Micro floppy double side double density-720 kb,MF- 2HD Micro floppy double side high density-1.44mb

**Optical storage disk:**

- **Compact Disk (CD)**

  The most popular among all optical storage devices is the compact disk read only memory (CDROM) type, which are found in almost all computers. It is non-volatile optical data storage medium using the same physical format as audio compact disk. CDROM is popular for distribution large databases, software and especially multimedia applications. The standard 12-cm diameter CDROM store about 660MB.

- ***Read and Write Optical disk***

The users many read and write data many times on Read/Write optical disks. Usually magneto-optical method is used to read and write data on this type of disks. Therefore they are also called magneto-optical disks. Magneto-optical disks can be erased and rewrite. It can store data about 650MB.

## 5. BUS:

A bus basically a collection of wires chips and slots inside the computer through which data are transmitted from one part of the computer to another part. It is often compared to a 'Highway'. There are three types of buses according to its functions: Data Bus, Address Bus and Control Bus.

- **Address BUS:** The address bus is a group of lines used to identify a peripheral or a memory location. The microprocessor uses the address bus to perform the first function identifying a peripheral or a memory location. In computer system, each peripheral or memory location is identified by a binary number, called an address, and the address bus is used to carry the binary as address. This is similar to the postal address of a house.
- **Data BUS: The** data bus is a group of lines used for data flow. These line flow in both directions the microprocessor and memory. The microprocessor uses the data bus to transfer data from one location to other.
- **Control BUS:** Control Bus is not group of lines like addresses and control bus but individual lines that provide a pulse to indicate and microprocessor operation. The microprocessor generates specific control signals for every operation it perform**.**

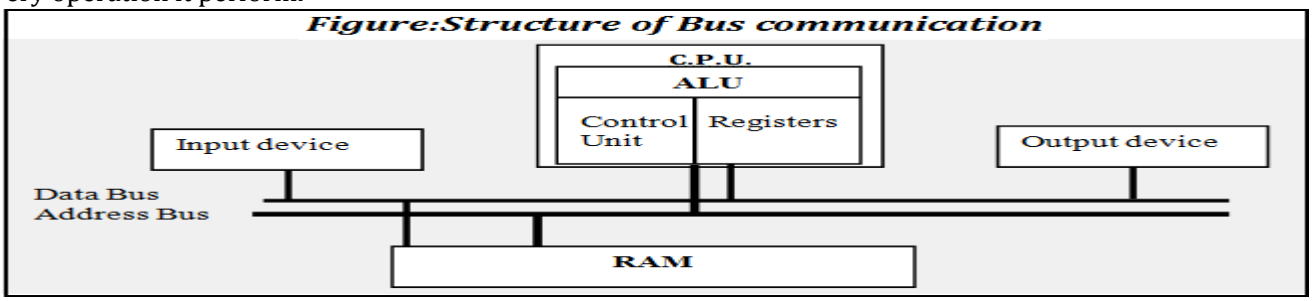



***Figure:Structure of Bus communication***

## 5. MICROPROCESSOR:

The microprocessor is the heart of any normal computer, whether it is a desktop machine, a server or a laptop. A microprocessor is also known as a CPU or central processing unit. It is a complete computation engine that is fabricated on a single chip. The first microprocessor was the "Intel 4004", introduced in 1971 by Intel corporation, USA. The microprocessor is built onto a single piece of silicon, known as a chip. Its size is about 0.5 cm, along one side and not thicker more than 0.05 cm. A microprocessor, many function by itself in a wide range of application, incorporating from as several elements on its single chip. Microprocessors are classified in terms of the number of bits of information that can be transferred in parallel and held in their registers. It is a multipurpose, programmable device that accepts digital data as input, processes it according to instructions stored in its memory, and provides results as output.

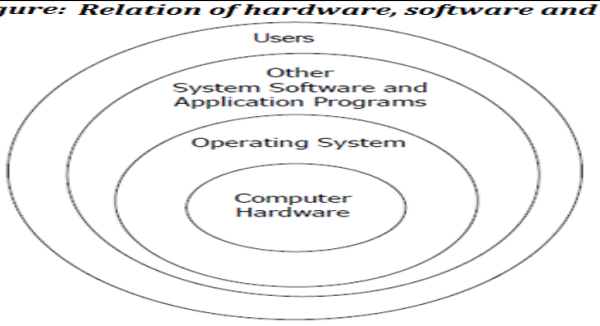
**6. MODEM:** It is stands for Modulator and Demodulator. It is combination media. This device referred as Input and output device. This device is capable to convert data into audio frequency (analog signals) and vice-versa. Email,

Internet is running by using Modem, PC and telephone line.

## 7. INTRODUCTION OF SOFTWARE:

As you know computer cannot do anything without instructions from the user. A computer is basically a lump of metal without software. In order to do any specific job you have to give a sequence of instructions to the computer. This set of instructions is called a computer program. Software refers to the set of computer programs, procedures that describe the programs, how they are to be used. We can say that it is the collection of programs, which increase the capabilities of the hardware. Software guides the computer at every step where to start and stop during a particular job. The process of software development is called programming. So, software is the set of computer programs, booting instructions, procedures and associated documentation related to the effective operations of the computer system. Software is logical glue which can hold a computer system and several digit devices of all kinds of together in coherent system.

*Figure: Relation of hardware, software and user*




You should keep in mind that software and hardware are complementary to each other. Both have to work together to produce meaningful result. Another important point you should know that producing software is difficult and expensive.

### TYPE OF SOFTWARES:

Computer software is normally classified into two broad categories.

- System software
- Application Software

**System Software:** You know that an instruction is a set of programs that has to be fed to the computer for operation of computer system. When you switch on the computer the programs written in ROM is executed which activates different units of your computer and makes it ready for you to work on it. This set of program can be called system software. Therefore system software may be defined as a set of one or more programs designed to control the operation of computer system. System software are general programs designed for performing tasks such as controlling all operations required to move data into and out of the computer. It communicates with various computer peripheral devices like printers, card reader, disks, tapes etc. and monitors the use of various hardware components like memory, CPU etc. System Software allows application packages to be run on the computer with less time and effort. Remember that it is not possible to run application software without system software.

Development of system software is a complex task and it requires extensive knowledge of computer technology. Due to its complexity it is not developed in house. Computer manufactures build and supply this system software with the computer system. DOS, UNIX and WINDOWS are some of the widely used system software. Out of these UNIX is a multi-user operating system whereas DOS and WINDOWS are PC-based. We will discuss in detail about DOS and WINDOWS in the next module. Some types of system software:

- **Operating system software:** Windows 95/98/2000/XP/NT, UNIX, LUNIX, Netware, MS-DOS etc.
- **Language processors:** Compiler, Assembler, Interpreter, Loader, Linker etc.
- **Utility Software:** Disk formatting utility, Data compression utility, Data backup utility, Antivirus utility.

**Operating system software:**

Operating System is an organized collection of software program which manages overall operations of computer the computer system. Operating system is a resource manager which allocates and manages various resources like processor, main memory, input system, output system devices and information on secondary storage devices. Operating system creates link between Hardware and Software and user of the computer. It hides the details of hardware resources from the users and provides them with a convenient interface for using a computer system. It is responsible for the smooth and efficient operation of the computer system. Operating System is very important because it sets both the environment in which the user interact with the computer and the environment in which the user's program work. This is the basic requirement of a computer system. For instance, A car has many parts and components those connected with each other and without fuel or petrol we cannot run the car. So the operating system is also the fuel of the computer machine. Operating Systems are system software which creates link between user and computer hardware so it plays vital role in the computer. Some system software or operating systems



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are Window95/98/2000/XP/Vista, Novell Netware, UNIX, Linux etc.

**Why is Operating system important?**

- OS is important because it sets the environment between Computer Hardware, Computer Software and User.
- OS is important because it sets the working limits of the computer Hardware.
- OS is important because it controls the various application programs such as word processor, Spread Sheets ,Database Managers, Graphical packages etc.
- OS is important because it provides house-keeping and file management utilities that performs useful tasks such as disk operations, file operations etc.

**Classification of Operating System:**

**1.** Single User Operating System :MS-DOS, Windows 98,Windows XP
**2.** Multi User Operating System :Windows NT,UNIX, Novell Netware
**3.** Multiprocessing Operating System :Windows, UNIX, OS/2
**4.** Multitasking Operating System :Windows , Apple Mac OS

**Main Functions of Operating System:**

- **Memory Management:** Takes care of allocation and de-allocation of memory space to the programs in need of the resources.
- **File Management:** Takes care of file related activities such as organization, storage, retrieval, naming, sharing and protecting of files.
- **I/O Management:** Keeps track of I/O devices .There which device is in use and by which job that device is using. The OS decides and allocates the devices to the job and de-allocates device after the completion of the job.
- **Process Management:** Takes care of creation and deletion of processes, scheduling of system resources to different process requesting them and providing mechanism for communication between the processes.
- **Security Management:** Protects the resources and information of a computer against destructions and unauthorized access.

## Some operating system software:

1. **Microsoft Disk Operating System: MS-DOS** is a system software or operating system used to make control over the machine which was developed by Microsoft, USA in 1981. It is a popular operating system for microcomputers. Especially it is designed for IBM PC and other computers. MS-DOS performs the operations of input output management, memory management disk checking and formatting, controls the flow of data from one part of the computer to other parts .It responsible for controlling peripheral devices such as monitor, keyboard, printers, modems etc. It recognizes any input to the computer by input device, processes and provides output through suitable output devices.

**Features of MS-DOS:**

- It is a Single Use and Single tasking OS software.
- It is a Character User Interface(CUI) based OS
- It Supports Various Languages.
- It manages easy filing environment.
- It supports Hard disk and Floppy disk also.

**Disadvantages of MS-DOS:**

- One User can Work at a time.
- One application can run at a time.
- It does not support Graphics.
- It does not support Networking.
- We can only make 2GB of Maximum partition as it supports only FAT 16.

2. **Windows Operating System:** Windows an application share set up commands, for example open, save, and print files. Windows makes it easy to switch programs, the set up program to share data between programs. It's graphic skill make it possible to mix both character base program. Such as painting and drawing application and move text or image easily between one applications to another. The Windows operating system add several features to windows graphical environment and actually improves its performance among the new features are object linking embedding (OLE) which allows graphics text data files and support for multimedia. It has various components like desktop, taskbar, icons (My document, My computer, Recycle Bin, My Network Places),System tray etc. In summary we can define it **as "Windows is an operating system which is a Graphical User Interface based organized collection of software programs that manages overall operations of the computer system."**

***The main Features of Windows Operating System:***

- Windows is easier to learn and use.
- Using Windows allows the user to work on a number of applications simultaneously.
- Windows has features of communication with other computers.



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- Windows has many built in programs.
- Windows has very fast processing capacity.
- Windows helps to run the multiple applications at a time.
- Windows is Graphical User Interface based software. It's every item is in graphical form.
- Windows contains Icons, desktop, system Icon tray, Taskbar, and other parts which makes easy to handle the system.

| Sr. | GUI Operating System | CUI Operating System |
|---|---|---|
| 1. | It based on Graphical user interface mode and instructions are given using graphical components like menu bar , tools bar etc. | It based on command user interface mode and instructions are given using characters. |
| 2. | It is graphical and user friendly and easy to learn and operate. | It is more textual and less user friendly and difficult to operate and learn. The user should memories the |
| 3. | It is very common and we can preview the contents before print | It is less common and impossible to preview the contents like GUI |
| 4. | It uses keyboard, mouse, and other advance devices | It only uses keyboard and not compatible with other devices. |
| 5. | It consists of different components such as text box ,icon, desktop, pointing devices etc. | Use Commands to operate the system. |
| 6. | It supports multi-user and multiprocessing system and it executes multiple programs simultaneously. | It supports Single-user and Single processing system and it executes multiple programs simultaneously. |
| 7. | Example: Windows XP, Windows Vista, Windows 8 | Example: Ms-DOS, PC DOS |

**Application Software:** Application Software is a set of programs to carry out operations for a specific application. It helps the user work faster, more efficiently and more productively. Application software may be written by a large software house which distributes this product widely to address general class problems or may be written by an individual to address particular problem. For example, payroll is application software for an organization to produce pay slips as an output. Application software is useful for word processing, billing system, accounting, producing statistical report, analysis of numerous data in research, weather forecasting, etc. MS WORD, Lotus 1-2-3 and dBase III Plus are some examples of application software.

**Types of Application Software:**

- **Tailored Software:** Tailored software is software specially designed to meet the specific requirement of an organization or individual. Tailored software is written on the demand of an individual need and serves only one user or organization. For different purposes different tailored programs are written. Example: Result processing of SLC, Payroll software, Sales Ledgers etc. Tailored Software are written in high level language such as BASIC, PASCAL, FORTRAN, C, C++.
- **Package Software:** Package software is a generalized set of programs that allows the computer to perform specific data processing job for the users. These programs are user friendly and designed to work on more than one environment. Example: Word processing, Spreadsheet software, Database software, Graphics Software, Entertainment software.

## Firmware:

In electronic systems and computing, firmware is a term often used to denote the fixed, usually rather small, programs and/or data structures that internally control various electronic devices. Typical examples of devices containing firmware range from end-user products such as remote controls or calculators, through computer parts and devices like hard disks, keyboards, memory cards, all the way to scientific instrumentation and industrial robotics. Also more complex consumer devices, such as mobile phones, digital cameras, synthesizers, etc., contain firmware to enable the device's basic operation as well as implementing higher-level functions.

Firmware refers to a sequence of instructions such as software substituted for hardware. This type of software is stored in a read only memory (ROM) chip of the computer, and is executed or used whenever computer has to perform any operation which demanded or commanded by the user. The increased use of firmware has today made it possible to produce to smart machines of all types. The programs stored in ROMs, PROMs, EPROMs or Flash Memory is known as firmware.

## 8. POINTS TO CONSIDER WHEN BUYING A NEW COMPUTER SYSTEM:

There was a time when computers were so expensive that, to own one was beyond the mere of a common man and, they were only affordable by the elite of the society. Times have changed and the prices of the computers have fallen so drastically that it has been moved from the lists of luxury items to the lists of essential items in a household. They have become so cheap that you can easily buy a brand new personal computer with basic configuration in very

low price .Some points to be considered before you purchase a new computer:

- **Identify the purpose behind purchasing the computer:** This is one aspect which people usually tend to forget or neglect. As a result they end up buying a system with configuration higher than their requirement or one with higher price than what would have been warranted given their requirements Common personal uses include browsing the net, sending and receiving emails, chatting, word processing, listening to music, watching movies and watching T.V.
- **Financing your purchase:** While buying a computer, its important to identify your budgetary constraints. Prices vary with the configuration and also with the brand.
- **Whether branded or assembled:** This is an aspect where people normally make uninformed decisions. Computers available in the market are divided into two categories Branded and Assembled computers. Branded computers are those that are manufactured by big Brands e.g. HCL , Lenovo ,Compact etc. These companies assemble computers in their manufacturing units and provide it to the customers with their warranty.
- **Warranty for the Computer and its Components:** In terms of warranty, a branded computer comes with a wrapper warranty covering the entire computer for a fixed period of time like 1 year, 2 year,3 year with an option to extend the warranty. On the other hand, assembled computers come with a warranty from the assembler and the warranties provided by the component manufacturers.
- **Knowledge of hardwares:** Before you buy a computer it is always good to read up about the different components that make up a best Personal Computer. Additionally you should also do some research about the current trends in the market and learn about the different options you have while deciding your configuration.
  * Processor * Motherboard *RAM * Monitor * Hard Disk Drive * CD/DVD Drive
  * Floppy Drive *Cabinet and SMPS * Printer * Speaker * UPS

Once you have a fair understanding about the components, go talk to a few dealers about your requirements.

- **Buying Place:** Visit few trading centers, some websites to find the price and other facilities. Purchase computer from the trading house which is well established and reliable. They provide support and give suggestions to handle your Computer.

## 9. COMPUTER NETWORKS:

Computer Network is a global system of distributed computers included hardware and software interconnected through communication media such as guided media and unguided media that used to communicate and provide user accessibility to share available resources such as hardware, application software, peripherals devices, processing powers etc. A network consists of two or more computers that interconnected with each-other through guided media such as cables, telephone lines or unguided communication media such as Radio waves, Satellites, Infrared Light beams etc. When computers on the network they can transfer data, information and programs among themselves. The computer that provides resources to other computers on a network is known as server. In the network the individual computers, which access shared network resources, are known as workstations or nodes. Offices, Organizations, companies, Universities, Colleges ,Schools etc. keep their computers on the network for the purpose of share computer hardware like printer, scanner; send or receive message or communication with each other ;to share data and information and software and programs etc.

**Components of Computer networks:**

- Computer System
- Networking Media : Guided media or Unguided media
- Networking Hardware : File server, Workstation, Repeater, Switch, Hub, Router, NIC
- Network Operating Softwares : Linux, Unix, Novel Netware, Windows, Sun Solaris

**Advantages of Computer Networks:**

- Shearing data, information and programs.
- Sharing of networked connected peripheral devices and hardware.
- Software and application sharing
- Processing capability sharing
- Easier backup process.
- Establishing communications.
- Access to Remote database
- Security

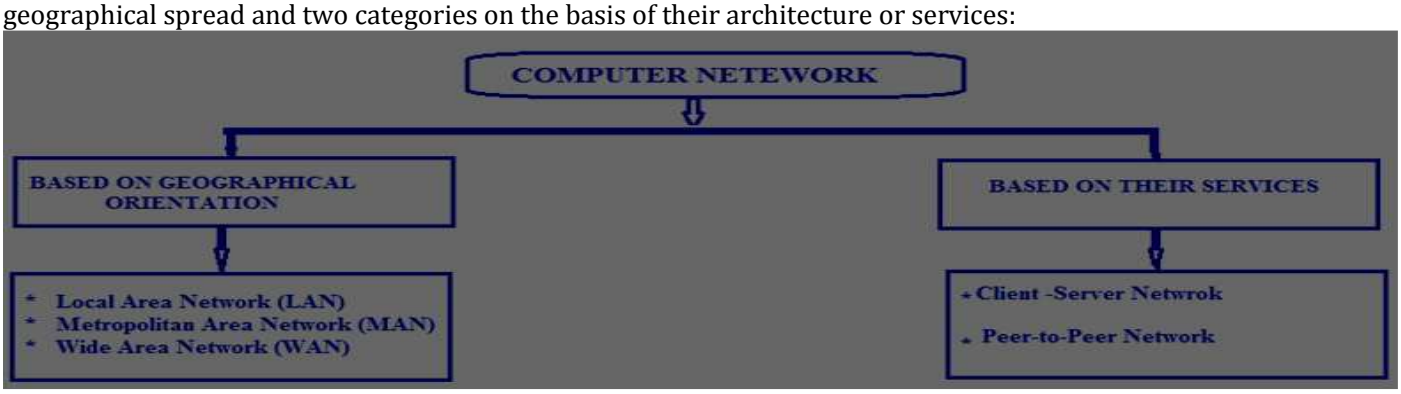
**Disadvantages of Computer Networks:**

- Computer network faults can cause loss of data and resources.
- Chance of Virus spreading.
- Required skilled professional to handle and maintain.
- Wiring can be expensive both to buy and to install.
- If a WAN is used, sophisticated equipment and cost required to pay.

### Types of Computer Networks or Network Categories:

The size and complexity of a network may vary from just two computers connected together to a chain of a few

hundred computers of different types spread around the world. Thus, Networks vary in size, complexity and geographical spread. The entire computer network can be classified into three categories depending on the basis of geographical spread and two categories on the basis of their architecture or services:




**1. Local Area Network (LAN):**

Networks used to interconnect computers in a single room, rooms within a building or buildings on one site are called Local Area Network (LAN). LAN transmits data with a speed of several megabits per second ($10^6$ bits per second). The transmission medium is normally coaxial cables. Usually LAN links computers within a limited geographical area because they must be connected by a cable, which is quite expensive. Because of this information exchange most of the business and government organizations are using LAN. LAN is mostly used for File transfers and Access, Word and text processing, Electronic message handling, Remote database access, Personal computing, Digital voice transmission and storage.

- Every computer has the potential to communicate with any other computers of the network
- High degree of interconnection between computers
- Easy physical connection of computers in a network
- Inexpensive medium of data transmission
- High data transmission rate

**Advantages of LAN**

- Addition of new computer to network is easy.
- High rate of data transmission is possible.
- Peripheral devices like magnetic disks , fax, scanner and printer can be shared by other computers.
- The reliability of network is high because the failure of one computer in the network does not effect the functioning for other computers.

**Disadvantages of LAN**

If the communication line fails, the entire network system breaks down.

**2. Metropolitan Area Network (MAN):**

Metropolitan Area Network is a network of computers spread over a city or town located in the same geographical area. This network is used as links between office buildings in a city. They typically used wireless infrastructure or optical fiber connections to link their sites. Cellular phone network, Cable television (CATV) are good examples of such network.

**Advantages of MAN**

- It covers larger than a LAN.
- It is owned by a single or multiple organizations.
- It uses cables or wireless media for connecting computers.
- ISP provides MAN services to organizations or offices which in turns require paying the service provider.

**3. Wide Area Network (WAN):**

The term Wide Area Network (WAN) is used to describe a computer network spanning a regional, national or global area. For example, for a large company the head quarters might be at Delhi and regional branches at Bombay, Madras, Bangalore and Calcutta. Here regional centers are connected to head quarters through WAN. The distance between computers connected to WAN is larger. Therefore the transmission mediums used are normally telephone lines, microwaves and satellite links.

**Characteristics of WAN**

Followings are the major characteristics of WAN.

- **Communication Facility:** For a big company spanning over different parts of the country the employees can save long distance phone calls and it overcomes the time lag in overseas communications. Computer conferencing is another use of WAN where users communicate with each other through their computer system.
- **Remote Data Entry:** Remote data entry is possible in WAN. It means sitting at any location you can enter data, update data and query other information of any computer attached to the WAN but located in other cities. For example, suppose you are sitting at Madras and want to see some data of a computer located at Delhi, you can do it through WAN.
- **Centralized Information:** In modern computerized environment you will find that big organizations go

for centralized data storage. This means if the organization is spread over many cities, they keep their important business data in a single place. As the data are generated at different sites, WAN permits collection of this data from different sites and save at a single site.

**Examples of WAN:** Internet, Intranet, Extranet, Ethernet, Arpanet etc.

- **Ethernet:** Ethernet developed by Xerox Corporation is a famous example of WAN. This network uses coaxial cables for data transmission. Special integrated circuit chips called *controllers* are used to connect equipment to the cable.
- **Arpanet:** The Arpanet is another example of WAN. It was developed at Advanced Research Projects Agency of U.S. Department. This Network connects more than 40 universities and institutions throughout USA and Europe.

**Client-Server and Peer-to Peer Network:**

Client-Server Network is a type of computer network in which one powerful computer server provides services to the general computer client. This model is also called Domain model. Sever computer provides various file services, print services, database services, network services to the client or workstation computer on the network. This type of network is widely used for the cartelized control the several devices and distribution of application services. Peer-to-peer network is another type of network architecture in which several workgroup systems are connected with each other. The equal responsibilities have distributed among the computers and devices.

**Difference between Client-Server and Peer-to Peer Network:**

| SN. | Client-Server Network | Peer-to-Peer Network |
|---|---|---|
| 1. | Client-Server Network consist the Server and Client computers where Server provides services to the client computer. | Peer-to-Peer Network consists the workgroups where are no service provider computers. |
| 2. | There is centralized control in this network. | There is no centralized control in this network. |
| 3. | It is also referred to as domain model. | It is referred as workgroup model. |
| 4. | Responsibilities distributed as powerful and normal computers in this system. | Responsibilities are equally distributed for all the computers. |
| 5. | Expensive system for network than peer-to-peer network. | Cheaper system for network than client-server network. |
| 6. | It covers larger geographical area. | It covers smaller geographical area. |
| 7. | This network is easier to expand. | This network is difficult to expand. |

## 10. NETWORK TOPOLOGY:

The term topology in the context of communication network refers to the way the computers or workstations in the network are linked together. According to the physical arrangements of workstations and nature of work. Network topologies describe the ways in which the elements of a network are mapped. They describe the physical and logical arrangement of the network nodes. The physical topology of a network refers to the configuration of cables, computers, and other peripherals. They are three main topologies star topology, bus topology and ring topology.

**Different Types of Topologies:**

- Bus Topology
- Star Topology
- Ring Topology
- Mesh Topology
- Tree Topology
- Hybrid Topology

**Star topology:**

In star topology a number of workstations (or nodes) are directly linked to a central node. Any communication between stations on a star LAN must pass through the central node. In a star network, each node (file server, workstations, and peripherals) is connected to a central device called a hub. In a star network, each node (file server, workstations, and peripherals) is connected to a central device called a hub. The hub takes a signal that comes from any node and passes it along to all the other nodes in the network. Data on a star network passes through the hub, switch, or concentrator before continuing to its destination. The hub, switch, or concentrator manages and controls all functions of the network. The star topology reduces the chance of network failure by connecting all of the systems to a central node. There is bi-directional communication between various nodes. The central node controls all the activities of the nodes.

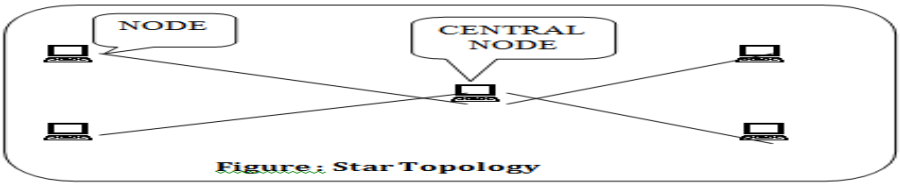



Figure: Star Topology

***Advantages of Star Topology***



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- Easy to manage
- Easy to locate problems (cable/workstations)
- Easier to expand than a bus or ring topology.
- Easy to install and wire.
- Easy to detect faults and to remove parts.

***Disadvantages of Star Topology***

- Requires more cable length than a linear topology.
- If the hub or concentrator fails, nodes attached are disabled.
- More expensive because of the cost of the concentrators.

**2. Bus Topology:**

In bus topology all workstations are connected to a single communication line called *bus*. All the nodes (file server, workstations, and peripherals) on a bus topology are connected by one single cable. A bus topology consists of a main run of cable with a terminator at each end. All nodes (file server, workstations, and peripherals) are connected to the linear cable. Popular on LANs because they are inexpensive and easy to install. In this type of network topology there is no central node as in star topology. Transmission from any station travels the length of the bus in both directions and can be received by all workstations.

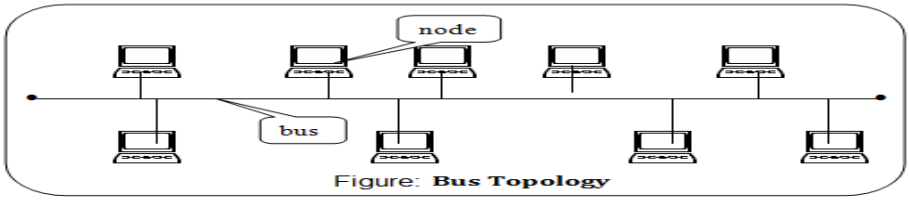

Figure: **Bus Topology**

***Advantages of Bus Topology***

- It is Cheap, easy to handle and implement.
- Require less cable
- It is best suited for small networks.

***Disadvantages of Bus Topology***

- The cable length is limited. This limits the number of stations that can be connected.
- This network topology can perform well only for a limited number of nodes.

**Ring Topology:**

In ring topology each station is attached nearby stations on a point to point basis so that the entire system is in the form of a ring. In a ring network, every device has exactly two neighbors for communication purposes.

In this topology data is transmitted in one direction only. Thus the data packets circulate along the ring in either clockwise or anti-clockwise direction. All messages travel through a ring in the same direction. A failure in any cable or device breaks the loop and can take down the entire network. To implement a ring network we use the Token Ring technology. A token, or small data packet, is continuously passed around the network. When a device needs to transmit, it reserves the token for the next trip around, then attaches its data packet to it.

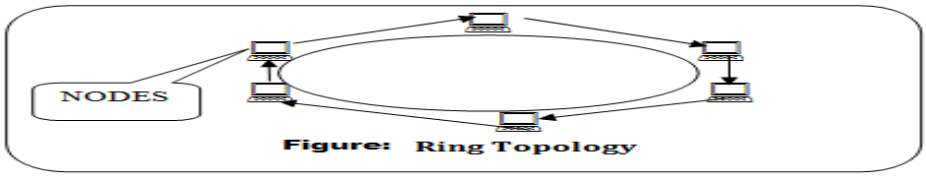

**Figure: Ring Topology**

***Advantage of Ring Topology***

- Very orderly network where every device has access to the token and the opportunity to transmit.
- Easier to Mange than a Bus Network
- Good Communication over long distances
- Handles high volume of traffic

***Disadvantages of Ring Topology***

- The failure of a single node of the network can cause the entire network to fail.
- The movement or changes made to network nodes affects the performance of the entire network.

**Tree Topology:**

A tree topology (hierarchical topology) can be viewed as a collection of star networks arranged in a hierarchy. This tree has individual peripheral nodes which are required to transmit to and receive from one other only and are not required to act as repeaters or regenerators. The tree topology arranges links and nodes into distinct hierarchies in order to allow greater control and easier troubleshooting. This is particularly helpful for colleges, universities and schools so that each of the connect to the big network in some way.



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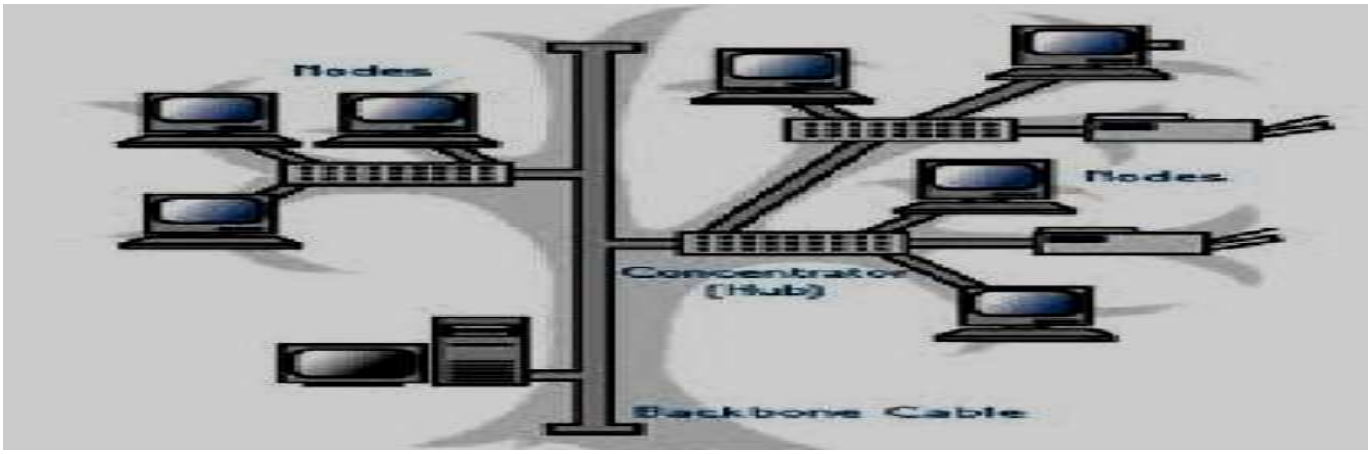



***Advantages of a Tree Topology***

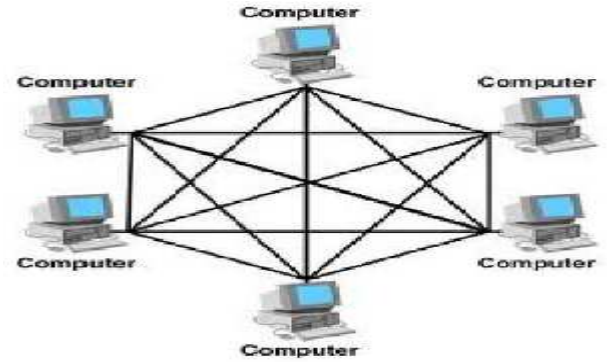
• Point-to-point wiring for individual segments.
• Supported by several hardware and software vendors.
• All the computers have access to the larger and their immediate networks.

***Disadvantages of a Tree Topology***

• Overall length of each segment is limited by the type of cabling used.
• If the backbone line breaks, the entire segment goes down.
• More difficult to configure and wire than other topologies.

**Mesh Topology**

In this topology, each node is connected to every other node in the network. Implementing the mesh topology is expensive and difficult. In this type of network, each node may send message to destination through multiple paths. While the data is travelling on the Mesh Network it is automatically configured to reach the destination by taking the shortest route which means the least number of hops.




***Advantage of Mesh Topology***

• No traffic problem as there are dedicated links.
• It has multiple links, so if one route is blocked then other routes can be used for data communication.
• Points to point links make fault identification easy.

***Disadvantage of Mesh Topology***

• There is mesh of wiring which can be difficult to manage.
• Installation is complex as each node is connected to every node.
• Cabling cost is high.

**Hybrid Topology**

A combination of any two or more network topologies. A hybrid topology always accrues when two different basic network topologies are connected. It is a mixture of above mentioned topologies. Usually, a central computer is attached with sub-controllers which in turn participate in a variety of topologies.



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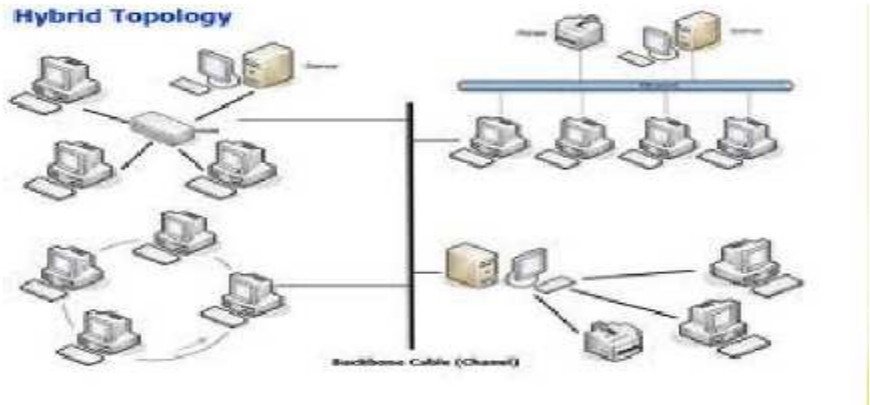


***Advantages of a Hybrid Topology***

- It is extremely flexible.
- It is very reliable.

***Disadvantages of a Hybrid Topology***

- Expensive



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