NON MAJOR ELECTIVE II - FUNDAMENTALS OF INFORMATION TECHNOLOGY

Objective :

To Provide the Basic Concepts in Information Technology:

Unit I - Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

Unit II - CPU and Memory - Secondary Story Devices - Input Devices - Output Devices.

Unit III - Introduction to Computer Software - Programming Language - Operating Systems - Introduction to Database Management System.

Unit IV - Computer Networks - WWW and Internet - Email - Web Design

Unit V - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

Text Book: Fundamentals of Information Technology, Alexis Leon And Mathews Leon, Vikas Publishing House Pvt. Ltd, 2009

Reference Book: Fundamentals of Computers and Information Technology, M.N Doja, 2005

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Unit I

Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

INTRODUCTION TO COMPUTER:

A computer is a programmable machine. The two principal characteristics of a computer are:

- It responds to a specific set of instructions in a well-defined manner.
- It can execute a prerecorded list of instruction (a program).

Modern computers are electronic and digital. The actual machinery - wires, transistors, and circuits – is called hardware; the instructions and data are called software.

All general-purpose computers require the following hardware components:
> **Central Processing Unit (CPU):** The "heart" of the computer, the component that actually executes instruction.
> **Memory**: Enables a computer to store, at least temporarily, data and programs.
> **Input device**: Usually a keyboard or mouse, the input device is the conduit through which data and instructions enter a computer.
> **Output device**: A display screen, printer, or other such devices that lets you see what the computer has accomplished.
> **Mass storage device**: Allows a computer to permanently retain large amounts of data. Common mass storage devices include disk drives and tape drives.

In addition to these components, many others make it possible for the basic components of a computer to work together efficiently.

Types of Computers

Computers can be classified by their size and power as follows:
- **Personal computer**: A small, single-user computer based on a microprocessor. In addition to the microprocessor, a personal computer has a keyboard for entering data, a monitor for displaying information, and a storage device for saving data.
- **Workstation:** A powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and a higher-quality monitor.
- **Minicomputer:** A multi-user computer capable of supporting 10 to hundred of users simultaneously.

- **Mainframe**: A powerful multi-user computer capable of supporting many hundreds of users simultaneously.
- **Supercomputer**: An extremely fast computer that can perform hundreds of millions of instructions per second.

['/Characteristics of Computers:

All computers have certain common characteristics irrespective of their type and size. Computers are not just adding machines; they are capable of doing complex activities and operations. They can be programmed to do complex, tedious and monotonous tasks. Computes are what they are because of the following characteristics.

Word Length:

A digital computer operates on binary digits – 0 and 1. It can understand information only in terms of 0's and 1's. A binary digit is called a bit; a group of 8 bits is called a byte. The number of bits that a computer can process at a time in parallel it called its *word length.* Commonly used word lengths are 8, 16, 32, 64 bits. Word length is the measure of the computing power of a computer.

Speed:

Computer can calculate at very high speeds. A microcomputer, for example, can execute millions of instructions per second over and over again without any mistake. As the power of the computer increase, the speed also increases.

Storage:

Computers have their main memory and auxiliary memory systems. A computer can store a large amount of data. With more and more auxiliary storage devices, which are capable of storing huge amounts of data, the storage capacity of a computer is virtually unlimited. The factor that makes computer storage unique is not that it can store vast amount of data, but the fact that it can retrieve the information that the user wants in a few seconds.

Accuracy:

The accuracy of a computer system is very high, Errors in hardware can occur, but error detecting and correcting techniques will prevent false results. In most cases, the errors are due to the human factor rather than the technological flaws.

Versatility:

Computers are very versatile machines. They can perform activities ranging from simple calculations to performing complex CAD modeling and simulation to navigating missiles and satellites. In other words, they are capable of performing almost any task, provided the task can be reduced to a series of logical steps. Computers can communicate with other computers and cam receive and send data in various forms like text, sound, video, graphics, etc. This ability of

computer to communicate to one another has led to the development of computer networks, Internet, WWW and so on.

Automation:

The level of automation achieved in a computer is phenomenal. Once a task is initiated, computers can proceed on its own till its completion. Computers can be programmed to perform a series of complex tasks involving multiple programs. Computers will perform these things flawlessly.

They will execute the programs in the correct sequence, they will switch on/off the machines at the appropriate time, they will monitor the operational parameters, and they will send warning signals or take corrective actions if the parameters exceed the control level, and so on. Computers are capable of these levels of automation, provided they are programmed correctly.

Diligence:

Diligence means being constant and earnest in effort and application. Human beings suffer from weakness like tiredness, lack of concentration, etc. Being a machine, a computer does not have any of these human weaknesses.

They will not go into depression or lose concentration. They will perform the tasks that are given to them, irrespective of whether it is interesting, creative, and monotonous or boring, irrespective of whether it is the first time or the millionth time, with exactly the same accuracy and speed.

What Computers Can Do:

o Today computers are either directly or indirectly influencing almost every aspect of our lives.
o As computers became cheaper, the computers became something that the common man could afford.
o Today, computers of all sizes and shapes are used for every purpose imaginable.
o We use them at home, in schools, in supermarkets and so on.
o They do stock market analysis, publish a newsletter, design a building, and play games.
o Selling railway tickers, running microwave ovens.
o Businesses use computers for a variety of purposes ranging from decision-making to electronic commerce. Scientists and researchers use computers to develop theories to collect and test data, to simulate test environments, and to exchange information electronically.
o Researchers can access databases in distant locations from their desktop.
o In medicine, computers are used for everything from diagnosing illnesses to monitoring patients during surgery and controlling permanent prostheses.

- Computers have found their way to classrooms and everyone from school children to research students.
- An engineer or architect designing a product can be far more productive with a computer than with pencil and paper.
- Used for everything from production planning to process control.
- 1946, ENIAC – the first large-scale computer ever developed was created for the US army. Initially, it was used to compute artillery-shell trajectories for different distances and weather conditions. The military uses computers in a variety of ways-aboard ships, submarines and fighter planes as well as in certain weapons and satellites.
- Musicians and singers have teamed up with computers to create an amazing range of instruments and sound simply by playing a keyboard,
- The music concerts and movies all use computers for a variety of purposes ranging from producing astonishing special effects and computer animations to control stage lighting. Most of the household appliances and gadgets have computers in them. Fine tunes the images in your television.
- Automates your washing machine and microwave oven.

What Computers Can't Do:

There is no doubt that computers are fulfilling their promise to perform certain tasks better, faster and cheaper. Along with fears about computers, there have long been great expectations about how computers would revolutionize our world.

But some of the benefits people expected form computers way back in 1950's just haven't happened. They are,

Productivity: Computers haven't yet me all our expectations as a productivity improvement tool. Sometimes it takes longer to do things with a computer than it would to do them manually. Sometimes it takes too much to learn how to use an application program that is supposed to increase productivity.

Reasoning: A book entitled Cybernetics stated that the computer shared similarities with the brain and the human nervous system. We have built machines to replace human labour we also build machines that do certain kind of thinking for us. But computers still lack many of the mental capabilities possessed by five-year-old children. Simply put, computers can't think.

Errors: Computers don't make errors, people do – either in the way they program computes or in the way they use them. They use the principle of logic; every instruction must be precisely entered. The computer does not allow spelling mistakes or typos.

Many of the problems with computers occur because the computer can't tell the difference between doing something sensible versus something ridiculous. Erasing all its

stored data is no different to a computer from adding to numbers. Computers operate logically, but they are incapable of acting prudently and rationally.

GENERATIONS OF COMPUTER

First Generation: Vacuum Tubes (1940-1956)

➢ The first computer systems used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms.

➢ These computers were very expensive to operate and in addition to using a great deal of electricity, the first computers generated a lot of heat, which was often the cause of malfunctions.

➢ First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time.

➢ It would take operators days or even weeks to set-up a new problem.

➢ Input was based on punched cards and paper tape, and output was displayed on printouts.

➢ The UNIVAC and ENIAC computers are examples of first-generation computing devices.

➢ The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

Second Generation: Transistors (1956-1963)

➢ The world would see transistors replace vacuum tubes in the second generation of computers.

➢ The transistor was invented at Bell Labs in 1947 but did not see widespread use in computers until the late 1950s.

➢ The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors.

➢ Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube.

➢ Second-generation computers still relied on punched cards for input and printouts for output.

From Binary to Assembly

➢ Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words.

High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN.

Third Generation: Integrated Circuits (1964-1971)

➢ The development of the integrated circuit was the hallmark of the third generation of computers.
➢ Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.
➢ Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory.
➢ Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

Fourth Generation: Microprocessors (1971-Present)

➢ The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip.
➢ What in the first generation filled an entire room could now fit in the palm of the hand.
➢ Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.
➢ Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

Fifth Generation: Artificial Intelligence (Present and Beyond)

➢ Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.
➢ The use of parallel processing and superconductors is helping to make artificial intelligence a reality.
➢ Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come.
➢ The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

CLASSIFICATION OF DIGITAL COMPUTER

Computer systems are classified as Microcomputers, Minicomputers, Mainframes and Supercomputers.

Micro Computers:

The most familiar kind of computer is the microcomputer. In the past, microcomputers have been considered to be of two types- Personal Computers and Workstations.

Personal Computers (PCs):

PCs were desktop or portable machines. These machines ran comparatively easy-to-use applications software such as the word processors, spreadsheets, and etc. they were usually easier to use and more affordable than workstations. However, they had less sophisticated video display screens, operating systems and networking capabilities. Most important, they did not have the processing power that workstations did. Examples of personal computers are Acer's Aspire, Compaq Presario, etc.

Workstations:

Workstations are, expensive, powerful machines used by engineers, scientists, and other professionals who processed a lot of data. People who need to run complex programs and display both work in progress and results graphically also use workstations. Workstations use sophisticated display screens featuring high-resolution colour graphics and operating systems such as UNIX that permitted multitasking workstations also use powerful networking links to other computers. It has powerful processor, which could churn out results much faster than the PCs. Example Sun, Apollo, Hewlett-Packard, NeXt and IBM.

Portable Computers:

Now, computers are becoming smaller yet more powerful. The portable computer, can be easily carried around. There are three categories of portable computers: Laptops or Notebook PCs, Sub notebooks and Personal Digital Assistants.

Laptops / Notebooks:

Laptops may be either AC-powered, battery-powered, or both. These computers are ideal for users who have to work away from their offices. The uses of these computers might be an executive on the move, a student, a journalist, a salesperson, etc. These computes combine the power of the PC with mobility. An example is IBM ThinkPad.

Subnotebooks:

Subnotebooks are for frequent flyers and life-on-the-road professionals. Subnotebook users give up a full display screen and keyboard in exchange for less weight. These computers fit easily into any briefcase. They typically have an external floppy disk drive and monochrome monitor, although of late colour models are available.

Personal Digital Assistant (PDAs):

PDAs are much smaller than the subnotebooks. They combine pen input, writing recognition, personal organizational tools, and communication capabilities in a very small package.

Typical users are executives, businessmen, etc. who use these machines for their day-to-day activities – scheduling, organization, etc. an example of a PDA is Apple's ipad.

Minicomputers:

Minicomputers are special purpose mainframe computers, they were used to control machine in a manufacturing unit. However, now they are widely used as general-purpose computes. Minicomputers work well in what are known as Distributed Data Processing g (DDP). That is, a company's processing power is decentralized, or distributed across different computers.

Mainframes:

Mainframe computers can process several million-program instructions per second, large organizations rely on these room-size systems to handle large programs with lots of data.

Mainframes are mainly used by insurance companies, banks, airline and railway reservation system, etc.

Supercomputers:

Supercomputers are the fastest calculation devices ever invented. A supercomputer can operate at speeds measured in nanoseconds and even in picoseconds. These machines are for applications requiring very large programs and huge amounts of data that must be processed quickly. Examples of such task are weather forecasting, oil exploration, weapons research, and large-scale simulation.

The chief difference between a supercomputer and a mainframe is that a supercomputer channels all its power into executing a few programs as fast as possible, whereas as mainframe uses its power to execute many programs concurrently. More powerful supercomputer thousands of integrated microprocessors.

Network Computers:

Network computers are computers with minimal memory, disk storage and processor power designed to connect to a network, especially the Internet. The idea behind network computers is that many users who are connected to a network don't need all the computer power they get from a typical personal computer. Instead, they can rely on the power of the network servers. Network computers minimizing the amount of memory and processor power required by the workstation.

ANATOMY OF DIGITAL COMPUTER

A Computer is composed of 3 main components:

1. **Input Unit**
2. **Central Processing unit**
3. **Output Unit**

Input Unit:

In this unit devices are connected externally to entering data into the computer. It is medium for making connection between user and interface. It transfer data, which is made by human being and make them understandable form for computers. Examples of input devices:
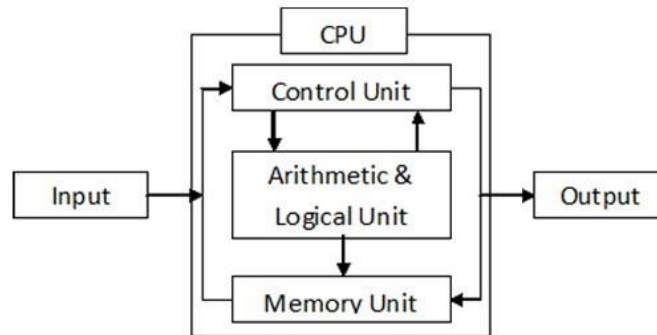

Fig. Block Diagram of Computer

Keyboard, mouse, scanner, card reader, OMR and OCR etc.

Central Processing Unit: It consist of three main parts

- **Memory**
- **Arithmetic and logical unit**
- **Control Unit**

Memory:

It is term, which is used in data storage, and also stored important information of data for future use and also transfer to another device when needed. We can say that it is primary type of storage or internal memory. Internal memory is executed through two types of memory technology

- **RAM (Random-access-memory):** It gives direct information on requirement.
- **ROM (Read-only-memory):** By the name, it can read only not write, which means CPU can read from storage but cannot write.

Arithmetic and logical unit:

Arithmetic means process like addition, subtraction, multiplication & division and all these operation is done by Arithmetic unit. It solves any type of complex arithmetic operation. And in Logical part, all type of logical operations like comparing, selecting, etc. It have few storage for an example registers, and which are basically made-up of electronic circuits. Which having capacity to perform operations like addition, subtraction, multiplication etc.

Control Unit:

It defines by controlling all operation of all parts of computer. It takes information from memory and determines where is to be taken. It gives result in the output form in memory section.

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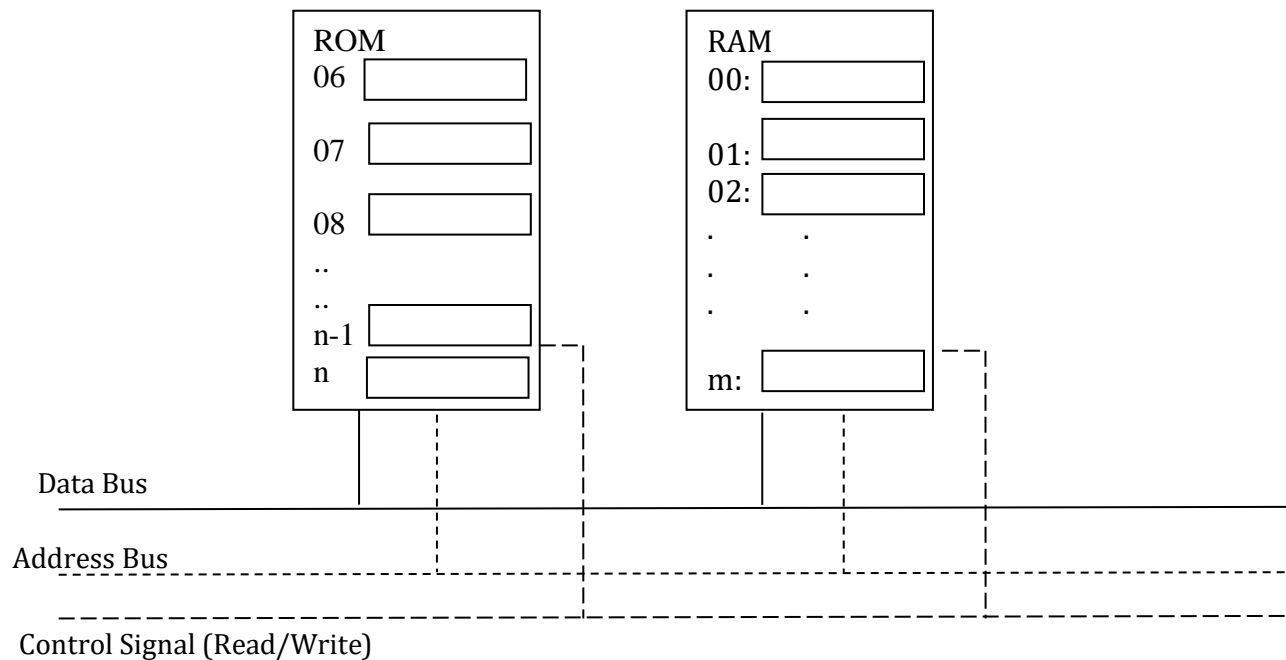Unit II - CPU and Memory - Secondary Storage Devices - Input Devices - Output Devices.

CPU AND MEMORY

➢ There are 2 basic type of memory:
   (i) Random Access Memory (RAM) – In this a processor can read or write data
       RAM is used to store changing information's like programs from disk etc.
       RAM can't retain data when power is turned off.
   (ii) Read Only Memory (ROM) – Where the data in ROM can never change.
       ROM retains data even when power in turned off
       ROM is used to store booting program of a device.
➢ Each type of memory has number of cells (storage locations)
➢ Each cell has a unique address.
➢ Lowest address is 0 and highest varies with the type of memory.
➢ A cell is 8-bit (1 byte) wide, giving each byte a unique address.

Working principle

➢ With a memory there can be only 2 operations: **Read** or **Write**.
➢ Write has to be performed,
   - Specify the address
   - Perform read or write

- The computer places the address to operate on in the address bus, which is carried to memory.
- Special circuitry determines which chip should satisfy the request and that chip is enabled.
- Processor also specifies weather it is a read or write operation.
- It is a read operation, and then memory copies the content of the location on to data bus.
- If it is a write operation the processor places the data in data bus, memory copies the data to a specified location.
- This follows Von Neumann Architecture where data and instructions can be stored in the same location.
- Processor knows whether it is addressing data or instructions.
- The CU accepts one instruction from data Bus and instructs the others components what to do.
- ALU performs basic arithmetic operation like add, sub, multiply, divide.
- Register bank contains a set of memory cells; data could be read or written much quickly than external memory.
- Condition code register has a set of bits that indicates whether the result of the last command was "greater than zero", "equal to zero", or "less than zero".

```
ROM                    RAM
06 [        ]          00: [        ]
07 [        ]          01: [        ]
                       02: [        ]
08 [        ]          .    .
..                     .    .
..                     .    .
n-1 [        ]
n   [        ]         m: [        ]
```

Data Bus

Address Bus

Control Signal (Read/Write)

- Pc has the address of the next instruction to be executed.

Peripheral Devices

- Peripheral devices communicate with the outside world.
- It has 3 basic classes:

     (i)   Mass Storage Device

     (ii)   Input Devices

     (iii) Output Devices

➢ Peripheral can be made to communicate with the computer through techniques such as

- Memory – Mapped I/O
- Using special I/O instruction
- Using separate I/O processors.

Memory – Mapped I/O:

➢ Each peripheral devices are assigned a address similarly like in memory

➢ To send data to monitor, processor places the address of monitor in address bus and the data in data bus.

➢ Processor controls the peripheral devices directly.

➢ This is a reliable way but time consuming, processor has to wait for the peripheral for acknowledgement before going to next instruction


Memory –Mapped I/o
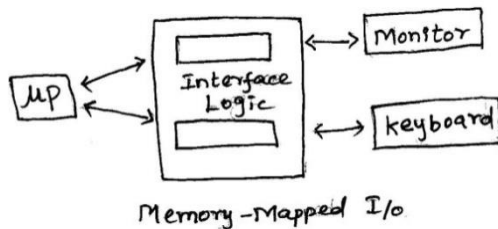
I/O Instruction:

➢ Special I/O instructions are used to instruct the processor that data has to be communicated to IO.

➢ There can be a spate address and Data bus for the I/O devices.

I/o instruction
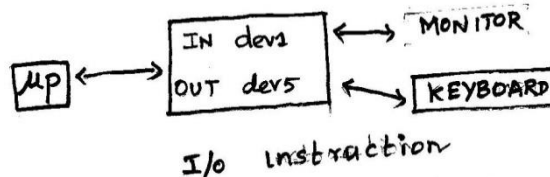
I/O Processor:-

➢ The most efficient way to connect to peripheral devices without tying up processor time.

➢ I/O processors are separate devices.

➢ Processor stores the data to be sent to a peripheral in separate places.
➢ Then it instructs the I/O processor to take care of the data
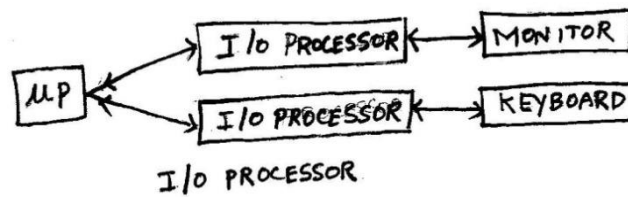

I/o PROCESSOR

Memory Cache:-

➢ Memory cache is a block of fast RAM placed between processor and slower memory
➢ Processor issues the I/O command and instructs the cache to hold data until the transaction is finished so that µp can go to next instruction.

MEMORY UNITS

➢ Memory units are the internal storage areas in a computer.
➢ Storage devices represent memory that exists on taps or disks (i.e. External Storage).
➢ **Definition:** Memory is an array of boxes, each of which can hold a single byte of information.
➢ There are different types of memory.

RAM

➢ Random Access Memory
➢ This refers to Read & write memory
➢ Is a volatile memory, meaning, it needs a constant power supply to maintain its contents
➢ Allows random access of data
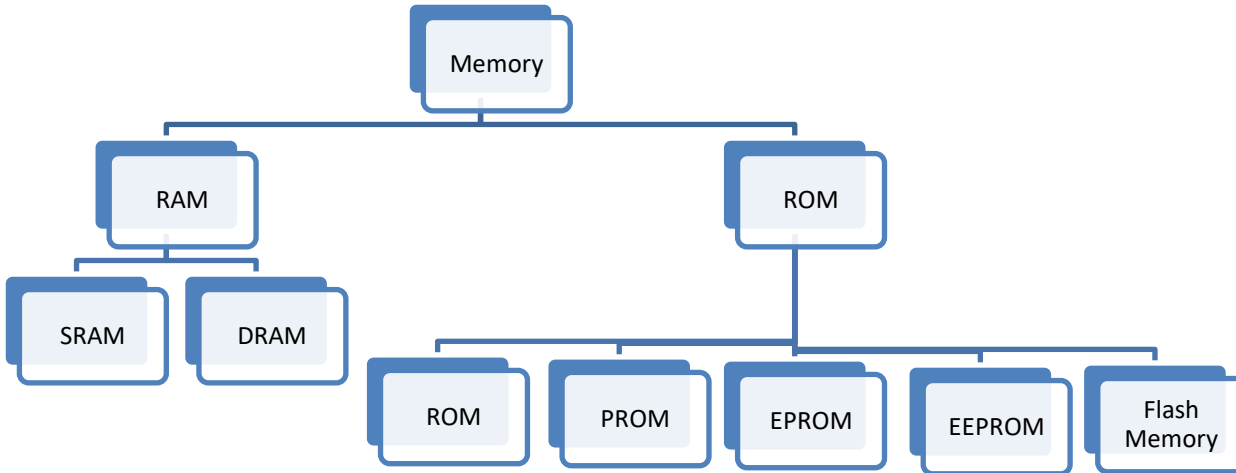
CLassification of Memory

➢ On power off, the contents are erased automatically.
➢ Data's can be accessed in random.
➢ There are 2 basic types of RAM.
  - Static RAM (SRAM)
  - Dynamic RAM (D-RAM)

SRAM	DRAM
SRAM could be refreshed less often	DRAM has to be refreshed 1000's of times per second to retain data.
Faster	Slower than SRAM
Expensive all	Less expensive

ROM

➢ ROM is a computer memory on which data has been pre-recorded.
➢ Once data is written to ROM chip, it cannot be removed and can only be read.
➢ ROM retains its contents even when the unit is turned off.
➢ This is a non-volatile memory.
➢ Every computer has a small amount of Rom to store program such as the booting program.
➢ ROM is present in all peripheral devices to store its settings.

PROM

- Programmable Read Only Memory-
- PROM is a memory chip where, data can be written only once and can never be erased.
- PROM retains their content when computer is turned off.
- PROM is manufactured as blank memory.
- A special device called a PROM programmer or PROM Burner is used to write data onto a PROM chip.

EPROM

- Erasable Programmable Read Only Memory
- This type of ROM retains its content until it is exposed to UV light.
- The UV light clears its contents, making it possible to reprogram the memory.
- These are used in Research Industries and computers, because it enables the manufacturer to change the contents of the PROM.

EEPROM

- Electrically Erasable Programmable Read Only Memory.
- Data can be erased one byte at a time by exposing it to an electrical charge.
- This retains contents on power off.
- Slower than RAM.

FLASH MEMORY

- Flash memory is a special type of EEPROM where data can be erased and reprogrammed in blocks.
- There is no need to erase the entre chip to make alternations.
- This type of memory is used in BIOS of the computer where updates can be made.
- These memories are used in places where the content has to be updated frequently.

  E.g.: Modem (to update protocols)

SECONDARY STORAGE DEVICES

- Auxiliary storage or secondary storage is the memory that supplements the main storage.
- They are non-volatile memory.
- Unlike RAM or ROM, these memory devices are Read-Write memory and can store data semi permanently.

- They are useful to transfer data from one computer to another.
- They can also function as backup devices.
- There are 2 types of auxiliary storage devices based on type of data access.

i) Sequential Access Media

ii) Random Access Media

- In sequential access media, the data can be read in sequence and to get to a particular point, you have to go through all the preceding points.

E.g.: Magnetic Tape

- In random access (direct access), a disk drive can access any point at random without having to pass through the preceding points.

E.g.: CD, DVD, etc.

- Various storage devices are:

Magnetic Tape, Winchester Disk, Hard Disk, Floppy Disk, Zip Disk, Jaz Disk, Super Disk, Optical Disk, CD-ROM, CD-R, CD-RW, Mo Drive, DVD, Blue Ray Disk, Pen Drive, SD Card, etc.

Magnetic Tape

- A magnetic tape is a magnetically coated strip of plastic on which data can be encoded.
- Storing data in tape is cheaper than storing in disk in 1990's.
- Tapes have large storage capacities ranging from 100 kb to several gb's.
- Accessing data is slower.
- Tapes are sequential access media.
- Tapes are used for long term storage and backup
- They can be used for transporting large amount of data.
- They come n a variety of sizes of formats.

No	Type	Capacity	Description
1	Half-inch	60MB-400MB	Cheep & needs expensive tape drive
2	Quarter inch	40Mb-5GB	Inexpensive & Support faster data transfer rate
3	8mm Helical Scan	1GB-5GB	Uses the technology as VCR Tatye needs expensive tape drive slow transfer rate greater capacity.
4	4mm DAT	2GB-@$ GB	Digital Audio Tape, Greatest Capacity, Require expensive type drive, Slow data transfer rate

Winchester Disk:

- Developed by IBM
- Stores 30 MB
- 30-mm access time, s the name its technology of data storing data in present day HDD.

Hard Disk:-

- Hard disk is a magnetic disk on which one can store data
- They can hold more data and are much faster than other devices.
- Storage ranges from few Gigabytes to Terabytes.
- There are two types of removable hard disk: disk packs and removable cartridges.

Structure:

- A single hard disk consists of several platters.
- Each platter requires two read/write heads, one for each side.
- All r/w heads are attached to a single access arm so they cannot move independently
- Each platter has some number of tracks and a track location that cuts across all platters is called a cylinder.

Floppy Disk:-

- Floppy disk is a soft magnetic disk.
- They are portable disks.
- Its disk drive is a called floppy drive.
- They are slower to access than hard drive and have less storage capacity, but are less expensive.
- They come in 2 basic sizes.
    - (1) $5^1/_4$ inch
        - o Made before 1987.
        - o General size for a computer.
        - o Stores between 100k – 1.2mb

    - (2) $3^1/_2$ inch
        - o Storage from 400k to 1.44mb
        - o Much smaller in size and are encased in a rigid envelope.

Zip Disk:-

  ➢ Removable disk created by Iomega Corporation.
  ➢ High capacity disk drives.
  ➢ Larger in size and thickness than conventional floppy.
  ➢ Fold up to 100 Mb of data
  ➢ Used to transfer or backup larger files.

Jaz Disk:-

  ➢ Removable disk created by Iomega Corporation.
  ➢ It has 12ms average seek time.
  ➢ Transfer rate of 5.5 mbps.
  ➢ Holds up to 1GB of data.

Super Disk:-

  ➢ A disk storage technology developed by Imation Corporation.
  ➢ These are etched with a servo pattern at the factory.
  ➢ This pattern is then read by the super disk drive to precisely align the r/w head.
  ➢ It has 2490 tracks, resulting in higher density rate.
  ➢ Super disk drive are backward compactable with older diskettes.

Optical Disk:-

  ➢ Optical disk is a storage medium from which data is written using lasers.
  ➢ Stores data up to 6 GB.
  ➢ There are 3 basic types of optical disk:
    - CD-ROM, WORM, CD-RW
    - CD-ROM comes with data already encoded into them, data can be read any number of times, but cannot be modified.
    - WORM – Write Once Read Memory. Data can be written only once by the user by using a CD writer. Then it behaves like a CD-ROM.
    - CD-RW: Rewritable optical Disks. They can be erased and loaded with new data, just like magnetic disk, these are also called as EO Disk (Erasable Optical)
    - Presently there are other optical disks like DVD, Blue Ray, etc.

CD-ROM:-

  ➢ CD-ROM is a type of optical disk capable of storing large amount of data.
  ➢ It has a capacity of 700 mb memory space.

- Data is recorded by the vendor and cannot be charged.
- To read a CD, CD-ROM, drive is required.
- A CD-ROM drive is a device that can read information from a CD.
- They can be internal or external.
- Internal drive work faster than external drives
- Seek time and data transfer rate are the important features for a drive.
- Seek time of access time is the time taken by the drive to access a particular place of information.
- Data transfer rate is the amount of data that can be transformed in one second.

CD-Drive:-

- Compact Disk-Recordable drive.
- It can be used to create CD-ROM's
- A feature that many CD-drive have is multisession recording
- This enables to add data over time in the same CD.
- Along with CD-R drive, a CD-R software package is used to write data.

CD-RW Disk:

- CD Rewritable disk.
- Enables data to be written in multisession.
- The complete CD can be erased and used a new.
- These RW disks come separately and the drive used to rewrite these disks are CD-RW Drive.

Magneto Optical (MO) Drive:-

- This combines the better features of floppy, magnetic tape and CD.
- They can be read and written to.
- They are removable,
- Storage ranges greater than 200 mb.
- They all faster and efficient they floppies.

DVD:-

- Digital Versatile Disk. Or Digital Video Disk.
- A optical disk storage format invented in 1995.
- Similar t CD but has higher storage capacity.
- It has capacity of

- 4.7GB for Single layer
- 8.5 GB for double layer
- 9.4 GB for double sided
- 17.08 GB for double side double layer.
- Read speed is 10 mbps.
- To write data, it uses a 650nm laser with a focused beam more powerful, than one used for reading.

➢ Various varieties of DVD media are DVD-RW, DVD-R.

Blue Ray:-

➢ Is a digital optical disk data storage format.
➢ It is capable of string hours of high-definition and ultra-high definition videos.
➢ Main application of Blue Ray is as a medium movies and video games.
➢ The name refers to the "blue laser" used to read the disc; which allows the information to be stored at a greater density.
➢ Capacity ranges from 25GB to 128GB.
➢ Sony released the first prototype in 2000.

Pen Drive:-

➢ Other names are USB Drive, USB stick, Thumb Drive, USB Flash Drive, Jump Drive, Disk key, Memory stick, etc.
➢ It is a data storage device that includes flash memory with an integrated USB interface.
➢ They are removable, rewritable and don't need special drive or software to transfer data to and from.
➢ Much smaller then optical disks.
➢ Storage ranges from few GB to 1 TB.
➢ Allows up to 100,000 write and erase cycles, depending on the type of memory chip used.
➢ Have a 10 years shelf storage time.
➢ They are more durable, portable and reliable.
➢ A flash drive consists of a small printed circuit board carrying the circuit elements and a USB connector insulated electrically ad protected inside a plastic, metal or rubber case.
➢ Most USB use a standard "Type –A USB connection" with a port in a pc.
➢ They draw power from the computer via a USB connection.

SD Card:-

- Secure Digital (SD) is a non-volatile memory card developed to use in portable devices.
- They come in 3 dimensions:

Standard, Min, Micro

- The card's electrical contacts are recessed beneath the surface of the card to protect them.
- Its asymmetrical shape of the sides prevents them from inserting them upside down.
- It has a CPRM security circuit for digital rights management content protection.
- It also has a write protect notch.

INPUT DEVICES:

- An input device is any machine that feeds data into a computer.
- Various input devices that are available are: keyboard, mouse, trackball, joystick, digital camera, MICR, OCR, OMR, Speech input devices, Touch Screens, Touch pad, Light pen and all types of sensors, etc.

Keyboard:-

- Keyboard is an input device consisting of a set of type-writer like keys that enable us to enter data to a computer.
- The keys are classified as
  - Alphanumeric keys
  - Punctuation keys
  - Special keys
- The standard layout of keyboard is the QWERTY layout for slow typing.
- Another layout for speed typing is DVORAK keyboards.
- A standard keyboard has 102 keys.
- There are other keyboards like ergonomic keyboard, gaming keyboard, multimedia keyboard etc for specific purposes.
- Each differs in the number of keys and its functions over each key.

Mouse:-

- Mouse is a device that controls the movement of the cursor or pointers on a display screen.
- Mouse is a pointing device that one can move on a flat surface.
- As the mouse moves, the pointer on the screen moves in the same direction.
- Invented in 1963 and is used from 1970 in GUI.
- Mouse contains 2 buttons and a scroll bar.
- Various function in a mouse are

  Left button single click – select on object.

  Left button double click – open file

Right click – display properties for the object.

Scroll up/down: move pages up and down.

Move mouse in any direction – move the pointer on screen in the same direction.

- ➢ Types of Mouse:

  Mechanical mouse has a rubber ball at its underside and can roll in all direction.

  Mechanical sensors surrounding the ball detect the direction to move the pointer to.

  Optomechanical use uses a ball at the bottom and optical sensors to detect motion.

  Optical muse uses laser to detect mouse's movement. These respond more precisely and quickly.

- ➢ Types of Connection in Mouse:

  Serial mice connect directly to PC in a serial port or PS/2 port.

  USB mices are used to connect to USB port n a computer.

  Wireless mice rely on infrared or radio waves to communicate with the computer.

- ➢ Mouse pad is a pad that is used as a flat surface for a must.
- ➢ They provide accuracy & smoothness.

Trackball:-

- ➢ A track ball is a pointing device and is similar to a mouse, but the rubber ball is on top of the device.
- ➢ Device stays fixed in one point and a user rotates the ball to move the cursor in a direction.
- ➢ It has buttons for specific purposes.
- ➢ Track ball can be placed in any surface.

Joystick:-

- ➢ A joy stick has a lever that moves in all direction and controls the movement of a pointer.
- ➢ The pointer continues moving in the direction the joystick is pointing, to stop the printer, return the joystick to its upright position.
- ➢ Most joysticks have 2 buttons called triggers.
- ➢ Used in gaming, CAD/CAM systems.

Digitizing Tablet:-

- ➢ Digitizing tablet is an ip device that enables you to enter drawing and sketches into a computer.
- ➢ It consists of an electronic tablet and a cursor or pen.
- ➢ A cursor (Puck) is similar to a mouse, except that it has a window with cross hairs for pinpoint placement. It can have up to 16 buttons.
- ➢ A pen (stylus) looks like a ballpoint but uses an electronic head instead of ink.

- Each point on the tablet represents a point on the display screen in a fixed manner.
- Used to trace drawings digitally.

Scanner:-

- Scanner is an input device that can produce a digital copy of the picture placed on the scanner bed.
- A scanner works by digitizing an image-dividing it into grid of boxes and representing each box with either 0 or 1.
- For color, each box is represented 25 bits.
- The resulting matrix of bits, called a bit map is stored in a file.
- Optical scanner does not distinguish text from picture. The entire content is stored as image.
- A OCR software is required to convent picture to text.
- Scanners differ from each other in one or more of the following aspects:

    Scanning Technology: Scanners use Charger Coupled Device (CCD) arrays, which consists of tightly packed tows of light receptors that can detect light variations in intensity and frequency.

    Industry strength scanner uses a technology called photo multiplied tube (PMT).

    Resolution: - The denser the bit map the higher the resolution.

    Resolution ranges from 72 to 600 dpi.

    Bit Depth: - The number of bits used to represent each pixel. The greater the bit depth, the more colors or grayscales can be represented.

    Size and Shape: - Size ranges from small hand held scanner to large flat bed scanners.

    Hand held scanners are good for scanning small. Pictures or photos. Other types are sheet fed scanner, flat bed scanner, etc.

Digital Camera:-

- Using a digital camera, images captured can be transferred directly to a computer.
- Various imaging tools are available to manipulate these images.
- The images captured are digital files.

Magnetic Ink Character Recognition (MICR)

- MICR allows computers to recognize characters printed using magnetic Ink.
- MICR is used in Banks.
- A special purpose machine known as a reader/sorter reads characters mad of ink containing magnetized particles.
- Another related technology is the magnetic strip in the back of ATM cards and ID cards.

Optical Character Recognition (OCR):-

➢ OCR refers to the branch of computer science that involves reading text from paper and translating the images into a form that a computer can manipulate.
➢ An OCR system includes a scanner for reading text and sophisticated software for analyzing the images.
➢ Advanced OCR system can translate typed text, but there is difficult with handwritten text.

Optical Mark Reorganization (OMR):-

➢ OMR also called as mark sensing technology where an OMR device senses the presence or absence of a mark.
➢ These are used in multiple choice tests.

Bar Code Reader:-

➢ Barcode Readers are photo electric scanners that read the bar code, or vertical zebra striped marks, printed on products.
➢ All supermarkets use a barcode system called Universal Product Code (UPC).
➢ The barcode identifies the product to the supermarkets computer that has the description and price of the product.

Speech Input Devices:-

➢ Speech or voice input device converts a person speech into digital form.
➢ These input devices combined with appropriate software, form voice recognition systems.
➢ These systems can be used for giving voice commands to computers.
➢ There are two types of voice recognition:
  ▪ Continuous speech
  ▪ Discrete word
➢ Continuous speech recognition systems are able to understand what the user able to understand what the user is speaking and produce appropriate text in the text editor.
➢ Discrete words are commands that will make the device t d something.

Touch Screen:-

- Touch screen is a type of display screen that has a touch sensitive transparent panel covering the screen.
- Instead of using a pointing device, one's finger is directly used to point directly to objects on the screen.
- Touch screen is used widely in smart phones, tablets, ATM's and laptops etc.

Touch Pad:-

- A small touch sensitive pad used a pointing device on portable computers.
- By moving a finger or other object along the pad, the pointer on the screen moves.

Light Pen:-

- Light pen is an input device that utilizes a light sensitive detector to select objects on a display screen.
- It is similar to a mouse, and works like a touch device.

Sensors:-

- Earlier reading from various devices were recorded manually and then fed to computer program for processing.
- Now-a-Days it is possible to connect the device directly to the computer and do Real Time Processing.
- These sensors combined with computer programs are used everywhere from inventory control to automatic motion of satellites.

OUTPUT DEVICES

- Output is anything that comes out of the computer.
- They can be meaning full, information or gibberish and they can take various forms-binary numbers, characters, printers and as printed pages.
- Various output devices are: display screen, loud speakers, printer, plotters, etc.

Monitor:-

Monitor is a display device capable of producing video on screen and has graphical abilities.
Based on color capabilities, monitor can be classified into three types:

Monochrome

These types of monitor display two colors, one for the background and another for the foreground. The colors can be Black & white, Green & Black, or Amber & Black.

Gray scale

A gray scale monitor is a special type of monitor capable of displaying different shades of gray.

Color

➢ These monitors can displays anywhere from 16 to 1 million colors.

➢ Color monitors are also called as RGB monitors, because they accept 3 signals – Red, Green and Blue.

➢ This differs from television monitors,

➢ An RGB monitor consists of a vacuum tube with 3 electron guns – one each for Red, Green and Blue at one end and screen at the other end.

➢ The screen has a phosphorous coating and upon the firing of electron guns, the phosphorous gets exited and glows to produce various colors resulting on video.

Classification of Monitor – Based on Signals:-

➢ Based on the type of signals they accept, monitors can be classified into two types: Analog, Digital, LCD, LED, and Plasma, OLED.

Digital Monitor :

➢ A digital monitor accepts digital signals rather than analog signals.

➢ All monitors (except Flat Panel Display) use CRT technology, which is essentially analog.

➢ The term digital refers only to the type of input received from the video adapter.

➢ A digital monitor then transfers the digital signals into analog signals that control the actual display.

➢ Although digital monitors are fast and produce clear images, they can't display variable colors continuously.

➢ They accept low quality video standards such as MDA (Monochrome Display Adapter), CGA (Control Graphics Adapter), EGA (Enhanced Graphics Adapter).

➢ VGA & SVGA required an analog monitor to produce images.

Analog Monitor :

➢ This is the traditional type of monitor that has been used for years.

➢ All monitors based on CRT technology are analog.

➢ EGA monitors are digital monitors, however the digital signals are transferred to analog signal in order to display image.

➢ Some monitors can accept both digital and analog signals.

- Low cost digital monitors are often called TTL (Transistor – Transistor Logic) monitors.
- Some monitors have fixed frequency which means that they accept input at only one frequency.
- Another type of monitor, called a multi scanning monitor, automatically adjusts to the frequency of the signals sent to it.
- These can accept input from different types of video adapters.

Monitor Types:-

- From the invention of a display device, there have been numerous advancements in monitors.
- Some of them are CRT monitors essentially uses Cathode Ray Tube to project pictures.
- Flat panel display is more common network-a-days.
- Various flat panel displays are LCD, LED, is a displays that uses the light emitting properties of liquid crystals.
- Liquid crystals do not emit light directly. Instead uses a back light or reflect to produce images in color or monochrome.
- **LCD (Liquid Crystal Display)** monitors consumes very less powers takes up much less space.
  - Initially used for laptop display later stand-alone monitors were produced and is being used considerably.
- The refresh rate and variety of resolution are limited compared to CRT monitors.
- **Light Emitting Diode (LED)** display is flat panel display which uses an array of light-emitting diodes as pixels for a video displays.
  - LED is a two-lead semiconductor light source. It uses p-n junction diodes to emit light.
- **OLED** (**Organic Light Emitting Diode**) is a **display** technology that offers bright, colorful images with a wide viewing angle, low power, high contrast ratio and fast response time for sports and action movies.
- **Plasma Display Panel (PDP)** is a type of flat panel display and they use small cells containing electrically charged ionized gases which are plasmas.
  - These are more expensive and are not used by consumers extensively.
  - These are of high quality but unstable, and don't work at high altitude.

Characteristics of a Monitor

Size:

- Screen sizes are measure in diagonal inches, i.e. the distance between the two opposite screen corners.
- Normal size of a small VGA monitor is 14 inches.
- The main measurement for display is width, height, total are & the diagonal.
- There is always some area around the edges of the screen that can't be used.

Resolution:
- The resolution of a monitor indicates how densely the pixels are packed.
- Pixel-Picture Element.
- A pixel is a single point in a graphic image.
- Graphic monitors display pictures by dividing the display screen into thousands of pixels, arranged in rows and columns.
- The pixels are so close together that they appear connected.
- Number of bits used to represent each pixel determines how many colors it can represent.
- On a color monitor, each pixel is composed of 3 dots. A Red, a Blue, and a Green that converge at the same point.
- The intentionally created convergence error makes the pixels appear fuzzy.
- Quality of a monitor depends on its resolution i.e. Number of pixel it can display, number of bits used for each pixel.
- Some of the resolution sizes are 600×800, 320×200. 1024×768, 1280×1024, 1600×1200, etc.
- The more numbers of pixel and bits, the move sharper the image.

Aspect Ratio:
- Until about 2003, most computer monitors had a 4:3 aspect ratio and some had 5:4.
- Between 2003 and 2006, monitors with 16:9 and mostly 16:10 (8:5) aspect ratios became commonly available, first in laptops and later also in standalone monitors.
- Uses for such monitors, are widescreen computer game play and movie viewing, the word processor display of two standard letter pages side by side, as well as CAD displays of large-size drawings and CAD application menus at the same time.
- In 2008 16:10 became the most common sold aspect ratio for LCD monitors and the same year 16:10 was the mainstream standard for laptops and notebook computers.
- In 2010 the computer industry started to move over from 16:10 to 16:9 because 16:9 was chosen to be the standard high-definition television display size, and because they were cheaper to manufacture.

Band width:
- The amount of data that can be transferred in a fixed amount of time is the bandwidth.
- It is expressed in bits or Bytes per Second-rate (BPS).
- For analog devices it is cycles per second of hertz. (Hz).

Refresh Rate:
  ➢ Display monitors must be refreshed many times per second.
  ➢ Refresh rate determines how many times pre second the screen is to be refreshed.
  ➢ Refresh rate is measured in hertz (Hz).
  ➢ The older standard monitor refresh rate was 60 Hz and the new standard monitors refresh rate is 75Hz for VGA and SVGA.
  ➢ The faster the refresh rate, the less the monitor flickers.

Interlaced or Non-Interlaced:
  ➢ Interlacing is a display technique that enabled a monitor to provide more resolution inexpensively.
  ➢ With interlacing monitors, the electron guns draw only half the horizontal lines with each pass (for e.g., all odd lines on one pass and all even lines on the next pass).
  ➢ Since only half the pixels are refreshed at a cycle, giving it greater resolution, with less expense.
  ➢ The reaction time is slower, so programs depend on quick refresh rates may experience flickering or streaking.

Dot-Pitch:
  ➢ A measurement that indicates the vertical distance between each pixel on a display screen.
  ➢ Measured in millimeters, it determines the quality of display monitors.
  ➢ The dot pitch of color monitors for personal computers ranges from about 0.15mm to 0.30mm.
  ➢ Another term for dot pitch is phosphor pitch.

Convergence:
  ➢ Convergence refers to how sharply an individual color pixel on a monitor appears.
  ➢ Each pixel is composed of three dots-a red, a blue and green one.
  ➢ The convergence of the three dots produces the color of a pixel.

Video Standards:-
  ➢ There are a variety of video standers that define resolution and colors for displays.
  ➢ Support for a graphics standard is determined by both the monitor and the video adapter.
  ➢ Video adapter must be capable of transmitting the appropriate signals to the monitor.
  ➢ Popular video standards for pc's are

(i) VGA:
  ➢ Video Graphics Array.
  ➢ Is a graphics display system for PC's developed by IBM.
  ➢ In text mode, VGA systems produce a resolution of 720×400 pixels.

➢ In graphics mode, the resolution is either 640×480 (with 16 colors) or 320 ×200 (with 256 colors).

➢ Uses analog signals for display.

(ii) SVGA:

➢ Super Video Graphics Array

➢ Offers greater resolution than VGA.

➢ Several varieties of SVGA provides different resolution such as

    ➢ 800 × 600 pixels

    ➢ 1024 × 768 pixels

    ➢ 1280 × 1024 pixels

    ➢ 1600 × 1200 pixels

➢ SVGA supports 16 million colors.

➢ Video Standards are developed by a consortium of monitor and graphics manufactures called VESA (Video Electronics Standards Association).

(iii) 8514/A

➢ A high resolution video standard for PC's designed to extend the capabilities of VGA.

➢ Provides 1024×768 pixel resolution.

➢ It supports a color palette of 262,000 colors in color display.

➢ In monochrome displays, it supports 64 shades of gray.

➢ Can display 256 colors simultaneously.

➢ It uses interlacing technique to provide low cost resolution.

(iv) XGA:

➢ Extended Graphics Array.

➢ It replaced the 8514/A video standard.

➢ It supports a resolution of

➢ 640×480

➢ 1024×768

➢ Supports 262,000 colors.

➢ Supports 65,000 colors simultaneously

➢ They are non-interlaced monitor.

(v) Ti 34010

➢ TI 34010 is a video standard that supports a resolution of 1024 ×768.

➢ It is non-interlaced.

Printer:-

➢ Printer is a device that prints text or illustration on paper or transparences media.

➢ Printers are classified under various categories like technology used size etc.

➢ Some of the printer types are Daisy-wheel printer, Dot Matrix printer, Ink Jet printer, Laser printer, LCD & LED printers, Line printers, Thermal printers.

Daisy Wheel Printer:-

- Daisywheel printer is printers that produce letter-quality type printouts.
- It works on the same principle as ball head typewriters.
- The daisy wheel is a disk made of plastic or metal on which characters stand out in relief along the outer edge.
- To print a character, the printer rotates the disk until the desired letter is facing the paper.
- Then a hammer strikes the disk, forcing the character to hit an ink ribbon, leaving an impression of character on the paper.
- Daisy wheel can be changed to print different fonts.
- They cannot print graphics, are noisy and slow.
- It s a mechanical printer.

Dot Matrix Printer:-

- Dot-Matrix printers create characters by striking pins against an ink ribbon.
- Each pin makes a dot, and contributors of dots form characters and illustrations.
- They are relatively fast and inexpensive.
- The quality of output is minimal.
- They vary in 2 characteristics:
- **Speed:** Measured in Characters per Second (CPS) and vary from 50 to 500 CPS. Speed differs with the quality of output.
- **Print Quality:** Determined by number of pins, that it cans vary from 9 to 24. Best quality is produced with 24 pins, although looked closely, can see the dots.

Ink Jet Printer:-

- Inkjet printer works by spraying ionized ink at a sheet of paper
- Magnetized plates in the ink's path direct the ink to the paper in desired shape.
- These are capable of producing high quality print.
- Resolution starts at 300dpi.
- They are slower than LaserJet printer.
- They require a special type of ink.
- They are portable and color inkjets are inexpensive way to print full-color documents.

Laser Printer:-

- Laser printer utilizes a laser beam to produce an image on a drum.
- The light of the laser alters the electrical charge on the drum wherever it hits.

- The drum is then rolled through a reservoir of tones, which is picked up by the charged portions of the drum.
- Finally the toner is transferred to the proper through a combination of heat and pressure.
- Laser printers are also called page printers, since an entire page is transmitted to the drum at once.
- Resolution ranges from 300 dpi to 2400 dpi. It also uses a technique called resolution enhancements to reduced high quality images.
- Black & White printer requires only one toner. In case of color laser jet, there are four toners to print in full color.
- Laser printers produce very high quality print and support every font available by two techniques.
- Font cartridges where on can insert font cartridge board (ROM Board).
- Soft Fonts – by using the system fonts and storing them temporarily in printers RAM memory.
- They print high quality graphics, make less noise and speed ranges from 4 to 20 pages per minute (PPM).

LCD & LED Printer:-
- The working principle is same as the laser printer but uses liquid crystal or light emitting diodes to produce image on the drum.

Line printers:-
- Line printers are high speed printers capable of printing an entire line at one time.
- A fast printer can print up to 3000 lines per minute.
- These printers can only text not graphics and the print quality are low.
- Suitable for speed and low quality requirements.

➢ **Thermal Printer:-**
- Thermal printers produce images by pushing electrically headed pins against special heat sensitive paper,
- They are inexpensive, used in calculators, Fax machines; ATM's billing devices, etc.
- Produce low quality print, and the paper tends to curl after printing and think fades after few weeks.

Characteristics for a Printer:-
(1) **Quality of Type**: The quality is said to be letter quality or draft quality.
(2) **Speed**: Measured in characters per second (CPS) per pages per minute (PPM).
(3) **Impact or Non-impact**: Impact printers include all printers that work by striking an ink ribbon. They are noisier and useful in making multiple copies. Non-impact printer's prints by producing the image of the page to print.

(4) **Graphics**: Some printers can print only text where as some other can print high quality images.

Plotter:-

➢ Plotter is a device that draws pictures on paper based on commands from a computer.
➢ Plotters draw line using a pen where printers use pixels.
➢ Multicolor plotters produce color drawings using different colored pens.
➢ Plotters are considerably more expensive than printers.
➢ They are used in engineering application where precision is necessary.

Sound Cards & Speakers:-

➢ Sound cards are expansion board that enables a computer to manipulate and output sounds.
➢ They are necessary for all CD-ROM's
➢ They enable the computer output sound through speakers connected to the board.
➢ They also help with microphone to geed sound input to the computer and manipulate sound on disk.
➢ Sound cards use two basic methods to translate digital data Internet analog sound
  1) FM (Frequency Modulation) synthesis on recoding mimics different musical instruments according to built-in formulas.
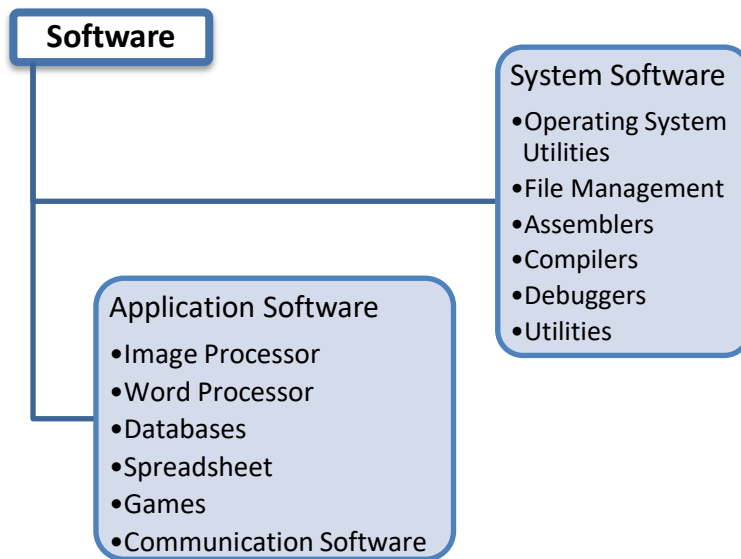 2) Wavetable synthesis relies on recordings of actual instruments to produce sound.

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Unit III - Introduction to Computer Software - Programming Language - Operating Systems - Introduction to Database Management System.

INTRODUCTION TO COMPUTER SOFTWARE:

• A computer needs both hardware and software for its proper functioning.
• Anything that is stored or processed electronically is called software.
• The physical devices represent hardware.
• Software is divided roughly into two categories:
  • System software

- Application software
- System software consists of low-level program that interact with the computer at basic level.
- This includes the operating system and all the utilities that enable the computer to function.
- Application software or end-user program include program that will work for users.
  Eg: word processor, spreadsheet, etc

Software

System Software
- Operating System Utilities
- File Management
- Assemblers
- Compilers
- Debuggers
- Utilities

Application Software
- Image Processor
- Word Processor
- Databases
- Spreadsheet
- Games
- Communication Software

Classification of Software's

Operating systems:

- Operating system is a collection of individual program that help to run the computer.
- Every computer must have an operating system.
- It Perform basic tasks such as import from cable, sending, keep track of files and directories on disk, controlling peripheral devices, monitor the condition of components etc.,
- Most commonly used operating system software are Microsoft Windows, DOS, Xenix, Mac OS, OS/2, UNIX etc.,

Utilities:

- Utilities are programs that perform a very specific task related to managing system resources.
- OS has a number of utilities for managing disk drivers, printers and other devices.
- Utilities differ from applications mostly in terms of size and complexity.

Compiler and interpreter:

- Compiler is a program that translates source code in the object code.
- It reads the entire program and produces the object code for the program at once.
- Interpreter is a program that produces object code from source code for each individual line.
- Interpreter compiles the program line by line whereas compiler compiles the full program entirely.
- Interpreters can execute the program immediately. Compilers take some time to run the program.
- Programs produced by compilers run much faster than the same program executed by an interpreter.

Word processor:

- A Word Processor is a program that enables you to perform word processing functions.
- They can be used to create, edit and print documents.
- It enables you to create a document, store it electronically on a disk.

Advantages:

- Make changes without retyping the entire document.
- Inserting & deleting words is easy.
- Moving text from one place to another is easy.
- After making changes, one can send the document to printer directly.

Spreadsheet:

- A spreadsheet is a table of values arranged in rows and columns. Each value can have a predefined relationship to the other values.
- Spreadsheet applications are computer programs that let you create and manipulate spreadsheet electronically.
- Some spreadsheets or multidimensional, meaning that you can link one spreadsheet to another.

Presentation graphics:

- This enables users to create highly stylized images for slideshow and reports.
- The software includes functions for creating various types of charts and graphs for inserting text in a variety of fonts.

Database management system: (DBMS)

- A DBMS is a collection of programs that enable you to store, modify and extract information from your database.
- There are many different type of DBMS ranging from small system that run on personal computer to huge system that run on mainframes.

Image processor:

- Image processors are graphics program that enables you to create, edit, manipulate, add special effects, view, and print and save images.
- Paint program or available to create a bit my pictures.
- Sophisticated paint applications are often called image editing programs.
- Drawing programs for specific purposes like CAD/CAM drawings, machine design, engineering design, digital enhancements applications are available.

PROGRAMMING LANGUAGES:

- Programming language is a set of rules that provides a way of instructing the computer to perform certain operations.
- To communicate with the computer, the programming language is mandatory.
- The programming language act as a communicator between humans and computer
- There are about more than 500 programming languages available today.
- Some of them are obsolete.
- Of the existing languages the choice depends on the purpose, for which we want to instruct the computer.
- There are five levels or generations of programming languages.
    - Machine language or first generation language.
    - Assembly languages or second generation languages.
    - Procedural languages third generation languages.
    - Problem oriented languages fourth generation languages.
    - Natural languages fifth generation languages.
- The characteristics or trends of these programming languages are given below.

	1st GL	2nd GL	3rd GL	4th GL	5th GL
Software Trends	User written programs	Packaged programs.	Operating Systems High level	Database Management Systems Micro	Natural languages Multipurpose graphics interfaced

	Machine languages	Symbolic Languages	language.	computer packages	expert assisted packages.

Machine Language:

- Machine language is the only programming language that the computer can understand directly without translation.
- It is a language made up of entirely 1s and 0s.
- There is not, however, one universal machine language because the language must be written in accordance with the special characteristics of a given processor.
- Each type or family of processor requires its own machine language.
- For this reason, machine language is said to be machine-dependent (also called hardware-dependent).
- Machine language programs have the advantage of very fast execution speeds and efficient use of primary memory.
- Use of machine language is very tedious, difficult and time consuming method of programming.
- Machine language is low-level language.
- Since the programmer must specify every detail of an operation, a low-level language requires that the programmer have detailed knowledge of how the computer works.
- Programmers had to know a great deal aobut the computer's design and how it functioned.
- As a result, programmers were few in numbers and lacked complexity.

Assembly Language:

- Assembly languages use mnemonic operation codes and symbolic addresses in place of 1s and 0s to represent the operation codes.
- A mnemonic is an alphabetical abbreviation used as memory aid.
- This means a programmer can use abbreviation instead of having to remember lengthy binary instruction codes.
- For example, it is much easier to remember L for Load, A for Add, B for Branch, and C for Compare than the binary equivalents i-e different combinations of 0s and 1s.
- They are also classified as low-level languages because detailed knowledge of hardware is still required.

- They were developed in 1950s.
- Assembly languages must be translated into machine language, before hey are used by the program.
- A language translator program called an assembler does this conversion.

Limitations:

- Although assembly languages represented an improvement, they had obvious limitations.
- Only computer specialists familiar with the architecture of the computer being used can use them.
- And because they are also machine dependent, assembly languages are not easily converted to run on other types of computers.

Advantage:

- It provide an easier and more efficient way to program than machine languages while still maintaining control over the internal functions of a computer at the most basic level.
- They produce programs that are efficient, use less storage, and execute much faster than programs designed using high-level languages.

High level Languages:

- Third generation languages, also known as high-level languages, are very much like everyday text and mathematical formulas in appearance.
- They are designed to run on a number of different computers with few or no changes.
- Objectives of high-level languages
    - To relieve the programmer of the detailed and tedious task of writing programs in machine language and assembly languages.
    - To provide programs that can be used on more than one type of machine with very few changes.
    - To allow the programmer more time to focus on understanding the user's needs and designing the software required meeting those needs.
- A language translator is required to convert a high-level language program into machine language.
- Two types of language translators are used with high level languages: compilers and interpreters.
- Types of HLL are:
    - Procedure Oriented Language or 3rd GL,
    - Problem oriented language or 4th GL,

- Natural language or 5th GL.

Procedure Oriented Language:

- High-level languages and often classified according to whether they solve general problems or specific problems.
- General-purpose programming languages are called procedural languages
- E.g.: Pascal, basic, COBOL, Fortran, C, C++ etc.,

Advantages:

- The program statement resembles English.
- They are easier to work with.
- Requires less time to program.
- Programs are easier to understand and modify.
- They are Machine independent

Limitations:

- Programs execute more slowly.
- The languages use computer resources less efficiently.

Problem Oriented Language:

- Fourth generation languages also known as problem oriented languages or high-level languages designed to solve specific problems by enabling you to describe what you want rather than step-by-step procedure to get there.
- Objectives of fourth generation languages are:
  - Increasing the speed of developing programs.
  - Minimizing user effort to obtain information from computer.
  - Decreasing the skill level required of users so that they can concentrate on the application rather than the intricacies of coding, and thus solve their own problems without the aid of a professional programmer.
  - Minimizing maintenance by reducing errors and making programs that are easy to change.

- Depending on the language, the sophistication of fourth generation languages varies widely.
- These languages are usually used in conjunction with a database and its data dictionary.
- Five basic types of language tools fall into the fourth generation language category.
  - Query languages
  - Report generators.
  - Applications generators.
  - Decision support systems and financial planning languages.
  - Some microcomputer application software.

3rd GL	4th GL
Intended for use by professional programmers	Maybe used by a non-programming end-user as well as a professional programmer
Requires specification of how to perform task	Required specification of what the task is to be performed
All alternatives must be specified	Default alternatives or built-in; an end-user need not specify these alternatives.
Require large number of procedural instructions.	Require far fewer instructions.
Code may be difficult to read, understand and maintain.	Code is easy to understand and maintain because of English commands.
Language developed for batch operation.	Language developed primarily for online use.
Can be difficult to learn	Easy to learn
Difficult to debug.	Easy to Debug
Typically file oriented.	Typically database oriented.

Natural Languages:

- Natural Languages represent the next step in the development of programming languages, i-e fifth generation languages.
- The text of a natural language statement very closely resembles human speech.
- In fact, one could word a statement in several ways perhaps even misspelling some words or changing the order of the words and get the same result.

- These languages are also designed to make the computer "smarter". Natural languages already available for microcomputers include Clout, Q&A, and Savvy Retriever (for use with databases) and HAL (Human Access Language).
- The use of natural language touches on expert systems, computerized collection of the knowledge of many human experts in a given field, and artificial intelligence, independently smart computer systems.

Compilers and Interpreters:

- Compiler is a translation program used to translate source code from a high-level programming language to machine language code.
- Machine language code is called the object code and can run immediately or some time later.
- Some of the most widely used compiled languages are C, C++, Java etc.,
- Interpreter is a computer program that directly executes instructions written in High Level Programming Language, without previously compiling them into a machine language program.
- In an interpreted language, no object code is stored, this means the program is compiled every time it is run.
- Compilers and Interpreters are machine dependent, so different compilers exists for the same language depending on the processor and OS used.

Difference between Compiler and Interpreter:

Compiler	Interpreter
Compiler Takes **Entire** program as input	Interpreter Takes **Single** instruction as input.
Intermediate Object Code is **Generated**	**No** Intermediate Object Code is **Generated**
Conditional Control Statements are Executes **faster**	Conditional Control Statements are Executes **slower**
Memory	**Memory**

Requirement : More(Since Object Code is Generated)	Requirement is Less
Program need not be **compiled** every time	Every time higher level program is converted into lower level program
Errors are displayed after **entire program** is checked	**Errors** are displayed for **every instruction** interpreted (if any)
Example : C Compiler	**Example** : BASIC

The Compilation Process:

- The objective of the compiler is to transform a program written in high-level programming language from source code into object code.
- Programmers write programs in a form called source code.
- The first step is to pass the source code through a compiler, which translates the HLL instruction into object code.
- The object code is then passed through a linker.
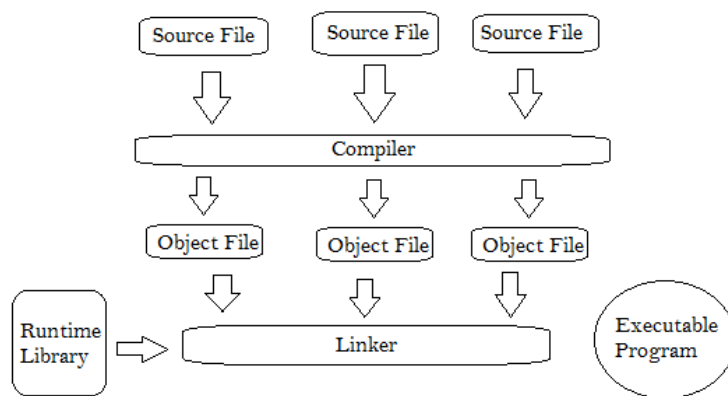
- The linker combines modules and give real values to all symbolic addresses.
- Every HLL language comes with a compiler.

OPERATING SYSTEM:

- An operating system manages and coordinates the functions performed by the computer hardware, including the CPU, input/output devices, secondary storage devices, and communication and networking equipment.
- Every general-purpose computer system must have an operating system to run other programs.
- Operating system perform basic tasks such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk and controlling Peripheral devices such as disk drives and printers.
- It also keep track of each hardware resources, determine who gets what, determine when the user will have access to the resource, allocate how much of the resource the user will be given, and terminate access at the end of the use period.
- Operating system may vary in complexity from those that support single user microcomputer to those that handle multiuser mainframes. their complexity depends on the computers size, scope and the type of performance provided to its users.
- The primary purpose of an operating system is to remise the productivity of a computer system by operating it in the most efficient manner and minimizing the amount of human intervention required.
- Many operating system or designed collection of program which can be organized around Micro computer operating system the Mac OS.
- Many operating systems are designed as a collection of program which can be organized around a central module, or kernel. Examples of some of the operating systems are Windows, DOS, OS/2, Mac OS, UNIX et cetera.

Functions of an operating system:

- Even the simplest operating system in the computer performs a number of resource management tasks or functions
- These functions include:
- Job Management: Job management software manages the jobs waiting to be processed. it recognizes the jobs, identifies their priorities, determines whether the appropriate main memory and secondary storage they require is available and schedules and finally runs each job at the appropriate moment
- Batch processing: System software is available support the different methods of processing a job. With batch processing, the most basic method, and data or accumulated and processed in groups.
- Online processing: in online processing data are processed instantaneously. Using an online system to request for information will be instantly acknowledged by the online software and appropriate steps will be taken to access the central database and return the

requested information to the terminal from which the request was made. It takes less than a few seconds to do the above task.

- Data management: operating system software also manages the storage and retrieval of data.
- Virtual storage: Operating system also manages the allocation of main memory to specific jobs. Some operating systems have a feature called virtual storage. With this software it is possible to increase the capacity of main memory without actually increasing its size.
- Input output management: operating system also manage the input to and output from a computer system. This applies to the flow of data among computers, terminals, and other devices such as printers. Operating system is also responsible for security, ensuring that unauthorized users do not access the system.

Classification of operating system:

Operating system can be classified as follow:

Multi-User:

- Multiuser operating system allows two or more user to run program at the same time. The OS of mainframe and minicomputers are multi-user systems. Example: MVS, UNIX etc.
- It is also called as time sharing.

Multiprocessing:

- Multiprocessing refers to a computer's ability to support more than one process at the same time.
- E.g.: MVS and UNIX. It also refers to the utilization of multiple CPU in one computer. it is also called as parallel processing.

Multitasking:

- Multitasking is the ability to execute more than one task at the same time, a task being a program.
- In multitasking only one CPU is involved, but it is switched from one program to another so quickly that it gives the appearance of executing all the programs at the same time.
- There are two basic types of multitasking: Preemptive and Cooperative
- In preemptive multitasking, the operating system parcels out CPU time slices to each program.
- In cooperative multitasking each program can control the CPU for as long as it needs it.

Multithreading:

- Multithreading is the ability of an OS to execute different parts of a program called thread simultaneously.
- The programmer carefully designs the program in such a way that all the thread can run at the same time without interfering each other.

Real-time:

- Real-time operating system or assistance address for the input immediately.
- This category includes operating system designed substantially for the purpose of controlling and a monitoring external activities time constraints.
- Example basic real-time monitor, C executive, CTOS, FADOS
- All operating system provide a software platform on top of which other program called application programs can run.
- The application program must be written to run on top of a particular operating system.
- To interact with operating system,
- In DOS operating system, it can be done through a set of commands.
- In Microsoft Windows a graphical user interface allows you to enter commands by pointing and clicking at objects that appear on the screen.

INTRODUCTION TO DATABASE MANAGEMENT SYSTEM:

Information

- Information is nothing but refined data, data that have been put into a meaningful and useful context and communicated to a recipient who uses it to make decision.
- A quality information must be accurate, relevant and used in time.

Database:

- A database consists of data, relationship, constraints and schema.
- Data are binary computer representation of stored logical entities.
- Relationship represents correspondence between various data elements.
- Constraints are predicates that define the correct database
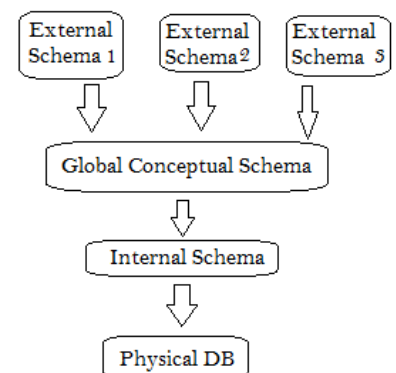
state.

- Schemer defines the various views of the database for DBMS
- Schema is of three types:
- The internal schema defines how and where data are organized in a physical data storage.
- The conceptual schema model defines the stored data structures in terms of DB model used.
- The external schema defines a view or views of the database for particular users

Advantages of database:

- *Redundancy can be reduced:* In non-database systems, each department has its own private files, resulting in multiple copies of the same information. By having a centralised database, repetition of information stored in different places can be avoided.
- *Inconsistency can be avoided:* When there are many copies of data that exist, updation has to be made in every copy. In case of a central database, updation is easy and all departments get to have the updated information at any point of time.
- *Data can be shared:* The existing application can share the data in a database.
- *Standards can be enforced*: With the central control of the database, the database admin can enforce standards.
- *Security restrictions can be applied:* Administrator can ensure that the data or accessed only through proper channels.
- *Integrity can be maintained:* Integrity means that the data in the database is accurate. Centralised Control of the data helps in permitting the admin to define integrity constraints to the data in the database.
- Conflicting requirements can be balanced: Knowing the overall requirements as opposed to the individual requirements, the database can be structured to provide an overall service that is best for the organisation.

Characteristics of data in the database

The data in a database should have the following features:

- Sharing of data among users
- Persistence: Data exist beyond the scope of the process that created it
- Validity/integrity/correctness: Data should be correct at any time.
- Security: The protection from unauthorised access.
- Consistency: the relationship between data has to be maintained.
- Non-redundancy: No two data item should represent a same item.
- Independence: The three levels in the schema should be independent of each other.

DBMS:

A DBMS is software that provides services for accessing a database, while maintaining all the required features of the data.

- In a DBMS, a user can create, modify or delete tables and databases as well as add, alter, delete, get report from the records in those tables.
- The maintenance and the characteristics are taken care of by the DBMS.

Services provided by a DBMS are:
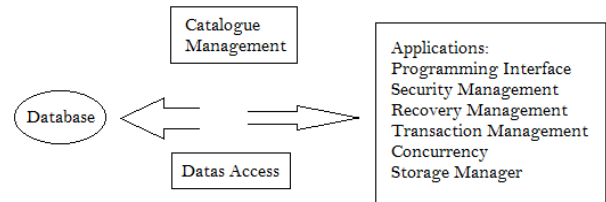
- *Transaction processing:* A Transaction is a sequence of database operation that represents a logical unit of work. A transaction can update a records, delete one, modify a set of records etc.
- *Concurrency management:* It is the activity of maintaining the consistency while data is accessed in sharing.
- *Recovery:* Recovery mechanism in a DBMS make sure that the database is returned to its consistent state after a transaction fails or aborts.
- *Security:* Security mechanism of a DBMS makes sure that only authorised users are given access to the data in the database. The access privileges of the user are monitored and controlled by the DBMS administrator.
- *Language interface:* The DBMS provides support languages used for the definition and manipulation of the data in the database.
- *Data catalogue:* Data catalogue or data dictionary is a system database that contains the description of data in the database (metadata). It contains information about data relationship, constraints and the entire schema that organises these features into a unified database. The data catalogue can be queried to get information about the structure of the database.
- *Storage management:* The DBMS provides a mechanism for the management of permanent storage of the data. The internal schema defines the storage management mechanism and the storage manager interfaces with the OS to access the physical storage.

Types of DBMS

There are five database model introduced so far:
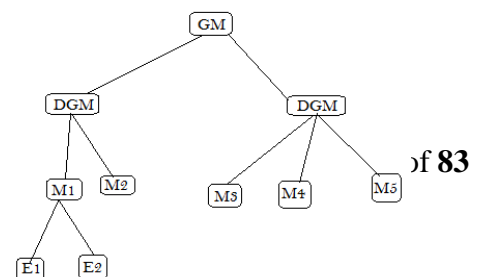
- Hierarchical, Network, Relational, Object-oriented and Deductive.

Hierarchical model

- The hierarchical model assumes that a tree structure is the most frequently occurring relationship.
- The hierarchal model organises data elements as tabular rows, one for each instance of an entity.
- The row position implies a relationship to the other rows.
- A given employee belongs to the department that is closest above it in the list and so on.

Network model
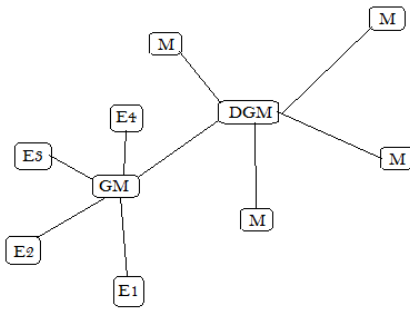
- The network model replaces the hierarchical tree with a graph thus allowing more general connection among the nodes.
- The network model was evolved specifically to handle non-hierarchical relationships.
- The relational model
- The relational model uses tables to organise the data elements
- Each table corresponds to an application entity (table) and each row represents an instance (record) of that entity.
- Structured query language (SQL) serves as a uniform interface for users providing a collection of standard expression for storing and retrieving data.

Object oriented model

- Object-oriented model represents an entity as a class.
- A Class represents both object attributes as well as the behavior of the entity.
- Instances of the class - object corresponds to individual books.
- Within an object the class attribute takes specific values, which distinguishes one book (object) from another.
- However the behavior patterns of the class is shared by all the objects belonging to the class.
- The object oriented model considers each record to be different objects.

- It maintains the relationship through logical containment.

Deductive/inference model

- Deductive model also known as the inferential model store as little data as possible, but compensate by maintaining rules that allow new data combination to be created when needed.
- Eg: A distributor can distribute more than one book and likewise one book can be distributed by many distributors.
- Such inference rules indirectly capture relationship groupings.
- The database thus stores certain elementary facts - axioms-from which other factors can be derived as and when needed using the rules.

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Unit IV - Computer Networks - WWW and Internet - Email - Web Design

COMPUTER NETWORKS

Definition:

A network is any arrangement where the sender transmits a message to a receiver over a channel consisting of some type of medium.

Architecture of a Network:

A network must consist of five basic components. They are terminals, telecommunication processors, telecommunication channels and media, computer and telecommunication software.

Terminals:

- Terminals include video display terminal and other end user workstations.
- Any input/output device that uses a network to transmit or receive data is a terminal.
- This includes microcomputers, telephones, fax machine, etc.

Telecommunication processors:

- These are devices which support data transmission and reception between terminal and computers.
- The devices include modem, multiplexers and frontend processors.
- These devices perform a variety of controls and support functions in a network.
- For examples they convert data from digital to analog and back, code and decode data, control the accuracy and efficiency of the flow of data between computers and terminals in a network.

Telecommunication channels and media:

- The media over which data are transmitted and received are called telecommunication channels.

Fig: Components of a communications network.
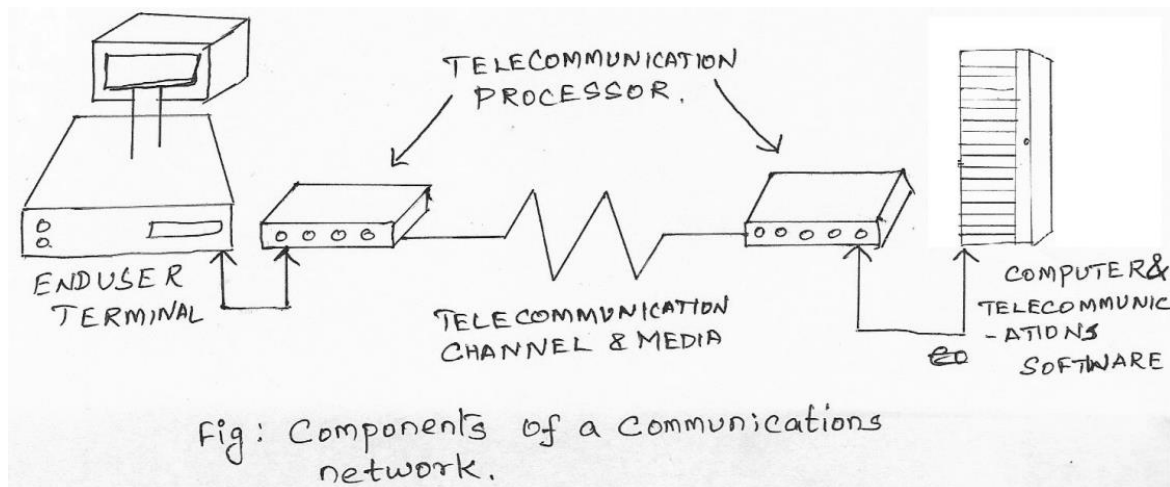
- Telecommunication channels use combinations of media, such as copper wire, coaxial cable, fiber-optic cables, microwave systems and communication satellite systems to interconnect the other components of a network.

Computer:

- Networks interconnect computers of all sizes and types so that they can carry out their information processing assignments.
- For example a mainframe computer may serve as a host computer for a large organizations network assisted by mini computers.

Telecommunication software:

- Telecommunication software consists of programs that reside in host computer systems, communication control computers and end-user computers.
- This controls the telecommunication activities of the computer systems and manages the functions of network.

Communication processor:

- Communication processor resemble computer CPU in that they have similar circuits, have memories, and can be programmed, but their purpose is limited-to enhance data communication between two points.
- Communication processors include modems, message switches, multiplexers, concentrators and controllers and front-end processors.

Modems: (MOdulator DEModulator).

- Models are the most common type of communication processor.
- They convert digital signal from a computer or transmission terminal at one end of a communication link into analog signal.
- A modem at the other end perform is the reverse process.
- The process of converting digital signal to analog signals and vice versa is called as modulation and demodulation.
- Modems come in several form including small size standalone units, plug in circuit boards and microelectronic modem chips.

Message switchers:

- A message switcher is a processor that receives data messages from terminals, determines their destination, and routes them one at a time to the CPU.
- It distributes the messages coming from the CPU to the appropriate terminal.
- Message switchers reduce long distance transmission cost, since only a single line is required.
- Only one terminal can communicate with the CPU at a time.
- These devices are efficient with low-speed terminals these are used at remote sites.

Multiplexes, concentrators and controllers:

- Multiplexer allow several terminal to use single line to communicate with a CPU.
- It allows the terminals to send their messages simultaneously.
- Concentrator is essentially a smart multiplexer- it can be programmed, has more processing capability, and is more flexible than a multiplexer.
- Controllers or cluster controllers, link group of terminals or other devices to a communication channel.
- These equipments are used at terminal sites having heavy input and output requirements.

Front-end processors:

- A front-end processor is located at the site of the CPU or the host computer and its purpose is to relieve the central computer of some of the communication task, leaving the larger computer free for processing application programs.

Communications media

- Channels also called as communication lines are links are the means by which data is transmitted between the sending and receiving devices in a network.
- A channel uses a variety of media such as twisted pair wire, coaxial cables and fiber-optic cables for physical link and microwave systems, communication satellite systems and cellular radio for wireless links.

Twisted pair wire:

- These are transmission lines that consist of copper wires twisted into pairs.
- These lines are used in established communications network throughout the world for both voice and data transmission.

Coaxial cable:

- Coaxial cables consist of a sturdy copper or aluminum wire wrapped with spacers to insulate and protect it.
- The insulation minimizes the interference and distortion of the signals.
- These high-quality lines can be placed underground and laid on the floors of lakes and oceans.
- They allow high-speed data transmission.

Fiber optic cables:

- Fiber-optic uses cables consisting of one or more hair thin filaments of glass fiber wrapped in a protective jacket.
- They can conduct light pulses generated by lasers at transmission rates up to 2 billion bits per second.
- Half inch diameter fiber - optic cable can carry up to 50,000 channels.
- Advantages:
  - They are not affected by and do not generate electromagnetic radiation.

- They have a minimal need for repeaters.
- They have much lower data error rate than other media.

Microwave systems:

- Terrestrial microwave system transmit high-speed the radio signals In a line of sight path between relay stations spaced approximately 25 to 35 miles apart.
- Microwave transmission consists of high-frequency radio waves that travel in straight lines through the air rather than through wires.
- These microwaves are relayed via antennas placed n top of buildings, towers, hills and mountain peaks.

Communication satellites:

- Communication satellites in space orbiting 22,000 miles above the earth are used as microwave relay station.
- They rotate at the precise point and speed above the equator that makes them appear stationery to microwave transmitters on the ground.
- Among the satellites now orbiting the earth that handle voice, video and data communications are those launched by INTELSAT, (INternational TELecommunications SATellite consortium).
- It accounts for most long-distance international communications.

Telecommunication software

Software is a visual component of all telecommunication networks. Communications control software includes program stored in the host computer as well as program in the front and the computers and other communication process.

The telecommunications software provides several major functions such as

- Access control - This function establishes the connections between terminals and the computers India network.
- Transmission control - This function allow computers and terminals to send and receive commands, messages, data and program.
- Network control - This function manages communications in a network. It also logs statistics of network activities and resource usage and detects and corrects errors.

- Error Control - Error Control involves detection and correction of transmission errors. Errors are usually caused by distortion in the communication channel, such as line noise and power surges. Communication software and processor control errors in transmission by several methods including Parity checking.
- Security control - Security control protects a communications network from unauthorized access. Access control software and other types of programs restrict access to data and the computing resources in the network. Data transmissions can also be protected by coding techniques called encryption. Data is scrambled into a coded form before translation and decoded upon arrival.

Types of network

There are basically two types of network:

1. Local Area Network (LAN) where the computers are geographically located close together
2. Wide Area Network (WAN) where computers are father apart and are connected by telephone lines or radio waves.

Other characteristics that are used to categorize different types of networks are:

1. Topology - the geometrical arrangement of computer in a network. Common topologies include a bus, star and ring topology.
2. Protocol - defines a common set of rules and signal that computers on the network use to communicate.
3. Architecture - networks can be broadly classified as using either peer to peer or client/server architecture.

Local area network (LAN):

- LAN is a network of computers, which span a relatively small area.
- Most LAN is confined to a single building or group of buildings.
- LAN connects workstations and personal computers.
- Each node (individual computer) has its own CPU with which it executes programs, but it is also able to access data and devices anywhere on the LAN.
- They can share devices such as printers, fax machines, Internet, and share messages between computers, engage in chat session.
- There are different types of LAN. Some of them are token ring network, Ethernet and ARC nets.

- LANs are capable of transmitting data at faster rates, much faster than data that can be transmitted over a telephone line; but the distance is limited, and there is also a limit on the number of computers that can be connected to a single LAN.

Wide area network (WAN):

- A WAN is a computer network that spans a relatively large geographical area.
- Typically, a WAN consists of two or more local area networks (LANs).
- Computers connected to a wide area network are often connected through public networks, such as the telephone system.
- They can also be connected through leased lines or satellites.
- The largest WAN in existence is the Internet.

Network topologies

- Topology is the geometrical arrangement of the computers in a network.
- Common topologies include star, ring and bus.

Star network

- The Star network is frequently used to connect one or more small computers or peripheral devices to a large host computer or CPU.
- In a time sharing setup, each terminal receives a fixed amount of the central CPU's time, called a time slice.
- By establishing time sharing, many people in a large organization can use a centralized computing facility.
- Star network is used in a LAN to connect several microcomputers to a central unit that works as a communications controller.
- If the users of one microcomputer want to send a document or a message to a user at another computer, the message is routed through the central communications controller.
- Central computer can be a mainframe computer that allows access to an organizations database.
- Access and control of star networks typically is maintained by a polling system. Polling means that the central computer "polls" or ask each device in the network if it has a message to send and then allows each in turn to transmit data.

Ring network

- The ring network is a local area network whose topology is in ring shape.

- It is a point-to-point connection of computers at disbursed locations, with no central host computer or communications controller.
- All of the nodes are connected in a closed loop.
- Messages travel around the ring, with each node reading those messages addressed to it.
- Access and control of rings network are maintained by a token passing system
- Token ring network is designed to link all types of computers together, including personal computers, minicomputer, mainframes etc.
- A token ring network resembles a Merry-go-round. To deliver a message, you would hand your address note to a rider (the token) on the merry-go-round, who would drop it off at the appropriate place.
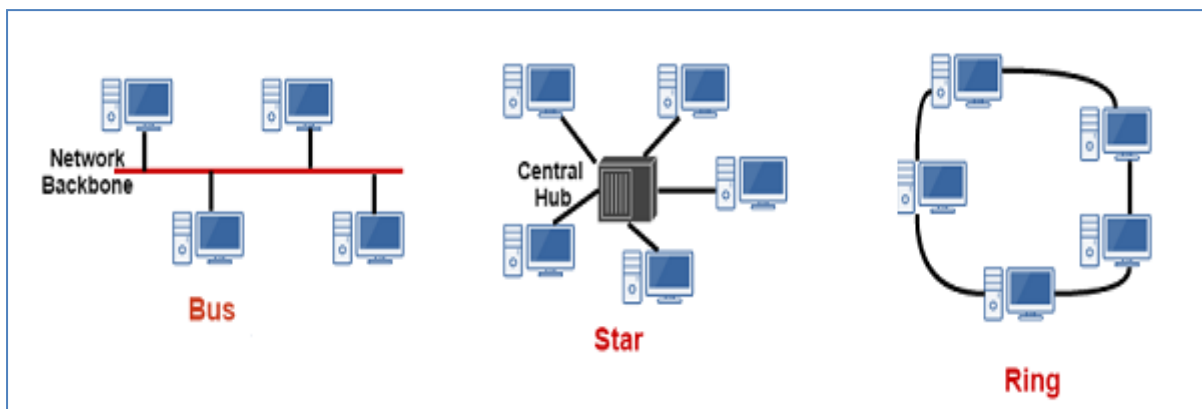
Bus network

- Bus network are similar to ring network except that the ends are not connected.
- All communications are carried on a common cable or bus and are available to each device on the network.
- Access and control of bus networks are maintained by a method called contention, whereby if a line is unused, a terminal or device can transmit its message at will, but if two or more terminals initiate message simultaneously, they must stop and transmit again at different intervals.

Network protocols

- A protocol is an agreed upon format for transmitting data between two devices.
- The protocol determines the following:
  ✓ The type of error checking to be used.
  ✓ Data compression method, if any.
  ✓ How the sending device will indicate that it has finished sending a message.
  ✓ How the receiving device will indicate that it has received a message.
- There are a variety of standard protocols from which programmers can choose.

- The protocol can be implemented either in hardware or software.
- Some of the popular protocols are TCP/IP, HTTP, FTP, SMTP, POP, Token-Ring, Ethernet, Xmodem, Kermit, MNP, etc,.

Network Architecture:

- The term architecture can refer to either hardware or software, or a combination of hardware and software.
- An open architecture allows the system to be connected easily to devices and programs made by other manufacturers.
- A system with a closed architecture is one whose design is proprietary, making it difficult to connect the system to other systems.
- Network architecture can be broadly classified as using either peer-to-peer or client/server architecture.

Peer-to-peer architecture:

- This is a type of network in which each workstation has equivalent capabilities and responsibilities.
- Some workstations are dedicated to serving the others.
- Peer-to-peer networks are simpler and less expensive, but they do not offer the same performance under heavy loads.

Client/server architecture:

- This is a network in which each computer or process on the network is either a client or a server.
- Servers are powerful computers or processors dedicated to managing disk drives (file servers), printers (print servers), or network traffic (network servers) controllers.
- Clients are less powerful PCs or workstations on which users run applications.
- Clients rely on servers for resources, such as files, devices, and even processing power.

WWW AND INTERNET

Internet:

- Internet is the world's largest computer network.
- It was created 25 years ago as a project for the US Department of defense.
- A network of networks or Internet is a group of two or more network that are-
  - Interconnected physically.
  - Capable of communicating and sharing data with each other.
  - Able to act together as a single network.
- Machines on one network can communicate with machines on other networks, and send data, files and other information back and forth.
- The Internet offers access to data, graphics, sound, software, text and people through a variety of services and tools for communication and data exchange.
- Some of the services are:
- Remote login (telnet)
- File transfer (FTP)
- Electronic mail (e-mail)
- News (USENET or network news)
- Hypertext (WWW)
- Internet is the cheapest and fastest means to get information, provide information and compile information.
- To make all the information available through the Internet, easily available to users, the Gopher, and the World Wide Web (WWW) were used.
- From the Internet, we can get information about people, products, organizations, research data, electronic versions of the printed media etc.

Internet access

- The Internet can be connected in two basic ways:
  - Dialing into an Internet service providers (ISP) computer.
  - With a direct connection to an Internet service provider.
- The difference is mainly the speed and cost.
- We can connect to Internet ISP using a telephone line and modem.

Dial-up connection

- Dial-up access is used either by way of SLIP (serial line Internet protocol) or PPP (point-to-protocol).
- To establish a dial-up connection to the Internet the following components are used:

- An account with an Internet access providers like BSNL, Airtel etc.
- A telephone connection.
- A computer with serial port for external modem or an expansion slot for internal modem.
- Communication software.
- With a dial-up account, a modem is used to convert computer bits and bytes into modulated (tonal) signals that the phone lines can transmit.

Direct connection:

- It is possible to get a direct connection to your ISP, where you have a fixed cable or a dedicated phone line to the ISP.
- The dedicated line is an ISDN (integrated services digital network) line which is a high-speed version of the standard phone line.
- It is possible to get a dedicated line called a T-1 or T-3.
- A T-1 line can handle 1280 kB per second.
- T-3 line can handle 10 times that speed.
- To have a dedicated line we have to use a router instead of a modem.

Internet protocols

- The most commonly used protocols are
- Transmission control protocol/Internet protocol (TCP/IP)
- File transfer protocol (FTP)
- Hyper text transfer protocol (HTTP)
- Telnet
- Gopher
- Wide area information service (WAIS).

Transmission control protocol/Internet protocol (TCP/IP):

- TCP/IP is a collection of protocols or rules that govern the way data travels from one machine to another across networks.
- The Internet is based on TCP/IP.
- The TCP/IP has two major components TCP and IP.

IP

- The IP component does the following:

- Envelopes and addresses the data.
- Enables the network to read the envelope and forward the data to its destination.
- Defines how much data can fit in a single "envelope" (a packet).

TCP

- The TCP component does the following:
- Breaks data up into packets that the network can handle efficiently.
- Verifies weather all the packets have arrived at their destination.
- Reassembles the data.

File transfer protocol (FTP):

- FTP is a part of the TCP/IP protocol suit.
- It is the protocol or a set of rules which enables files to be transferred between computers.
- FTP works on the client/server principle.
- Files that can be transferred are stored on computers called FTP servers.
- To access these files, an FTP client program is used.
- This is an interface that allows the user to locate the files to be transferred and initiate the transfer process.
- Anonymous FTP allows a user to access a wealth of publicly available information without any kind of authentication. No special account or password is needed.

Hyper text transfer protocol (HTTP):

- It is the set of rules or protocols that governs the transfer of Hypertext between two or more computers.
- Hypertext is text that is specially coded using a standard system called Hyper Text Markup Language (HTML).
- The HTML codes are used to create links.
- These links can be textual or graphic, and when clicked on, can link the user to another resource such as other HTML documents, text files, graphics, animation and sounds.
- HTTP is based on client/server principle.
- HTTP allows "Computer A" (the client) to establish a connection with "Computer B" (the server) and make a request.
- The server accepts the connection initiated by the client and sends back a response.
- An HTTP request identifies the resource that the client is interested in and tells the server what "action" to take on the resource.

- HTTP provides access to other Internet protocols like FTP, simple mail transfer protocol, network news transfer protocol, gopher, Telnet etc.,

Telnet:

- Telnet is a protocol that enables one computer to connect to another computer.
- This process is also referred to as remote login.
- The user's computer, which initiates the connection, is referred to as the local computer, and the machine being connected to, which accepts the connection, is referred to as the remote, or host computer.
- The remote computer can be physically located in the next room, the next town, or in another country.
- Once connected the user's computer emulates the remote computer.
- When the user types in commands, they are executed on the remote computer.
- The user's monitor displays what is taking place on the remote computer during the telnet session.
- Telnet also operates on the client/server principle.
- The local computer uses a telnet client program and the host computer uses a telnet server program to accept the request and send responses back to the local computer.

Gopher

- Gopher is a protocol designed to search, retrieve, and display documents from remote sites on the Internet.
- Information accessible via gopher is stored on many computers all over the Internet.
- These are called Gopher servers. Information stored on many kinds of non-gopher servers are called special Gopher servers and act as gateways.
- Servers do not just contain files, directories and searchable databases; they also contain references to other servers.
- To retrieve and search this information, a gopher client application has to be run on the computer.

Internet addressing

- Internet addressing is a systematic way to identify people, computers and Internet resources.

IP address

- An IP (Internet protocol) address is an identifier for a particular machine on a particular network; it is part of a scheme to identify computers on the network.
- An IP address consists of four sections separated by periods.
- Each section contains a number ranging from 0 to 255. Eg: 202.54.1.6.
- These four sections represent both the machine and the network that the host is on.
- The network portion of the IP address is allocated to Internet service providers (ISP) by the InterNIC.
- ISPs then assigns the host portion of the IP address to the machines on the networks that they operate.
- The IP addresses have the following characteristics in common.
- IP addresses or unique.
- No two machines can have the same IP number.
- IP addresses are also global and standardized.
- All machines connected to the Internet agree to use the same scheme for establishing an address.

Domain name:

- A domain name is a way to identify and locate computers connected to the Internet.
- A domain name always contains two or more components separated by periods.
- Some examples of domain names are *microsoft.com, ibm.com, nasa.gov, tcs.co.in.*
- The last portion of the domain name is the top level domain name and describes the type of organization holding that name.
- The major categories for top level domain names are:
- COM – commercial entities.
- EDU – educational institutions.
- NET – organizations directly involved in Internet operations
- ORG – miscellaneous organizations like non-profit groups
- GOV – United States Federal government entities
- Country codes – a two letter abbreviation for a particular country.
- Each domain name corresponds to numeric IP addresses.
- The Internet uses the numeric IP address to send data.
- The Domain Name System (DNS) completes the task of matching the domain names to IP addresses.
- Domain name system server and computers that translates domain names to IP addresses.

Electronic mail address:

- Electronic mail or email allows information to be sent between computers and people on the Internet.
- An electronic mail message can be sent to one or more email addresses.
- An email address identifies a person and the computer, for the purposes of exchanging electronic mail messages.
- The basic structure of an email address is

   username@host.subdomain.second-level-domain.first-level-domain

Eg: alex@giasmd01.vsnl.net.in   alexis@gmail.com

- "Alexis" is referred to as the username and gmail.net is part of the domain name of the organization.

Uniform resource locator (URL):

- A URL identifies a particular internet resources; for example a webpage.
- URL represent a standardized addressing scheme for Internet resources, and help the users to locate these resources by indicating exactly where they are.
- Every resource available via the World Wide Web has a unique URL.
- URL consist of letters, numbers and punctuation.
- The basic structure of a URL is hierarchical, and hierarchy moves from left to right.

   protocol://server-name.domain-name.top-level-domain:port/directory/filename

Eg: http://www.inl.net/alexis/index.html

   ftp://ftp.xyz.com/

The World Wide Web (WWW)

- The WWW is the brainchild of Tim Berners-Lee a CERN engineer, who had the idea of creating an electronic web of research information.
- During 1980s he created HTML on which the web is based.
- Early web pages consisted only of text. Later on technologies were developed to include images, audio, video and other multimedia elements.
- WWW has accelerated the growth of the Internet by giving it an easy to use, point and click, graphical interface.

- A web page is interactive.
- To navigate the WWW, users "surf" from one page to another by pointing and clicking on the hyperlinks in text or graphics.
- The World Wide Web or W3 is the universe of information available via hyper text transfer protocol (HTTP).
- The world wide web and HTTP,
    - Allows you to create links from one piece of information to another.
    - Can incorporate references to sounds, graphics, movies etc.,
    - Communicate with other Internet protocols such as FTP, telnet etc.,

WebPages and HTML

- A web page is a single unit of information, often called a document that is available via the World Wide Web (WWW).
- A web page can be longer than a computer screen and may require more than one piece of paper when it is printed.
- A web page is created using HTML.
- HTML stands for hyper text markup language.
- HTML consists of standardized codes or "tags" that are used to define the structure of information on a web page.
- These codes enable web pages to have many features including bold text, italics text, headings, paragraph breaks and numbered or bulleted list.
- HTML is a way of defining the formats of text in a web page.
- HTML utilizes descriptive markup to define the structure of an area of text.

HTML tags

- HTML is standardized and portable.
- A document that has been prepared using HTML markup tags can be viewed using a variety of browsers.
- A browser interprets the tags in an HTML file and presents the file as a formatted readable webpage.
- In addition, HTML documents can be viewed on all types of systems such as mackintosh, Windows and UNIX machines.
- A web page is transferred to a user's computer via the HTTP.
- HTTP is the method through which hypertext files such as web pages are transferred over the Internet.
- HTTP is a client/server based Internet protocol.

Web browsers

- A browser is a piece of software that acts as an interface between the user and the Internet.
- The browser acts on behalf of the user. The browser:
  - Contacts a web server and send a request for information.
  - Receives the information and then displays it on the user's computer.
- A Browser can be graphical or text based.
- A text based browser shows the user only the textual matter.
- A graphics browser allows the user to see graphics, photographs and multimedia.
- It also allows the user to point and click with a mouse to select hypertext links, and the uses drop-down menu and toolbar buttons to navigate and access resources on the internets.
- A text-based browser allows a user to see only text.
- Graphic elements are not displayed and hypertext links or accessed by using the keyboard.
- Examples of some common browsers are:
  - Chrome
  - Microsoft Internet explorer
  - Firefox
  - Netscape Navigator
  - Opera

Search engines

- A web search engine is an interactive tool to help people locate information available via the World Wide Web.
- Web search engines are databases that contain references to thousands of resources.
- Users interact with the database, submitting questions, if it contains resources that match specific criteria.
- Search engine provides an interface between the user and the underlying database.
- The web search engine runs the search string against the database, returns a list of resources that match the criteria, and displays the results for the user.

Meta search engines:

- A web meta searcher is a tool that helps user's locate information available via the world wide web.
- It provides a single interface that enables users to search many different engines, indexes and databases simultaneously.

- A Meta-searcher provides a central location where the query is typed in once, and the results can be obtained from multiple search engines.
- Meta-searchers differ from other search engines in the following:
- Single search engines and indexes provide a collection or database of resources that can be queried.
- Meta-searchers do not provide a database. They provide a service that sends a single query to multiple databases.

ELECTRONIC MAIL

Definition

- Email is an electronic message sent from one computer to another.
- You can send or receive personal and business-related messages with attachments like pictures or other documents.

Features:

- An email is also passed from one computer to another as it travels along the network.
- Each computer reads the email address under routs 8 to another computer until it eventually reaches its destination.
- It is then stored in an electronic mail box.
- With the Internet, this whole process usually takes just a few minutes, allowing you to communicate quickly and easily with millions of people around the world any time.
- With the advent of MIME, (Multipurpose Internet Mail Extension) and other types of encoding schemes like Uuencode, not only can you send a messages electronically, but you can also send formatted documents, photos, sound files and video files as attachments.
- From the user's standpoint, the onslaught of messages from peoples and Internet mailing list can quickly become unmanageable.
- That is no guarantee that messages will arrive safely.
- It is much more convenient and economical to send a message or document by email than by conventional mail.
- Email is less private than the conventional mail since its contents could be read by anyone who has access to the recipient's computer.
- It is also possible to interrupt an email on its way, read it and then send it as if it were untouched.

Working of email

The working of electronic mail is illustrated below:

1. Type the message and enter the recipients email address and press the send button in the email program.
2. Once addressed and sent the email, it gets encoded by a modem and is sent down the phone line as an analog signal. [A]
3. he email message arrives at service providers server. If it recognizes the email address as valid, Tthe mail will be sent. [B]
4. The mail is sent via the Internet. [C]
5. It will be received by the recipient's provider [D]
6. Then it is sent to the provider's mail server [E]
7. From there it will be delivered to the recipient's mailbox [F]
8. The mail will remain there until the recipient next connects to the Internet.
9. Finally, the recipient's modern and computer decode the data; he or she can read the email message [G]
10. It is very important to type the residence address correctly.
11. If the computer trying to deliver your message does not recognize the mailing address, it will automatically send you a message informing that the mail could not be delivered.

Email names and addresses

- Electronic mail message can be sent to one or more email addresses.
- An email address identifies the person or computer for purpose of exchanging electronic mail messages.
- The basic structure of an email address is

Username @host.subdomain.second-level-domain.first-level-domain

Eg:

     alex@giasm01.vsnl.net.in
     alex@yahoo.com

- Alexis is the name of the person sending or receiving the message this is referred to as the username
- Yahoo is part of the domain of the organization.
- Com is also part of the domain name and it indicates that yahoo is a commercial organization.

- Other networks may use different electronic mail addressing schemes within their own networks.
- Names on the internet are case sensitive, so when typing the name one should exactly use the correct adderss.

Structure of an email

To compose an email message click on the compose new message button on the toolbar. An empty mail form which will have the following parts will be displayed.

To - Receivers email address.

CC- Email address of the person to whom the copy of the message is to be sent.

Subject- Brief description as to what the message is about

Body- Enter the actual message here.

BCC-list of email address to whom the copy of the message is to be sent without others knowing it.

Features of an email program:

- All email program have features like Address book, signature feature and attachment facility.

Address book

- An address book is a place where you can store information about the people with whom you correspond.
- The advantage of having persons details in the address book is that user can select the persons name and they email ID will automatically get inserted.
- Every email address to whom we have sent so far will be added to the address book.

Signature

- You can store the information that you want to attach at the end of the messages as your signature.

- Then you can configure your assistance in such a way that all the outgoing messages will have your signature at the end of the message.

File attachments

- One drawback of email is that you cannot send formatted text.
- The solution is to send the formatted file as an attachment with the mail.
- You can attach any file via mail to a mail.
- It is also a good idea to compress the file you are attaching which will reduce the file size and save time and money during transmission.

Replying and forwarding email messages

- We can reply to the order by pressing the reply button in the mail.
- The to address will automatically populated and in the subjects there will be *"Re"* at the beginning followed by the subject of the actual mail.
- *"Re"* denotes that the present mail is in reply to a mail.

Customizing the mail program

- The spellchecking feature of the email program is useful, so that spelling errors can be avoided.
- The text mail programs don't allow the user to format text.
- A HTML program is capable of including formatting like making the text bold, italics, or creating numbered list etc.
- Filters are a feature where the incoming mails can be sorted to separate folders based on conditions.
- SPAM is a folder where unfamiliar mails and mail deemed as unwanted by the mail server were placed.

Email ethics

- Email messages are like letters. Our email says a lot about values, and the reputation of the organization we represent.
- Like any forms of Communication, there are certain manners that you should follow when using the email.
- Some of them are:
- Have a personal touch with every message.

- Know your recipient. Different people have different ideas of what is acceptable. Find out and respect each person's wishes.
- Be brief. This not only saves bandwidth but also cuts down on eyestrain.
- Make the subject line precise
- Do not copy the full text of your long message into your response. Copy only the parts you need to refer to.
- Use technology. A memory resident spellchecker or thesaurus will help to avoid miss spelling of words or usage of incorrect words.
- Compose messages in off-line. Read the messages before sending it.
- Configure your email client to check all your accounts in one shot. If security is not a concern configure your email client to remember password.
- Be aware that email can be archieved and under some circumstances, may not be secure.
- Avoid Urgent and priority unless it really is.
- Check your email regularly. Unlike postal mail or fax, email message is not automatically delivered to your desktop. You have the log on to check your mail.

Internet code of conduct

- The Internet reliance on the cooperation of its constituents – user with user, service provider with other service providers, users and service providers with one another. The following guidelines for conduct were developed by the Internet Society (ISOC).
- Mailing list, News group and bulletin boards
- Post within the Forum scope/topic.
- Avoid redundant, empty or stupid postings.
- Respect the opinion of other participants.
- Use common courtesy when postings negative comments.
- Do not use expression that are considering discriminatory.
- Advertising
- Do not post to list or boards or newsgroups whose purpose states no advertising.
- Use email enabled information services like mailing list to which user can subscribe or send email to obtain information.
- Privacy
- Do not invade the personal privacy of other users.
- Do not forward email without permission.
- Do not deliberately break into computer systems.
- Security
- System break-in or aiding others to break into systems is illegal.

- Getting password or other access information fraudulently is unacceptable.
- Intellectual property
- Copying or making available copies of protected works without the author's permission is illegal.

Advantages of email

- Email can be accessed 24 hours a day from anywhere in the world to endless amount of data and information.
- Global communication is easier.
- The technology has opened the door for professionals to work at home because they can still tap into corporate information.
- Thus work can now be done anywhere a computer can be plugged in.

Disadvantages of email

- It has created an information overload.
- People or swamped by junk mail.
- Finding what are relevant from the hundreds of mail can become a daunting task.
- Email can be a distraction and prevent people from doing any productive work

Mailing list

- A mailing list is a way to share information via electronic mail with many people.
- People choose to be part of a mailing list by subscribing to it.
- Once a user is joined the list, then he or she will receive regular information by email about the subject that particular list is concerned with.
- These emails or automatically delivered to the subscriber.
- This keeps on continuing until the user choose to unsubscribe.

News groups

- News group on the internet are public email discussion forums where the participants post their messages to be seen by all readers of the newsgroup.
- Anyone reading the message can choose to reply publicly or privately.
- News group provide a forum for interested people to discuss topics of common interest.
- Newsgroups offer the most stimulating, useful and controversial content on the Internet.

WEB DESIGN

Since Sir Tim Berners-Lee, a research scientist, proposed and developed an internet-based hypertext system back in 1989, and then, in the early 1990s, developed the first HTML documents, HTML has been the backbone for creating websites. While style sheets have been a part of markup languages.

Since the 1980s, CSS (Cascading Style Sheets), which was created to separate presentation (design) from content (markup documents), was first adopted in the mid-1990s; since then, CSS has become the standard styling language for the Web.

The Language of the Web: HTML

HTML, or HyperText Markup Language, is the authoring language that describes how a Webpage should be displayed by a Web browser. It has two essential features: hypertext and universality. Hypertext means when a visitor clicks a link on a Web page, the visitor is led to another Web page or document. Universality means that because HTML documents are savedas text files, virtually any computer can read a Web page.

For increased accessibility to your Web pages, we recommend using XHTML (extensible Hypertext Markup Language) when creating your Web pages.

How Browsers Display Web pages

When a Web page is opened in a browser, the browser reads and interprets the HTML file and formats the Web page for display. If there are references to external files, such as images or multimedia, these files are downloaded from the server and displayed in the browser window. It is important to note that HTML files are text files that only contain references to the external files – you do not "embed" these files into the Web page.

Saving a Web Page You Visit

Sometimes you may want to save a copy of a Web page you visit so you can view the design of the Web page later in a Web editor. To save a Web page, follow these steps:

step 1. View the Web page in your browser, if it is not currently visible.

step 2. From the File menu in your browser select Save As (Internet Explorer, Safari) or Save Page As (Firefox).

step 3. For the PC: In the drop-down menu next to the Save as type field, select Web Page, HTML only. If you want to save the Web page and the associated images, select Web Page, Complete (Internet Explorer, Firefox)

For the Macintosh: In the drop-down menu next to Format select HTML Source (Internet Explorer) or Web Page, HTML only (Firefox). Choose Web Archive (Internet Explorer) or Web

Page, complete (Firefox) to save the Web page and its images. In Safari, simply go to the next step.

step 4. Choose the name of the Web page file and select the location on your computer where you want to save the Web page.

step 5. Click Save.

SITE STRUCTURE

Every Web site that you build or inherit should have a consistent and simple organization – called a site structure. A site is a collection of HTML files, documents and images contained in a single master folder (the root folder). Within this root folder you can save your documents and subfolders organized in a manner that makes sense to you, as well as to others in your department that may need to edit the information.

Web site include:

1. A root folder that contains the Web site.

2. A Web page entitled index.htm (or index.html) that resides within the root folder to represent the default homepage for the Web site.

3. An images folder that contains the graphics, illustrations, images and photographs used in your Web

pages.

4. Additional folders for organizing your content.

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Unit V - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.

Computers at Home

There are a lot number of uses of Computer at Home, regardless of the fact they are important or not.

Home Budget:
- Computer can be used to manage the home budget.
- The user can easily calculate expenses and income. He can list all expenses in one column and income in another column.
- He can apply any calculation on these columns to plan home budget.

- Ne can write important documents and print them in a font everyone understands (because not everyone understands every ones handwriting)

Computer Games:

- An important use of computer at home is playing games. Different types of games are available.
- These games are a source of entertainment and recreation.
- Many games are available that are specially developed to improve your mental capability and thinking power.

Working from Home:

- People can manage office work at home.
- The owner of a company can check the work of employees from home.
- He can control his office while sitting at home.

Entertainment:

- People can find entertainment on the internet using computer.
- They can watch movies, hear songs and download different stuff.
- They can also watch live matches on internet.

Information:

- Any person can find any type of information from internet.
- Educational and informative websites are available to download books, tutorials etc. to improve knowledge.

Chatting:

- You can chat with your friends on internet. You can also talk with them.
- Different messages, files and information can be sent to them.

Online Shopping:

- To Shop online (better than to go to the shop and find out what you want is not in stock).

Storing Information:

- So far computer are cheaper and safer means of storing information.
- In a home, various business applications help to plan and analyze their finances, store treasured photos and videos, records of various transactions etc.

Smart home:

- Smart home is building automation for home.
- It involves the control and automation of lighting, heating (such as smart thermostats), ventilation, air conditioning (HVAC), and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers.
- Wi-Fi is often used for remote monitoring and control.

Computers in Education & Training

- Computer teaching plays a key role in the modern education system.
- Students find it easier to refer to the Internet than searching for information in fat books.
- The process of learning has gone beyond learning from prescribed textbooks.
- Internet is a much larger and easier-to-access storehouse of information.
- When it comes to storing retrieved information, it is easier done on computers than maintaining hand-written notes.
- The advantages of computers in education primarily include:
  - Storage of information
  - Quick data processing
  - Audio-visual aids in teaching
  - Better presentation of information
  - Access to the Internet
  - Quick communication between students, teachers and parents
- Today, a life without computers is unimaginable. This underlines the importance of computer education.
- Knowledge of computers can propel one's career in the right direction.
- Computers are a part of almost every industry today.
- They are no longer limited any specific field.
- They are used in networking, for information access and data storage and also in the processing and presentation of information.

Computers are a brilliant teaching aid.

- Online education has revolutionized the education industry.
- Computer technology has made the dream of distance learning, a reality.
- Education is no longer limited to classrooms.
- It has reached far and wide, thanks to computers.
- Physically distant locations have come closer due to Internet accessibility.
- So, even if students and teachers are not in the same premises, they can very well communicate with one another.
- There are many websites that provide online educational courses, whereby students are not required to attend classes or be physically present for lectures.
- They can learn from the comfort of their homes and adjust timings as per their convenience.
- You can download educational material, books and tutorials without going outside.

- Some universities provide online lectures for the students. Students can ask questions and discuss problems by sending emails to websites.

Computer-aided learning (CAL)

- Computer aided learning is the process of using information technology to help teaching and enhance learning process.
- The use of compute can reduce the time that is spent on preparing teaching material.
- It can also reduce the administrative load of teaching and research.
- Presentation software like PowerPoint and animation software like Flash among others can be of great help to teachers while delivering lectures.
- Computers facilitate audio-visual representation of information, thus making the process of learning interactive and interesting.
- Computer-aided teaching adds a fun element to education. Teachers hardly use chalk and board today.
- They bring presentations on a flash drive, plug it into a computer in the classroom, and the teaching begins. The use of multimedia projector and slides has improved the quality of teaching.
- There's color, there's sound, there's movement - the same old information comes forth in a different way and learning becomes fun and interesting due to audio-visual effects.
- Due to the visual aid, difficult subjects can be explained in better ways.
- Computer software helps better presentation of information.

Computers in Entertainment

- Music: As technology advanced, computers became increasingly versatile in what they could do.
- With the creation of the Internet and faster processors, file sharing and entertainment became a popular use for personal computers everywhere.
- Computers have endless uses in the entertainment industry by directly marketing products to users.
- Music and Movies are available in the internet.
- They are used to record music without a professional studio.
- They allow musicians to create artificial instruments to record with, called MIDI instruments.
- Television & Movies: With the advancement of video card and Internet speeds, movies and streaming television are now at the click of a mouse button.

- With the use of newer HD televisions and computers, the option of sending your computers video feed to a full-screen television is possible.
- Art: Pictures, paintings, poetry and more are readily available online at any moment.
- Computer photo editing programs and animation programs are also the sources behind most movies and professional photographs.
- Games: Computer games offer a very wide array of possibilities. Computers have access to many peripheral devices such as keyboards, mouse, joysticks, controllers and more.
- Computer games also are highly customizable because computers can manipulate game files.
- Computers are absolutely necessary for programming any sort of new video game.
- Sports: If there is a perfect way to pitch a ball, execute a spin on the ice, or take off from a ski jump, computers can find it.
- By analyzing the motions of the best athletes, sports trainers and kinetic specialists establish profiles.
- Other athletes can compare themselves to those profiles and try to improve their own styles and moves.

Computers in Science

- Six Uses of Computers in Science
- Data Collection: Scientists use computers to collect data and make hypotheses on the basis of collected data.
- Analysis and Testing Of Data: Scientists use computers to analyze collected data and test their hypotheses.
- The first large scale computer was called "Colossus" and it was used in World War II to crack German wartime codes, an aspect of combinatorics.
- Exchanging Information: Scientists use computers to exchange information with their colleagues.
- The Internet allows for almost instantaneous sharing of data across any distance.
- Different Researches all over the world can share their research with one another.
- This will be helpful for research because this will increase the rate of completion of research projects.
- Simulation of Different Events: Scientists may use computers for simulation of complex events.
- Machines can be used to run automated tests and complete simple tasks.
- Use Of Computer in Medical Science: Computers may also be used to simulate the functions of parts of human body.

- Uses of Computer in Space Science: Computers are playing an important role to explore the outer space.
- The computers are mostly used to collect space data, perform experiments and prepare results.
- Computers are used to operate certain machines and robots to collect information from space and send it back on earth.

Computers in Medicine:

Computer is needed at following places in a hospital

- Reception: as soon as patient walks in, all details of patient are entered in computer. most hospitals have software which helps to book appointment, send reminders to patients etc.
- Doctor room: These days hospitals are going paperless and so all patient records including their medical condition, investigation ordered and treatment etc is entered in software available in computer at your doctor's desk
- Investigation room: Computers are the excellent means for storage of patient related data.
- Investigations are done and uploaded into software and reports can be assessed by doctor from his room.
- Machines operated by computers: Medical imaging is a vast field that deals with the techniques to create images of the human body for medical purposes.
- Magnetic resonance imaging, Computed tomography, Sophisticated computers and infrared cameras are used for obtaining high-resolution images. Computers are widely used for the generation of 3-D images in medicine
- The functioning of hospital-bed beeping systems, emergency alarm systems, X-ray machines and several such medical appliances is based on computer logic.
- Pharmacy: Computers can keep track of prescriptions and billing information.
- Pharmacy uses computer to upload stock available, medicine sold on particular day and to generate invoice.
- Stores: Hospital maintain store room and computers are used here to maintain stock of all medical equipment and consumables
- Councilor: Many hospitals appoint councilors to explain the medical condition to patients and discuss treatment options.
- They also explain and demonstrate surgical options via special softwares on compute
- Knowledge Base: Medicine comprises vast base of knowledge.
- Computer storage can serve as the best means of housing this information.
- Medical journals, research and diagnosis papers, important medical documents and reference books can best be stored in an electronic format.

Computers in Engineering:

- Product engineers apply science, math and original thought to develop new products or new product solutions.
- Traditionally, this consisted of drawing out new products by hand, then building them.
- Using computers and specialty computer software, engineers can design, test and make changes to products in minimal time.
- Computers help them complete the task at hand much more quickly.
- CAD, or computer-aided design, is the process of designing new products using computer software.
- Such software helps designers and engineers take their ideas from a concept state to a model in a 3-D environment.
- CFD: Typically, when engineers are developing things such as airplanes and automobiles, they'll put the product through wind tunnel testing to make sure that drag is minimized.
- Drag slows the speeds of such vehicles, which can lead to a reduction in fuel economy.
- CFD, or computational fluid dynamics, software has allowed engineers to do such testing virtually.
- Using a computer, they can take their CAD designs and put them through wind tunnel testing in 3-D.
- This saves time, in that they can immediately calculate such effects without having to physically test them.
- File Sending: Engineers can upload their CAD files to websites and select what materials and technologies they want used to create their parts.
- Alterations: Computers facilitate the ability to make corrections quickly, so engineers can develop their products with ease and speed.
- Computers are capable of accessing and storing large quantities of information quickly, which saves times and improves efficiency.

INTRODUCTION TO COMPUTER SECURITY

- Internet is becoming a dangerous place for all organizations and individuals to protect their sensitive data or reputation. This is because of the numerous people and machines accessing it.
- Sealing of information (hacking) three main factors:

    1. Hacking tools that can be found very easily by everyone just by googling and they are endless.

2. Technology with the end-users has increased rapidly within these years, like internet bandwidth and computer processing speeds.

3. Access to hacking information manuals.

- Since locking down all networks is not an available option, the only response the security managers can give is to harden their networks, applications and operating systems to a reasonable level of safety, and conducting a business disaster recovery plan.

Things to secure in a computer environment:

- Check the physical security by setting control systems like motion alarms, door accessing systems, humidity sensors, and temperature sensors. All these components decrease the possibility of a computer to be stolen or damaged by humans and environment itself.
- People having access to computer systems should have their own user id with password protection.
- Monitors should be screen saver protected to hide the information from being displayed when the user is away or inactive.
- Secure your network especially wireless, passwords should be used.
- Internet equipment as routers to be protected with password.
- Data that you use to store information which can be financial, or non-financial by encryption.
- Information should be protected in all types of its representation in transmission by encrypting it.

Potential Losses due to Security Attacks

- Losing you data
- Bad usage of your computer resources
- Reputation loss
- Identity theft

Basic Computer Security Checklist

There are some basic things that everyone must do in every operating system:

- Check if the user is password protected.
- Check if the operating system is being updated.
- Check if the antivirus or antimalware is installed and updated.

- Check for the unusual services running that consumes resources.
- Check if your monitor is using a screen saver.
- Check if the computer firewall is on or not.
- Check if you are doing backups regularly.
- Check if there are shares that are not useful.
- Check if your account has full rights or is restricted.
- Update other third party software's.

COMPUTER VIRUSES, BOMBS, WORMS:

Viruses:

Viruses cannot spread without the help of us humans. They are like parasites because they need a host to attach themselves to. The host is usually a legitimate looking program or file. Once this program is launched, the virus is executed and infects other files on your computer. Viruses can be very destructive.

They can do damage to your computer hardware, software and files. Viruses are spread through the sharing of files and are many times sent within emails via attachments.

Various types of viruses are worms, Trojan horse, bomb, bacteria.

Worms:

A worm is a malicious program that can replicate itself onto other computers on a network.

Unlike a virus, worms don't need a human to be able to spread and infect systems. Once it infects a system, it uses that system to send out other copies of itself to other random systems attempting to infect them.

Trojan Horse:

A Trojan horse is a malicious program that can be used to do silly things to a system like changing its desktop, mess with the user interface, and take control of your mouse. It can also be used for some serious things like accessing your data, erasing your files, stealing your passwords, and capturing your keystrokes.

They cannot replicate themselves.

Logic Bombs:

Logic bombs are usually pieces of code that are programmed into a program that lie dormant until a certain time or until a user does a certain action which causes it to be executed. When it is triggered it performs a certain function that the program wasn't intended to do.

Bacteria:

Bacteria make many copies of themselves and eventually end up taking up all of the computers recourses such as all of its processor power, memory and disk space. This results in the legitimate user losing access to those resources.

Blended Threats:

Blended threats combine all of the characteristics of the above and use them along with system vulnerabilities to spread and infect machines.

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