

TELECOMMUNICATION AND COMPUTER NETWORK

TELECOMMUNICATION



Telecommunication is exchange of information over a significant distance using electrical signals or electromagnetic waves. Examples of telecommunications systems are the telephone network, the radio broadcasting system, computer networks and the Internet. Telecommunications is also known as telecom.

DATA COMMUNICATION

Data communications refers to the transmission of information in digital form between two or more computers.

Components of data communications

Data: This is the data that is to be communicated.

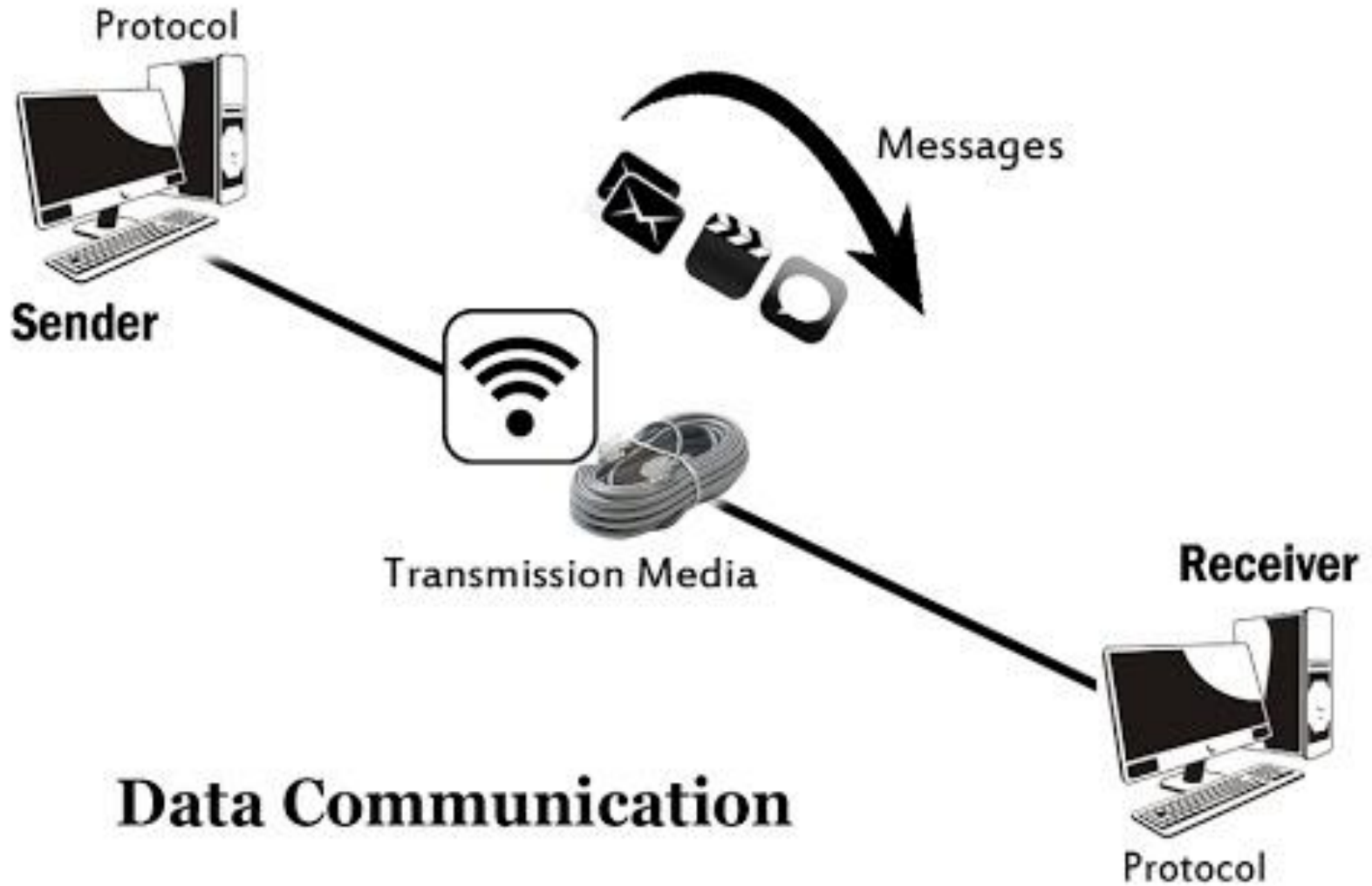
Sender: This is the device used to send data.

Medium: This is the device through which the sender makes communication to the receiver.

Receiver: This is the device which receives data sent by the sender.

Protocol: This is the set of rules that are followed by the sender and the receiver to make communication possible.





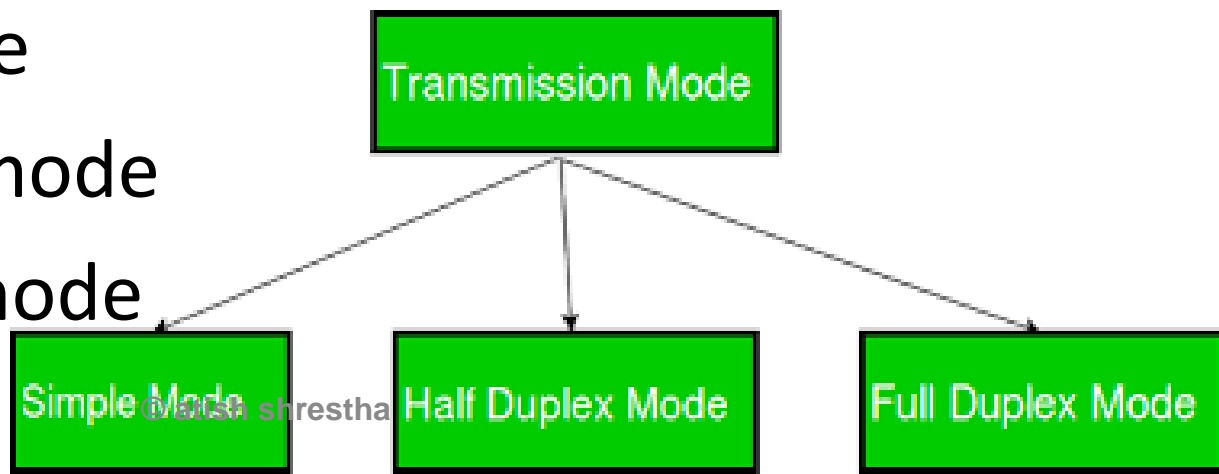
Data Communication

MODES OF DATA COMMUNICATION

The manner or way in which data are transmitted from one point to another point is called modes of data communication. It is also called data transmission mode. A data transmission mode defines how the data travels from sender to receiver.

There are three modes of data communication:

- i) Simplex mode
- ii) Half Duplex mode
- iii) Full Duplex mode



SIMPLEX MODE

In this mode data can be transmitted in one direction only. A terminal can only send data and cannot receive or it can only receive data but cannot send it. This type of channel design is easy and inexpensive to set up.

eg. Speaker, radio and television broadcasting



HALF DUPLEX MODE

In this mode data can be transmitted in both directions but only in one direction at a time. If one device is sending data then other device cannot send data until it receives the data which is already in transmission.

eg. Walkie Talkie



FULL DUPLEX MODE

In this mode data can be transmitted in both directions simultaneously. Both the devices can send and receive the data at the same time. This is the fastest mode of data transmission.

eg. Telephone, Mobile phone



What is Signal?

A signal is an electrical or electromagnetic current that is used for carrying data from one device or network to another.

It is the key component behind virtually all:

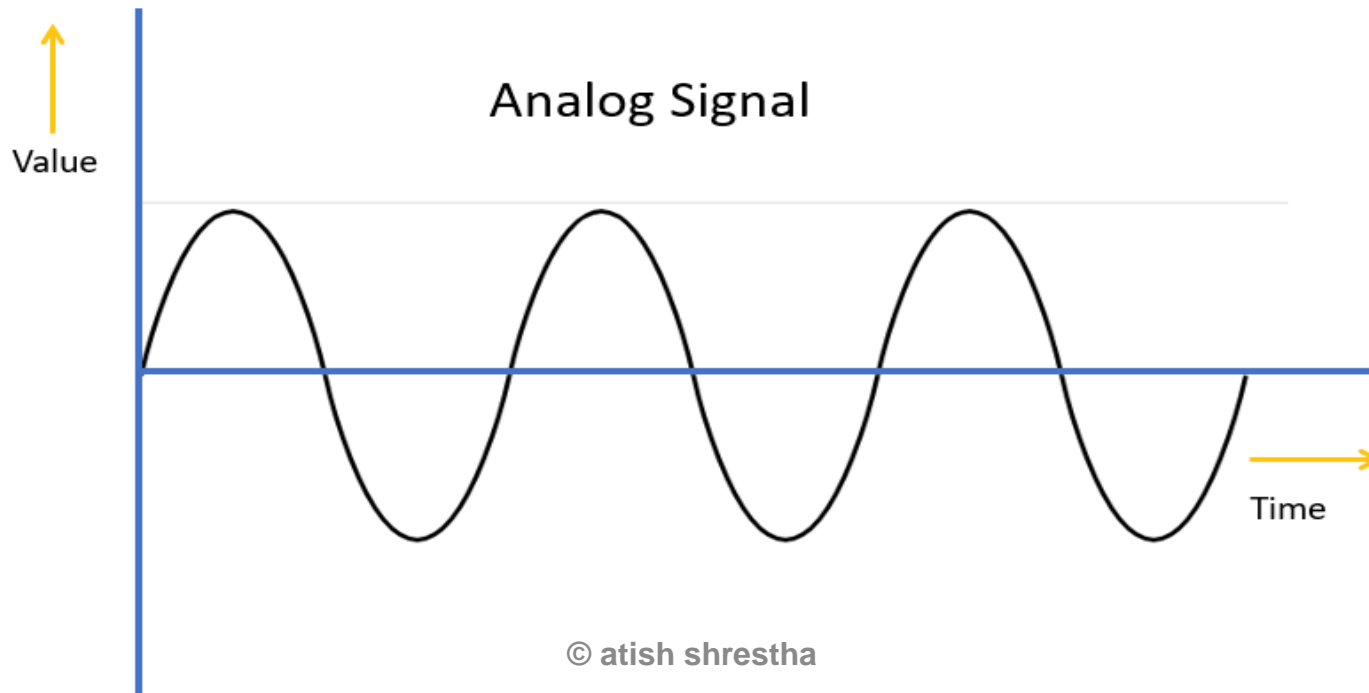
- Communication
- Computing
- Networking
- Electronic devices



- A signal can be either **analog** or **digital**.

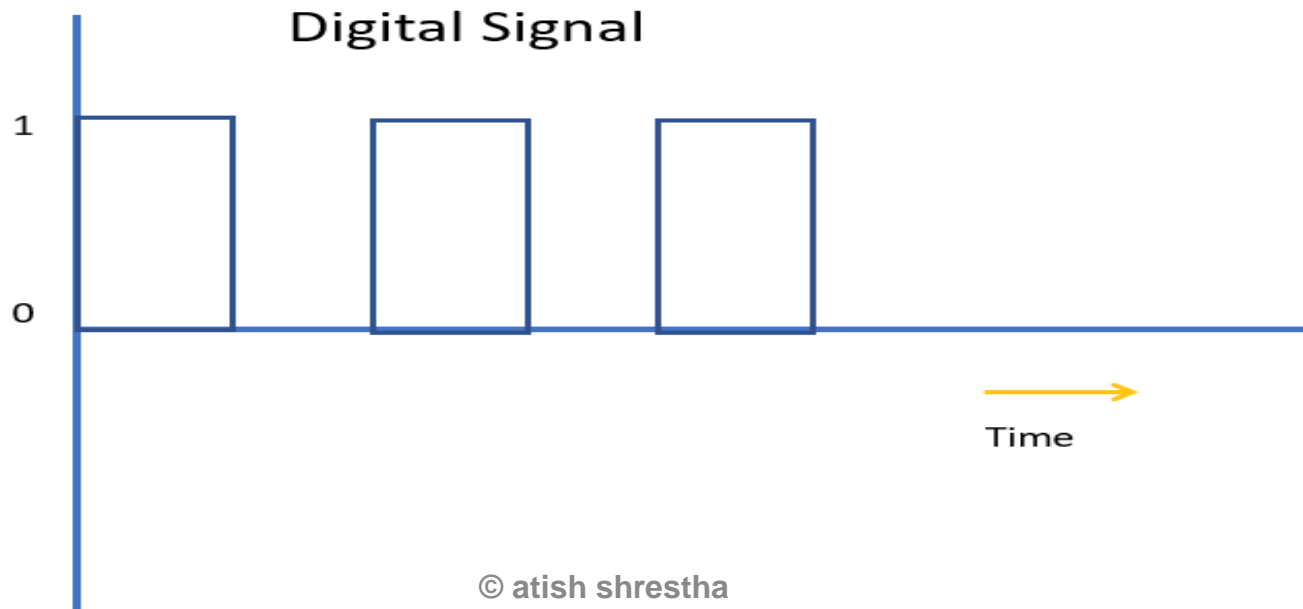
ANALOG SIGNAL

In this type of transmission, analog signals are transmitted in continuous form and can be represented in sine waves. Telephone line, FM radio music, TV transmission are the examples of analog signals.



DIGITAL SIGNAL

In this type of transmission data flow is in the form of bits (0,1). 0 means absence of current and 1 means presence of current. These signals are discrete in nature. For example: Pen drive to hard disk, DVD-ROM to pen drive are the common example of digital signal transmission.



COMPUTER NETWORK

A **computer network** is a set of **computers** connected together for the purpose of sharing resources. The most common resource shared today is connection to the Internet. Other shared resources can include a printer or a file server. The Internet itself can be considered a **computer network**.



ADVANTAGES

- It can share copies of single file among many users at the same time.
- It can share application in entire network, which reduce the cost of purchasing multiple software.
- It can share computer resources like printer, scanner, fax machine, modem etc.
- Faster and cheap communication possible.
- Data backup and recovery is possible.



DISADVANTAGES

- Virus can spread each mostly through the computer network.
- Cyber crimes are originated from the computer network.
- With the help of computer network the anti social groups are able to launch their evil activities.
- It is expensive to setup.
- Lots of chances of technical problem in computer network.
- Special skilled manpower is required to operate and maintain computer network.



TYPES OF COMPUTER NETWORK

ON THE BASIS OF GEOGRAPHICAL AREA

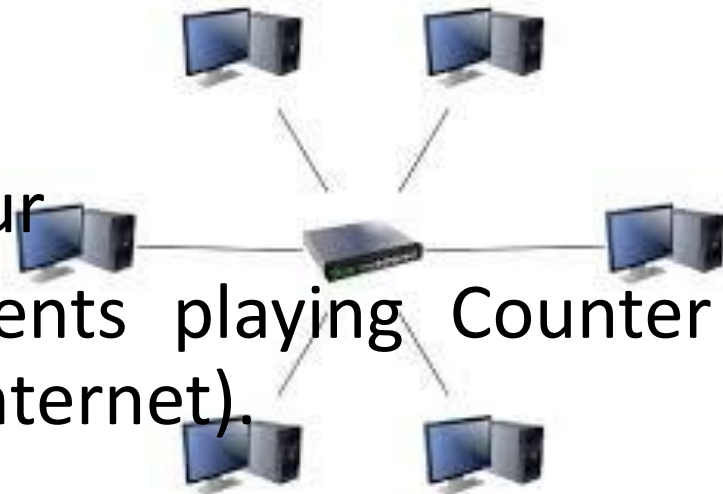
- LAN (Local Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

LAN (Local Area Network)

A local area network (LAN) is a computer network within a small geographical area such as a home, school, computer laboratory, office building or group of buildings. Ethernet and Wi-Fi are the two most common technologies of LAN today. **Ethernet** is a technology that connects wired local area networks (LANs) and enables the device to communicate with each other through a protocol which is the common network language.

The range of LAN is usually around 1 to 2 km in diameter.

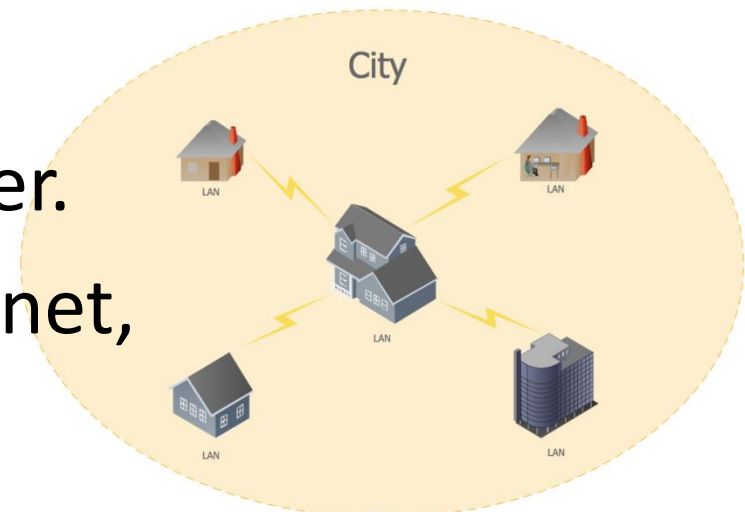
eg. The network of computers in our Computer lab, A bunch of students playing Counter Strike in the same room (without internet).



MAN (METROPOLITAN AREA NETWORK)

Metropolitan Area Network is a network designed for a town or city. Geographically MANs are larger than LAN, but smaller than WAN. MANs are usually formed by connecting multiple LANs. It is more expensive than LAN. Data transfer rate is slow as compared to LAN partly because of their reliance on unbounded media over great distance.

The range of MAN is usually around 50 to 100 km in diameter.
eg. Cable Television, cable internet,
microwave links in banks

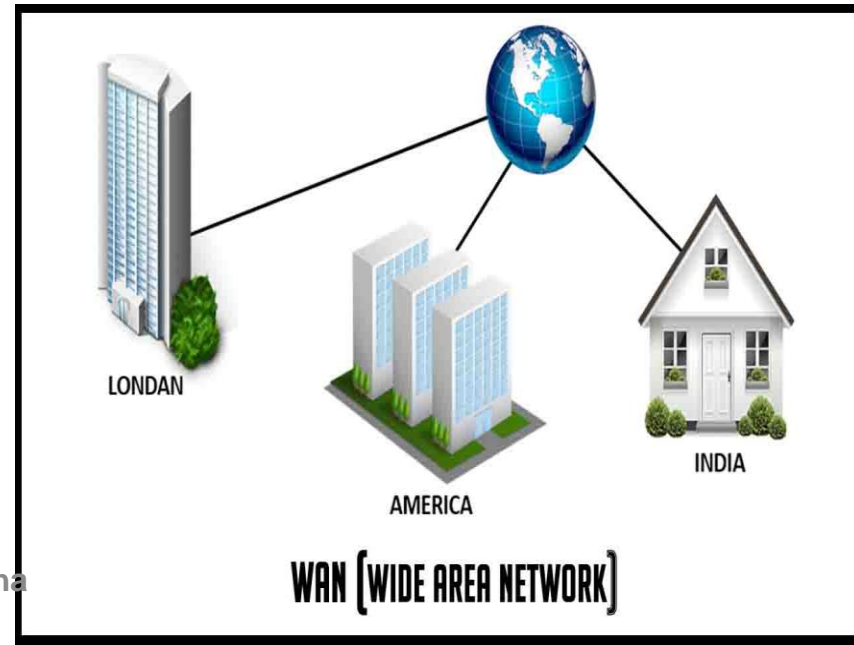


WIDE AREA NETWORK (WAN)

A wide area network (WAN) is a network that exists over a large-scale geographical area. A WAN connects different smaller networks, including local area networks (LANs) and metropolitan area networks (MANs). It covers a broad area and large distance such as states, countries, continents.

The range of WAN is usually more than 100km in diameter.

The best example of WAN is an Internet.



TYPES OF COMPUTER NETWORK

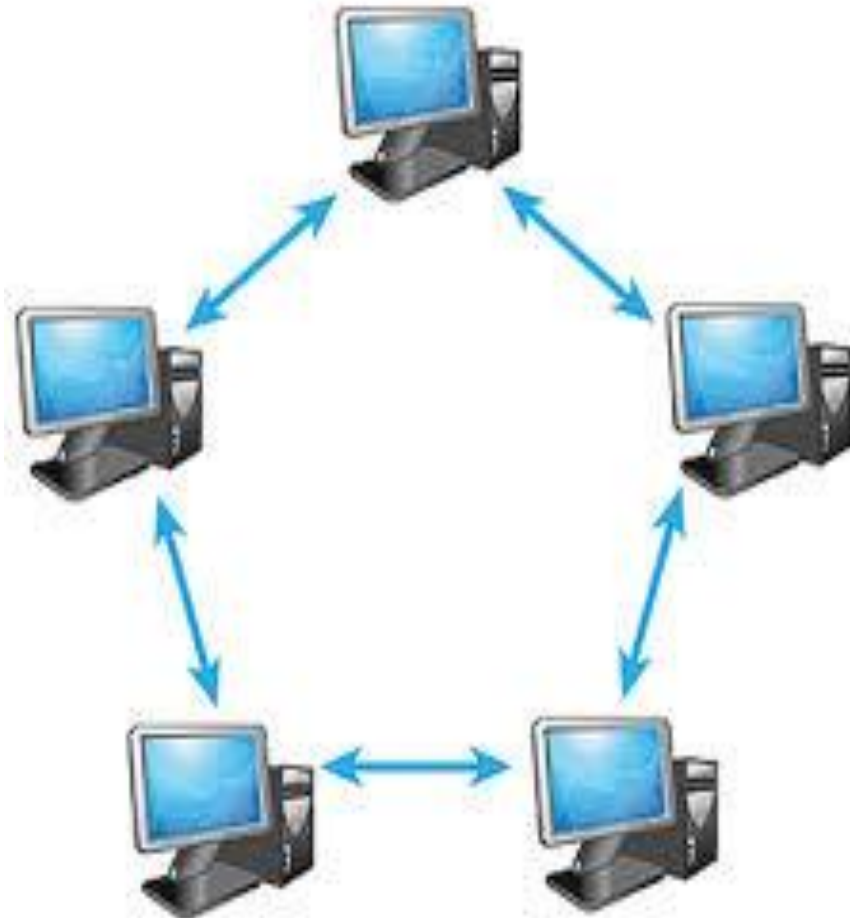
ON THE BASIS OF ARCHITECTURE

- Peer to Peer Network
- Client Server Network

Network architecture defines how computers are organized and how tasks are allocated to the computer.

Peer to Peer Network

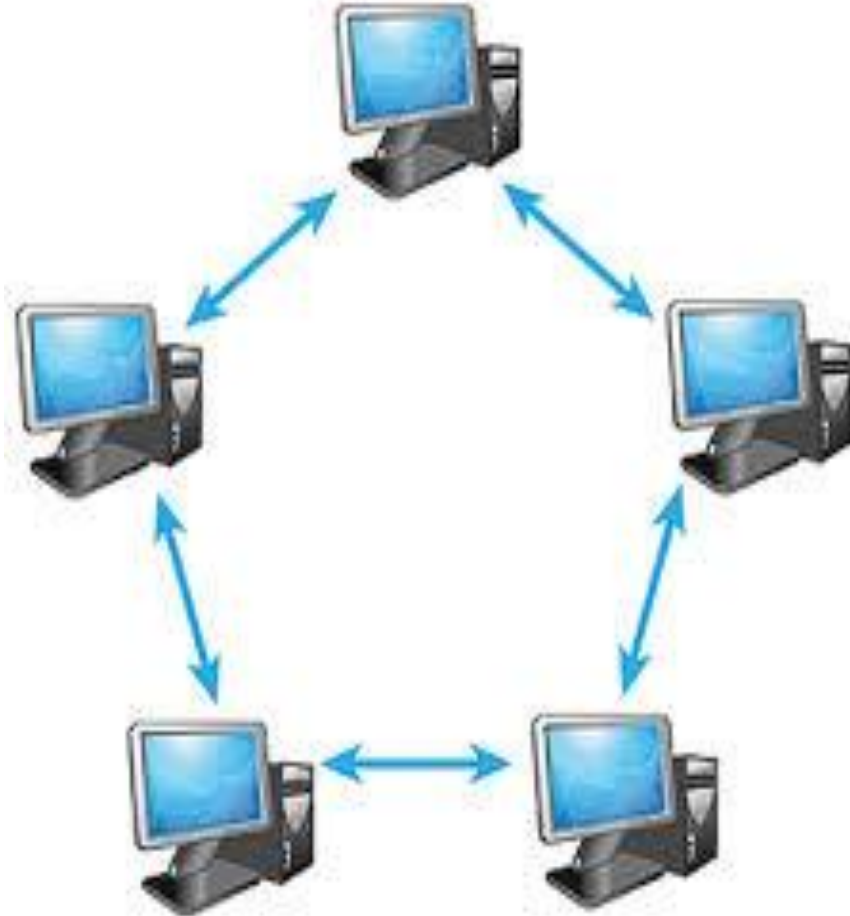
- Peer-To-Peer network is a network in which all the computers are linked together with equal privilege and responsibilities for processing the data.
- All the computers are equal and therefore are known as peers.
- Peer-To-Peer network is useful for small environments, usually up to 10 computers.
- Peer-To-Peer network has no dedicated server. Peer-To-Peer network can take both a client and a server role.



Peer (word meaning): a person who is the same age or has the same social position or the same abilities as other people in a group

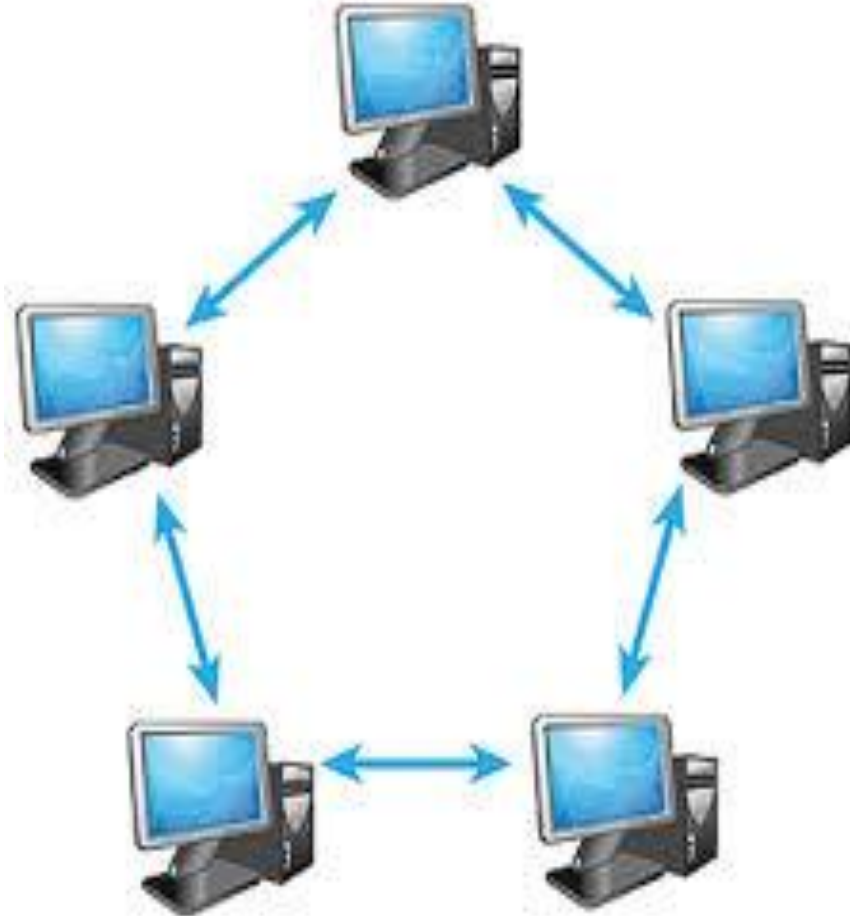
Advantages of Peer to Peer Network

- It is less costly as it does not contain any dedicated server.
- It is easy to set up.
- They don't require a network administrator
- Users can manage their own resources.



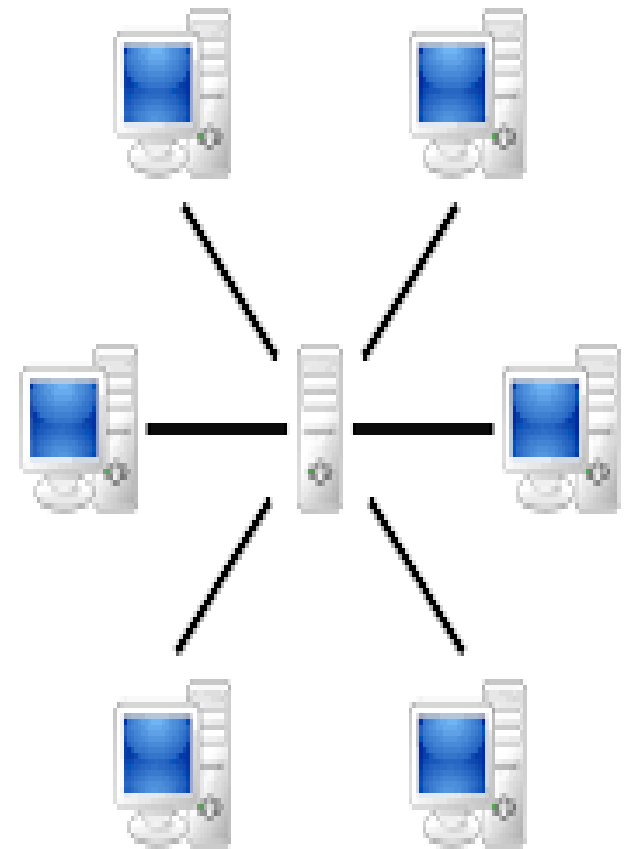
Disadvantages of Peer to Peer Network

- It provides less security.
- Useful for only small organization.
- They don't allow for central management.
- Each machine must be backed up individually to protect all shared data.



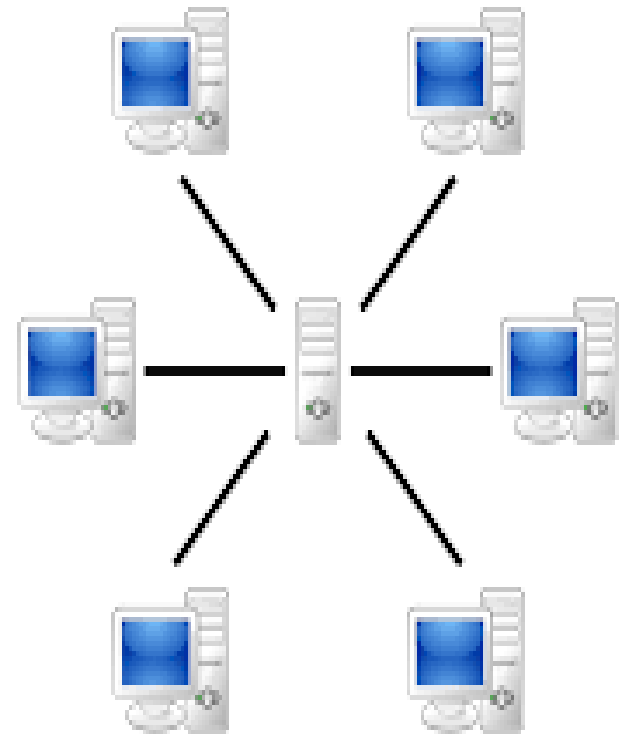
Client Server Network

- Client/Server network is a network model designed for the end users called clients, to access the resources such as songs, video, etc. from a central computer known as Server.
- The central controller is known as a **server** while all other computers in the network are called **clients**.
- A server performs all the major operations such as security and network management.
- A server is responsible for managing all the resources such as files, directories, printer, etc.
- All the clients communicate with each other through a server.



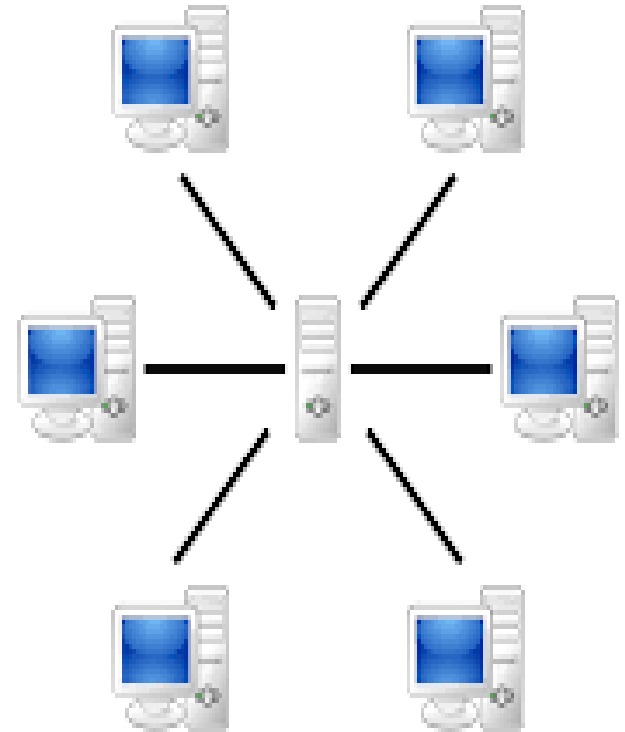
Advantages of Client Server Network

- It covers large geographical area.
- Centralize the network management
- Data backup and recovery is possible.
- High data security



Disadvantages of Client Server Network

- Expensive.
- Difficult to troubleshoot and maintain.
- Server failure leads to whole network failure.
- Difficult to install and required technical manpower.



SERVER

A server is a type of computer on a network that manages network resources. Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. They are called that because they “serve” another computer, device, or program called “client” to which they provide functionality.



SERVER



Some of the most common types of server include:

Database servers

They allow other computers to access a database and retrieve or upload data from and into it.

File servers

They provide users with access to files and data stored centrally.

Web servers

They deliver requested web pages to multiple client web browsers.

Mail servers

They are a sort of “virtual post office” that store and sort emails before they are sent to users upon request.

Application servers

They are servers that provide an environment with all the necessary requirements to run or develop an application.

WORKSTATIONS

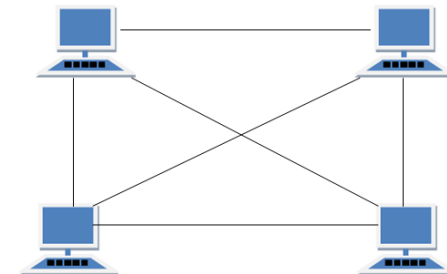
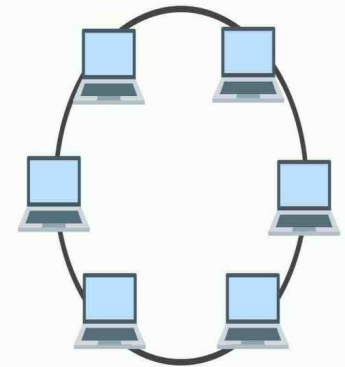
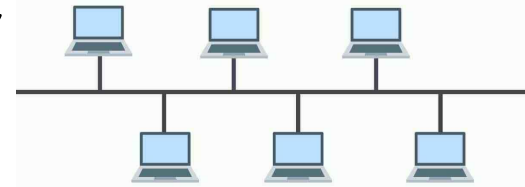
Workstations are the individual computer that uses the available resources of the computer network. They are also known as clients. It uses the operating systems like Windows 10, Windows NT etc.



NETWORK /LAN TOPOLOGY

- **Network topology** refers to the physical or logical layout of a **network**.
- *Network Topology* refers to how different nodes in a network are connected to each other and how they communicate. Topologies are either physical (the physical layout of devices on a network) or logical (the way that the signals act on the network media, or the way that the data passes through the network from one device to the next).

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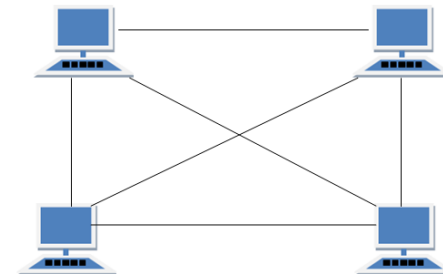
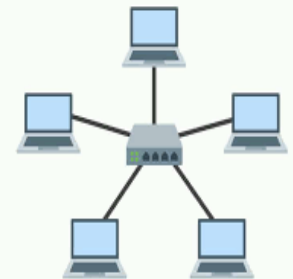
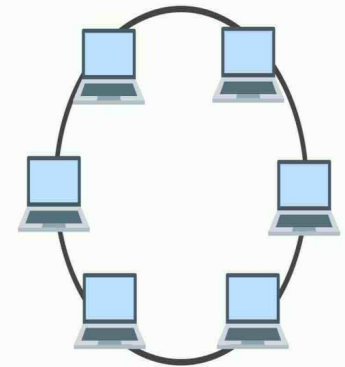
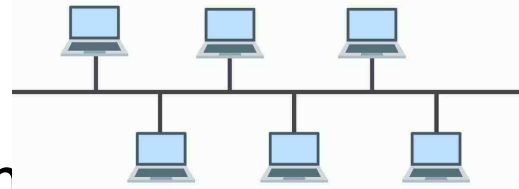
NETWORK /LAN TOPOLOGY

While selecting the network topology the following point must be considered.

- The cost of physical interconnections.
- The time delay during the communication.
- Reliability and possibilities of failure.
- Network controlling strategy.

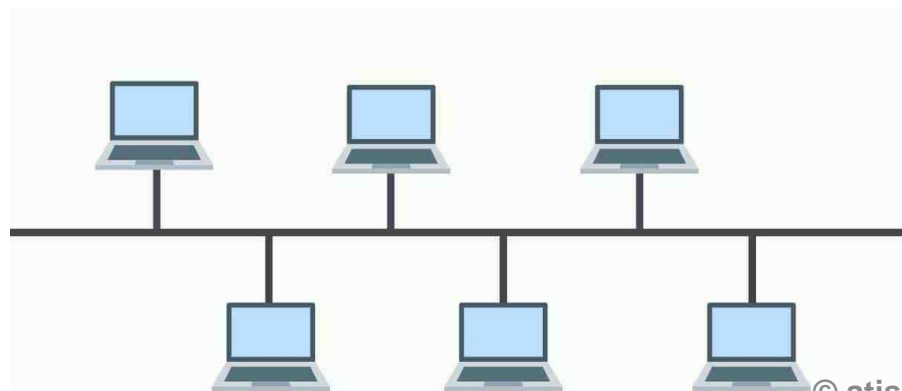
There are different types of Network topology used in computer networking. They are:

- 1) Bus Topology
- 2) Ring Topology
- 3) Star Topology
- 4) Mesh Topology

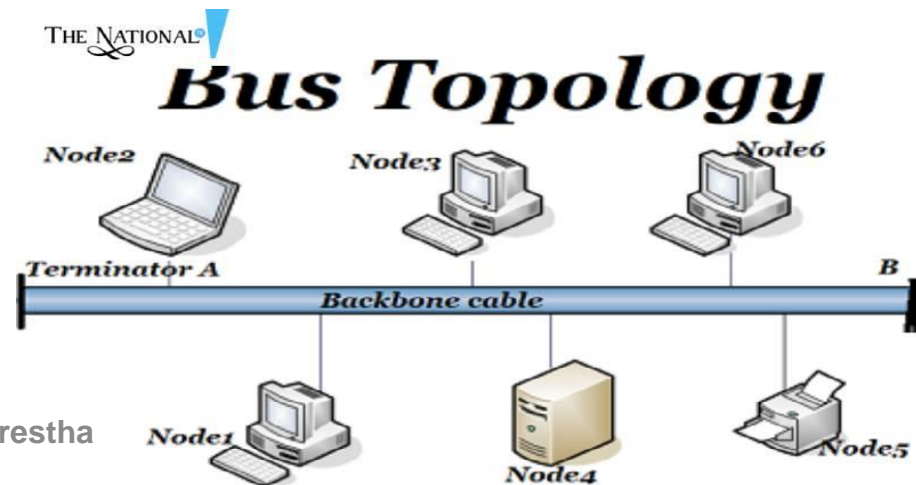


BUS TOPOLOGY

The Bus **Topology** is the simplest network topology. A bus topology uses one long cable (backbone) to which network devices are directly attached by using short drop cable. Backbone must be terminated at both ends. Without a terminator the electrical signal would reach the end of copper wire and bounce back, causing errors on the network.

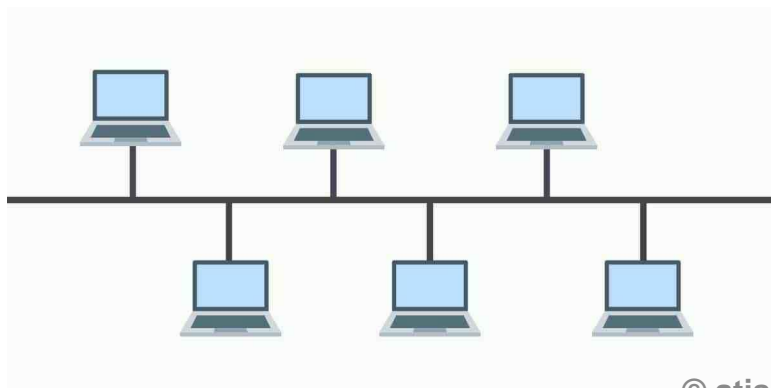


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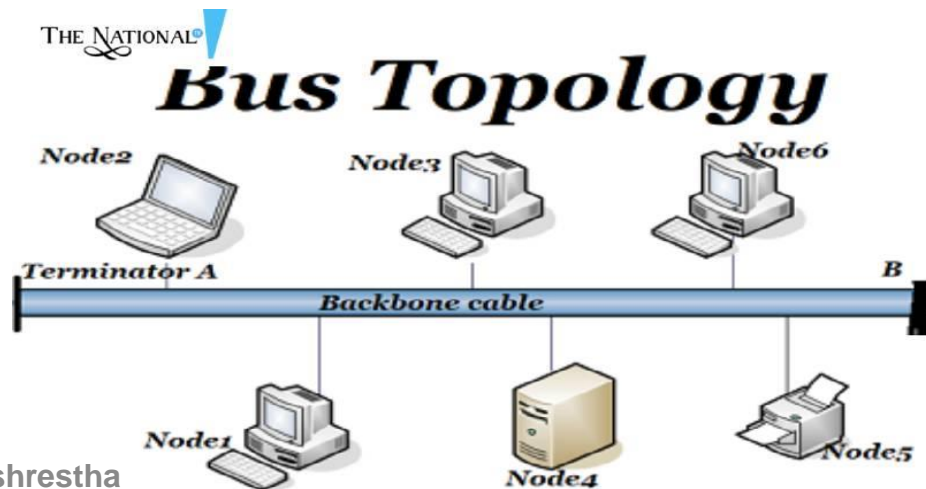


ADVANTAGES OF BUS TOPOLOGY

- Easy to install and cheap.
- Easy to add new nodes.
- Less cable required.
- It does not affect the network if one computer goes down.

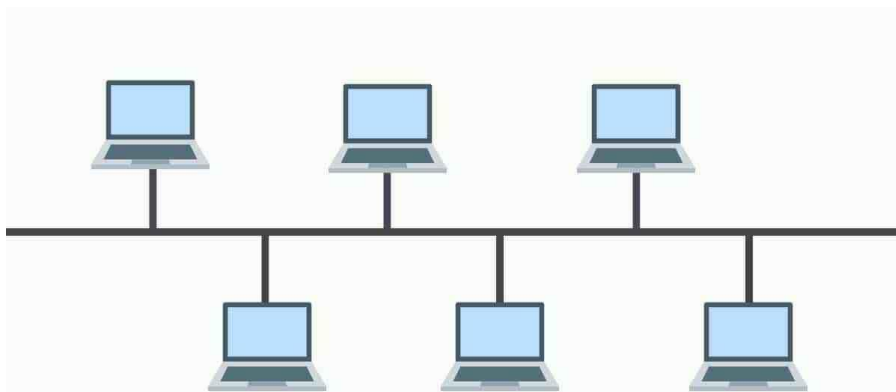


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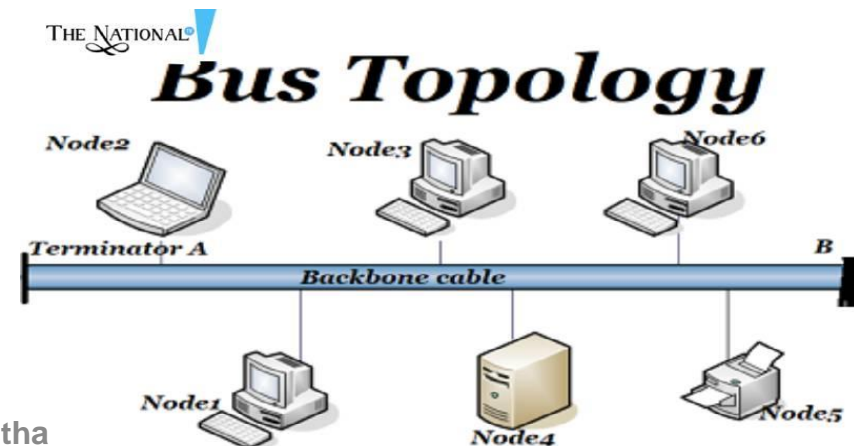


DISADVANTAGES OF BUS TOPOLOGY

- If the backbone cable goes down, the entire network system breaks down.
- It covers small geographical area.
- Possibility of data collision.
- Difficult to troubleshoot because a cable break or loose connector will cause reflections and bring down the whole **network**.

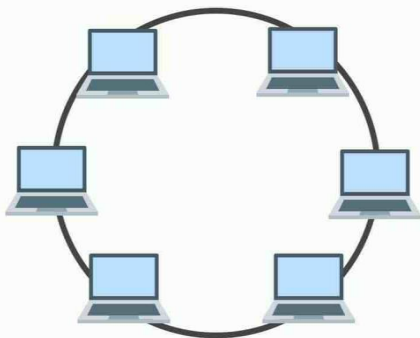


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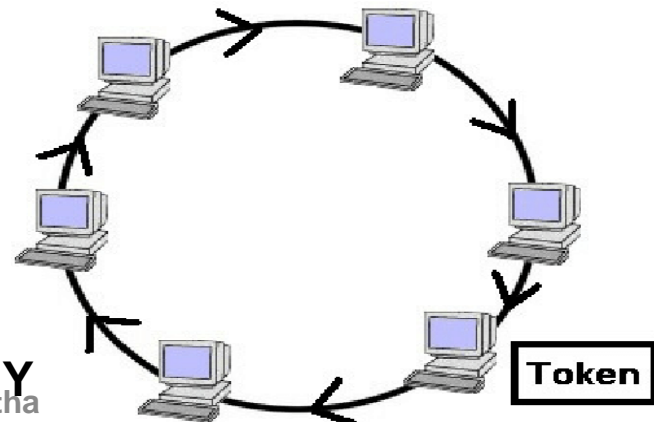


RING TOPOLOGY

Ring topology consists of several computer joined together to form a circle. It is called loop topology. Messages move from one computer to the next in one direction only. When a computer receives a message addressed to it, the message is copied and sent back with modification to indicate that it was received. Computers connected to a ring topology are responsible for moving data from themselves to next computer. Thus, if one computer fails, it affects the rest of the network.

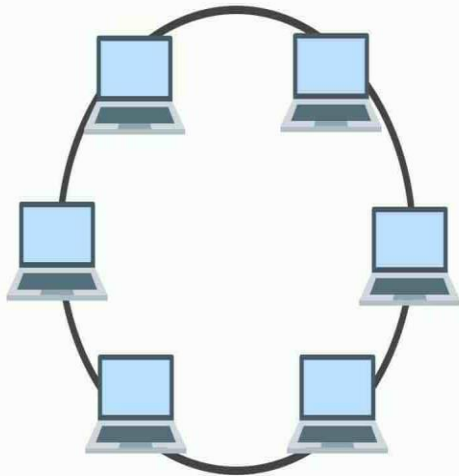


RING TOPOLOGY
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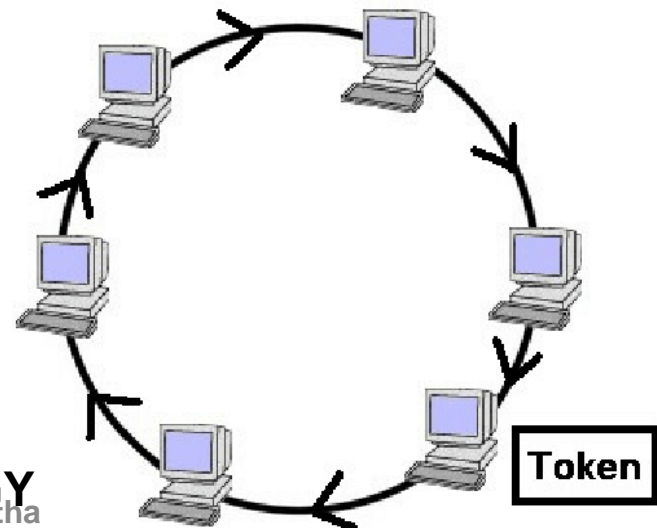


ADVANTAGES OF RING TOPOLOGY

- They are very easy to troubleshoot because each device incorporates a repeater.
- It is easy to install.
- Short cable connection which cause an increase in network reliability.
- There are no collisions of data.

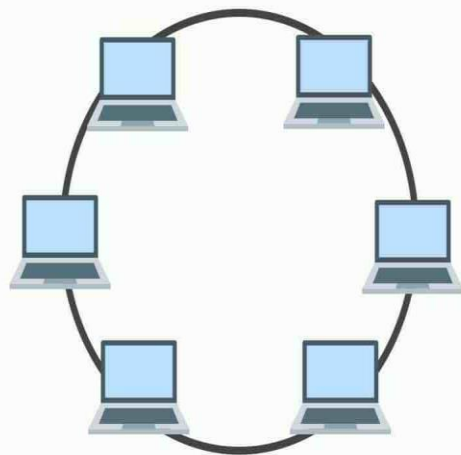


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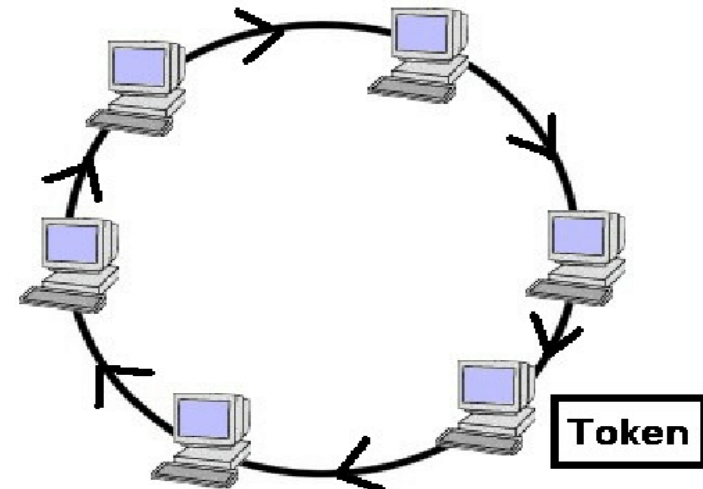


DISADVANTAGES OF RING TOPOLOGY

- The failure of one station will cause the system to break down as the link will be broken.
- Adding and removing nodes disturbs the entire network.
- In a ring network communication delay is directly proportional to the number of nodes in the network. Hence the addition of new node increases the communication delay.



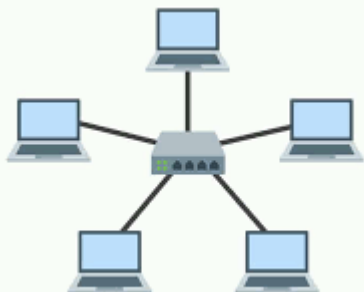
RING TOPOLOGY
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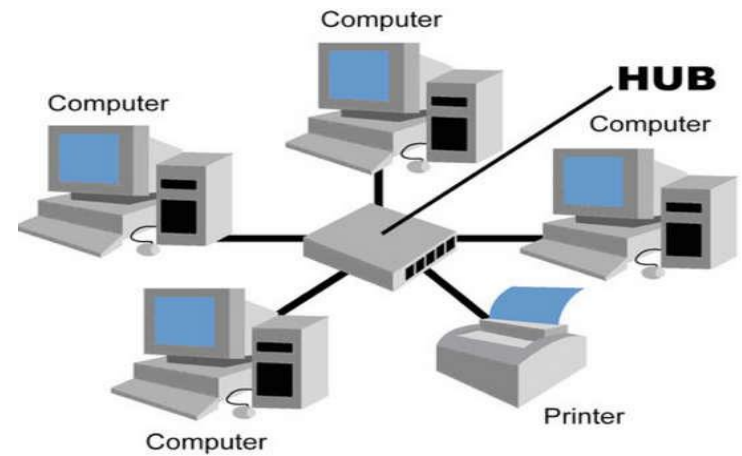
STAR TOPOLOGY

In star topology, each device (node) has a dedicated point to point link only to a central controller, usually called hub. The computers are not directly linked to one another.

Unlike other topology, star topology does not allow direct traffic (flow of data) between computers. The controller acts as an exchange. If one computer wants to send data to another, it first sends the data to the controller which then relays the data to the other computer. If one link fails, only that link is affected and all other links are active.

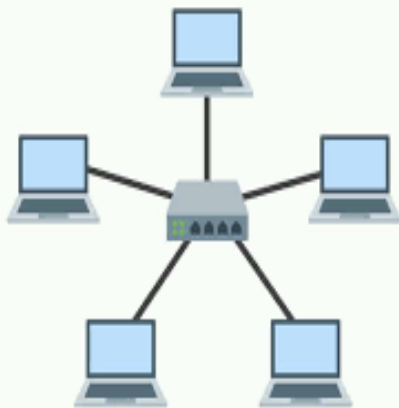


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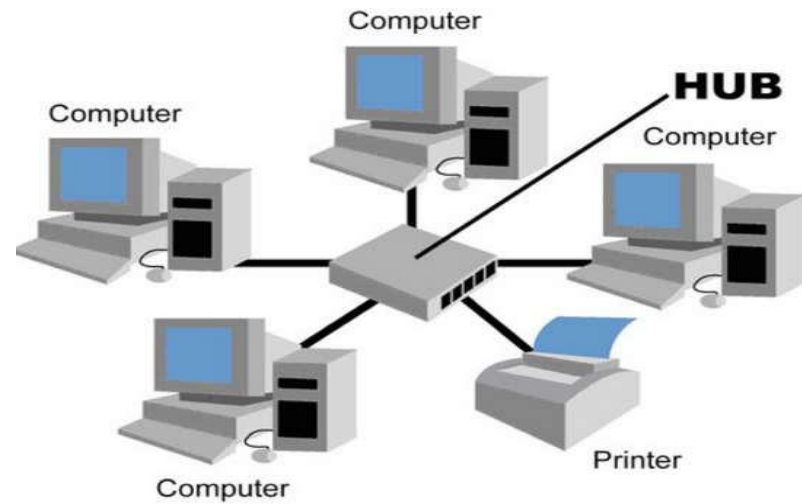


ADVANTAGES OF STAR TOPOLOGY

- Easy to install and configuration.
- Easy to find out the fault.
- Easy to modify and expansion.
- Single computer failure does not affect other computer in network.
- High data transmission is possible.

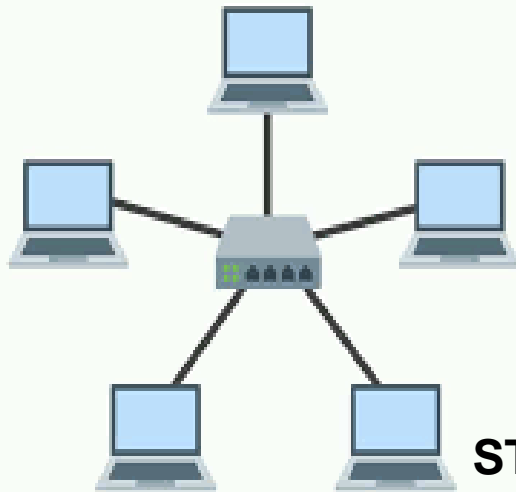


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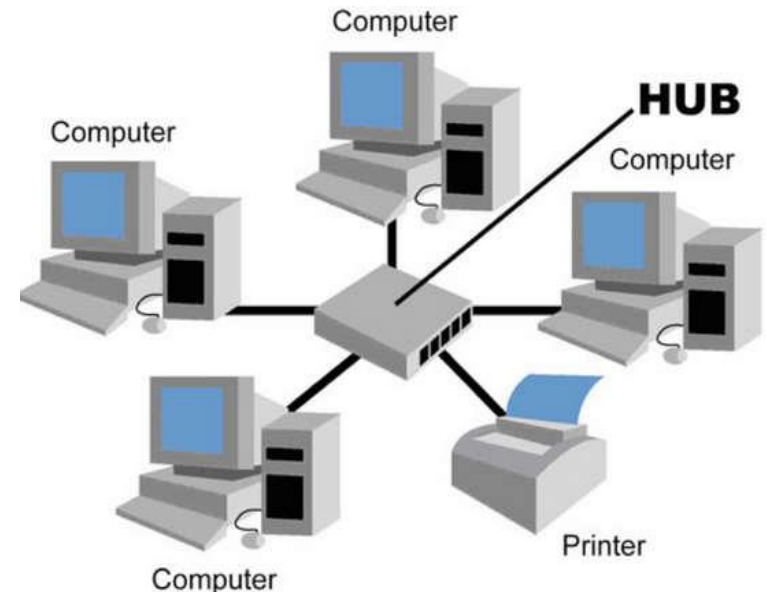
DISADVANTAGES OF STAR TOPOLOGY

- If the central controller (hub) fails whole network goes down.
- Require more cable than most topologies.
- More expensive than linear bus topologies because of the cost of the networking device.



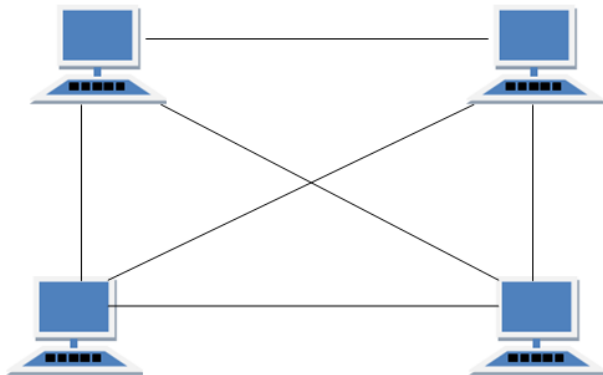
STAR TOPOLOGY

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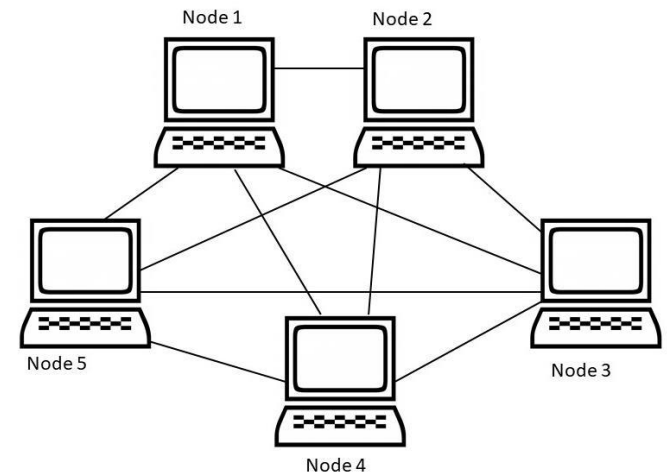


MESH TOPOLOGY

In mesh topology, each computer has a dedicated point to point link to other computers. The term dedicated means that the link carries traffic only between the two devices. Hence, a fully connected topology of 'n' computers has $n(n-1)/2$ links. If one link fails, it does not affect entire system. Each node should have $(N-1)$ I/O ports. It has privacy or security. Large amount of cable is required.

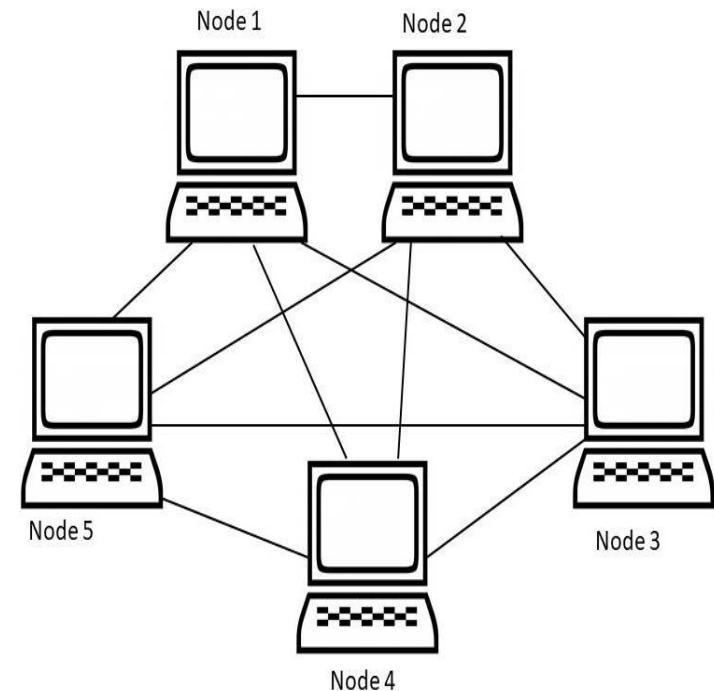
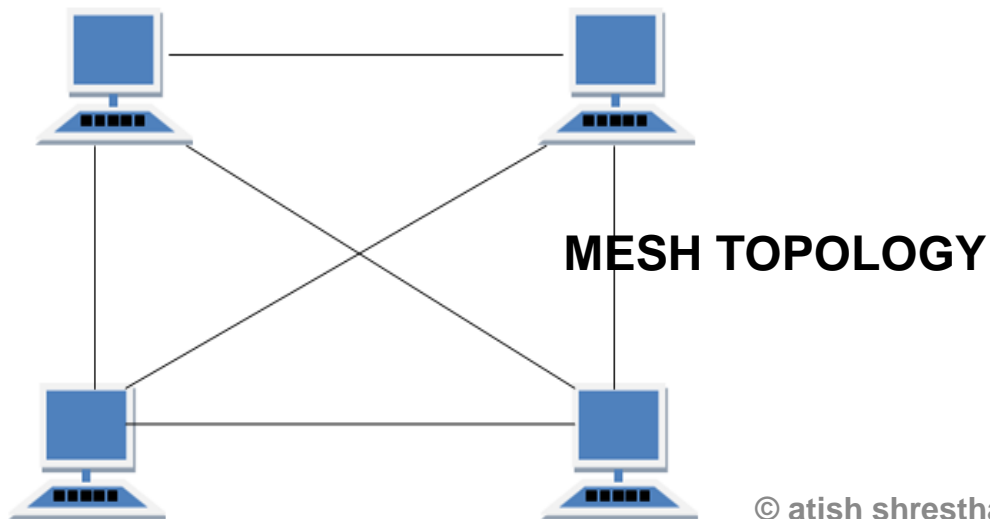


MESH TOPOLOGY
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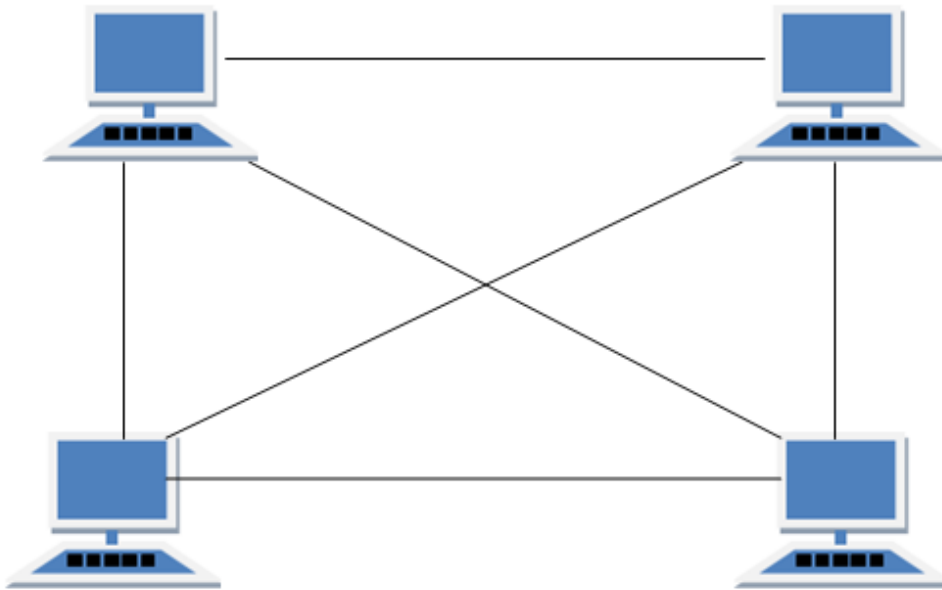
ADVANTAGES OF MESH TOPOLOGY

- It provides alternative routes between nodes.
- Point-to-point link makes fault identification easy.
- Fastest data transmission.
- Failure in one of the computer does not affect the entire network.
- More reliable.

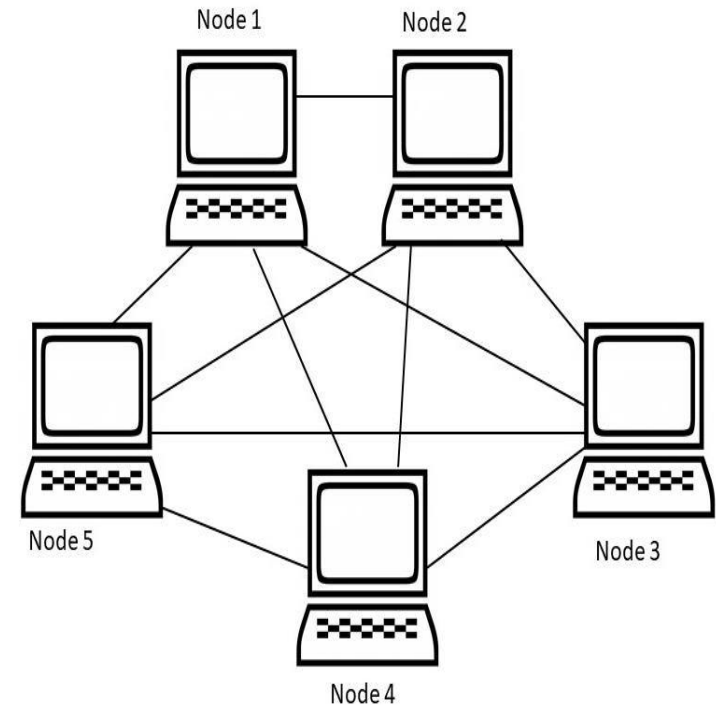


DISADVANTAGES OF MESH TOPOLOGY

- Difficult to install/setup.
- It is expensive and difficult to expand.
- It requires large cabling.



MESH TOPOLOGY
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COMMUNICATION MEDIA COMMUNICATION CHANNEL TRANSMISSION MEDIA

The channel through which the data get transmitted from one point to another in a network is called communication media.

Communication media refers to the means of delivering and receiving data or information.

Some examples of communication media are fiber optics cable, satellite, Bluetooth etc.



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COMMUNICATION MEDIA

TYPES OF COMMUNICATION MEDIA

There are two types of communication media. They are:

- 1) Guided/ Wired/ Bounded communication media
- 2) Unguided/ Wireless/ Unbounded communication media



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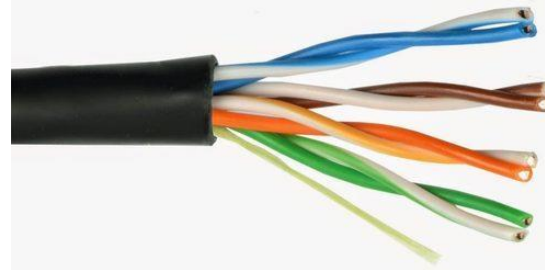


COMMUNICATION MEDIA

Guided/ Wired/ Bounded communication media

The communication media in which data signals are transmitted along a specific path through cable is known as Guided Communication Media. It transfers data from one place to another with the help of wire. There are three types of cables used in this media:

- 1) Twisted Pair Cable
- 2) Coaxial Cable
- 3) Fiber Optics Cable



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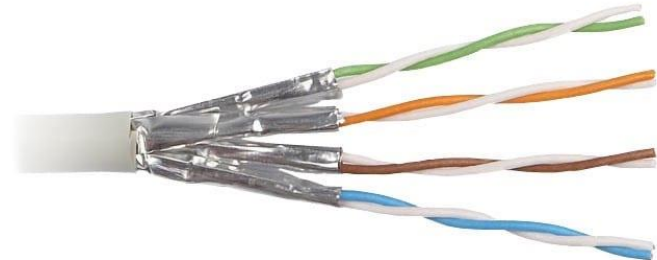
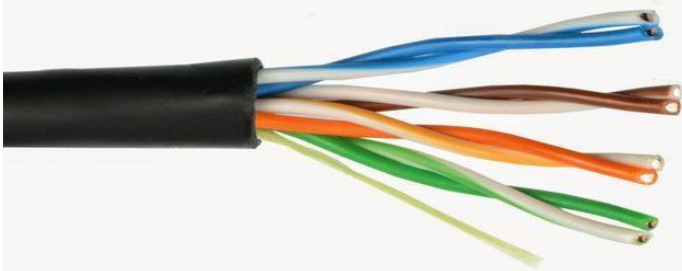


Twisted Pair Cable

The most popular form of communication media is twisted pair cable. It consists of a pair of insulated copper wire twisted around each other. It is relatively easy to setup a network using a twisted pair cable. A single twisted pair cable is capable of providing a capacity up to 1 GBPS for short distances (typically not more than 100 to 200 meters).

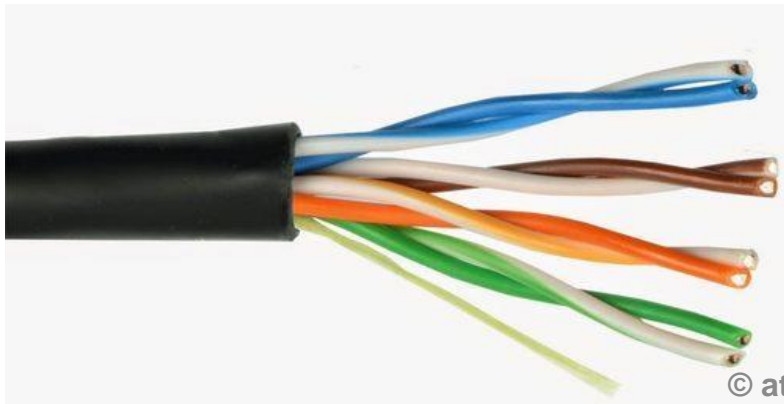
There are two basic types of twisted-pair cable:

- a) unshielded twisted pair (UTP) and**
- b) shielded twisted pair (STP).**



Unshielded Twisted Pair (UTP) Cable

It is most popular twisted pair cable. The quality of UTP may vary telephone wire to extremely high speed cable. It is commonly used for LAN and telephone connection. It is less expensive and easier to work but it does not offer high bandwidth. The data transfer rate in UTP is up to 100MBPS. Twisted pair cables are inexpensive and easy to install and use. However their use is limited because they easily lose the data when distance exceeds beyond 100 meters.



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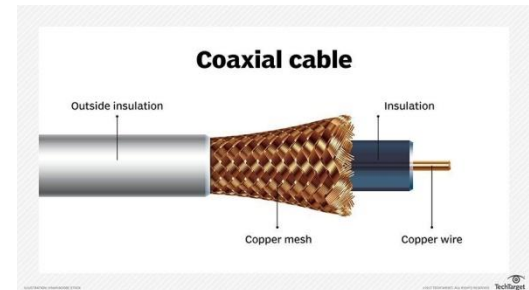
Shielded Twisted Pair (STP) Cable

A shielded twisted pair cable (also known as IBM type I) is similar to UTP but it has metallic covering placed just underneath the plastic casing. It is more expensive than UTP cables. STP cable offers the best protection from interference. It can support data transfer rate from 16Mbps to 1000Mbps.



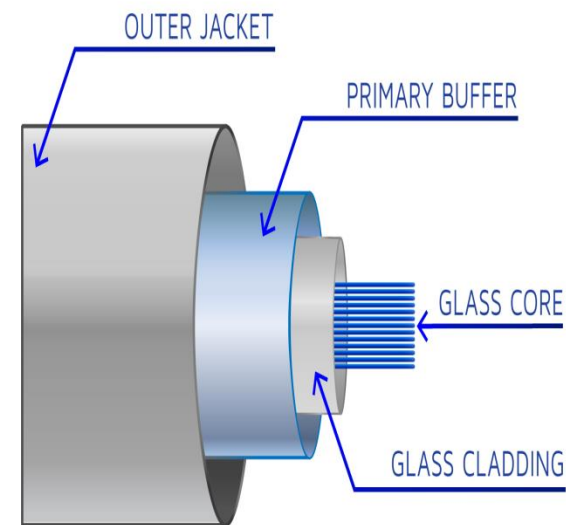
Coaxial Cable

- ❖ A coaxial cable is a type of shielded and insulated copper cable that is used in computer networks and to deliver cable TV services to end users.
- ❖ Less susceptible to noise but more expensive than twisted pair.
- ❖ Wider bandwidth, more difficult to install
- ❖ **Coaxial cable** works by carrying data in the centre conductor, while the surrounding layers of shielding stop any signal loss
- ❖ Coaxial cable can be cabled over longer distances than twisted-pair cable.
- ❖ 10Mbps of data transfer rate



Fiber Optics Cable

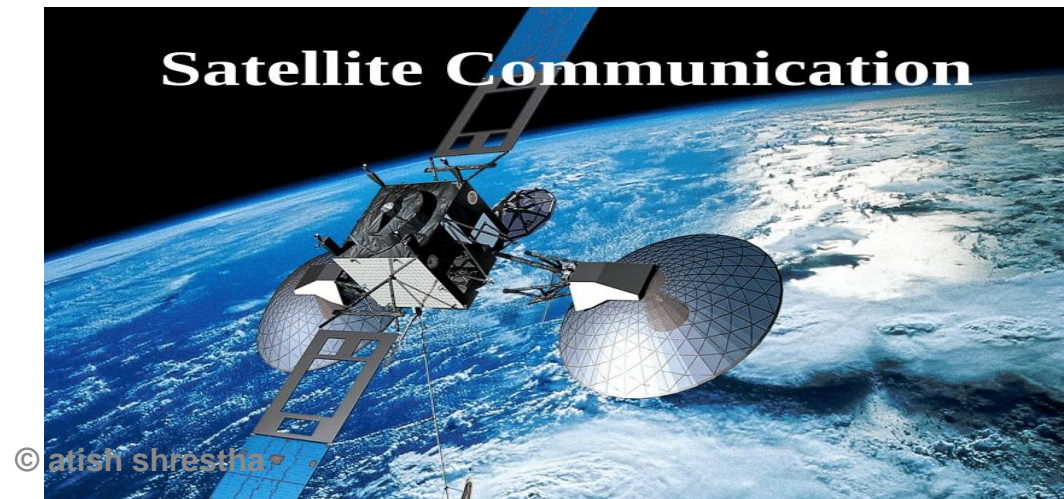
- ❖ actually composed of two layers of glass: The core, which carries the actual light signal, and the cladding, which is a layer of glass surrounding the core.
- ❖ provides higher bandwidth and transmit data over longer distances.
- ❖ Low error rate, very high noise immunity to electrical and magnetic noise.
- ❖ High cost of installation with special equipment and skilled manpower required.
- ❖ High data transfer rate over 2 Gbps.
- ❖ support much of the world's internet, cable television, and telephone systems.



Unguided/ Wireless/ Unbounded communication media

In unguided media transmission, messages or electromagnetic signals travel through air or space. Cables, connectors and other solid conductors are not required in unguided media systems. Wireless communication is particularly useful in those regions where cables are difficult to implement or install. The three main types of wireless media are:

- 1) Radio waves
- 2) Microwaves
- 3) Infrared waves



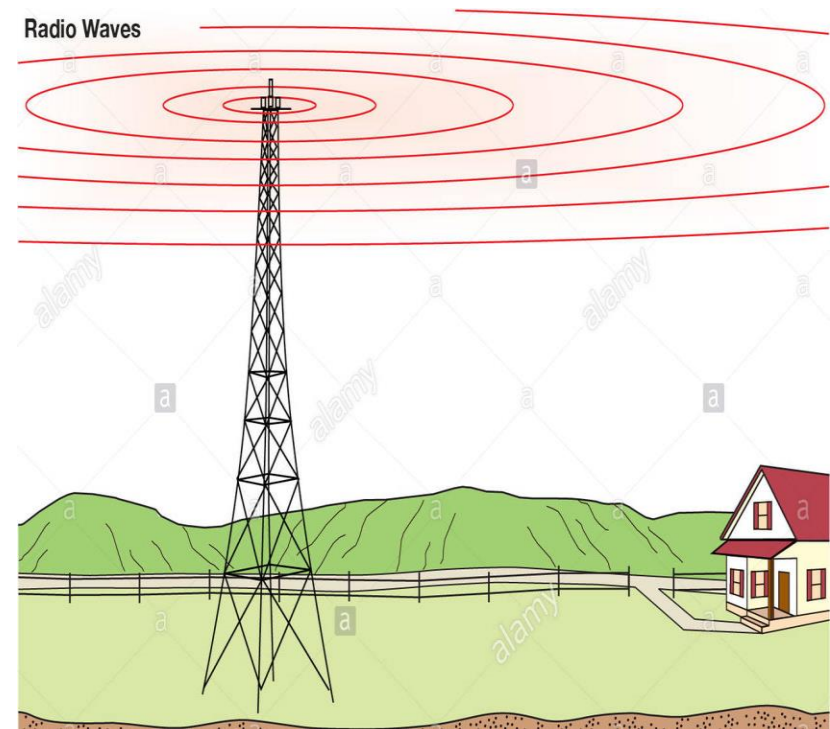
Radio Waves

Radio waves are the electromagnetic waves that lie in the region of 300 GHz to 3 kHz of frequency.

Radio waves are omnidirectional. When an antenna transmits radio waves, they are propagated in all directions. This means that the sending and receiving antennas do not have to be aligned. A sending antenna send waves that can be received by any receiving antenna.

Radio waves are easy to generate and penetrate buildings. It also can travel long distances.

Examples of radio waves are television, AM and FM radio, cordless phones etc.

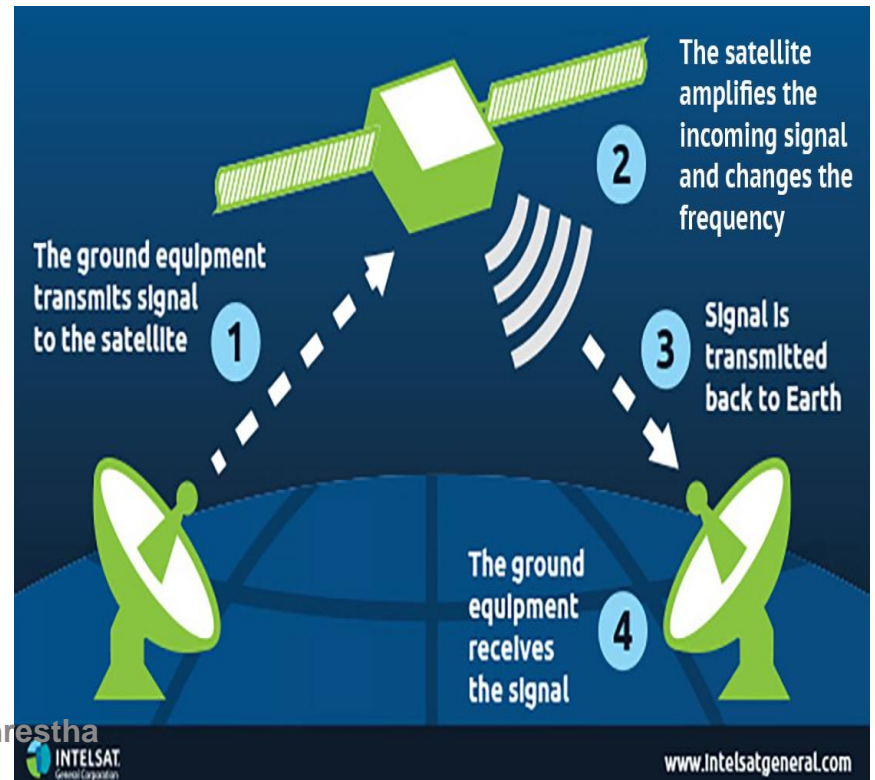
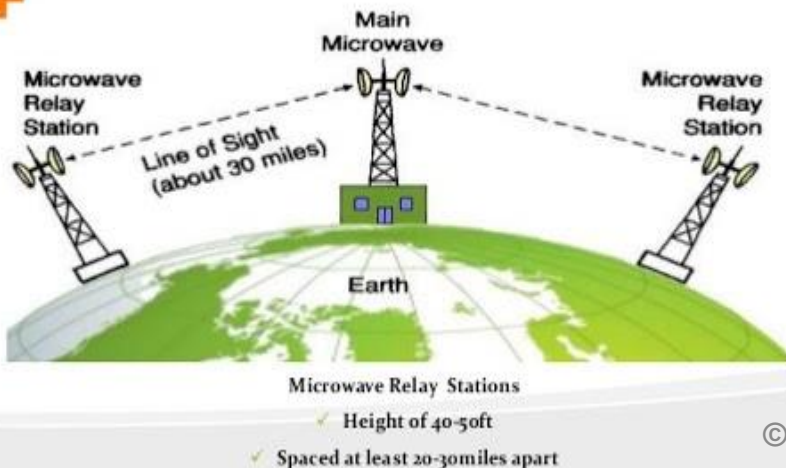


Microwaves

Microwaves includes a line of sight transmission that is the sending and receiving antennas that need to be properly aligned with each other. Microwaves have frequencies between 300 MHz and 300 GHz . Cellular phones, satellite networks, and wireless LANs are using Microwaves. Two types of Microwave Transmission are as follows:

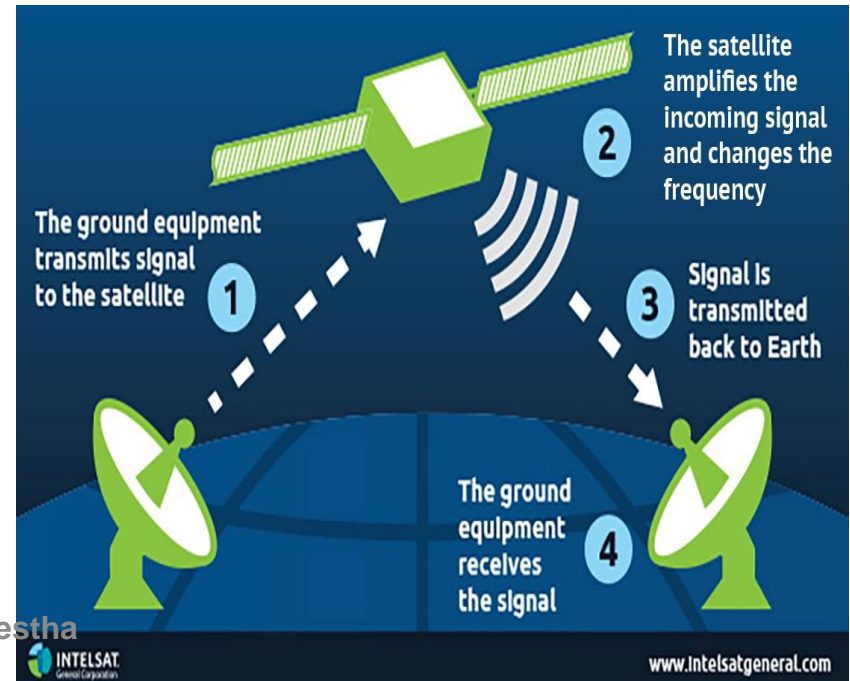
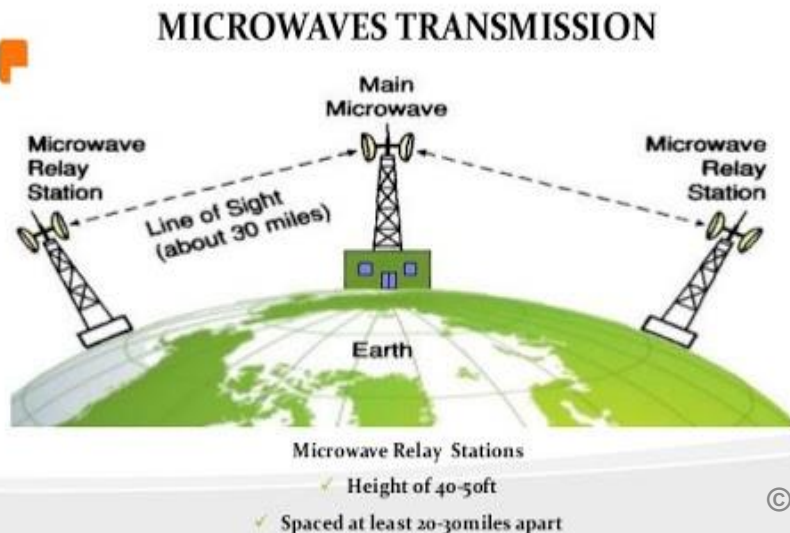
1. Terrestrial Microwave
2. Satellite Microwave

MICROWAVES TRANSMISSION



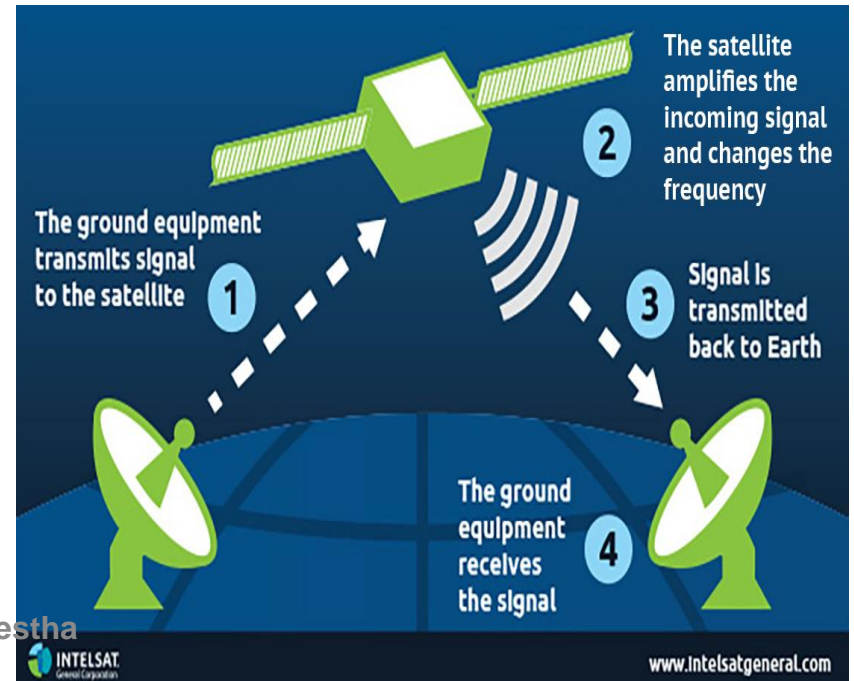
Advantages of Microwaves

- Supports larger bandwidth and hence more information is transmitted.
- More antenna gain is possible.
- Antenna size gets reduced, as the frequencies are higher.
- Low power consumption as the signals are of higher frequencies.



Disadvantages of Microwaves

- Cost of equipment or installation cost is high.
- They are hefty and occupy more space.
- Electromagnetic interference may occur.

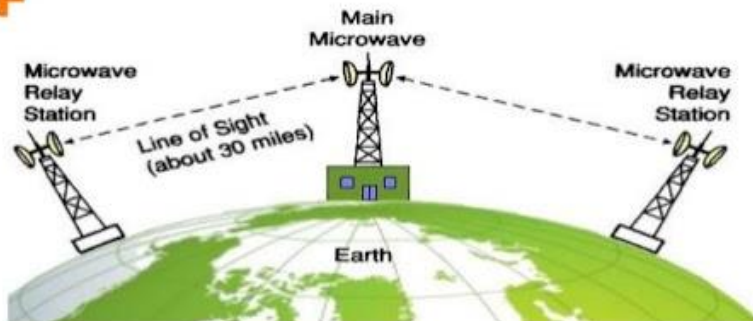


Terrestrial Microwaves

Terrestrial microwave is a wireless **microwave** networking technology that uses line-of sight communications between pairs of Earth-based transmitters and receivers to relay information. For increasing the distance served by terrestrial microwave, repeaters can be installed with each antenna .The signal received by an antenna can be converted into transmittable form and relayed to next antenna as shown in below figure. It is an example of telephone systems all over the world



MICROWAVES TRANSMISSION

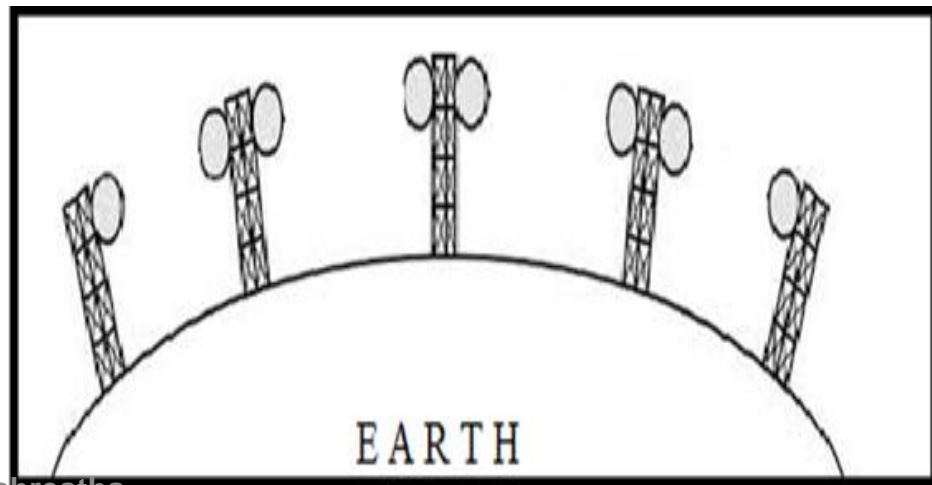


Microwave Relay Stations

Height of 40-50ft

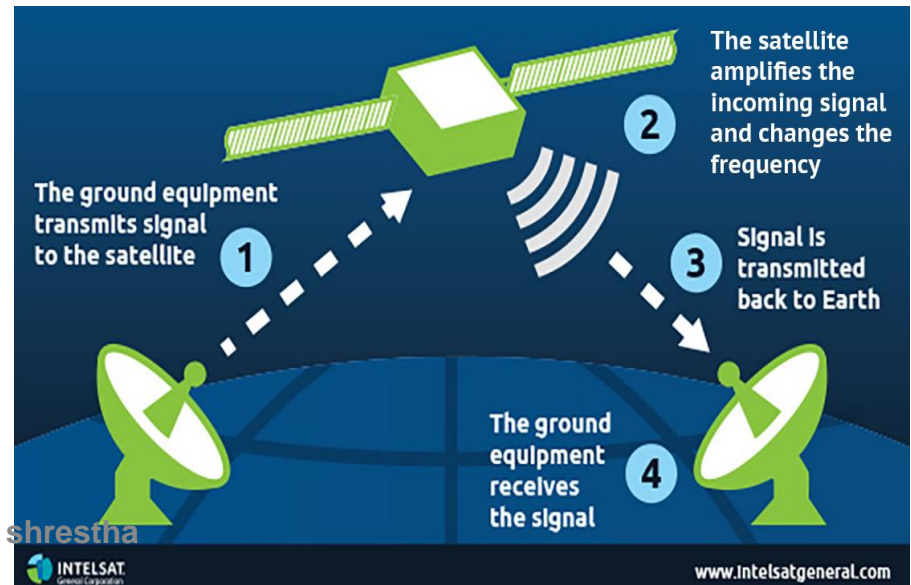
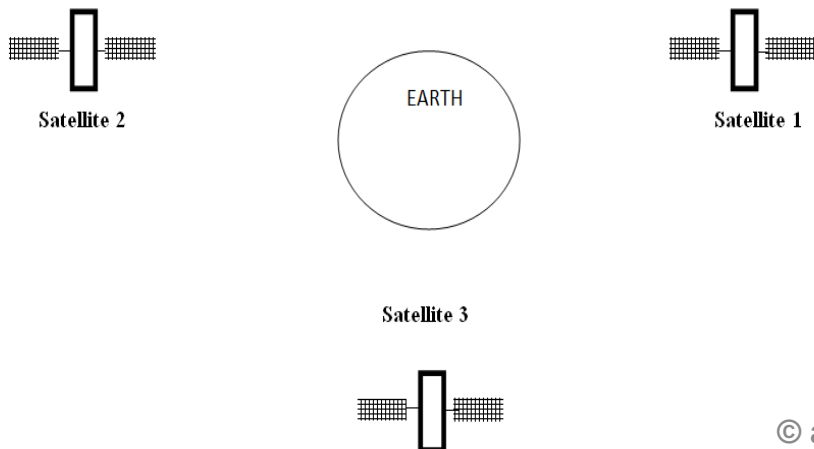
Spaced at least 20-30miles apart

© atish shrestha



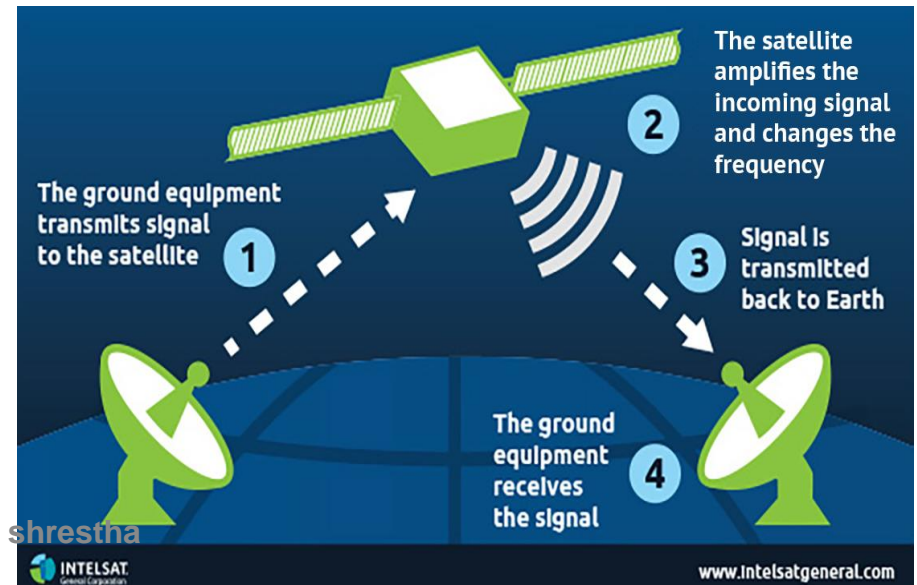
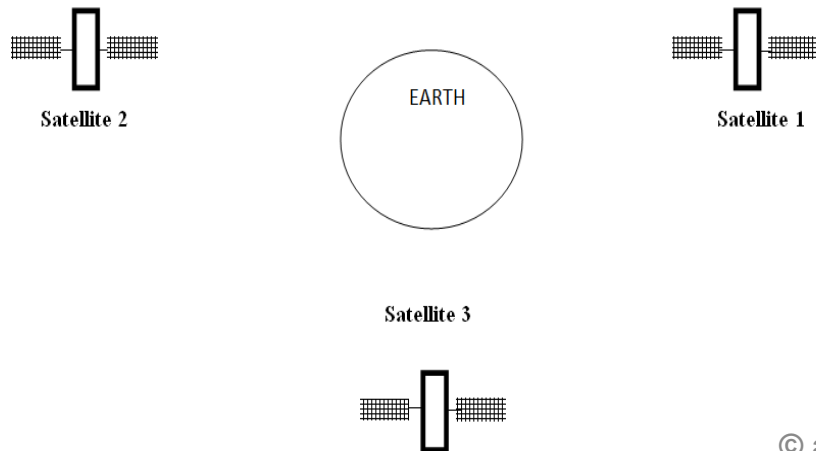
Satellite Micro Waves

This is a microwave relay station which is placed in outer space. The satellites are launched either by rockets or space shuttles carry them. These are positioned 36000 Km above the equator with an orbit speed that exactly matches the rotation speed of the earth. As the satellite is positioned in a geo-synchronous orbit, it is stationery relative to earth and always stays over the same point on the ground. This is usually done to allow ground stations to aim antenna at a fixed point in the sky.



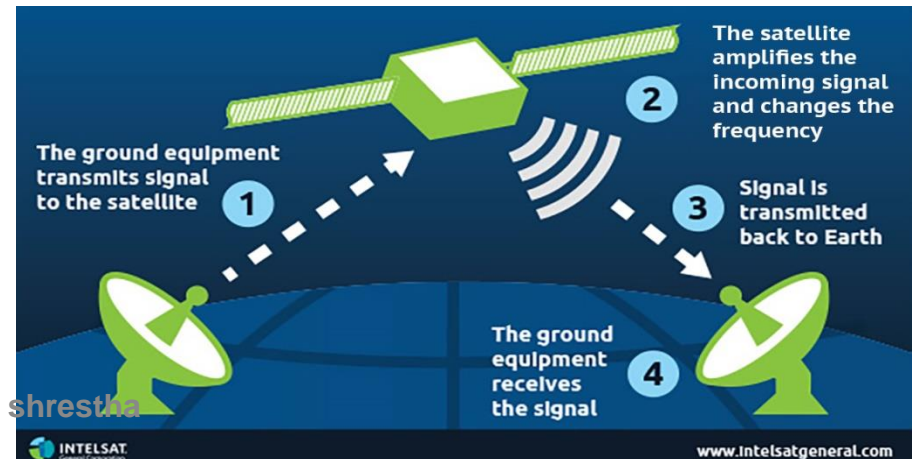
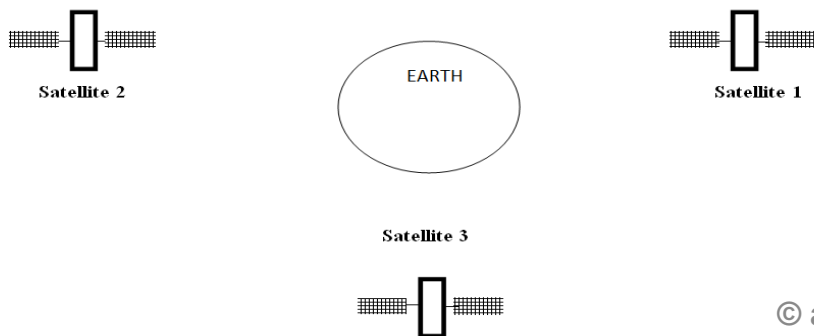
Advantages of Satellite Micro Waves

- ➔ It is used for mobile and wireless communication applications independent of location.
- ➔ It is easy to install and manage the ground station sites.
- ➔ Satellite system can be interfaced with internet infrastructure to obtain internet service. It is also used for GPS applications in various mobile devices for location determination.
- ➔ It is used in wide variety of applications which include weather forecasting, radio/TV signal broadcasting, gathering intelligence in military, navigation of ships and aircrafts, global mobile communication, connecting remote areas etc.



Disadvantages of Satellite Micro Waves

1. Satellite manufacturing cost is very high
2. Cost of launching satellite is very expensive
3. Transmission highly depends on whether conditions, it can go down in bad weather
4. Satellite once launched, requires to be monitored and controlled on regular periods so that it remains in the orbit.
5. Satellite has life which is about 12-15 years. Due to this fact, another launch has to be planned before it becomes un-operational.



Infrared Waves

Infrared waves, with frequencies from 300 GHz to 400 THz, can be used for short-range communication. Infrared waves, having high frequencies, cannot penetrate walls. This advantageous characteristic prevents interference between one system and another, a short-range communication system in one room cannot be affected by another system in the next room.



NETWORKING DEVICES

Hardware devices that are used to connect computers, printers, fax machines and other electronic devices to a network are called **network devices**. These devices transfer data in a fast, secure and correct way over same or different networks.

Network devices may be inter-network or intra-network. Some devices are installed on the device, like NIC card or RJ45 connector, whereas some are part of the network, like router, switch, etc. Let us explore some of these devices in greater detail.

Hub



Gateway



Router



Repeater



Bridge



Switch



NETWORK INTERFACE CARD (NIC)

The network interface card (NIC) provides the physical connection between the network and the computer workstation. Most NICs are internal, with the card fitting into an expansion slot inside the computer. Laptop computers can now be purchased with a network interface card built-in or with network cards that slip into a PCMCIA slot.

Ethernet card speeds may vary depending upon the protocols it supports. Old Ethernet cards had maximum speed of **10 Mbps**. However, modern cards support fast Ethernets up to a speed of **100 Mbps**. Some cards even have capacity of **1 Gbps**.



MODEM

Modem is a device that enables a computer to send or receive data over telephone or cable lines. The data stored on the computer is digital whereas a telephone line or cable wire can transmit only analog data.



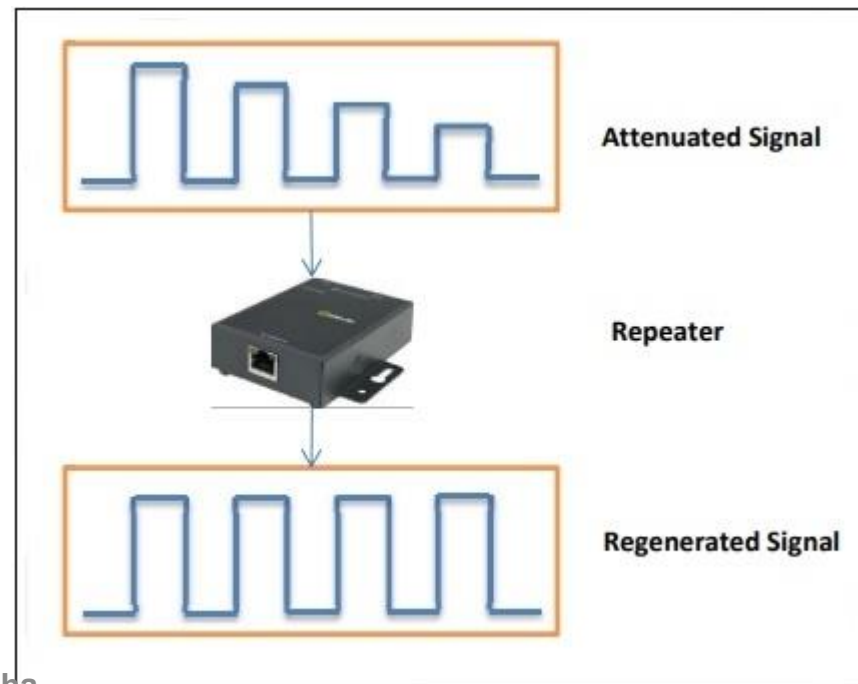
The main function of the modem is to convert digital signal into analog and vice versa. Modem is a combination of two devices – **modulator** and **demodulator**.

The **modulator** converts digital data into analog data when the data is being sent by the computer. The **demodulator** converts analog data signals into digital data when it is being received by the computer.



REPEATER

Since a signal loses strength as it passes along a cable, it is often necessary to boost the signal with a device called a repeater. Repeaters are network devices that amplify or regenerate an incoming signal before retransmitting it. They are incorporated in networks to expand its coverage area. They are also known as signal boosters.

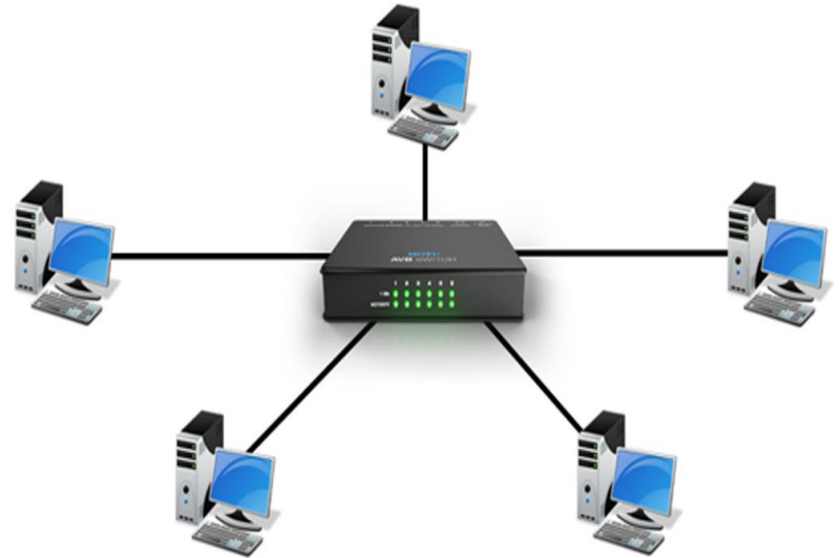


HUB

A hub, also called a network hub, is a common connection point for devices in a network. The hub contains multiple ports. Basically, it is similar to switch but are not as "smart" as switch.

When a hub receives a packet of data at one of its ports from a network device, it transmits (repeats) the packet to all of its ports to all of the other network devices.

In the past, network hubs were popular because they were cheaper than a switch or router. Today, switches do not cost much more than a hub and are a much better solution for any network.

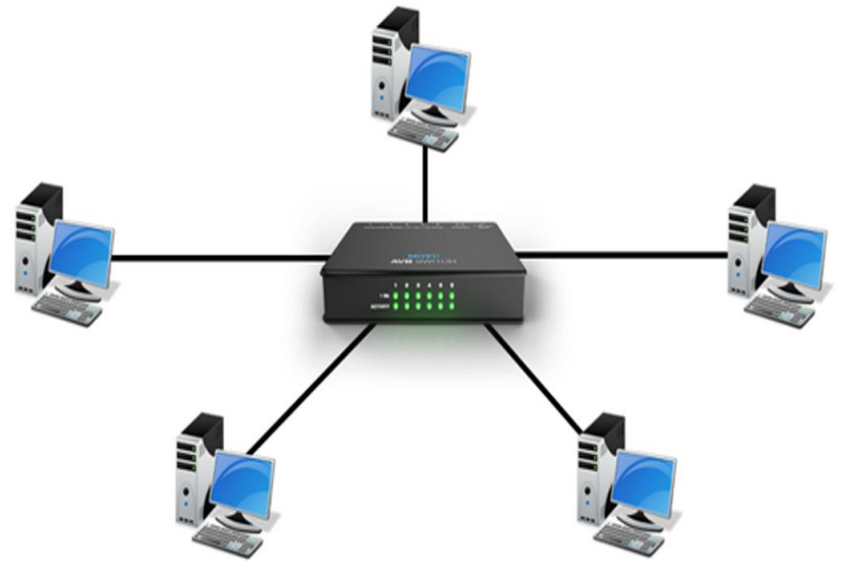


SWITCH

A network switch physically resembles a network hub. Unlike hubs, however, network switches are capable of inspecting incoming messages as they are received and directing them to a specific communications port—a technology called packet switching.

The switch maintains a list of network addresses of all the devices connected to it.

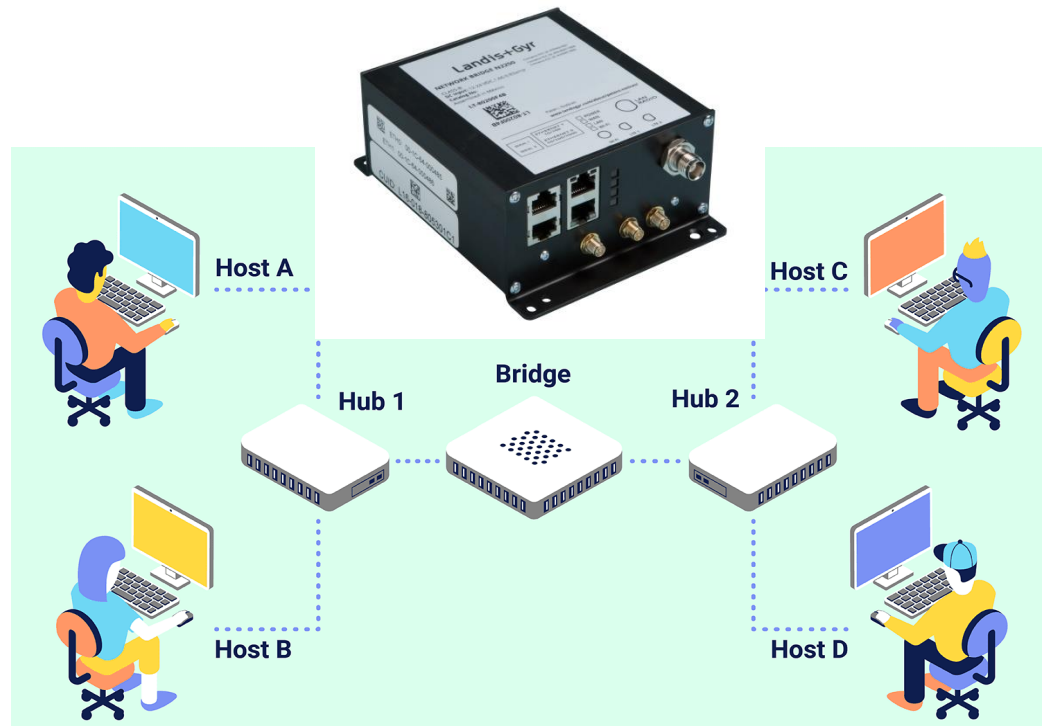
On receiving a packet, it checks the destination address and transmits the packet to the correct port. Before forwarding, the packets are checked for collision and other network errors.



BRIDGE

A network bridge joins two separate computer networks. The network bridge enables communication between the two networks and provides a way for them to work as a single network. Bridges extend local area networks to cover a larger physical area than the LAN can reach. Bridges are similar to — but more intelligent than — simple repeaters, which also extend signal range.

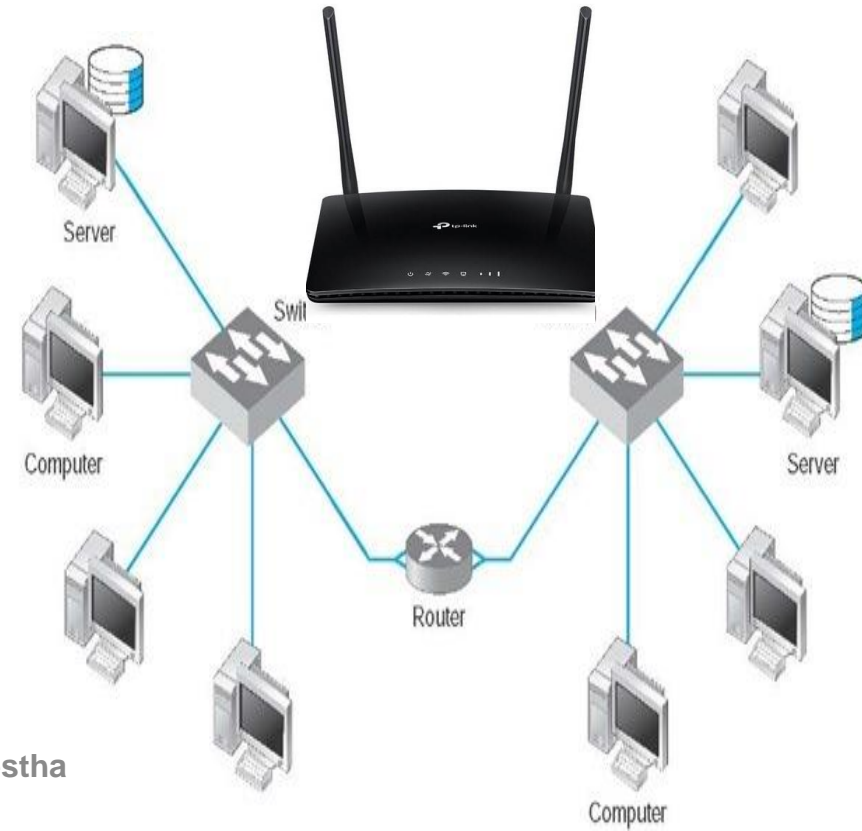
Network bridges offer substantial improvements over network hubs, but they are not widely used anymore in modern LANs. Switches are commonly used instead.



ROUTER

The router is an internetworking device that is designed to receive, analyze, and forward data packets between computer networks. A router examines a destination IP address of a given data packet, and it uses the headers and forwarding tables to decide the best way to transfer the packets. Routers select the best path to route a message, based on the destination address and origin.

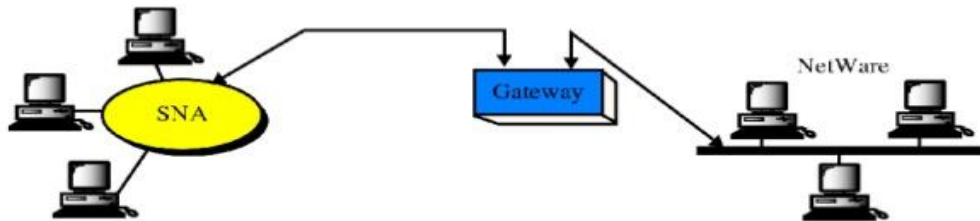
A **router** is far more **intelligent** than a switch because of its ability to carry out the operation of transferring data across various networks.



GATEWAY

The gateways are used to connect two networks that do not communicate with the same network protocol, so it is necessary to translate these protocols between both networks. Unlike bridges and routers, gateways operate slowly because of protocol conversion. And since, typically, the gateways connect very different systems, their configuration can be relatively more complicated than that of other interconnection devices.

A gateway



SNA network (IBM)
Netware network (Novell)
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CONNECTORS

Connector is the part of a cable that plugs into a port or interface to connect one device to another. Most connectors are either *male* (containing one or more exposed pins) or *female* (containing holes in which the male connector can be inserted). There are three types cable connectors in a basic cabling installation techniques: twisted-pair connectors, coaxial cable connectors and fiber-optic connectors. Examples are Registered Jack 45 (RJ45), BNC connector, SC connector etc.

RJ 45 Connector



ST connector



SC connector



LC connector



MTRJ connector



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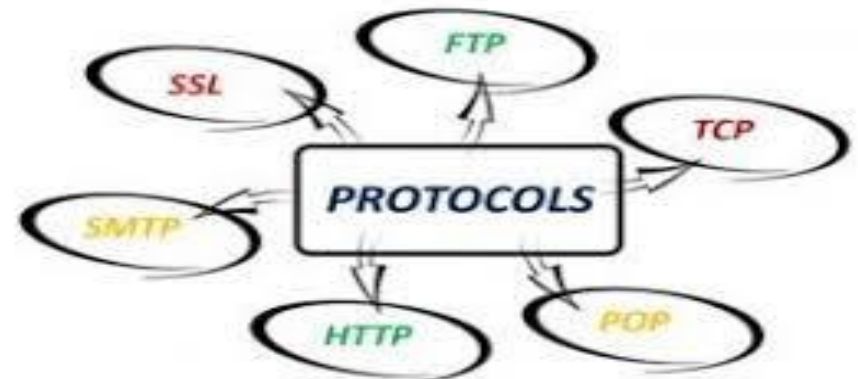
BNC Connector



NETWORKING SOFTWARE

A general phrase for software that is designed to help set up, manage, and/or monitor computer networks. Networking software applications are available to manage and monitor networks of all sizes, from the smallest home networks to the largest enterprise networks.

- ❖ Helps to set up and install computer networks
- ❖ Enables users to have access to network resources
- ❖ Allows administrations to add or remove users from the network



NETWORK OPERATING SYSTEM

Abbreviated as *NOS*, a network operating system includes special functions for connecting computers and devices into a local-area network (LAN) or Inter-network. The term *network operating system* is generally reserved for software that enhances a basic operating system by adding networking features. Novell Netware, Microsoft Windows Server, Windows NT, Linux are examples of a NOS.

- ❖ It allows multiple computers to connect so that they can share data, files and hardware
- ❖ Provide security features such as authentication, logon restrictions and access control.



INTERNET, INTRANET, EXTRANET

- The **Internet** is a globally-connected network of computers that enables people to share information and communicate with each other.
- An **intranet**, on the other hand, is a local or especially a private network created using World Wide Web software.
- An **extranet** is like an intranet that allows access only to certain outside individuals or businesses.
- ***Intranet and Extranet are more secure than Internet. Accessing any information on Internet is not much difficult today.***
- ***Internet has no hard and fast policies while there is a complete organization policy behind the setup of Intranet and Extranet.***

COMMUNICATION PROTOCOL

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

Some Important Protocols and their job:

Protocol	Acronym	Its Job
Transmission Control Protocol/internet Protocol	TCP/IP	The backbone protocol of the internet. Popular also for intranets using the internet
Simple Mail Transfer Protocol	SMTP	Used to send Email over a network
Post Office Protocol 3	POP3	Used to retrieve e-mail from a mail server and holds email for an individual until they pick it up
File Transfer Protocol	FTP	Used to send and receive files from a remote host
Hyper Text Transfer Protocol	HTTP	Used for the web to send documents that are encoded in HTML.
Telnet		Used to connect to a host and emulate a terminal that the remote server can recognize
NetBIOS/NetBEUI		Used for LAN Manager and Windows NT networks

THANK YOU