UNIT – I:
Generation of Modern Computers – Classification of Digital Computer Systems: Microcomputers - Minicomputers - Mainframes – Super Computers – Network Computers.
UNIT – II:
Anatomy of a Digital Computer: Parts of a computer – CPU and Memory: Introduction – CPU – Memory – Memory organization – RAM – ROM – Registers.
UNIT – III:
Input Devices: Keyboard-Mouse-Scanners-Barcode Reader- Webcams-OMR. Output devices: Monitor-Printer.
UNIT – IV:
Computer Networks: Introduction-Types of networks-Network Topology. Internet &World Wide Web: Introduction-What is special about the internet?-Internet Access.
UNIT – V:
Overview of Electronic Mail: Introduction- How E-mail Works?-Why Use E-mail?-E-mail-Names and Addresses-Mailing Basics. Introduction to Intranets: Introduction-Characteristics of Intranet-Advantages of Intranets.

UNIT-I

Generations of Computer

Introduction:

A computer is an electronic device that manipulates information or data. It has the ability to store, retrieve, and process data.
Nowadays, a computer can be used to type documents, send email, play games, and browse the Web. It can also be used to edit or create spreadsheets, presentations, and even videos. But the evolution of this complex system started around 1940 with the first Generation of Computer and evolving ever since.
There are five generations of computers.

1. FIRST GENERATION

- *Introduction:*
  1. 1946-1959 is the period of first generation computer.
  2. J.P.Eckert and J.W.Mauchy invented the first successful electronic computer called ENIAC, ENIAC stands for "Electronic Numeric Integrated And Calculator".
- *Few Examples are:*
  1. ENIAC
  2. EDVAC
  3. UNIVAC
  4. IBM-701
  5. IBM-650

  …

- *Advantages:*
  1. It made use of vacuum tubes which are the only electronic component available during those days.
  2. These computers could calculate in milliseconds.
- *Disadvantages:*
  1. These were very big in size, weight was about 30 tones.
  2. These computers were based on vacuum tubes.
  3. These computers were very costly.
  4. It could store only a small amount of information due to the presence of magnetic drums.
  5. As the invention of first generation computers involves vacuum tubes, so another disadvantage of these computers was, vacuum tubes require a large cooling system.
  6. Very less work efficiency.
  7. Limited programming capabilities and punch cards were used to take inputs.
  8. Large amount of energy consumption.
  9. Not reliable and constant maintenance is required.

2. SECOND GENERATION

- *Introduction:*
    1. 1959-1965 is the period of second-generation computer.
    2. 3.Second generation computers were based on Transistor instead of vacuum tubes.
- *Few Examples are:*
    1. Honeywell 400
    2. IBM 7094
    3. CDC 1604
    4. CDC 3600
    5. UNIVAC 1108
    … many more

- *Advantages:*
    1. Due to the presence of transistors instead of vacuum tubes, the size of electron component decreased. This resulted in reducing the size of a computer as compared to first generation computers.
    2. Less energy and not produce as much heat as the first genration.
    3. Assembly language and punch cards were used for input.
    4. Low cost than first generation computers.
    5. Better speed, calculate data in microseconds.
    6. Better portability as compared to first generation
- *Disadvantages:*
    1. A cooling system was required.
    2. Constant maintenance was required.
    3. Only used for specific purposes.

3. THIRD GENERATION

- *Introduction:*
  1. 1965-1971 is the period of third generation computer.
  2. These computers were based on Integrated circuits.
  3. IC was invented by Robert Noyce and Jack Kilby In 1958-1959.
  4. IC was a single component containing number of transistors.
- *Few Examples are:*
  1. PDP-8
  2. PDP-11
  3. ICL 2900
  4. IBM 360
  5. IBM 370

  … and many more

- *Advantages:*
  1. These computers were cheaper as compared to second-generation computers.
  2. They were fast and reliable.
  3. Use of IC in the computer provides the small size of the computer.
  4. IC not only reduce the size of the computer but it also improves the performance of the computer as compared to previous computers.
  5. This generation of computers has big storage capacity.
  6. Instead of punch cards, mouse and keyboard are used for input.
  7. They used an operating system for better resource management and used the concept of time-sharing and multiple programming.
  8. These computers reduce the computational time from microseconds to nanoseconds.
- *Disadvantages:*

1. IC chips are difficult to maintain.
2. The highly sophisticated technology required for the manufacturing of IC chips.
3. Air conditioning is required.

4. FOURTH GENERATION

- *Introduction:*
  1. 1971-1980 is the period of fourth generation computer.
  2. This technology is based on Microprocessor.
  3. A microprocessor is used in a computer for any logical and arithmetic function to be performed in any program.
  4. Graphics User Interface (GUI) technology was exploited to offer more comfort to users.
- *Few Examples are:*
  1. IBM 4341
  2. DEC 10
  3. STAR 1000
  4. PUP 11

  … and many more

- *Advantages:*
  1. Fastest in computation and size get reduced as compared to the previous generation of computer.
  2. Heat generated is negligible.
  3. Small in size as compared to previous generation computers.
  4. Less maintenance is required.
  5. All types of high-level language can be used in this type of computers.
- *Disadvantages:*

1. The Microprocessor design and fabrication are very complex.
2. Air conditioning is required in many cases due to the presence of ICs.
3. Advance technology is required to make the ICs.

5. FIFTH GENERATION

- *Introduction:*
  1. The period of the fifth generation in 1980-onwards.
  2. This generation is based on artificial intelligence.
  3. The aim of the fifth generation is to make a device which could respond to natural language input and are capable of learning and self-organization.
  4. This generation is based on ULSI(Ultra Large Scale Integration) technology resulting in the production of microprocessor chips having ten million electronic component.
- *Few Examples are:*
  1. Desktop
  2. Laptop
  3. NoteBook
  4. UltraBook
  5. Chromebook
  … and many more

- *Advantages:*
  1. It is more reliable and works faster.
  2. It is available in different sizes and unique features.
  3. It provides computers with more user-friendly interfaces with multimedia features.
- *Disadvantages:*
  1. They need very low-level languages.
  2. They may make the human brains dull and doomed.

S.No	Generation & Description
1	**First Generation** The period of first generation: 1946-1959. Vacuum tube based.
2	**Second Generation** The period of second generation: 1959-1965. Transistor based.
3	**Third Generation** The period of third generation: 1965-1971. Integrated Circuit based.
4	**Fourth Generation** The period of fourth generation: 1971-1980. VLSI microprocessor based.
5	**Fifth Generation** The period of fifth generation: 1980-onwards. ULSI microprocessor based.

Classification Of Digital Computer

The digital computers that are available now a days vary in their sizes and types.These digital computers are broadly classified into four categories based on their size and type.

- ## Micro Computer
- ## Mini Computer
- ## Mainframe Computer
- ## Super Computer

- ## **Micro Computer:**
    Micro Computer are small low cast and single user digital computers.
- It is a device with microprocessor,Input unit ,storage unit and CPU(Central Processing Unit). Microcomputer Computer formerly a commonly used term for Personal Computers particularly any of class of any small digital computers.
- Its CPU contained on a single integrated semi conductor chip.
- IBM PC based on Pentium microprocessor and Apple Macintosh are some Examples of microcomputers.
- Microcomputers include desktop computers, notebook computers or laptop,tablet compute, handheld computer,smartphones and notebook.

Types of Micro Computers:

A)Desktop Computer or Personal Computer(PC):-It is the most type of microcomputer.A desktop computer is a personal computer designed for regular use at a single location on or near a desk or table due to its size and power requirements.It is not very expensive and is suited t the needs of a single user at home,small business units,and organization.
Examples:Apple,Microsoft,Dell,and Lenovo ,Sony,HP,etc are some of the PC manufactures.

B)Notebook Computers or Laptop:-A laptop is a small, portable computer and have all the features of a desktop computer. The advantage of the laptop is that it is small in size, so it can be carried anywhere.

Notebook computers use a variety of techniques, known as flat-panel technologies, to produce a lightweight and non-bulky display screen. Laptops Computers are costlier than the desktop computers.

C)Netbook:-These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications.Netbooks deliver the performance needed to enjoy popular activities like streaming videos ort music,e-mailing,web surfing or instant messaging.

D)Tablet:- A tablet is a wireless, portable personal computer with a touchscreen interface. The tablet form factor is typically smaller than a notebook computer, but larger than a smartphone.

E)Handheld Computer or Personal Digital Assistant(PDA):-It is a small computer that can be heald on the top of the palm.It is small in size.PDA uses a pen or a stylus for input,instead of the keyboard.They have a limited memory and are less porful.PDAs can be connected to the internet via wireless connnection.

F)Smart Phones:A smartphone is a mobile phone with highly advanced features. A typical smartphone has a high-resolution touch screen display, WiFi connectivity, Web browsing capabilities, and the ability to accept sophisticated applications. The majority of these devices run on any of these popular mobile operating systems: Android, Symbian, iOS, BlackBerry OS and Windows Mobile.

Mini Computer:

- These perform multi-tasking and allow terminals to be connected to their services.the ability to connect minicomputers to each other and mainframes has popularized them among larger businesses.
- This use is being challenged by the development in the microcomputer range and the practice of starting resources of microcomputer under a network.Minicomputer are still recognized as being able to process large amounts of data.

Types of minicomputer

The types of minicomputer are- tablet PC, Desktop minicomputers, cell phones, notebooks, high-end mP3 players, etc.

Examples:- IBM's   AS/400e

Mainframe Computer:

- Main frame computers generally require special attention and are kept in a controlled atmosphere.
- They are multi-tasking and generally used in areas where large database are maintained example as government agency or airline industry.

Examples:- IBM LinuxONE

Super Computer:

- Super Computers operate very fast and have multiple processors. Ther are very few of these machines in existence due to their cost.
- This type of computer has been developed for scientific applications usually involving complex arithmetic and mathematical operations. One such use is in weather forecasting.
- A supercomputer is a type of computer that has the architecture, resources and components to achieve massive computing power.
- Although advances like multi-core processors and GPGPUs (general-purpose graphics processing units) have enabled powerful machines for personal use (see: desktop supercomputer, GPU supercomputer), by definition, a supercomputer is exceptional in terms of performance.
- China has owned the fastest supercomputer in the world. "Fast" is defined by the number of petaflops the computer system can perform. A petaflop is one thousand teraflops, or one quadrillion floating point operations per second.

Year	Supercomputer	Peak speed	Location
2016	Sunway TaihuLight	93.01 PFLOPS	Wuxi, China
2013	NUDT Tianhe-2	33.86 PFLOPS	Guangzhou, China
2012	Cray Titan	17.59 PFLOPS	Oak Ridge, U.S.
2012	IBM Sequoia	17.17 PFLOPS	Livermore, U.S.
2011	Fujitsu K computer	10.51 PFLOPS	Kobe, Japan

Classification of Computers

The computer systems can be classified on the following basis:

1. On the basis of size.
2. On the basis of functionality.
3. On the basis of data handling.

Classification on the basis of size

1. **Super computers :**
   - The super computers are the most high performing system.
   - A supercomputer is a computer with a high level of performance compared to a general-purpose computer.
   - The actual Performance of a supercomputer is measured in FLOPS instead of MIPS.

- All of the world's fastest 500 supercomputers run Linux-based operating systems.
- Supercomputers actually play an important role in the field of computation and are used for intensive computation tasks in various fields, including quantum mechanics, weather forecasting, climate research, oil and gas exploration, molecular modeling, and physical simulations. eg: PARAM, jaguar, roadrunner.

2. **Mainframe computers :**

- These are commonly called as big iron, they are usually used by big organizations for bulk data processing such as statics, census data processing, transaction processing and are widely used as the severs as these systems has a higher processing capability as compared to the other classes of computers.
- Most of these mainframe architectures were established in 1960s, the research and development worked continuously over the years and the mainframes of today are far more better than the earlier ones, in size, capacity and efficiency.
Eg: IBM z Series, System z9 and System z10 servers.

3. **Mini computers :**

- These computers came into the market in mid 1960s and were sold at a much cheaper price than the main frames, they were actually designed for control, instrumentation, human interaction, and communication switching as distinct from calculation and record keeping, later they became very popular for personal uses with evolution.
- In the 60s to describe the smaller computers that became possible with the use of transistors and core memory technologies, minimal instructions sets and less expensive peripherals such as the ubiquitous Teletype Model 33 ASR.
- They usually took up one or a few inch rack cabinets, compared with the large mainframes that could fill a

room, there was a new term "MINICOMPUTERS" coined

Eg: Personal Laptop, PC etc.

4. **Micro computers :**
   - A microcomputer is a small, relatively inexpensive computer with a microprocessor as its CPU.
   - It includes a microprocessor, memory, and minimal I/O circuitry mounted on a single printed circuit board.The previous to these computers, mainframes and minicomputers, were comparatively much larger, hard to maintain and more expensive.
   - They actually formed the foundation for present day microcomputers and smart gadgets that we use in day to day life.
   Eg: Tablets, Smartwatches.

Classification on the basis of functionality

1. **Servers :** Servers are nothing but dedicated computers which are set-up to offer some services to the clients. They are named depending on the type of service they offered. Eg: security server, database server.
2. **Workstation :** Those are the computers designed to primarily to be used by single user at a time. They run multi-user operating systems. They are the ones which we use for our day to day personal / commercial work.
3. **Information Appliances :** They are the portable devices which are designed to perform a limited set of tasks like basic calculations, playing multimedia, browsing internet etc. They are generally referred as the mobile devices. They have very limited memory and flexibility and generally run on "as-is" basis.
4. **Embedded computers :**
   - They are the computing devices which are used in other machines to serve limited set of requirements.
   - They follow instructions from the non-volatile memory and they are not required to execute reboot or reset.

- The processing units used in such device work to those basic requirements only and are different from the ones that are used in personal computers- better known as workstations.

Classification on the basis of data handling

1. **Analog :**
   - An analog computer is a form of computer that uses the continuously-changeable aspects of physical fact such as electrical, mechanical, or hydraulic quantities to model the problem being solved.
   - Any thing that is variable with respect to time and continuous can be claimed as analog just like an analog clock measures time by means of the distance traveled for the spokes of the clock around the circular dial.
2. **Digital :**
   - A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system of "0" and "1".
   - Computer capable of solving problems by processing information expressed in discrete form.
   - From manipulation of the combinations of the binary digits, it can perform mathematical calculations, organize and analyze data, control industrial and other processes, and simulate dynamic systems such as global weather patterns.
3. **Hybrid :**
   A computer that processes both analog and digital data, Hybrid computer is a digital computer that accepts analog signals, converts them to digital and processes them in digital form.

Computer Network

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

Characteristics of a Computer Network

- Share resources from one computer to another.

- Create files and store them in one computer, access those files from the other computer(s) connected over the network.

- Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.

Following is the list of hardware's required to set up a computer network.

- Network Cables
- Distributors
- Routers
- Internal Network Cards
- External Network Cards

Network Cables

Network cables are used to connect computers. The most commonly used cable is Category 5 cable RJ-45.

Distributors

A computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work.

The solution is to use a central body to which other computers, printers, scanners, etc. can be connected and then this body will manage or distribute network traffic.

Router

A router is a type of device which acts as the central point among computers and other devices that are a part of the network. It is equipped with holes called ports. Computers and other devices are connected to a router using network cables. Now-a-days router comes in wireless modes using which computers can be connected without any physical cable.

Network Card

Network card is a necessary component of a computer without which a computer cannot be connected over a network. It is also known as the network adapter or Network Interface Card (NIC). Most branded computers have network card pre-installed. Network cards are of two types: Internal and External Network Cards.

Internal Network Cards

Motherboard has a slot for internal network card where it is to be inserted. Internal network cards are of two types in which the first type uses Peripheral Component Interconnect (PCI) connection, while the second type uses Industry Standard Architecture (ISA). Network cables are required to provide network access.

External Network Cards

External network cards are of two types: Wireless and USB based. Wireless network card needs to be inserted into the motherboard, however no network cable is required to connect to the network.

Universal Serial Bus (USB)

USB card is easy to use and connects via USB port. Computers automatically detect USB card and can install the drivers required to support the USB network card automatically.

Basics of Computer Networking

Open system:
A system which is connected to the network and is ready for communication.

Closed system:
A system which is not connected to the network and can't be communicated with.

Computer Network:
An interconnection of multiple devices, also known as hosts, that are connected using multiple paths for the purpose of sending/receiving data or media. Computer networks can also include multiple devices/mediums which help in the communication between two different devices; these are known as **Network devices** and include things such as routers, switches, hubs, and bridges.

Router　　　Hub　　　Bridge

Wireless Router　　　Switch　　　Wireless Bridge

Network Topology:
The layout arrangement of the different devices in a network. Common examples include: Bus, Star, Mesh, Ring, and Daisy chain.

star

Mesh

Hybrid

Point-to-Point

Daisy Chain

Ring

Tree
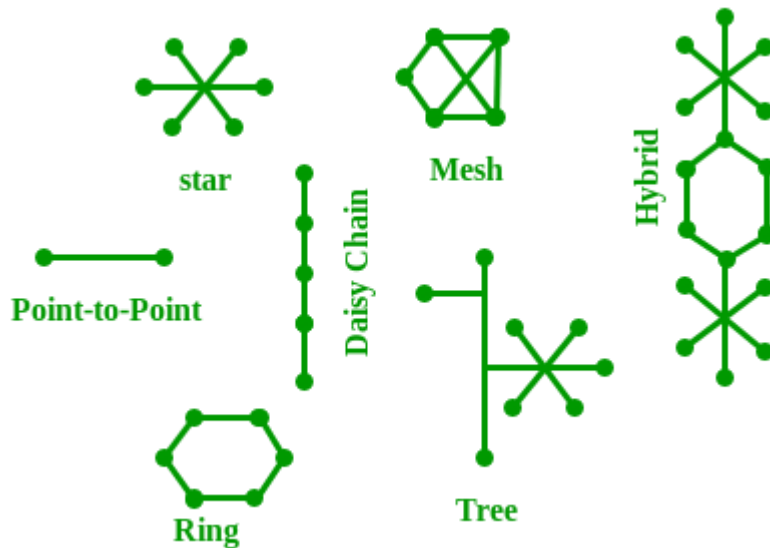
OSI:

OSI stands for **Open Systems Interconnection**. It is a reference model that specifies standards for communications protocols and also the functionalities of each layer.

Protocol:

A protocol is the set of rules or algorithms which define the way how two entities can communicate across the network and there exists different protocol defined at each layer of the OSI model. Few of such protocols are TCP, IP, UDP, ARP, DHCP, FTP and so on.

UNIQUE IDENTIFIERS OF NETWORK

Host name:

Each device in the network is associated with a unique device name known as Hostname. Type "hostname" in the command prompt(Administrator Mode) and press 'Enter', this displays the hostname of your machine.

IP Address (Internet Protocol address):

Also known as the Logical Address, the IP Address is the network address of the system across the network.

To identify each device in the world-wide-web, the Internet Assigned Numbers Authority (IANA) assigns an IPV4 (Version 4) address as a unique identifier to each device on the Internet.

The length of an IPv4 address is 32-bits, hence, we have 2^{32} IP addresses available. The length of an IPv6 address is 128-bits.

Type "ipconfig" in the command prompt and press 'Enter', this gives us the IP address of the device.

MAC Address (Media Access Control address):
Also known as physical address, the MAC Address is the unique identifier of each host and is associated with its NIC (Network Interface Card).
A MAC address is assigned to the NIC at the time of manufacturing.
The length of the MAC address is : 12-nibble/ 6 bytes/ 48 bits
Type "ipconfig/all" in the command prompt and press 'Enter', this gives us the MAC address.

Port:
A port can be referred to as a logical channel through which data can be sent/received to an application. Any host may have multiple applications running, and each of these applications is identified using the port number on which they are running.
A port number is a 16-bit integer, hence, we have 2^{16} ports available which are categorized as shown below:
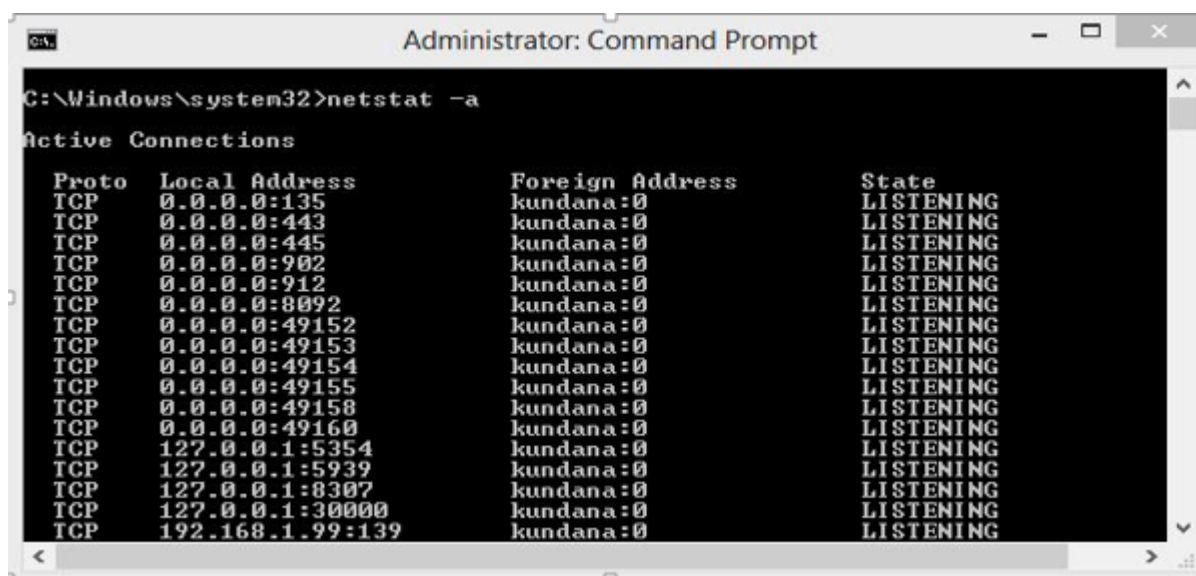
PORT TYPES	RANGE
Well known Ports	0 – 1023
Registered Ports	1024 – 49151
Ephemeral Ports	49152 – 65535

Number of ports: 65,536
Range: 0 – 65535
*Type "**netstat -a**" in the command prompt and press 'Enter', this lists all the ports being used.*

Socket:
The unique combination of IP address and Port number together are termed as Socket.
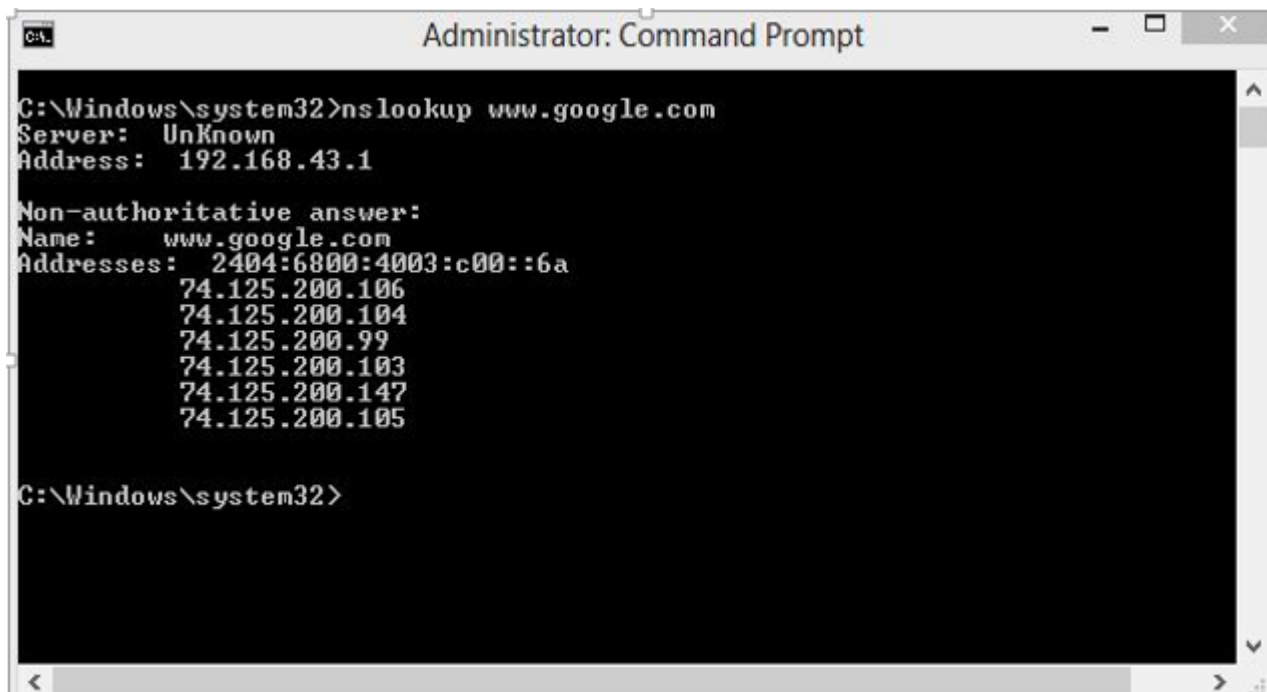**Other related concepts**
DNS Server:
DNS stands for **Domain Name system**.
DNS is basically a server which translates web addresses or URLs (ex: www.google.com) into their corresponding IP addresses. We don't have to remember all the IP addresses of each and every website.
The command '**nslookup**' gives you the IP address of the domain you are looking for. This

also provides the information of our DNS Server.

ARP:
ARP stands for **Address Resolution Protocol**.
It is used to convert an IP address to its corresponding physical address(i.e., MAC Address).
ARP is used by the Data Link Layer to identify the MAC address of the Receiver's machine.
RARP:
RARP stands for **Reverse Address Resolution Protocol**.
As the name suggests, it provides the IP address of the device given a physical address as input. But RARP has become obsolete since the time DHCP has come into the picture.

UNIT – II:
Anatomy of a Digital Computer: Parts of a computer – CPU and Memory:
Introduction – CPU – Memory – Memory organization – RAM – ROM –
Registers.

Parts of a computer

Central Processing Unit (CPU)

Central Processing Unit (CPU) consists of the following features:

- CPU is considered as the brain of the computer.

- CPU performs all types of data processing operations.

- It stores data, intermediate results, and instructions (program).

- It controls the operation of all parts of the computer.

CPU itself has following three components.

- Memory or Storage Unit

- Control Unit

- ALU (Arithmetic Logic Unit)
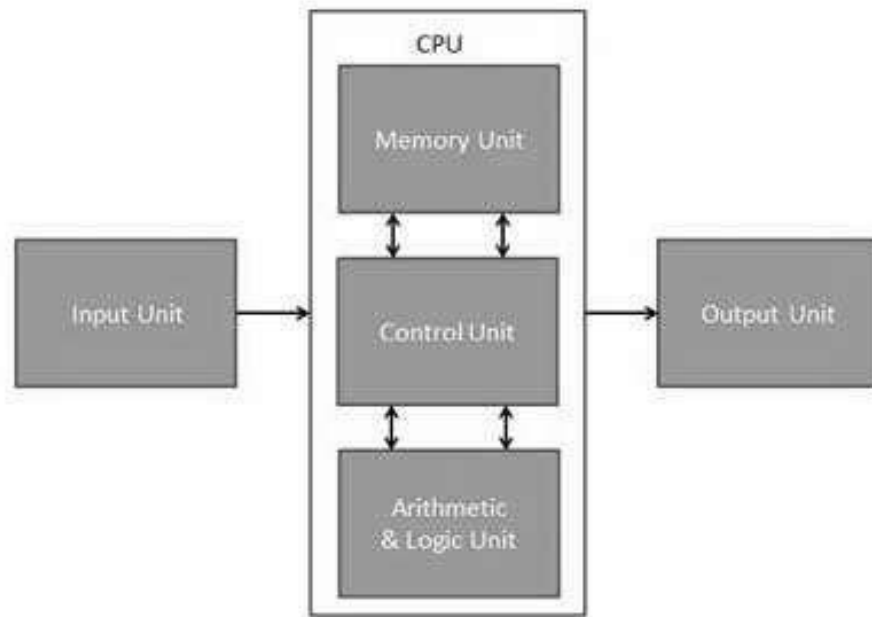
Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its size affects speed, power, and capability. Primary memory and secondary memory are two types of memories in the computer. Functions of the memory unit are:

- It stores all the data and the instructions required for processing.

- It stores intermediate results of processing.

- It stores the final results of processing before these results are released to an output device.

- All inputs and outputs are transmitted through the main memory.

Control Unit

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

Functions of this unit are:

- It is responsible for controlling the transfer of data and instructions among other units of a computer.

- It manages and coordinates all the units of the computer.

- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.

- It communicates with Input/Output devices for transfer of data or results from storage.

- It does not process or store data.

ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely,

- Arithmetic Section

- Logic Section

Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

memory

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored. The memory is divided into large number of small parts called cells. Each location or cell has a unique address, which varies from zero to memory size minus one. For example, if the computer has 64k words, then this memory unit has 64 * 1024=65536 memory locations. The address of these locations varies from 0 to 65535.

Memory is primarily of three types -

- Cache Memory

- Primary Memory/Main Memory

- Secondary Memory

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up the CPU. It acts as a buffer between the CPU and the main memory. It is used to hold those parts of data and program which are most frequently used by the CPU. The parts of data and programs are transferred from the disk to cache memory by the operating system, from where the CPU can access them.

Advantages

The advantages of cache memory are as follows:

- Cache memory is faster than main memory.

- It consumes less access time as compared to main memory.

- It stores the program that can be executed within a short period of time.

- It stores data for temporary use.

Disadvantages

The disadvantages of cache memory are as follows:

- Cache memory has limited capacity.

- It is very expensive.

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

Characteristics of Main Memory

- These are semiconductor memories. It is known as the main memory.

- Usually volatile memory.

- Data is lost in case power is switched off.

- It is the working memory of the computer.

- Faster than secondary memories.

- A computer cannot run without the primary memory.

Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than the main memory. These are used for storing data/information permanently. CPU directly does not access these memories, instead they are accessed via input-output routines. The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.

Characteristics of Secondary Memory

- These are magnetic and optical memories. It is known as the backup memory.

- It is a non-volatile memory.

- Data is permanently stored even if power is switched off.

- It is used for storage of data in a computer.

- Computer may run without the secondary memory.

- Slower than primary memories.

RANDOM ACCESS MEMORY

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types -

- Static RAM (SRAM)

- Dynamic RAM (DRAM)

Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

Characteristic of Static RAM

- Long life

- No need to refresh

- Faster

- Used as cache memory

- Large size

- Expensive

- High power consumption

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually **refreshed** in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

Characteristics of Dynamic RAM

- Short data lifetime

- Needs to be refreshed continuously

- Slower as compared to SRAM

- Used as RAM

- Smaller in size

- Less expensive

- Less power consumption

ROM stands for **Read Only Memory**. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as **bootstrap**. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.
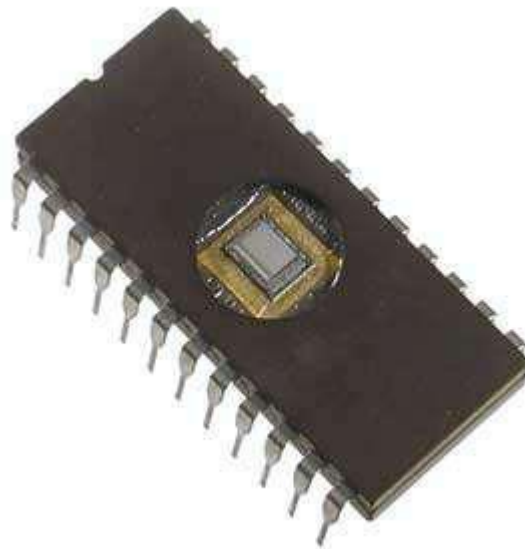
Let us now discuss the various types of ROMs and their characteristics.

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

PROM (Programmable Read Only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM (Erasable and Programmable Read Only Memory)

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of re-programming is flexible but slow.

Advantages of ROM

The advantages of ROM are as follows:

- Non-volatile in nature

- Cannot be accidentally changed

- Cheaper than RAMs

- Easy to test

- More reliable than RAMs

- Static and do not require refreshing

- Contents are always known and can be verified

UNIT – III:
Input Devices: Keyboard-Mouse-Scanners-Barcode Reader- Webcams-
OMR. Output devices: Monitor-Printer.

Input Devices

Following are some of the important input devices which are used in a computer:

- Keyboard

- Mouse

- Joy Stick

- Light pen

- Track Ball

- Scanner

- Graphic Tablet

- Microphone

- Magnetic Ink Card Reader (MICR)

- Optical Character Reader (OCR)

- Bar Code Reader

- Optical Mark Reader (OMR)

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Advantages

- Easy to use

- Not very expensive

- Moves the cursor faster than the arrow keys of the keyboard

Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Light Pen

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.
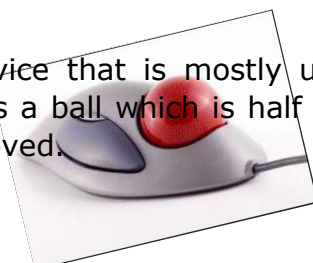
Scanner

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

Microphone

Microphone is an input device to input sound that is then stored in a digital form.

The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.

Magnetic Ink Card Reader (MICR)

MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader (OCR)

OCR is an input device used to read a printed text.

OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books, etc. It may be a handheld scanner or may be embedded in a stationary scanner.

Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which is then fed to the computer that the bar code reader is connected to.

Optical Mark Reader (OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked.

It is specially used for checking the answer sheets of examinations having multiple choice questions.

OUTPUT DEVICES

Following are some of the important output devices used in a computer.

- Monitors

- Graphic Plotter

- Printer

Monitors

Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)

- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

There are some disadvantages of CRT:

- Large in Size

- High power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.
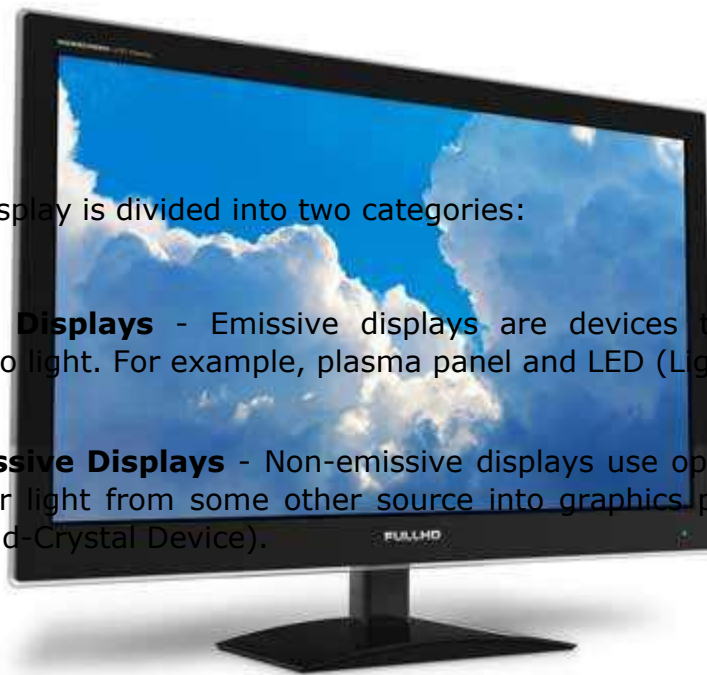
The flat-panel display is divided into two categories:

- **Emissive Displays** - Emissive displays are devices that convert electrical energy into light. For example, plasma panel and LED (Light-Emitting Diodes).

- **Non-Emissive Displays** - Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. For example, LCD (Liquid-Crystal Device).

Printers

Printer is an output device, which is used to print information on paper.

There are two types of printers:

- Impact Printers

- Non-Impact Printers

Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.

Characteristics of Impact Printers are the following:

- Very low consumable costs

- Very noisy

- Useful for bulk printing due to low cost

- There is physical contact with the paper to produce an image

These printers are of two types -

- Character printers

- Line printers

Character Printers

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer (DMP)

- Daisy Wheel

Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.

Advantages

- Inexpensive

- Widely Used

- Other language characters can be printed

Disadvantages

- Slow Speed

- Poor Quality

Daisy Wheel

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.

Advantages

- More reliable than DMP
- Better quality
- Fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

Line Printers

Line printers are the printers which print one line at a time.

These are of two types -

- Drum Printer
- Chain Printer

Drum Printer

This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts cannot be changed

Chain Printer

In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

Non-impact Printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types -

- Laser Printers

- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers

- They are not noisy

- High quality

- Supports many fonts and different character size

Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed

- Very high quality output

- Good graphics quality

- Supports many fonts and different character size

Disadvantages

- Expensive

- Cannot be used to produce multiple copies of a document in a single printing

Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing

- More reliable

Disadvantages

- Expensive as the cost per page is high

- Slow as compared to laser printer

UNIT – IV:
Computer Networks: Introduction-Types of networks-Network Topology.
Internet &World Wide Web: Introduction-What is special about the internet?-Internet Access.

Computer Network

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

Characteristics of a Computer Network

- Share resources from one computer to another.

- Create files and store them in one computer, access those files from the other computer(s) connected over the network.

- Connect a printer, scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over the network.

Computer network is a telecommunication channel using which we can share data with other coomputers or devices, connected to the same network. It is also called Data Network. The best example of computer network is Internet.

Computer network does not mean a system with one Control Unit connected to multiple other systems as its slave. That is Distributed system, not Computer Network.

A network must be able to meet certain criterias, these are mentioned below:

1. Performance
2. Reliability
3. Scalability

Computer Networks: Performance

It can be measured in the following ways:

- **Transit time :** It is the time taken to travel a message from one device to another.
- **Response time :** It is defined as the time elapsed between enquiry and response.

Other ways to measure performance are :

1. Efficiency of software
2. Number of users
3. Capability of connected hardware

Computer Networks: Reliability

It decides the frequency at which network failure take place. More the failures are, less is the network's reliability.

Computer Networks: Security

It refers to the protection of data from any unauthorised user or access. While travelling through network, data passes many layers of network, and data can be traced if attempted. Hence security is also a very important characteristic for Networks.

Properties of a Good Network

1. **Interpersonal Communication:** We can communicate with each other efficiently and easily. Example: emails, chat rooms, video conferencing etc, all of these are possible because of computer networks.

2. **Resources can be shared:** We can share physical resources by making them available on a network such as printers, scanners etc.

3. **Sharing files, data:** Authorised users are allowed to share the files on the network.

Types of Computer Network: LAN, MAN and WAN

A computer network is a group of computers connected with each other through a transmission medium such as cable, wire etc. In this guide, we will discuss the types of computer networks in detail.
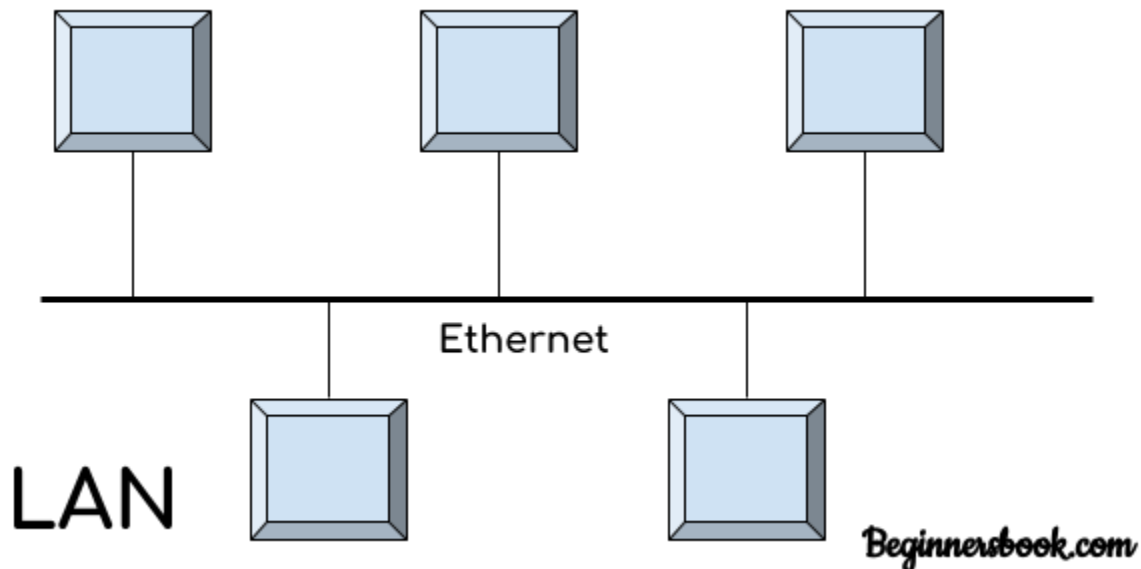
Types of Computer Network
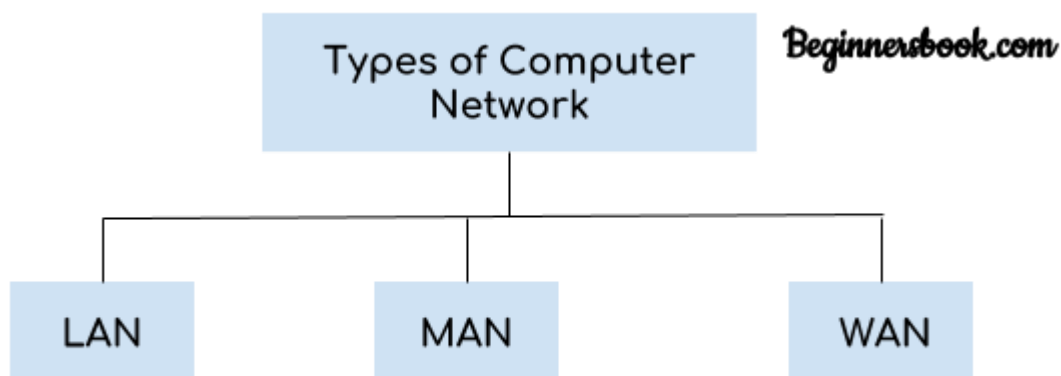
There are mainly three types of computer networks based on their size:
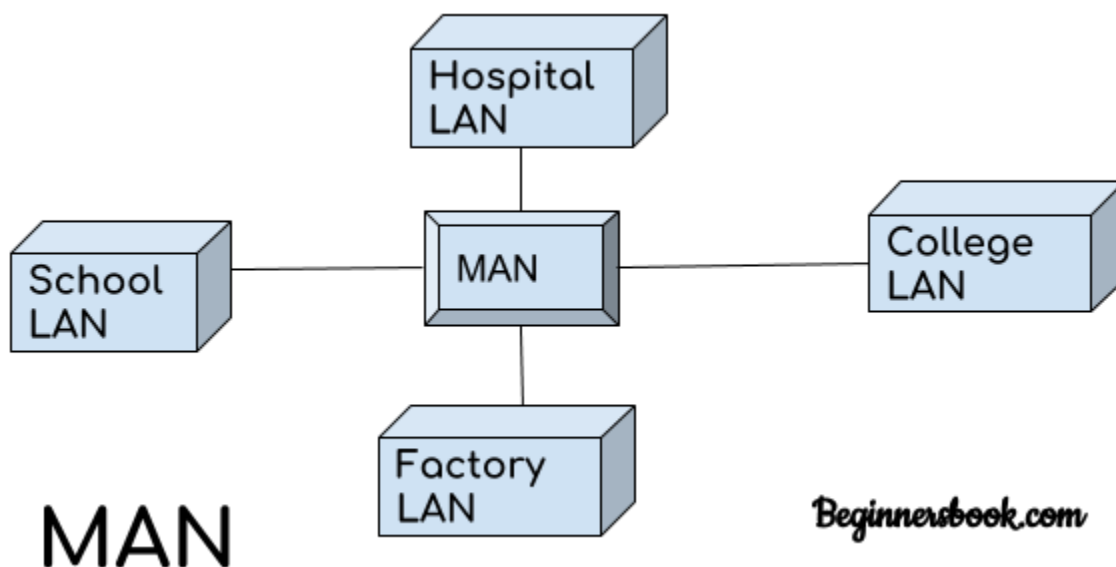
1. Local Area Network (LAN)
2. Metropolitan Area Network (MAN)
3. Wide area network (WAN)

1. Local Area Network (LAN)

1. Local area network is a group of computers connected with each other in a small places such as school, hospital, apartment etc.
2. LAN is secure because there is no outside connection with the local area network thus the data which is shared is safe on the local area network and can't be accessed outside.
3. LAN due to their small size are considerably faster, their speed can range anywhere from 100 to 100Mbps.
4. LANs are not limited to wire connection, there is a new evolution to the LANs that allows local area network to work on a wireless connection.

2. Metropolitan Area Network (MAN)

MAN network covers larger area by connections LANs to a larger network of computers. In Metropolitan area network various Local area networks are connected with each other through telephone lines. The size of the Metropolitan area network is larger than LANs and smaller than WANs(wide area networks), a MANs covers the larger area of a city or town.

3. Wide area network (WAN)
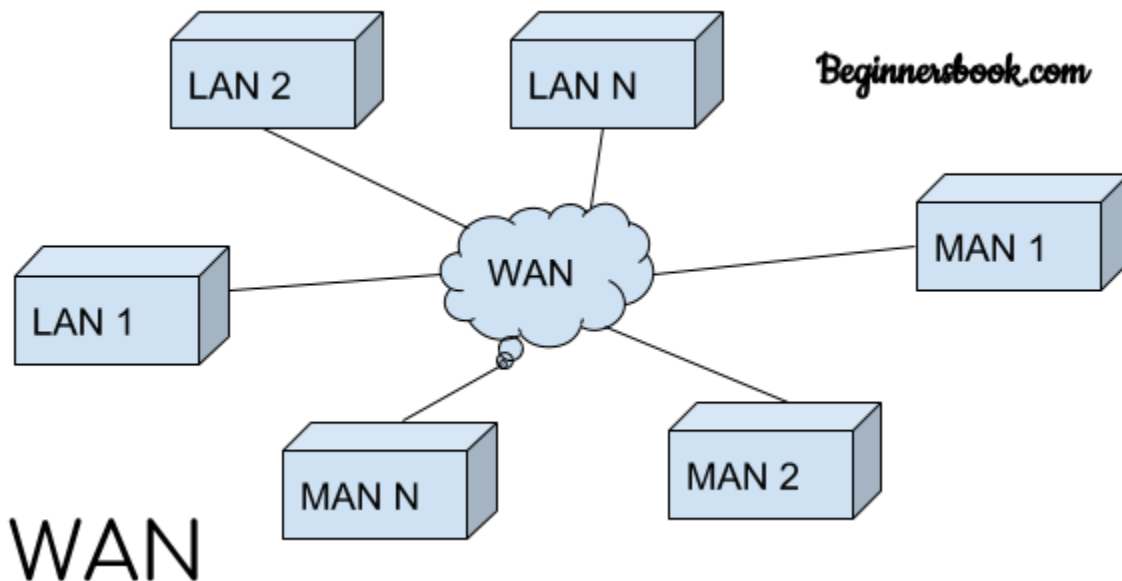
Wide area network provides long distance transmission of data. The size of the WAN is larger than LAN and MAN. A WAN can cover country, continent or even a whole world. Internet connection is an example of WAN. Other examples of WAN are mobile broadband connections such as 3G, 4G etc.

Advantages of WAN:

Centralized infrastructure: One of the main advantage of WAN is the that we do not need to maintain the backup and store data on local system as everything is stored online on a data centre, from where we can access the data through WAN.

Privacy: We can setup the WAN in such a way that it encrypts the data that we share online that way the data is secure and minimises the risk of unauthorized access.

Increased Bandwidth: With the WAN we get to choose the bandwidth based on the need, a large organization can have larger bandwidth that can carry large amount of data faster and efficiently.

Area: A WAN can cover a large area or even a whole world though internet connection thus we can connect with the person in another country through WAN which is not possible is other type of computer networks.

Disadvantages of WAN:

Antivirus: Since our systems are connected with the large amount of systems, there is possibility that we may unknowingly download the virus that can affect our system and become threat to our privacy and may lead to data loss.
Expensive: Cost of installation is very high.
Issue resolution: Issue resolution takes time as the WAN covers large area, it is really difficult to pin point the exact location where the issues raised and causing the problem.

Types of Network Topology

The arrangement of a network which comprises of nodes and connecting lines via sender and receiver is referred as network topology. The various network topologies are :

a) Mesh Topology :

In mesh topology, every device is connected to another device via particular channel.
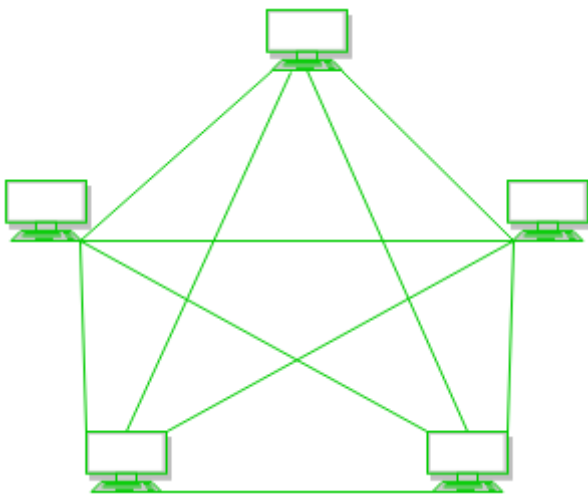

Figure 1 : Every device is connected with another via dedicated channels. These channels are known as links.

- If suppose, N number of devices are connected with each other in mesh topology, then total number of ports that is required by each device is ? N-1. In the Figure 1, there are 5 devices connected to each other, hence total number of ports required is 4.
- If suppose, N number of devices are connected with each other in mesh topology, then total number of dedicated links required to connect them is $^{N}C_{2}$ i.e. N(N-1)/2. In the Figure 1, there are 5 devices connected to each other, hence total number of links required is 5*4/2 = 10.

Advantages of this topology :

- It is robust.
- Fault is diagnosed easily. Data is reliable because data is transferred among the devices through dedicated channels or links.

- Provides security and privacy.

Problems with this topology :

- Installation and configuration is difficult.
- Cost of cables are high as bulk wiring is required, hence suitable for less number of devices.
- Cost of maintenance is high.

b) Star Topology :

? In star topology, all the devices are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node. The hub can be passive ?in nature i.e. not intelligent hub such as broadcasting devices, at the same time the hub can be intelligent known as active ?hubs. Active hubs have repeaters in them.
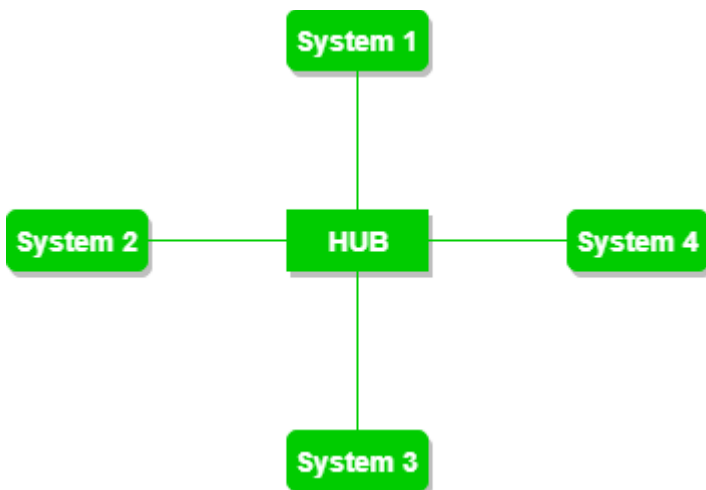

Figure 2 : A star topology having four systems connected to single point of connection i.e. hub.

Advantages of this topology :

- If N devices are connected to each other in star topology, then the number of cables required to connect them is N. So, it is easy to set up.
- Each device require only 1 port i.e. to connect to the hub.

Problems with this topology :

- If the concentrator (hub) on which the whole topology relies fails, the whole system will crash down.
- Cost of installation is high.
- Performance is based on the single concentrator i.e. hub.

c) Bus Topology :

? Bus topology is a network type in which every computer and network device is connected to single cable. It transmits the data from one end to another in single direction. No bi-directional feature is in bus topology.
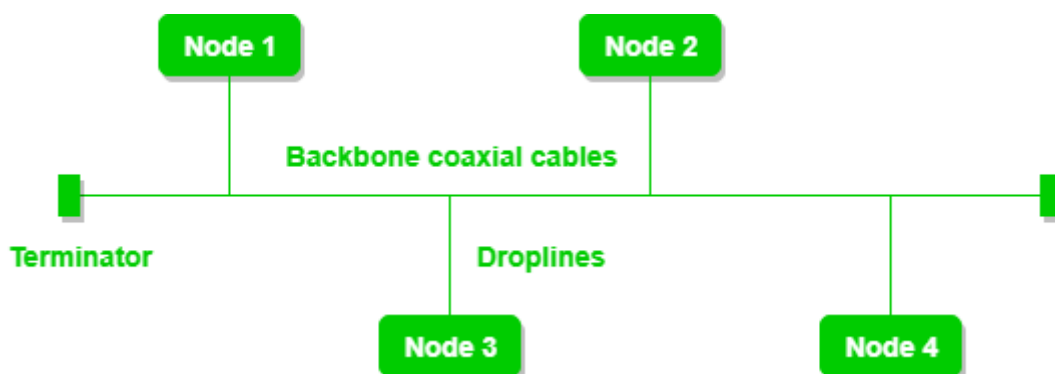

Figure 3 : A bus topology with shared backbone cable. The nodes are connected to the channel via drop lines.

Advantages of this topology :

- If N devices are connected to each other in bus topology, then the number of cables required to connect them is 1 ?which is known as backbone cable and N drop lines are required.
- Cost of the cable is less as compared to other topology, but it is used to built small networks.

Problems with this topology :

- If the common cable fails, then the whole system will crash down.
- If the network traffic is heavy, it increases collisions in the network. To avoid this, various protocols are used in MAC layer known as Pure Aloha, Slotted Aloha, CSMA/CD etc.

d) Ring Topology :

? In this topology, it forms a ring connecting devices with its exactly two neighboring devices.

A number of repeaters are used for Ring topology with a large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.

The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called Dual Ring Topology.
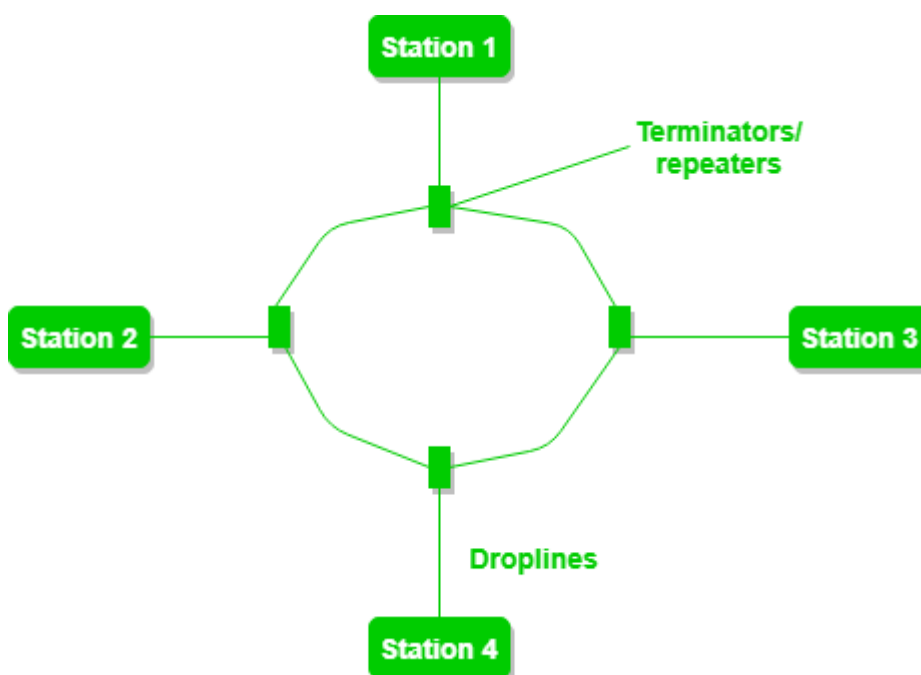

Figure 4 : A ring topology comprises of 4 stations connected with each forming a ring..
The following operations takes place in ring topology are :

1. One station is known as **monitor** station which takes all the responsibility to perform the operations.
2. To transmit the data, station has to hold the token. After the transmission is done, the token is to be released for other stations to use.
3. When no station is transmitting the data, then the token will circulate in the ring.
4. There are two types of token release techniques : **Early token release** releases the token just after the transmitting the data and **Delay**

token release releases the token after the acknowledgement is received from the receiver.

Advantages of this topology :

- The possibility of collision is minimum in this type of topology.
- Cheap to install and expand.

Problems with this topology :

- Troubleshooting is difficult in this topology.
- Addition of stations in between or removal of stations can disturb the whole topology.

e) Tree Topology :

? This topology is the variation of Star topology. This topology have hierarchical flow of data.
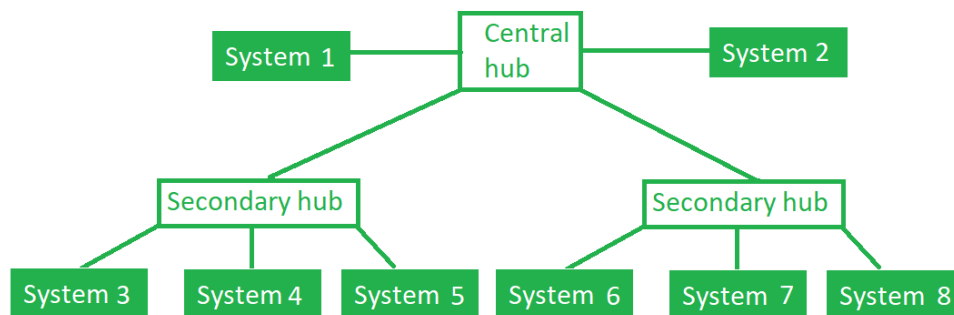

Figure 5 : In this the various secondary hubs are connected to the central hub which contains the repeater. In this data flow from top to bottom i.e. from the central hub to secondary and then to the devices or from bottom to top i.e. devices to secondary hub and then to the central hub.

Advantages of this topology :

- It allows more devices to be attached to a single central hub thus it increases the distance that is travel by the signal to come to the devices.
- It allows the network to get isolate and also prioritize from different computers.

Problems with this topology :

- If the central hub gets fails the entire system fails.
- The cost is high because of cabling.

Internet

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

A special computer DNS (Domain Name Server) is used to provide a name to the IP Address so that the user can locate a computer by a name. For example, a DNS server will resolve a name http://www.tutorialspoint.com to a particular IP address to uniquely identify the computer on which this website is hosted.

Internet is accessible to every user all over the world.

Intranet

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

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

Similarities between Internet and Intranet

- Intranet uses the internet protocols such as TCP/IP and FTP.

- Intranet sites are accessible via the web browser in a similar way as websites in the internet. However, only members of Intranet network can access intranet hosted sites.

- In Intranet, own instant messengers can be used as similar to yahoo messenger/gtalk over the internet.

Differences between Internet and Intranet

- Internet is general to PCs all over the world whereas Intranet is specific to few PCs.

- Internet provides a wider and better access to websites to a large population, whereas Intranet is restricted.

- Internet is not as safe as Intranet. Intranet can be safely privatized as per the need.

- **World Wide Web (WWW)**, byname **the Web**, the leading information retrieval service of the Internet (the worldwide computer network).

- The Web gives users access to a vast array of documents that are connected to each other by means of hypertext or hypermedia links— i.e., hyperlinks, electronic connections that link related pieces of information in order to allow a user easy access to them.
- Hypertext allows the user to select a word or phrase from text and thereby access other documents that contain additional information pertaining to that word or phrase.
- Hypermedia documents feature links to images, sounds, animations, and movies.
- The Web operates within the Internet's basic client-server format;
- servers are computer programs that store and transmit documents to other computers on the network when asked to, while clients are programs that request documents from a server as the user asks for them.

- Browser software allows users to view the retrieved documents.

UNIT – V:
Overview of Electronic Mail: Introduction- How E-mail Works?-Why Use E-mail?-E-mail-Names and Addresses-Mailing Basics. Introduction to Intranets: Introduction-Characteristics of Intranet-Advantages of Intranets.

Email

Email is a service which allows us to send the message in electronic mode over the internet. It offers an efficient, inexpensive and real time mean of distributing information among people.

E-Mail Address

Each user of email is assigned a unique name for his email account. This name is known as E-mail address. Different users can send and receive messages according to the e-mail address.

E-mail is generally of the form username@domainname. For example, webmaster@tutorialspoint.com is an e-mail address where webmaster is username and tutorialspoint.com is domain name.

- The username and the domain name are separated by **@ (at)** symbol.
- E-mail addresses are not case sensitive.

- Spaces are not allowed in e-mail address.

E-mail Message Components

E-mail message comprises of different components: E-mail Header, Greeting, Text, and Signature. These components are described in the following diagram:
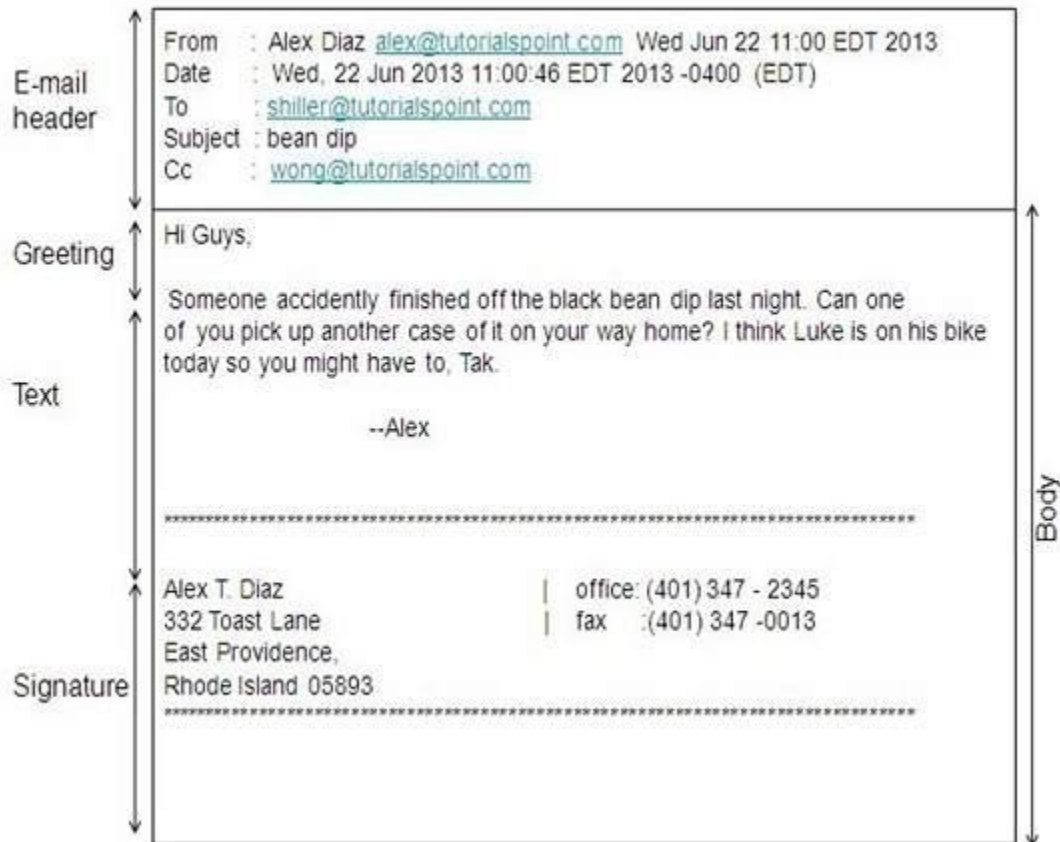
E-mail Header

The first five lines of an E-mail message is called E-mail header. The header part comprises of following fields:

- From
- Date
- To
- Subject
- CC
- BCC

The **From** field indicates the sender's address i.e. who sent the e-mail.

The **Date** field indicates the date when the e-mail was sent.

The **To** field indicates the recipient's address i.e. to whom the e-mail is sent.

The **Subject** field indicates the purpose of e-mail. It should be precise and to the point.

CC stands for Carbon copy. It includes those recipient addresses whom we want to keep informed but not exactly the intended recipient.

BCC stands for Black Carbon Copy. It is used when we do not want one or more of the recipients to know that someone else was copied on the message.

Greeting is the opening of the actual message. Eg. Hi Sir or Hi Guys etc.

It represents the actual content of the message.

This is the final part of an e-mail message. It includes Name of Sender, Address, and Contact Number.

Advantages

E-mail has prooved to be powerful and reliable medium of commmunication. Here are the benefits of **E-mail:**

- Reliable
- Convenience
- Speed
- Inexpensive
- Printable
- Global
- Generality

Reliable

Many of the mail systems notify the sender if e-mail message was undeliverable.

Convenience

There is no requirement of stationary and stamps. One does not have to go to post office. But all these things are not required for sending or receiving an mail.

Speed

E-mail is very fast. However, the speed also depends upon the underlying network.

Inexpensive

The cost of sending e-mail is very low.

Printable

It is easy to obtain a hardcopy of an e-mail. Also an electronic copy of an e-mail can also be saved for records.

Global

E-mail can be sent and received by a person sitting across the globe.

Generality

It is also possible to send graphics, programs and sounds with an e-mail.

Disadvantages

Apart from several benefits of E-mail, there also exists some disadvantages as discussed below:

- Forgery
- Overload
- Misdirection
- Junk
- No response

Forgery

E-mail doesn't prevent from forgery, that is, someone impersonating the sender, since sender is usually not authenticated in any way.

Overload

Convenience of E-mail may result in a flood of mail.

Misdirection

It is possible that you may send e-mail to an unintended recipient.

Junk

Junk emails are undesirable and inappropriate emails. Junk emails are sometimes referred to as spam.

No Response

It may be frustrating when the recipient does not read the e-mail and respond on a regular basis.
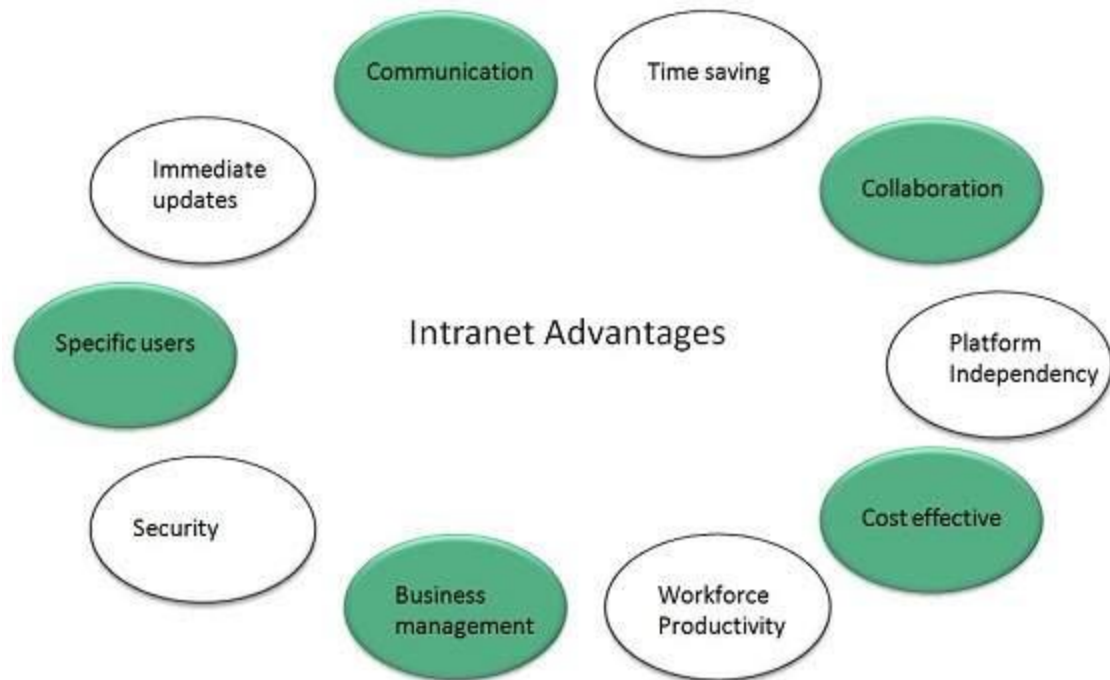
Intranet

Intranet is defined as private network of computers within an organization with its own server and firewall. Moreover we can define Intranet as:

- Intranet is system in which multiple PCs are networked to be connected to each other. PCs in intranet are not available to the world outside of the intranet.

- Usually each company or organization has their own Intranet network and members/employees of that company can access the computers in their intranet.

- Every computer in internet is identified by a unique IP address.

- Each computer in Intranet is also identified by a IP Address, which is unique among the computers in that Intranet.
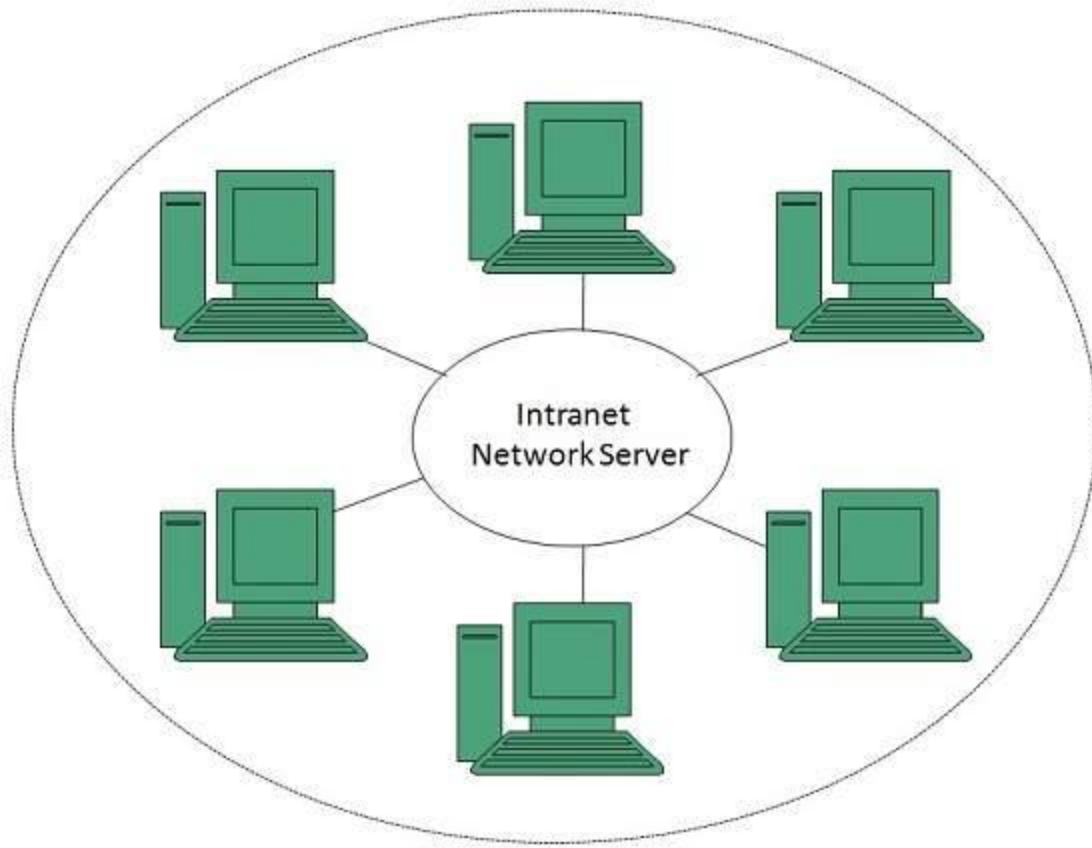
Benefits

Intranet is very efficient and reliable network system for any organization. It is beneficial in every aspect such as collaboration, cost-effectiveness, security, productivity and much more.

Communication

Intranet offers easy and cheap communication within an organization. Employees can communicate using chat, e-mail or blogs.

Time Saving

Information on Intranet is shared in real time.

Collaboration

Information is distributed among the employees as according to requirement and it can be accessed by the authorized users, resulting in enhanced teamwork.

Platform Independency

Intranet can connect computers and other devices with different architecture.

Cost Effective

Employees can see the data and other documents using browser rather than printing them and distributing duplicate copies among the employees, which certainly decreases the cost.

Workforce Productivity

Data is available at every time and can be accessed using company workstation. This helps the employees work faster.

Business Management

It is also possible to deploy applications that support business operations.

Security

Since information shared on intranet can only be accessed within an organization, therefore there is almost no chance of being theft.
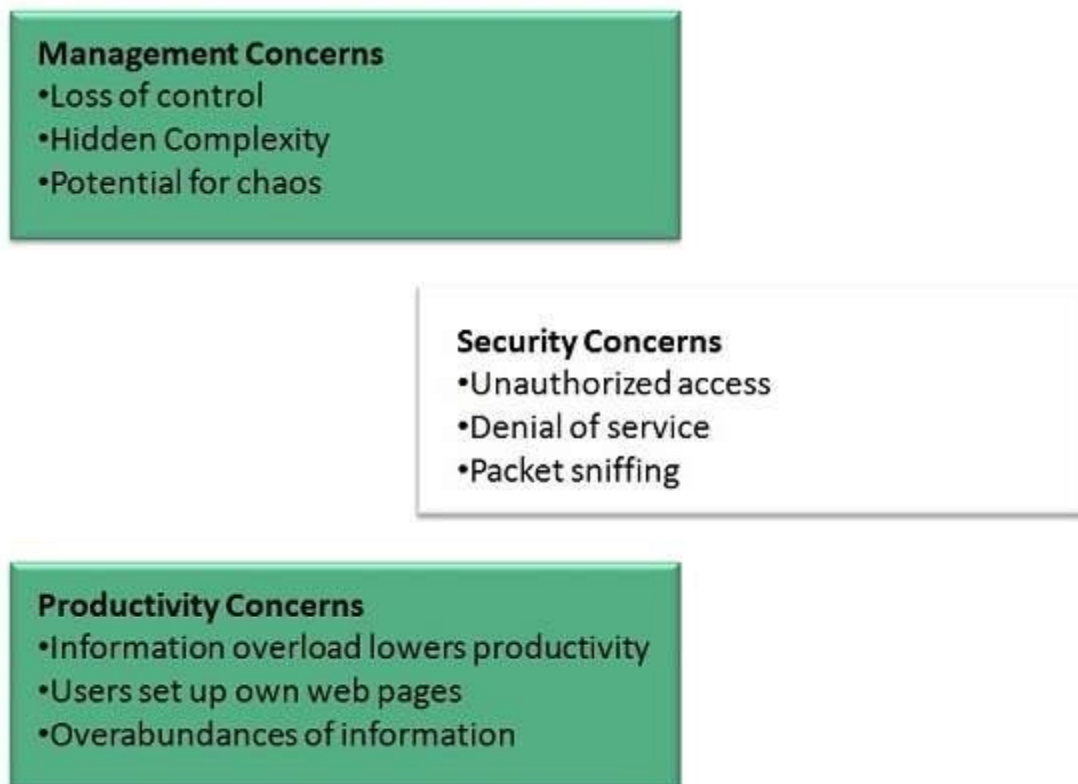
Specific Users

Intranet targets only specific users within an organization therefore, once can exactly know whom he is interacting.

Immediate Updates

Any changes made to information are reflected immediately to all the users.

Issues

Apart from several benefits of Intranet, there also exist some issues.. These issues are shown in the following diagram:

Management Concerns
• Loss of control
• Hidden Complexity
• Potential for chaos

Security Concerns
• Unauthorized access
• Denial of service
• Packet sniffing

Productivity Concerns
• Information overload lowers productivity
• Users set up own web pages
• Overabundances of information

Applications

Intranet applications are same as that of Internet applications. Intranet applications are also accessed through a web browser. The only difference is that, Intranet applications reside on local server while Internet applications reside on remote server. Here, we've discussed some of these applications:
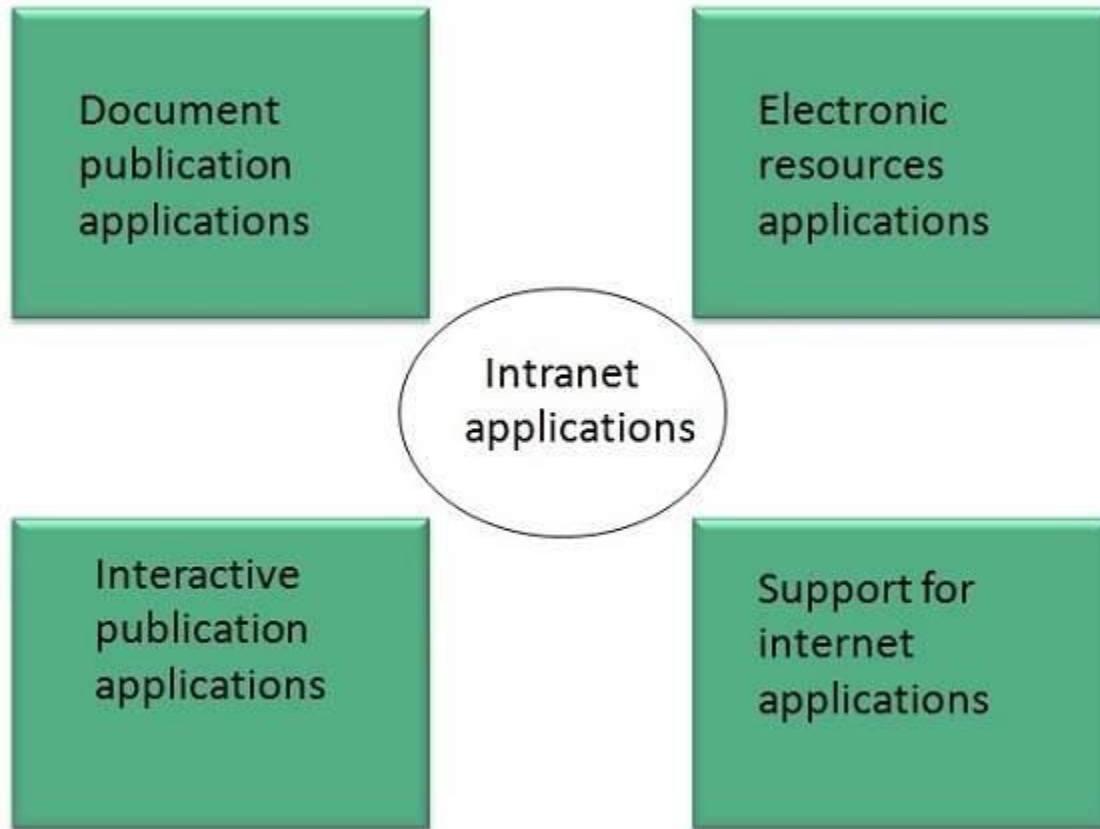
Document publication applications

Document publication applications allow publishing documents such as manuals, software guide, employee profits etc without use of paper.

Electronic resources applications

It offers electronic resources such as software applications, templates and tools, to be shared across the network.

Interactive Communication applications

Like on internet, we have e-mail and chat like applications for Intranet, hence offering an interactive communication among employees.

Support for Internet Applications

Intranet offers an environment to deploy and test applications before placing them on Internet.

Internet vs. Intranet

Apart from similarities there are some differences between the two. Following are the differences between Internet and Intranet:

Intranet	Internet
Localized Network.	Worldwide Network
Doesn't have access to Intranet	Have access to Internet.
More Expensive	Less Expensive
More Safe	Less Safe
More Reliability	Less Reliability