What is Network:

A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files, or allow electronic communications

The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams

Networks are used to:

- Facilitate communication via email, video conferencing, instant messaging, etc.
- Enable multiple users to share a single hardware device like a printer or scanner
- Enable file sharing across the network
- Allow for the sharing of software or operating programs on remote systems
- Make information easier to access and maintain among network users

Different Types of Networks:

Depending upon the geographical area covered by a network, it is classified as:

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

Local Area Network (LAN):

1) A LAN is a network that is used for communicating among computer devices, usually within an office building or home.
2) LAN's enable the sharing of resources such as files or hardware devices that may be needed by multiple users
3) Is limited in size, typically spanning a few hundred meters, and no more than a mile
4) Is fast, with speeds from 10 Mbps to 10 Gbps
5) Requires little wiring, typically a single cable connecting to each device
6) Has lower cost compared to MAN's or WAN's
7) LAN's can be either wired or wireless. Twisted pair, coax or fibre optic cable can be used in wired LAN's.
8) Every LAN uses a protocol a set of rules that governs how packets are configured and transmitted.
9) Nodes in a LAN are linked together with a certain topology. These topologies include:
   - –Bus
   - –Ring
   - –Star
10) LANs are capable of very high transmission rates (100s Mb/s to G b/s).

Metropolitan Area Network (MAN):

1) metropolitan area network(MAN) is a large computer network that usually spans a city or a large campus.
2) A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities.
3) A MAN might be owned and operated by a single organization, but it usually will be used

by many individuals and organizations.

4) A MAN often acts as a high speed network to allow sharing of regional resources.
5) A MAN typically covers an area of between 5 and 50 km diameter.
6) Examples of MAN: Telephone company network that provides a high speed DSL to a customers and cable TV network.

Wide Area Network (WAN):

1) WAN covers a large geographic area such as country, continent or even whole of the world.
2) A WAN is two or more LANs connected together. The LANs can be many miles apart.
3) To cover great distances, WANs may transmit data over leased high-speed phone lines or wireless links such as satellites.
4) Multiple LANs can be connected together using devices such as bridges, routers, or gateways, which enable them to share data.
5) The world's most popular WAN is the Internet.

What is Network Topology:

Network topology is the arrangement of the different networking elements like network links, computers, switches, nodes, Wi-Fi access points, laptops and other network devices in a computer network.

Computer network topology is the way various components of a network (like nodes, links, peripherals, etc) are arranged. Network topologies define the layout, virtual shape or structure of network, not only physically but also logically. The way in which different systems and nodes are connected and communicate with each other is determined by topology of the network. **Topology can be physical or logical.** *Physical Topology* is the physical layout of nodes, workstations and cables in the network; while *logical topology* is the way information flows between different components.

Types of Network Topologies:

1)Bus topology:

Bus Topology is the simplest of network topologies. In this type of topology, all the nodes (computers as well as servers) are connected to the single cable (called bus), by the help of interface connectors. This central cable is the backbone of the network and is known as Bus (thus the name). Every workstation communicates with the other device through this Bus.

A signal from the source is broadcasted and it travels to all workstations connected to bus cable. Although the message is broadcasted but only the intended recipient, whose MAC address or IP address matches, accepts it. If the MAC /IP address of machine doesn't match with the intended address, machine discards the signal.

A terminator is added at ends of the central cable, to prevent bouncing of signals. A barrel connector can be used to extend it. Below I have given a basic diagram of a bus topology and then have discussed advantages and disadvantages of Bus Network Topology

Advantages (benefits) of Bus Topology:

1) It is easy to set-up and extend bus network.
2) Cable length required for this topology is the least compared to other networks.
3) Bus topology costs very less.
4) Linear Bus network is mostly used in small networks. Good for LAN.
5) Easy to connect device in a bus.
6) Does not require any specialized devices.

Disadvantages (Drawbacks) of Bus Topology:

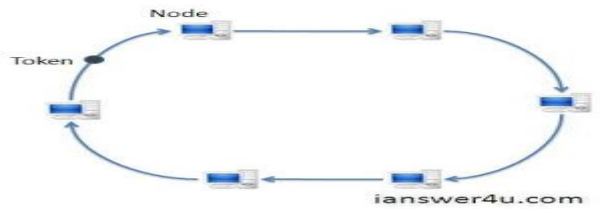
1)There is a limit on central cable length and number of nodes that can be connected.
2)Dependency on central cable in this topology has its disadvantages. If the main cable (i.e. bus) encounters some problem, whole network breaks down.
3)Proper termination is required to dump signals. Use of terminators is must.
4)It is difficult to detect and troubleshoot fault at individual station.
5)Maintenance costs can get higher with time.
6)Efficiency of Bus network reduces, as the number of devices connected to it increases.
7)It is not suitable for networks with heavy traffic.
8)Security is very low because all the computers receive the sent signal from the source.

Ring Topology:

In a ring topology, each device has a dedicated point – to - point connection with only the two devices on either side of it. A signal is passed along the ring in one direction, from device to device, until it reaches its destination. Each device in the ring incorporates a repeater. When a device receives a signal intended for another device, its repeater regenerates the bits and passes them along.

In a ring topology, each device is connected to each other in the form of closed loop like ring. Each device has only two neighbors for communication purpose one is upstream and another is downstream. Data travels through many points before reaching the destination which makes it inefficient network compared with other topologies. For example consider a ring network having 8 devices, if device 1 wants to transmit the data to the device 4, data must be travel from the device 1 to device 4 through device 2 & device 3 and then it reaches its destination.

The ring topology is commonly used in FDDI (Fiber Distributed Data Interface), Token ring, Sonnet network. All messages are travelled in the same direction either clockwise or anticlockwise (data travels only in unidirectional) In token ring a special signal or a small message called token is continuously passed from one device to another. The device which has token is allowed to transmit data over the network. Data is extracted by the appropriate device and the acknowledgement is sent back to the transmitting device. This topology also sends the data on priorities basis where message of higher priorities are sent before message with lower priority.



Advantages of Ring Topology :

1)This type of network topology is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.
2) Even when the load on the network increases, its performance is better than that of Bus topology
3)There is no need for network server to control the connectivity between workstations.
4)Additional components do not affect the performance of network.
5)Each computer has equal access to resources.

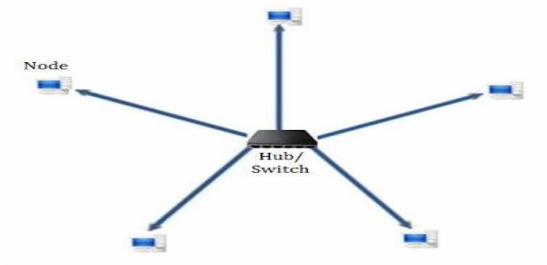
Disadvantages of Ring Topology:

1)Each packet of data must pass through all the computers between source and destination. This makes it slower than Star topology
2)If one workstation or port goes down, the entire network gets affected.
3) Network is highly dependent on the wire which connects different components.
4) MAU's and network cards are expensive as compared to Ethernet cards and hubs.

Star topology:

In Star topology, all the components of network are connected to the central device called "hub" which may be a hub or a switch. Unlike *Bus topology* (discussed earlier), where nodes were connected to central cable, here all the workstations are connected to central device with a point-to-point connection. So it can be said that every computer is indirectly connected to every other node by the help of "hub".

All the data on the star topology passes through the central device before reaching the intended destination. Hub acts as a junction to connect different nodes present in Star Network, and at the same time it manages and controls whole of the network. Depending on which central device is used, "hub" can act as repeater or signal booster. Central device can also communicate with other hubs of different network. Unshielded Twisted Pair (UTP) Ethernet cable is used to connect workstations to central node.



Advantages of Star Topology:

1) As compared to Bus topology it gives far much better performance, signals don't necessarily get transmitted to all the workstations. A sent signal reaches the intended destination after passing through no more than 3-4 devices and 2-3 links. Performance of the network is dependent on the capacity of central hub.

2) Easy to connect new nodes or devices. In star topology new nodes can be added easily without affecting rest of the network. Similarly components can also be removed easily.

3) Centralized management. It helps in monitoring the network.

4) Failure of one node or link doesn't affect the rest of network. At the same time its easy to detect the failure and troubleshoot it.

Disadvantages of Star Topology:

1) Too much dependency on central device has its own drawbacks. If it fails whole network goes down.

2) The use of hub or a switch as central device increases the overall cost of the network.

3) Performance and as well number of nodes which can be added in such topology is depended on capacity of central device

What is transmission media ? Types of transmission media. :

Transmission media is a pathway that carries the information from sender to receiver. We use different types of cables or waves to transmit data. Data is transmitted normally through electrical or electromagnetic signals.

An electrical signal is in the form of current. An electromagnetic signal is series of electromagnetic energy pulses at various frequencies. These signals can be transmitted through copper wires, optical fibers, atmosphere, water and vacuum Different Medias have different properties like bandwidth, delay, cost and ease of installation and maintenance. Transmission media is also called Communication channel.

Types of Transmission Media:

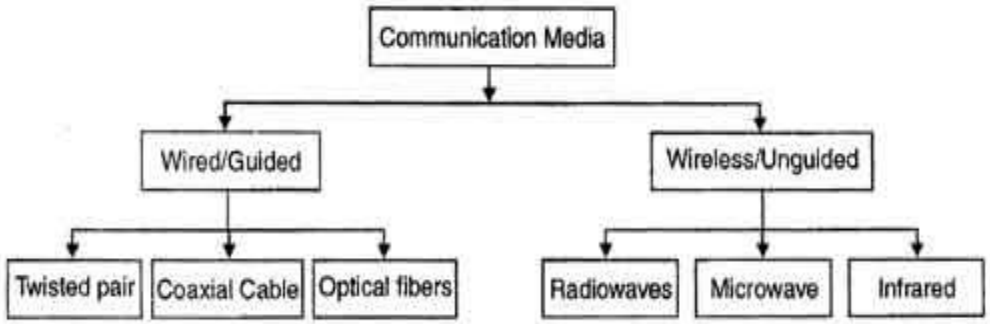
Transmission media is broadly classified into two groups.
1. Wired or Guided Media or Bound Transmission Media
2. Wireless or Unguided Media or Unbound Transmission Media

Wired or Guided Media or Bound Transmission Media:

Bound transmission media are the cables that are tangible or have physical existence and are limited by the physical geography. Popular bound transmission media in use are twisted pair cable, co-axial cable and fiber optical cable. Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost etc.

Wireless or Unguided Media or Unbound Transmission Media:

Unbound transmission media are the ways of transmitting data without using any cables. These media are not bounded by physical geography. This type of transmission is called Wireless **communication.** Nowadays wireless communication is becoming popular. Wireless LANs are being installed in office and college campuses. This transmission uses Microwave, Radio wave, Infra red are some of popular unbound transmission media



Twisted pair cable	Co-axial cable	Optical fiber
1. Transmission of signals takes place in the electrical form over the metallic conducting wires.	1. Transmission of signals takes place in the electrical form over the inner conductor of the cable.	1. Signal transmission takes place in an optical forms over a glass fiber.
2. In this medium the noise immunity is low.	2. Coaxial having higher noise immunity than twisted pair cable.	2. Optical fiber has highest noise immunity as the light rays are unaffected by the electrical noise.
3. Twisted pair cable can be affected due to external magnetic field.	3. Coaxial cable is less affected due to external magnetic field.	3. Not affected by the external magnetic field.
4. Cheapest medium.	4. Moderate Expensive.	4. Expensive
5. Low Bandwidth.	5. Moderately high bandwidth.	5. Very high bandwidth
6. Attenuation is very high.	6. Attenuation is low.	6. Attenuation is very low.
7. Installation is easy.	7. Installation is fairly easy.	7. Installation is difficult.

Twisted Pair:

The least-expensive and most widely-used guided transmission medium is twisted pairs. A twister pair consists of two conductors (normally copper) .Each with its own plastic insulation, twisted together as shown in fig.

A twisted pair consists of two insulated copper wires arranged in a regular spiral pattern. A wire pair acts as a single communication link. Typically, a number of these pairs are bundled together into a cable by wrapping them in a tough protective sheath. Over longer distances, cables may contain hundreds of pairs. The twisting tends to decrease the crosstalk interference between adjacent pairs in a cable.

Advantages of Twisted pair cable:

1. It can be used to carry both analog and digital data.

2. It is relatively easy to implement and terminate.

3. It is the least expensive media of transmission for short distances.

4. If portion of a twisted pair cable is damaged it does not effect the entire network.

Disadvantages of Twisted pair cable:

1. It offers poor noise immunity as a result signal distortion is more?

2. Attenuation is very high.

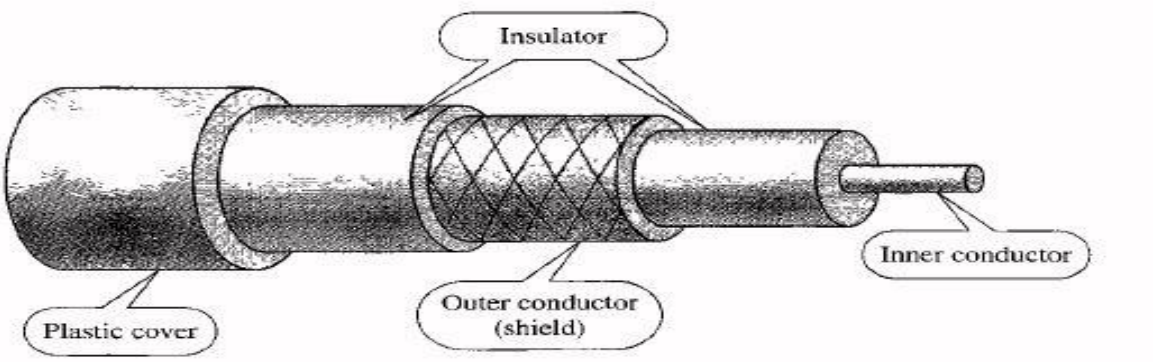
3. It supports lower bandwidth as compared to other Medias. It supports 10 mbps upto a distance of 100 meters on a 10BASE-T.

4. It offers very poor security and is relatively easy to tap.

5. Being thin in size, they are likely to break easily.

Coaxial Cable:

Coaxial cable, like twisted pair, consists of two conductors, but is constructed differently to permit it to operate over a wider range of frequencies. It consists of a hollow outer cylindrical conductor that surrounds a single inner wire conductor (Figure 13.3b). The inner conductor is held in place by either regularly spaced insulating rings or a solid dielectric material. The outer conductor is covered with a jacket or shield. coaxial cable is much less susceptible to interference and crosstalk than is twisted pair.



Advantages of Coaxial Cables:

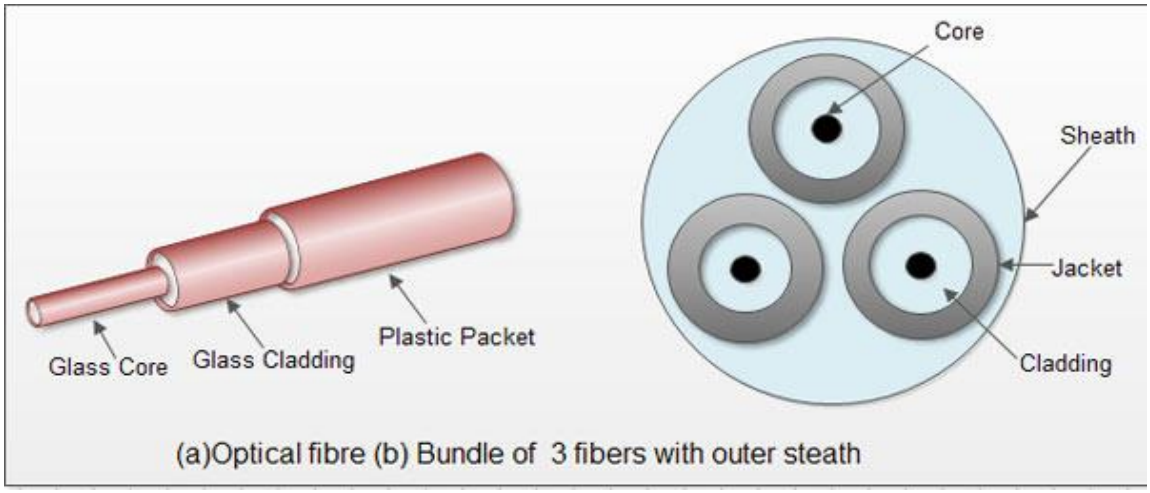
1.It can be used for both analog and digital transmission.
2. It offers higher bandwidth as compared to twisted pair cable and can span longer distances.
3.Because of better shielding in coaxial cable, loss of signal or attenuation is less.
4.Better shielding also offers good noise immunity.
5.It is relatively inexpensive as compared to optical fibers.
6.It has lower error rates as compared to twisted pair.
7. It is not as easy to tap as twisted pair because copper wire is contained in plastic jacket.

Disadvantages of Coaxial Cables:

1. It is usually more expensive than twisted pair.
2. High installation cost
3. High maintenance cost.

Optical fiber:

Optical fiber consists of thin glass fibers or plastic that can carry information at frequencies in the visible light spectrum and beyond. The typical optical fiber consists of a very narrow strand of glass called the core. Around the core is a concentric layer of glass called the cladding



(a)Optical fibre (b) Bundle of 3 fibers with outer steath

Advantages of Optical Fiber

1. They are not affected by electrical and magnetic interference as the data travel in form of light.

2. Optical fiber offers higher bandwidth than twisted pair or coaxial cable.

3. Optical fibers are thin, lighter in weight and small in size as compared to other wired Medias. It is easier to group several optical fibers in one bundle.

4. Glass is more resistant to corrosive materials as compared to copper. Hence can be laid in different environments.

5. In optical fibers, attenuation (loss of signal) is very low. Therefore these fibers can run several kilometers without amplification.

6. Fibers do not leak light and are quite difficult to tap. So they provide security against potential wiretappers.

7. There is no cross-talk problem in optical fibers.

8. They are highly suitable for environments where speed is needed with full accuracy.

9: Photons in fiber do not affect one another (as they have no charge) and are not affected by stray photons outside the fiber. But when electrons move in a wire they affect each other and are themselves affected by electrons outside the wire.

10. The size (diameter) of the optical fibers is very small (it is comparable to the diameter of human hair). Therefore a large number of optical fibers can fit into a cable of small diameter.

11. The material used for the manufacturing of optical fibers is "silica glass". This material is easily available. So the optical fibers cost lower than the cables with metallic conductors.

12. As the light rays have a very high frequency in the GHz range, the bandwidth of the optical tiber is extremely large. This allows transmission of more number of channels. Therefore the information carrying capacity of an optical fiber is much higher than that of a co-axial cable.

Disadvantages of Optical Fiber:

1. Fiber optics cables are fragile *i.e.* more easily broken than wires.

2. Being fragile, optical fibers need to be put deep into the land. This causes a lot of installation cost. Also the interface used for these fibers are expensive.

3. Optical fibers are unidirectional for two-way communication, two fibers are required.

4. It is a newer technology and requires skilled people to administer and maintain them.

Characteristics of Optical Fiber Cables:

Fiber optic cables have the following characteristics:

1. Fiber optic cabling can provide extremely high bandwidths in the range from 100 mbps to 2 gigabits because light has a much higher frequency than electricity.
2. The number of nodes which a fiber optic can support does not depend on its length but on the hub or hubs that connect cables together.
3. Fiber optic cable has much lower attenuation and can carry signal to longer distances without using amplifiers and repeaters in between.
4. Fiber optic cable is not atlected by EMI effects and can be used in areas where high voltages are passing by.
5. The cost of tiber optic cable is more compared to twisted pair and co-axial.
6. The installation of fiber optic cables is difficult and tedious

Wireless Transmission:

Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wirelessly. Wireless signals are spread over in the air and are received and interpreted by appropriate antennas.

When an antenna is attached to electrical circuit of a computer or wireless device, it converts the digital data into wireless signals and spread all over within its frequency range. The receptor on the other end receives these signals and converts them back to digital data.

Satellite Communication:

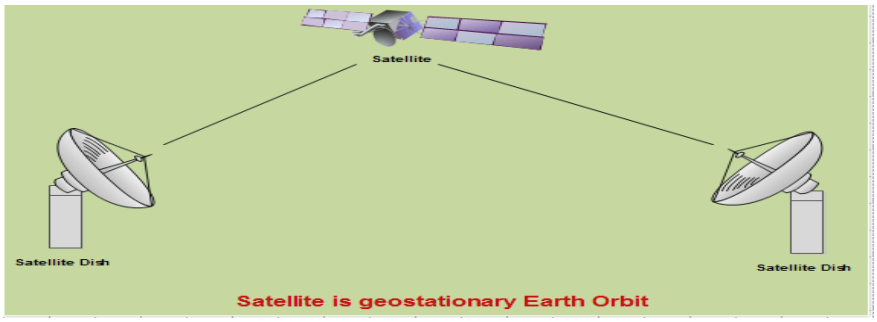
Satellite radio, quite simply, is a non-terrestrial microwave transmission system utilizing a space relay station. Satellites have proved invaluable in extending the reach of voice, data, and video communications around the globe and into the most remote regions of the world. Contemporary satellite communications systems involve a satellite relay station that is launched into a geostationary, geosynchronous, or geostatic orbit. Such satellites are called geostationary satellites.
At that altitude and in an equatorial orbital slot, the satellite revolves around the earth with the same speed as of that the speed of revolution of earth and maintains its relative position over the same spot of the earth's surface. Consequently, transmit and receive earth stations can be pointed reliably at the satellite for communications purposes. Such high frequency signals are especially susceptible to attenuation in the

atmosphere. Therefore, in case of satellite communication two different frequencies are used as carrier frequencies to avoid interference between incoming and outgoing signals. These *are:*

Uplink frequency It is the frequency used to transmit signal from earth station to satellite. The uplink signal can be made stronger to cope better with atmospheric distortion. The antenna at transmitting side is centered in a concave, reflective dish that serves to focus the radio beam, with maximum effect, on the receiving satellite antenna. The receiving antenna, similarly, is centered in a concave metal dish, which serves to collect the maximum amount of incoming signal.

Downlink frequency It is the frequency used to transmit the signal from satellite to earth station. In other words, the downlink transmission is focused on a particular footprint, or area of coverage. The lower frequency, used for the downlink; can better penetrate the earth's atmosphere and electromagnetic field, which can act to bend the incoming signal much as light bends when entering a pool of water.

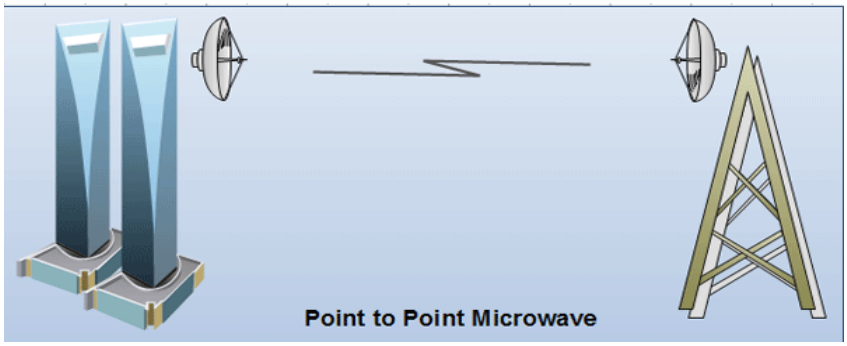
Broadcast The wide footprint of a satellite radio system allows a signal to be broadcast over a wide range Thereby; any number (theoretically an infinite number) of terrestrial antennae can receive the signal, more or less simultaneously. In this manner, satellites can serve a point-to-multipoint network requirement through a single uplink station and multiple downlink stations,



Microwave Transmission:

Microwave radio, a form of radio transmission that use. Ultra-high frequencies developed out of experiments with radar (radio detecting and ranging) during the period preceding World War II. There are several frequency ranges assigned to microwave systems, all of which are in the Giga Hertz (GHz) range and the wavelength in the millimeter range. This very short wavelength gives rise to the term microwave. Such high frequency signals are especially susceptible to attenuation and, therefore must be amplified or repeated after a particular distance.

In order to maximize the strength of such a high frequency signal and, therefore, to increase the distance of transmission at acceptable levels, the radio beams are highly focused. The transmit antenna is centered in a concave, reflective metal dish which serves to focus the radio beam with maximum effect on the receiving antenna, as illustrated in Figure. The receiving antenna, similarly, is centered in a .concave metal dish, which serves to collect the maximum amount of incoming signal.

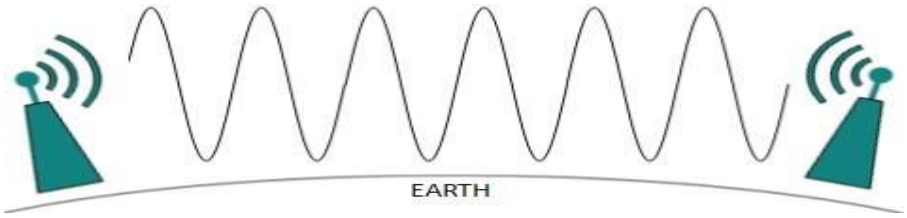


Radio Transmission

Radio frequency is easier to generate and because of its large wavelength it can penetrate through walls and structures alike.Radio waves can have wavelength from 1 mm – 100,000 km and have frequency ranging from 3 Hz (Extremely Low Frequency) to 300 GHz (Extremely High Frequency). Radio frequencies are sub-divided into six bands.

Radio waves at lower frequencies can travel through walls whereas higher RF can travel in straight line and bounce back.The power of low frequency waves decreases sharply as they cover long distance. High frequency radio waves have more power.

Lower frequencies such as VLF, LF, MF bands can travel on the ground up to 1000 kilometers, over the earth's surface.



Radio waves of high frequencies are prone to be absorbed by rain and other obstacles. They use Ionosphere of earth atmosphere. High frequency radio waves such as HF and VHF bands are spread upwards. When they reach Ionosphere, they are refracted back to the earth.

Network Devices:

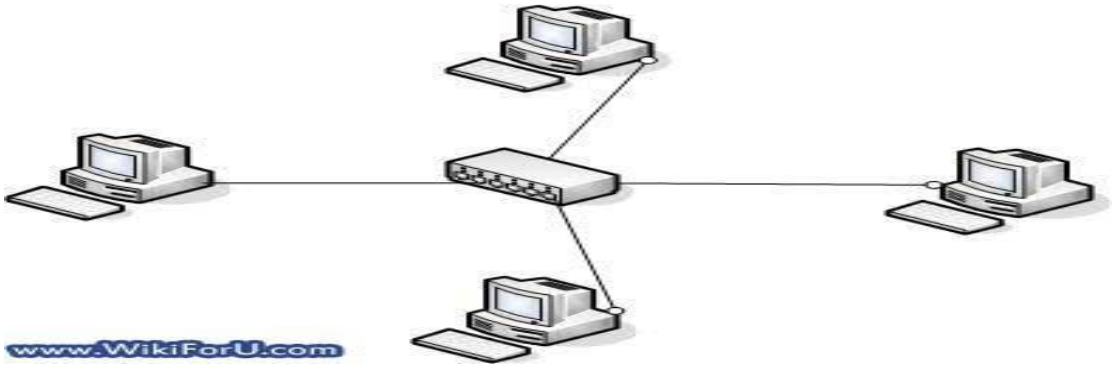
HUB:

Hub is one of the basic icons of networking devices which works at physical layer and hence connect networking devices physically together. Hubs are fundamentally used in networks that use **twisted pair cabling** to connect devices. They are designed to transmit the packets to the other appended devices without altering any of the transmitted packets received. They act as pathways to direct electrical signals to travel along. They transmit the information regardless of the fact if data packet is destined for the device connected or not.

Types of HUB:

Active Hub: They are smarter than the passive hubs. They not only provide the path for the data signals infact they regenerate, concentrate and strengthen the signals before sending them to their destinations. Active hubs are also termed as **'repeaters'**.

Passive Hub: Passive Hub works like a simple Bridge. It is used for just creating a connection between various devices. It does not have the ability to amplify or regenerate any incoming signal. It receives signal and then forward it to multiple devices.
Intelligent Hub: This is the third and last type of HUB. It can perform tasks of both Active and Passive buses. Also, it can perform some other tasks like Bridging and routing. It increases the speed and effectiveness of total network thus makes the performance of whole network fast and efficient.



Routers

Routers are network layer devices and are particularly identified as Layer- 3 devices of the OSI Model. They process *logical* addressing information in the Network header of a packet such as IP Addresses. Router is used to create larger complex networks by complex traffic routing. It has the ability to connect dissimilar LANs on the same protocol. It also has the ability to limit the flow of broadcasts. A router primarily comprises of a hardware device or a system of the computer which has more than one network interface and routing software.

Functionality:

When a router receives the data, it determines the destination address by reading the header of the packet. Once the address is determined, it searches in its **routing table** to get know how to reach the destination and then forwards the packet to the higher hop on the route. The hop could be the final destination or another router.

Routing tables play a very pivotal role in letting the router makes a decision. Thus a routing table is ought to be *updated* and *complete*. The two ways through which a router can receive information are:

- **Static Routing**: In static routing, the routing information is fed into the routing tables manually. It does not only become a time-taking task but gets prone to errors as well. The manual updating is also required in case of statically configured routers when change in the topology of the network or in the layout takes place. Thus static routing is feasible for tinniest environments with minimum of one or two routers.

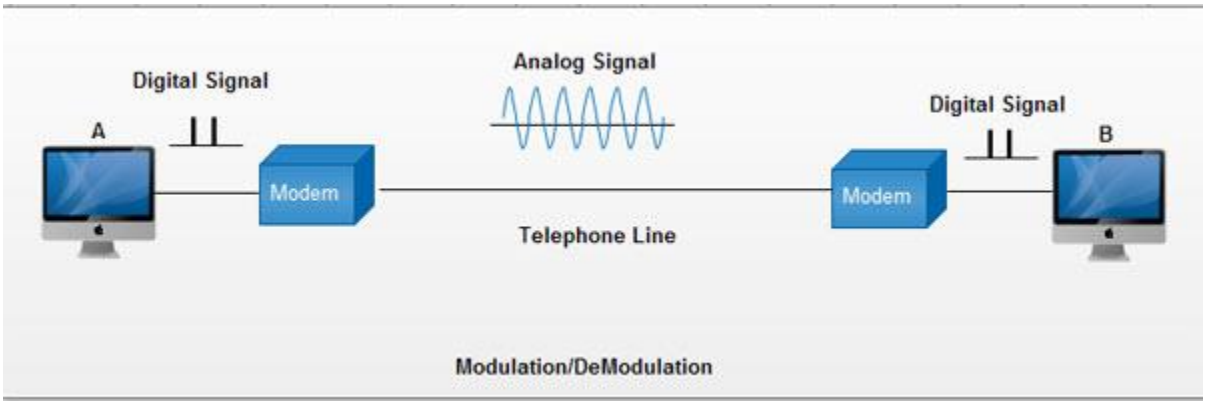
- **Dynamic Routing**: For larger environment dynamic routing proves to be the practical solution. The process involves use of peculiar routing protocols to hold communication. The purpose of these protocols is to enable the other routers to transfer information about to other routers, so that the other routers can build their own routing tables.

Modem:

Modem is abbreviation for Modulator – Demodulator. Modems are used for data transfer from one computer network to another computer network through telephone lines. The computer network works in digital mode, while analog technology is used for carrying massages across phone lines.

Modulator converts information from **digital mode to analog mode** at the transmitting end and demodulator converts the same from **analog to digital at receiving end**. The process of converting analog signals of one computer network into digital signals of another computer network so they can be processed by a receiving computer is **referred to as digitizing.**

When an analog facility is used for data communication between two digital devices called Data Terminal Equipment (DTE), modems are used at each end. DTE can be a terminal or a computer.



The modem at the transmitting end converts the digital signal generated by DTE into an analog signal by modulating a carrier. This modem at the receiving end demodulates the carrier and hand over the demodulated digital signal to the DTE.

Repeater – A repeater operates at the physical layer. Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted so as to extend the length to which the signal can be transmitted over the same network. An important point to be noted about repeaters is that they do no amplify the signal. When the signal becomes weak, they copy the signal bit by bit and regenerate it at the original strength. It is a 2 port device.

Ethernet

Ethernet, pronounced "E-thernet" (with a long "e"), is the standard way to connect computers on a network over a wired connection. It provides a simple interface and for connecting multiple devices, such computers, routers, and switches. With a single router and a few Ethernet cables, you can create a LAN, which allows all connected devices to communicate with each other.

A standard Ethernet cable is slightly thicker than a phone cable and has an RJ45 connector on each end. Ethernet ports look similar to telephone jacks, but are slightly wider. You can plug or unplug devices on an Ethernet network while they are powered on without harming them.

Like USB, Ethernet has multiple standards that all use the same interface. These include:

- 10BASE-T - supports up to 10 Mbps
- 100BASE-T - supports up to 100 Mbps
- 1000BASE-T (also called "Gigabit Ethernet") - supports up to 1,000 Mbps

Token Ring:

Token passing on different topology: token bus (IEEE802.3) and token ring (IEEE802.4)
•Only one device can talk at a time
•The device wait for a free token in order to use the communication channel to talk
•The token circulates among the devices until one of them wants to use the channel
•The device then grabs the token and uses the channel
•The sending device sets the token busy bit, adds an information field, adds the message it would like to send, and adds a trailer packet
•The header packet contains the address of the device for which the message was intended
•The entire message is then sent out on the communication channel
•Every device examines the header and checks the address to see if it is being talked to. If not, it ignores the message
•The intended device copies the message and sets bits in the trailer field to indicate that the message was received, then sends the message back out on the communication channel
•The original device receives the message back and checks that the message was received. It then frees the token and sends it out for other

device to use

Access Methods:

Contention:

CSMA/CD (Carrier Sense Multiple Access/Collision Detection)

In CSMA/CD (Carrier Sense Multiple Access/Collision Detection) Access Method, every host has equal access to the wire and can place data on the wire when the wire is free from traffic. When a host want to place data on the wire, it will "sense" the wire to find whether there is a signal already on the wire. If there is traffic already in the medium, the host will wait and if there is no traffic, it will place the data in the medium. But, if two systems place data on the medium at the same instance, they will collide with each other, destroying the data. If the data is destroyed during transmission, the data will need to be retransmitted. After collision, each host will wait for a small interval of time and again the data will be retransmitted, to avoid collision again.

CSMA/CA (Carrier Sense Multiple Access/Collision Avoidance)

In CSMA/CA, before a host sends real data on the wire it will "sense" the wire to check if the wire is free. If the wire is free, it will send a piece of "dummy" data on the wire to see whether it collides with any other data. If it does not collide, the host will assume that the real data also will not collide.

Token Passing

In CSMA/CD and CSMA/CA the chances of collisions are there. As the number of hosts in the network increases, the chances of collisions also will become more. In token passing, when a host want to transmit data, it should hold the token, which is an empty packet. The token is circling the network in a very high speed. If any workstation wants to send data, it should wait for the token. When the token has reached the workstation, the workstation can take the token from the network, fill it with data, mark the token as being used and place the token back to the network.

Polling:

Polling resembles a well-ordered meeting in which the chairman must recognize an attendee before that person is allowed to speak. The chairman's responsibility is to maintain order in the meeting and ensure that each person who wants to speak has an opportunity to do so.
•It's also called master-slave method

•The master device calls out the slave device's address, the slave responds