

The diagram illustrates the architecture of a mobile satellite system. It shows the flow of data between various components:

- Satellite:** The central hub in the sky, labeled "Satellite".
- Provider:** A ground station on the left, labeled "Provider", which communicates with the satellite.
- Internet:** A cloud in the center, labeled "Internet", representing the global network.
- Satellite dish:** A ground station on the right, labeled "Satellite dish", which also communicates with the satellite.
- GPSS Provider:** A radio tower at the bottom center, labeled "GPSS Provider", which connects to the provider and the mobile phone.
- Mobile GPSS Phone:** A mobile device at the bottom center, labeled "Mobile GPSS Phone", which connects to the GPSS provider and the computer.
- Computer:** A desktop computer on the bottom right, labeled "Computer", which connects to the mobile phone and the satellite dish.

The flow of traffic is indicated by arrows:

- Incoming Traffic:** Arrows labeled "Incoming Traffic" point from the "Satellite" to the "Provider" and from the "Satellite" to the "Satellite dish".
- Outgoing Traffic:** Arrows labeled "Outgoing Traffic" point from the "Provider" to the "GPSS Provider", from the "GPSS Provider" to the "Mobile GPSS Phone", from the "Mobile GPSS Phone" to the "Computer", and from the "Satellite dish" to the "Satellite".

decreasing continuously with compare to traditional means. Using traditional means, time and cost are increased speedily with increase in distance, but there is negligible effect of time and cost, when the communication is made with computers. As well in the data communication the data accuracy remains very good.

## **Transmission Media**

For data communication it is necessary to have a physical medium between sender and receiver. The medium is known as transmission medium or communication channel. These media are of several types. At the time of selecting media, several things are kept in mind e.g. their cost, working efficiency, speed of data communication etc. Transmission media are generally divided into two groups: (1) Wired Media and (2) Wireless Media.

### **Wired Transmission Media**

In these media wire or cable is used for transmission of signals from one computer to another computers. These are also known as Guided Media. On the basis of wire used, these media are of following types.

#### **I. Twisted Pair Cable**

This is oldest and cheapest means used for networking. In twisted pair cable, there are two insulated copper wires, which are twisted each other spirally or as like coil. The aim of twisting is to minimize the electrical interference. In such twisted wires electrical interference goes very low. This happens due to opposite electric interference in these twisted wires. This type of interference is known as Cross Talk. Copper is good conductor of electricity. These copper wires are generally 22 to 24 gauze in thickness.

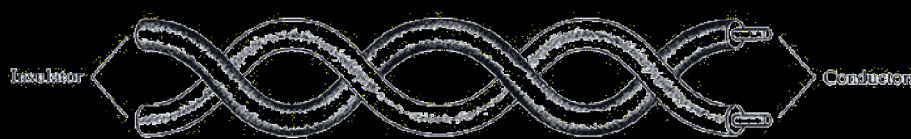


Diagram 3.2 Twisted Pair Cable

Twisted pair cables are of two types:

#### **1. Unshielded Twisted Pair Cable (UTP)**

It is most popular twisted pair cable. In this type of cable the set of twisted pairs are covered by a simple plastic covering. These are most popular in local area network (LAN) cabling. UTP has been generally being used in telephone system cable and in

most offices already. In this type of cable possibility of cross talk is much more.

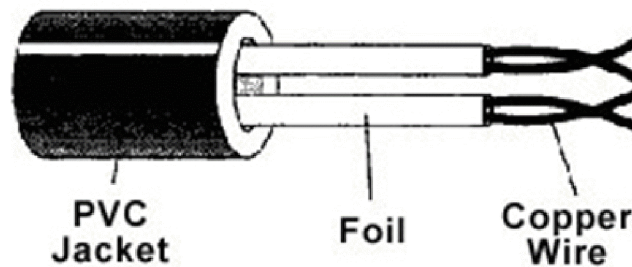


Diagram 3.3 Unshielded Twisted Pair Cable

## 2. Shielded Twisted Pair Cable (STP)

In this type of cable a jacket of high grade twisted copper wire is used, which is safer than UTP covering. STP wires are covered with a foil, which makes an efficient insulation and protects the data from external obstructions. It minimizes the possibility of cross talk. The cost of STP is more in compare to UTP but it is better in speed and quality of data transmission.

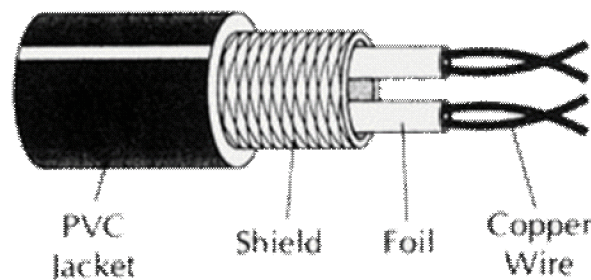


Diagram 3.4 Shielded Twisted Pair Cable

Twisted pair cable is mostly used in small distance (up to one kilometer) communication. This cable is also used in connecting computers in LAN. The data transmission speed of this cable is 1 to 2 MB per second. But with the increase of distance data transmission speed decreases. Therefore, repeaters have to be used in between.

Twisted pair cables are used in both analog and digital transmission. It is comparatively cheap and easy to use.

## II. Coaxial Cable

Its main part is a copper wire which is known as core. It is covered by an

insulating plastic covering. This covering protects wire from external strokes. This covering is mainly made up of plastic substance. This covering is surrounded by a protective shield, which is made up of insulating substance. In this way coaxial cable has two conductors and two insulators. Signals are transmitted through innermost copper wire core.

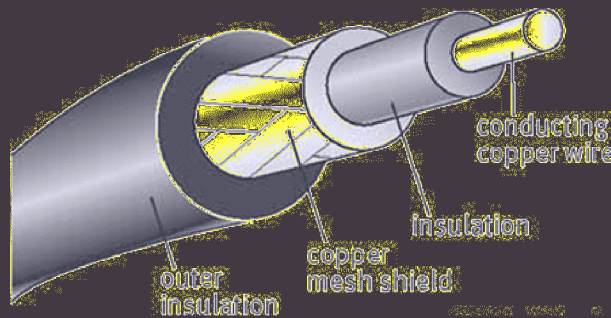


Diagram 3.5 Coaxial Cable

Their cost increases with the increase of diameter. Thin coaxial cables cost less while thick cost more.

Coaxial cables are used in cable TV transmission, long distance telephone communication, connecting the computer devices situated on short distance and local area network. These are also used in high speed broadband network.

#### **Coaxial cables are of two types**

- (I) Thinnet - These are flexible and cheap. Their installation is easy. These are mostly used in networking.
- (II) Thicknet - These are thick and cannot be easily bended. Therefore it is rather difficult to use them

Coaxial cables are used in medium distance communication. Due to presence of external wire mesh, the effect of electrical interference decreases considerably. Their bandwidth are more in compare to twisted pair cable. But these are costly in compare to twisted pair cable.

### **III. Optical Fiber Cable**

This is the latest type of cable in wired cables. In this cable light waves are transmitted in light waves in place of electric signals and this transmission is not in analog form but in digital form. A single optical fiber is thinner than a human hair. Its diameter is 2 to 125 micrometers. Its innermost part which is known as core, made up of glass or

plastic. Core is covered externally with a thin layer, which is also made up of glass. This layer is known as cladding. The refractive index of cladding is less with compare to core.

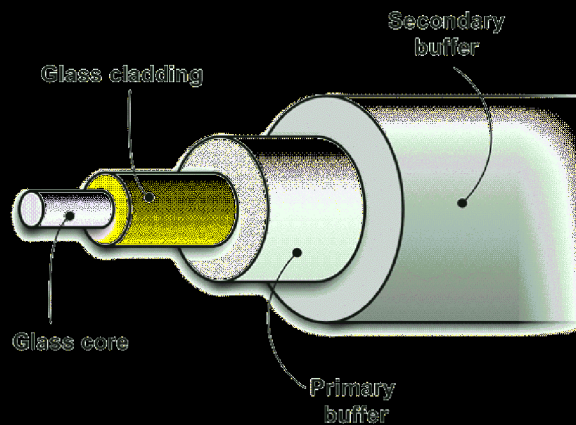


Diagram 3.6 Optic Fiber Cable

When light signals are transmitted two substances having different refraction index, the light rays are reflected in spite of refract. In this way the mechanism of OFC is based on total internal reflection. Due to this total internal reflection the optical signals are only remain in the core of fiber. That's why these do not grow weak with the transmission. Besides cladding, in optical fiber there is found another jacket, surrounding the cladding, which provides the necessary strength to fiber. As the single optic fiber is very fine, so thousands of optical fibers can be fitted into a cable of normal thickness.

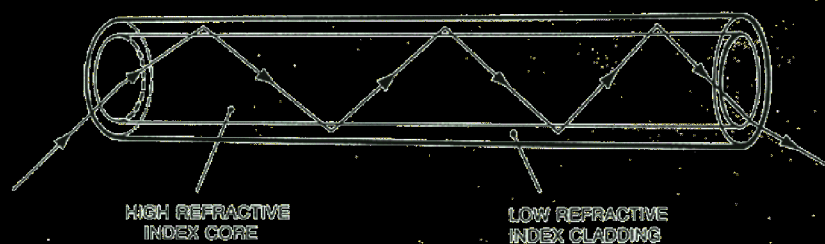


Diagram 3.7 Transmission of Light Signals through OFC

A computer always gives off electric signals, whereas only optical signals can be transmitted through optical fibers. So electric signals have to convert into optic signals with the help of a converter, before transmission.

OFC is most reliable and safe means of data communication, because data

cannot be stolen from this. OFC is most appropriate for long distance and speedy data transmission. Its data transmission rate is 100 MB to 2 GB per second. OFCs are light in weight with compare to copper cables and occupy less space. The data transmission error rate is also negligible. But the technology used in OFC is comparatively complicated and expensive, so OFC is the most costly means of data communication in wired media.

## Wireless Transmission Media

In these media such electromagnetic waves are used, which does not require any media for their transmission, for transmission of signals from one computer to another computer, in spite of using wire or cable. These are also known as Unguided Media. On the basis of type of electromagnetic waves and devices used, the main wireless media are as follows:

### 1. Radio Waves

Radio waves can be generated easily and can travel up to long distance. These are easily passed through large buildings or other obstacles. Therefore these waves are mostly used in data transmission. Radio waves from transmitter can be transmitted in the directions, so there is no necessity of sender and receiver being in a line of sight. Radio communication was used in transmission of telegraph signals for long time. This communication was held on slow transmission speed and on low frequencies, but now a days speedy data communication has become possible by using VHF (Very High Frequency), UHF (Ultra High Frequency) and SHF (Super High Frequency) in radio transmission.

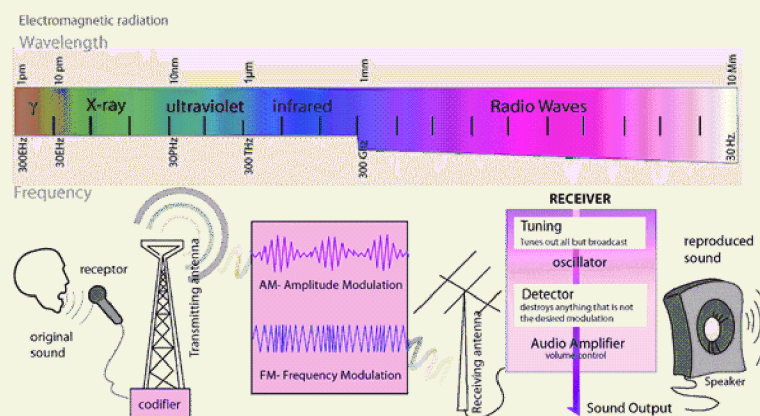


Diagram 3.8 Radio Wave Communication

### 2. Microwave Transmission

Microwave transmission takes place through high frequency radio waves. The problems of installing cables can be avoided by using this medium. On the places where cabling is difficult, this medium is most useful.

Microwaves can be transmitted in a straight line. These cannot pass through any large building, hill or any other physical obstacle. So it is necessary for the transmitter and receiver to be in line of sight. To achieve this transmitter antenna and receiver antenna are placed on much height and in a straight direction. The tall towers installed on high places are actually microwave towers. But with the increase of distance the roundness of earth becomes obstacle. In line of sight. Therefore transmission is interrupted. This problem is resolved by installing repeaters between sender and receiver. Normally these repeaters are installed on every 25 to 30 kilometers distance. All these repeaters should also be in straight line.

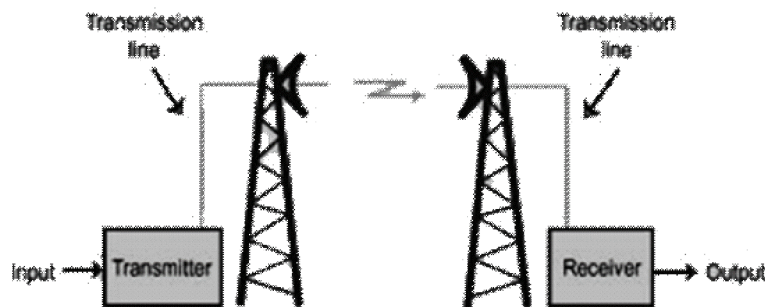


Diagram 3.9 Microwave Communication

Microwave signals also get weaker with the increase of distance. Repeaters also amplify these signals. Microwave transmission is relatively a cheap means of transmission. But it is based on weather. The quality of transmission is decreased in bad weather. Microwave transmission is mostly used in long distance telephone communication, cellular phone communication and in television transmission.

### 3. Satellite Communication

In this transmission also microwave signals are used but their frequencies are higher than microwave signals used on earth for transmission. Communication satellites are generally established in a geostationary orbit above equator over 36000 kilometer height. The speed of satellite moving around in geostationary orbit is synchronized with the speed of rotation of earth on its axis. Therefore the satellite remains on a constant point in relation to the earth.

Communication satellite can be considered as a microwave relay station. As the



satellite is established on more height so there is no problem of line of sight. Three satellites established on equal distance above equator can transmit the signals on whole of the earth. These signals can be received everywhere on the earth.

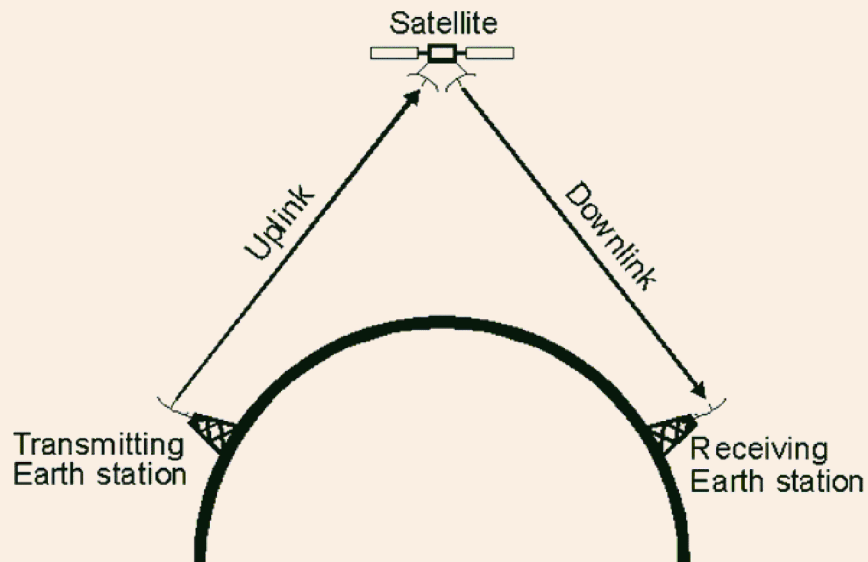


Diagram 3.10 Satellite Communication

In satellite communication the signals of 6 Giga Hertz frequency are sent to satellite from earth. These signals become weaker as they travel a long distance (36000 kilometer). So these signals are made powerful and then retransmitted to earth by transponders mounted on the satellite. As many receiver can receive these signals on earth. Different frequencies are used for sending and receiving the signals to satellite to prevent interference of each other.

The satellite communication is used in long distance telephony, transmission of TV program, international communication etc.

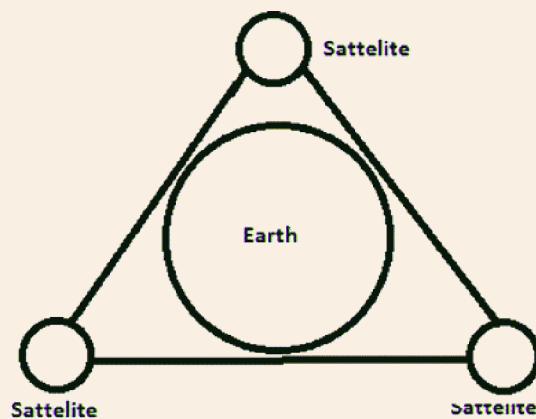




Diagram 3.11 Three satellites can transmit the signals on whole of the earth

The satellite communication is the best means of communication in remote and isolated areas, but to establish it in the orbit is too much expensive.

#### 4. Infrared Transmission

In this transmission infrared rays are used for data communication. This is a cheap, safe and easily usable means of communication. For infrared communication there should not be any obstacle between sender and receiver. Infrared signals work on very high frequency therefore the speed of data transmission is very fast.

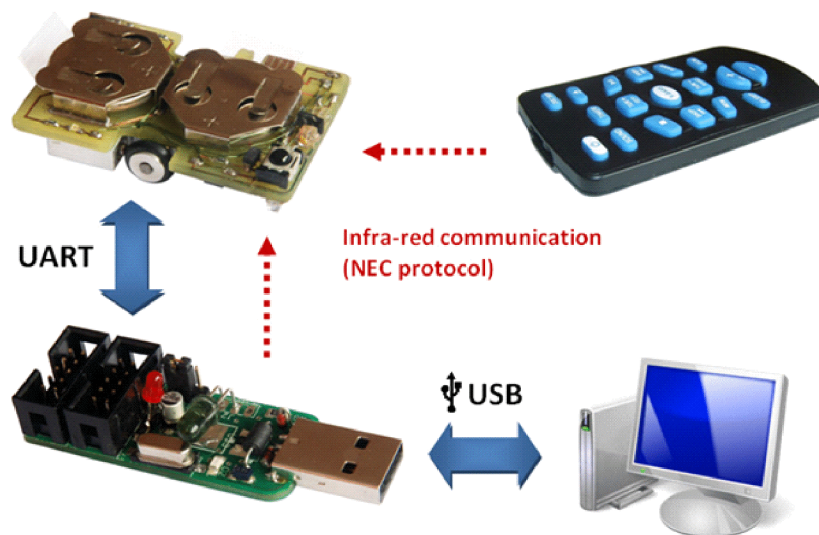


Diagram 3.12 Infrared Communication

Infrared rays are used in TV and music system remote for communication. It can be used for establishing LAN within a house. Computers placed in a room can also be connected through infrared media.

#### 5. Wi-Fi (Wireless Fidelity)

Wi-Fi is the popular technique of today for connecting computers without wire to the network. Actually it is a wireless network. It is also known as WLAN (Wireless Local Area Network) which is based on IEEE (Institute of Electricals and Electronics Engineers). Wi-Fi is the trade mark of the Alliance Company.

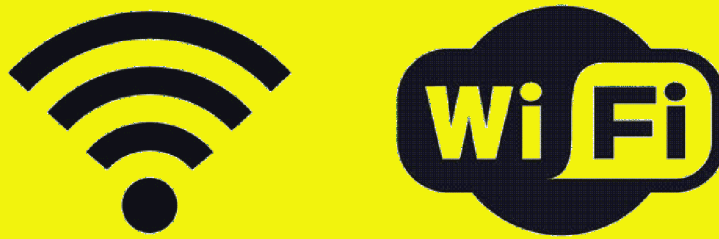


Diagram 3.13 Symbols of Wi-Fi

Now a days Wi-Fi device is installed in most of PCs, Laptops, Palmtops, Video games, Console, Smart Phones, Printers etc. Wi-Fi enabled devices can connect with internet when it comes in the range of internet connected wireless network. Wi-Fi coverage area can be limited to few rooms to a city.



Diagram 3.14 Wi-Fi Communication

Wi-Fi uses radio waves (like cell phone, TV and radio) for communicating information. When any person wants to communicate data with this device, the data is first converted into radio signals then it is broadcasted with use of antenna. Wireless router receives signals and decodes them. Router sends information to internet using wired Ethernet connection. This action happens vice-versa too, when router receives information from internet and converts it into radio signals and sends these signals to wireless adaptor.

These radio waves used for Wi-Fi communication are same as used for cell phones and radios. But only the difference is of their frequencies are 2.4 Giga Hertz to 5 Giga Hertz, which is much higher than cell phones frequencies. Wi-Fi waves also have capacity of carrying more data. 802.11 network standards are used in Wi-Fi communication.

Wi-Fi facility is available in most of the educational institutes, offices, airports, hotels etc. These places are known as Wi-Fi hotspots. On these places any person can connect with whole of the world with the help of Wi-Fi enabled phone or laptop.

## 6. Bluetooth

Bluetooth is such a wireless technique by help of which various electronic apparatus can connect each other and can exchange data. Radio waves are too used for connecting them. Bluetooth was basically designed for minimize the number of cables connecting the apparatus to computer.

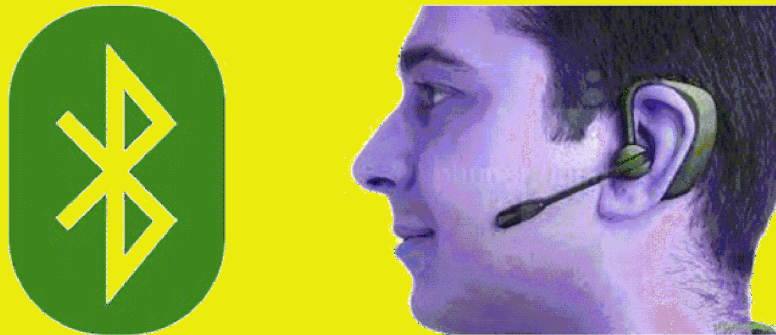


Diagram 3.15 Bluetooth

Generally the Bluetooth application is used for connecting headset to remote mobile phone or connecting mouse, keyboard or printers to a computer. Bluetooth provides an easy way to connecting electronic devices like PDA (Personal Digital assistant), mobile phone, tablet, laptop, PC, printer digital camera, video game console etc. and exchanging data in these devices.

### Forms of Data Transmission

Generally electric signals are used for data communication. These signals are of two types: 1. Analog and 2. Digital.

1. Analog - These signals are continuously changing in relation to time. The value of an analog signal is anything in a given range. A telephone system is an example of analog data communication.
2. Digital - These signals are non-continuous or discrete. A digital signal can receive only few values in a given range. These signals are transmitted in "on" and "Off" form.

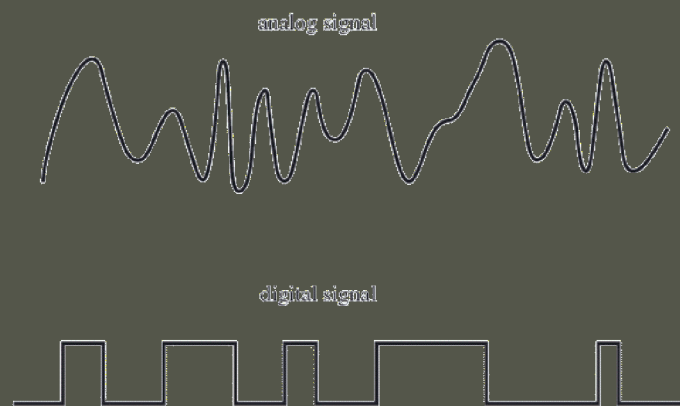


Diagram 3.16 Analog and Digital Communication

Computer uses digital data. Digital signals are also used for computer data communication. But the mostly used medium (Telephone Line) for data communication between two computers can only transmit analog signals.

Therefore the digital signals of a computer first have to change into analog signals before data communication. This process is known as modulation. In the same way the analog signals transmitting in a telephone line cannot be sent directly to the computer. Before sending to computer analog signals have to convert into digital signals. This process is known as demodulation.

## Computer Network

When several independent computers are connected with each other for data communication, this arrangement is known as computer network. In other words it can be said that a computer network is interconnected collection of several independent computers. In a computer network other devices like printers, plotters etc. can also be connected besides computers. The communication media, which connects computers and other devices in a computer network is known as link.

## Purposes of Computer Network

### 1. Resource Sharing

The main object of the network is to share and work together on all the devices within it like computer, apparatus, data and program. If any data is not available on one computer, but it is available on another computer connected to network, it can be accessed from there. On need of a high capacity computer for data processing, any remote computer connected with network can be used. If a user wants to print a drawing, but he has no plotter, he can use any plotter connected with network. All the users

connected with network can use a same printer for printing. In this way network plays an important role in maximum utilization of limited and costly devices.



Diagram 3.17 Computer Network

## **2. As a Communication Media**

Users can communicate each other very easily and speedily with the computers connected with network. Users can exchange all types of data and information with network.

## **3. Reliability and Availability**

If any hardware or software become faulty (out of order) or not available for some time, other devices connected with network can be used. Important data can be stored on more than one computers so that in case of disconnecting of one computer from network or corrupting the data, data can be accessed from another computers.

## **4. Cost Reduction**

No any user can able to purchase all the expensive computer devices. But by the help of network he can use all the devices (hardware, software), which is not available with him, whenever he needs them.

## **Applications of Network**

### **1. Accessing remote databases**

Any user can access data on his computer available on other computers of the network. With worldwide web information system any information regarding any subjects like arts, science, health, history, sports etc. can be accessed as well as information regarding rail, roadways, air service and their reservation can be accessed easily.

### **2. Fax**

Fax can be sent to any computer connected with the network and can be received as well. For this fax modem and fax software must be available with both the sender and receiver computers.

### **3. Electronic Mail or E-mail**

Currently email is used widely. Messages can be sent very speedily through this, as well various documents, audio and video files can also be sent as attachment.

### **4. Video Conferencing**

Now a days Skype, Google, WhatsApp etc. several messengers are available, which provide video conferencing facility to computers connected with network. Video conferencing has made it very easy to contact with people living on distant places with audio and video chatting.

### **5. Online Services**

Today several online services are available on computers connected with network as like online trading, online shopping, online banking, online education, online playing etc. Online services are expanding continuously.

## **Categories of Computer Network**

Computer network is categorized into three categories on the basis of their distance of expansion.

### **1. Local Area Network**

This network is extended in a limited geographical area, which normally can be of few kilometers. This is used for exchange of information and resources of computers of any big office, institute or factories. This network is generally known as LAN.



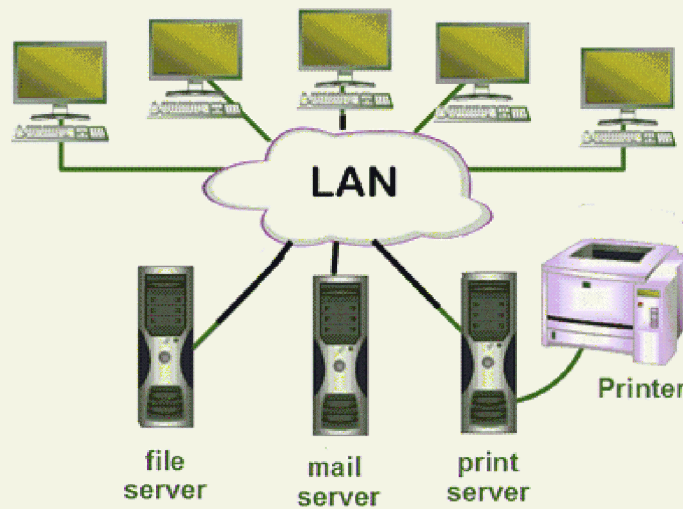


Diagram 3.18 Local Area Network

LAN generally spreads out in a small area like any large building or in campus. There is a master computer in a LAN, which is known as server and remaining are dumb computers, which are known as terminals. Server controls over all the terminals. All the computers in LAN are connected through twisted pair cable or coaxial cable. Generally not more than 100 computers are connected in a LAN.

LAN are small so it is easy to handle and maintain them. Sometimes they can be defected due to short circuits and other unwanted signals. All the terminals are connected in LAN with a single cable.

In LAN the speed of data transmission is high (10 to 100 Megabyte per second), which is the main characteristic of LAN. LAN is most flexible network, more computers can be added or removed from LAN without disturbing whole network. Due to limited area of LAN, various topologies are used in this network. In LAN persons can work independently as well the can watch others work and can edit or change them.

## 2. Metropolitan Area Network (MAN)

This network is expanded relatively into a large area. Its geographical range is generally a city or town. MAN, actually a large form of LAN, because it uses the technique of LAN to. But its installation is more difficult in comparison to LAN. This connects branches of different organization or institutes located in different regions of a city.



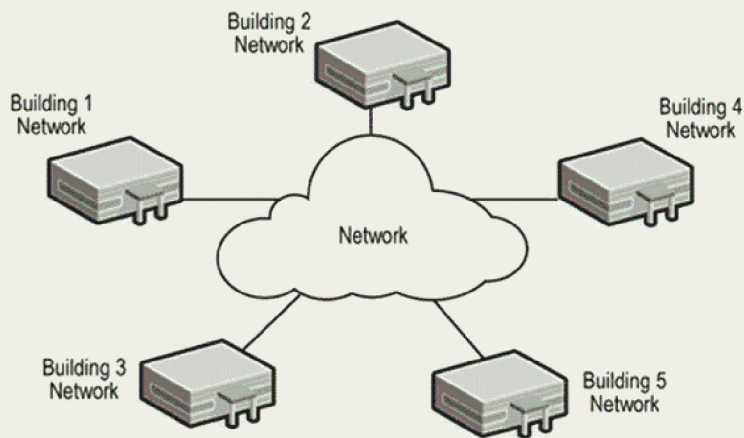


Diagram 3.19 Metropolitan Area Network

The main objective of MAN is to use software and hardware resources by sharing. In MAN whole the network is controlled by a centralized machine. Data and voice both can be transmitted through MAN.

### 3. Wide Area Network (WAN)

WAN's geographical range is much vast. It can be expanded in whole country, peninsula or in whole world. In WAN all the computers of countries or peninsula are connected with each other. These computers can exchange data and can make centrally controlled transmission. WAN is a highly odd type of network. In this network some of the parts can be connected through cable or some can be connected through telephone lines, optical fibers, microwaves or through satellites.

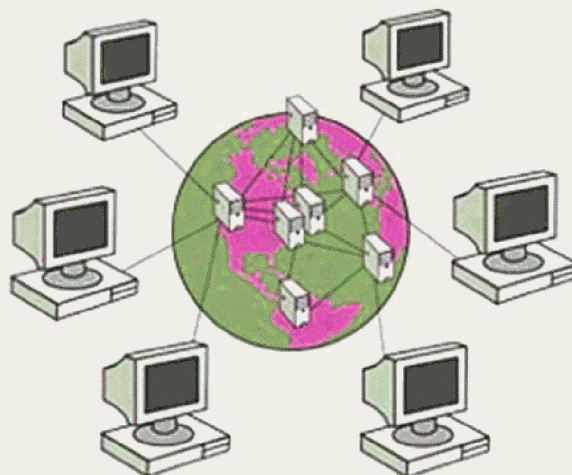


Diagram 3.20 Wide Area Network

Connecting the WAN network is a complicated task. It has more possibility of short circuits, faults arising due to breaking of wires or cables and any other circuit faults. Its data transmission speed is relatively slow in comparison to other network. Internet is the most appropriate example of WAN.

## Network Topology

The method by which nodes of a network are connected each other is known as topology. It is determined by topology that which paths are available for data communication. The cost and complexity of establishing a network is mostly depended upon topology. Therefore at the time of deciding the topology it is essential to keep in mind its complexity, cost, expansion in the future etc. Some important topologies are follow.

### 1. Linear or Bus Topology

In this topology all the computers are connected with single cable. Generally coaxial cables are used for connecting computers. Both the ends of cable have terminators. Every computer or device is connected with network through a network interface card (NIC). Each NIC has a unique address.

Linear topology is the simplest topology. In this topology it is not essential to each computers to be in running state. If any computer gets fault, remaining network continue to work. Its expansion is also easy. New node (computer or any other device) can be connected everywhere in the bus.

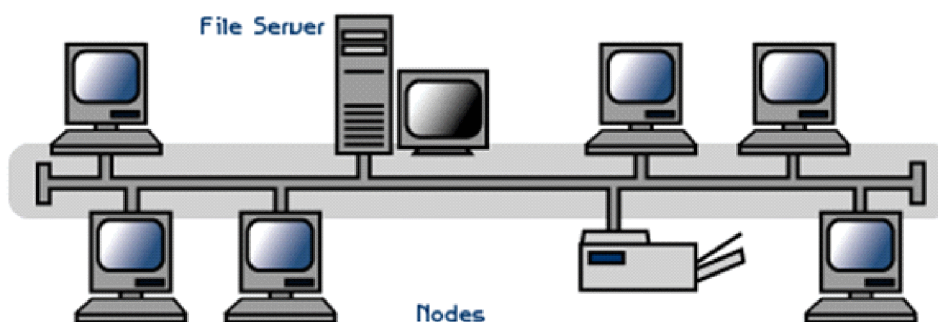


Diagram 3.21 Linear or Bus Topology

But the control of the network in this topology is not centralized. So it is hard to find out any fault which occurs somewhere. Repeaters have to be used in case of lengthy bus. Whole the network can stop working if any fault arise in cable.

## 2. Circular or Ring topology

In this topology all the nodes are connected in a ring. Twisted pair cable, coaxial cable or optical fiber cables are used to connect these nodes each other. Each node is connected with its two adjacent nodes and receives data from one node and transmits data to another node. Every node amplify the data signals before transmitting them to next node.

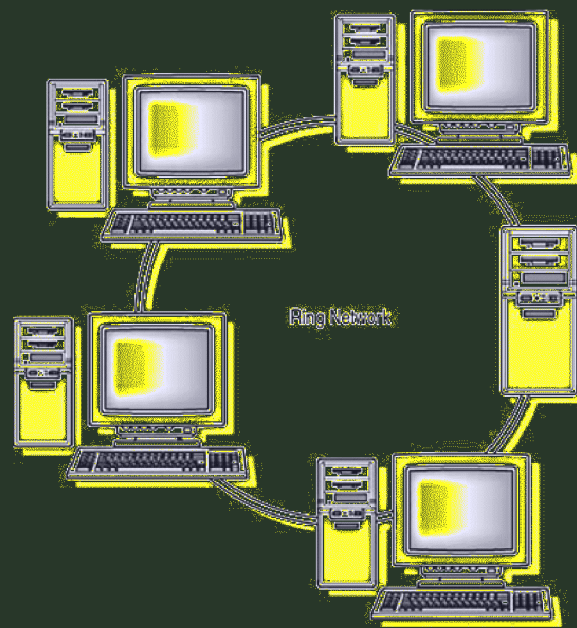


Diagram 3.22 Ring Topology

In ring topology there is no any main controller computer, so it is more suitable for peer to peer network. This is also a reliable topology, because data communication is not depended on a single computer in this topology. It has also no need of repeaters. But in this topology, if one computer stops working properly, whole of the network can be failed. All the network becomes interrupted at the time of removal or insertion of a computer.

## 3. Star Topology

In this topology all the nodes are connected with a central computer, which is known as hub or host. In this topology no any two nodes are connected directly. Communication between nodes takes place through central computer. This controls over all the communication between all the nodes.

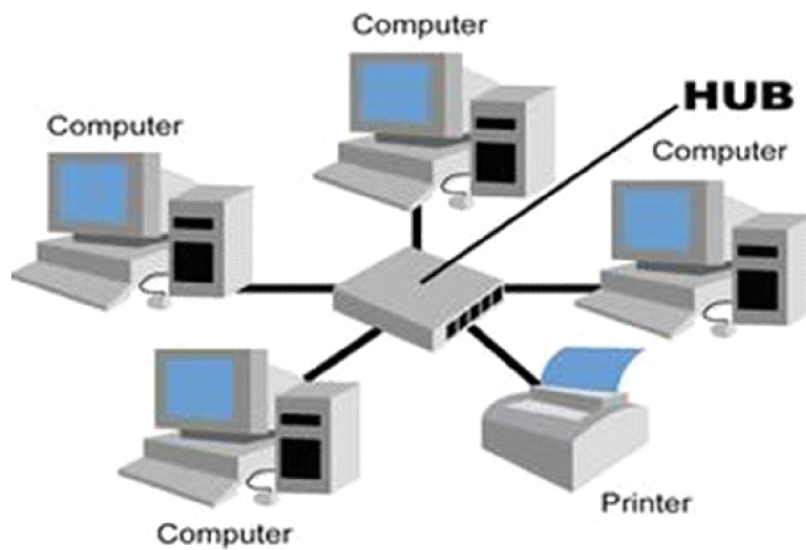


Diagram 3.23 Star Topology

The network management in this topology is relatively easy. If a node becomes defective, remaining network does not affected. But due to depending the control of whole network on the central computer, all the network stops working on the failure of it. More cable is also required in this network.

#### 4. Tree Topology

In this topology nodes are connected in hierarchical way. The top most node in the hierarchy system is known as Root Node. Root node has sub nodes which are connected with root node in hierarchical way. Sub nodes can have several levels e.g. primary, secondary, tertiary etc.

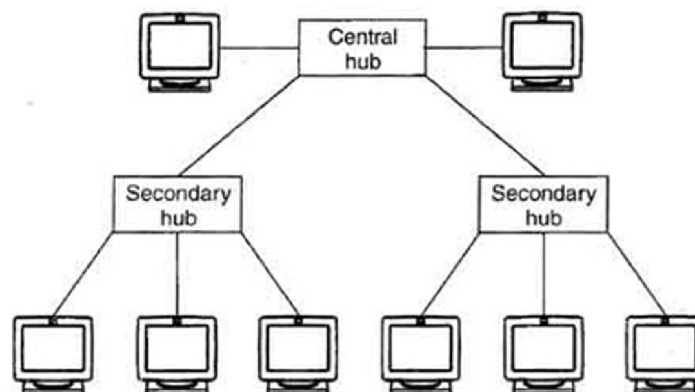


Diagram 3.24 Tree Topology

Tree topology is really a slight modified form of bus topology. The data communication in this topology takes place just like bus topology. The tree topology is more suitable for those applications in which data flows take place in several levels

## 5. Graph or Mesh Topology

In this topology no any special structure is used for connecting the nodes with each other. A node can be connected with any node or can also be more than one node. It is not necessary to connect all the nodes with each other in this topology.

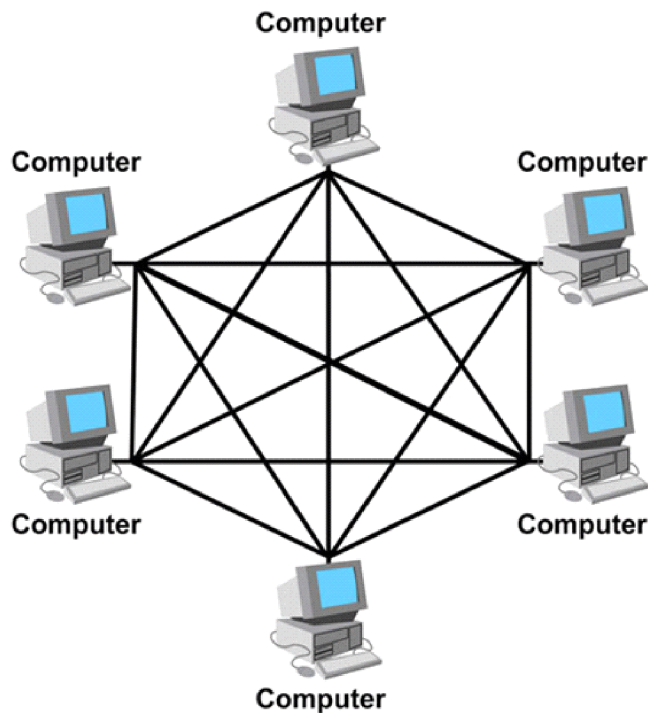


Diagram 3.25 Mesh Topology

### Network Devices

Network devices are those apparatus or units which are used for exchange of data in the computer network. These are also known as Network Equipment. Details of some network devices is given below.



Diagram 3.26 Various Types of Modem

## 1. Modem

The main objective of a modem is to generate such a signals which can be sent from one computer to another computer with ease and less expenses. Generally we use analog phone modem, by the help of which, a computer is connected with phone line. On telephone lines, only analog signals can be sent, whereas computer understand only digital signals and produce digital signals also. So modem is required for coordination between these two, which converts analog signals into digital and digital signals into analog signals. The conversion of digital signals into analog signals is called Modulation and the conversion of analog signals into digital signals is called Demodulation. The word modem has created by adding mo and dem. Here mo has taken from modulation and dem has taken from demodulation.

## 2. Repeater

In all the transmission media signals become weak after covering some distance. Therefore signals can transmit up to a certain distance in each transmission media. So it is essential to amplify the weak signals, when there is much distance between two computers. The device, which amplify the signals is known as repeater. Generally repeaters are of two types - amplifiers and signal generation devices.

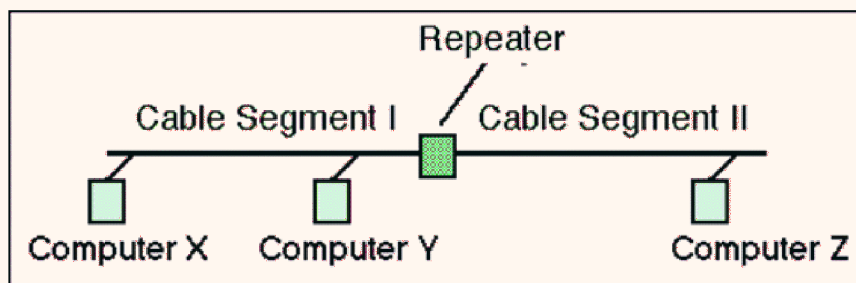


Diagram 3.27 Repeater



**Amplifier** - These only amplify the signals. These amplify undesired signals (Noise) too, along with main signals.

**Signal Generation Device** - These repeaters have the capacity of segregate undesired signals (Noise) from the main signals. These repeaters regenerate the signals after segregation the noise from signals, amplify them and then re transmit them. Complex technology is used in these repeaters. These are relatively expensive too.

### 3. Bridge

Bridge is such a device which connects the networks using different transmission media. When the number of nodes increases in a LAN, the effective speed of data transmission decreases, so its working capacity is affected adversely. Connecting the different LAN with each other is the solution of this problem. By this more nodes could be connected and there would expansion of geographical range of network too. Bridge is the most appropriate device for this purpose. Bridge is a cheap and fast device based on easy technology. The effective size of network increases with use of bridge. As like repeaters bridge sends signals from one part to another part and regenerates the signals.

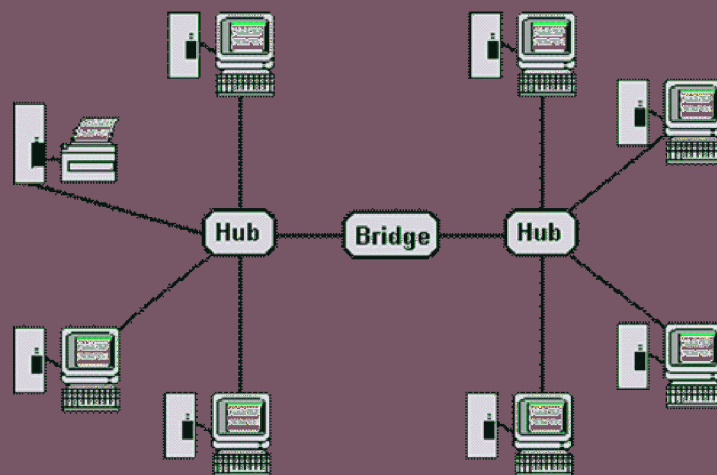


Diagram 3.28 Bridge

### 4. Router

Router also connects the different network like bridge, but it works more efficiently in compare to bridge. Bridge only gives the way (path) to the signals, whereas router forwards them after their rectification. Router receives data from all the networks connected with it and forwards them according to their destination addresses.





Diagram 3.29 Router

## 5. Gateway

This is also a device like bridge and router to connect different networks with each other. Its technique is more complex than router. Through this device two entirely different networks can be connected with. This is not possible by the bridge and router. Besides forwarding the data gateway makes necessary transformation in the data before sending it from one network to another network. The transmission protocols used in two entirely different networks are different too. The transformation of these protocols is carried by gateway. Besides this if two networks have different addressing scheme, gateway also works for address transformation.

In this way gateway is more refined device in compare to router, which provides various additional facilities. But it is relatively costly and its installation, maintenance and operation are also more complicated.

## 6. Host

There are so many computers are in wide area network, whose objective is to execute the programs of users. These computers are called hosts. Hosts are connected with each other through a communication subnet.

A computer can be called a host only, if it provides such a services which can be utilized by other computers or apparatus connected with the network. Generally users communicate with host through application software like e-mail messenger, file transfer protocol (FTP) etc.

## 7. RJ - 45 Connector

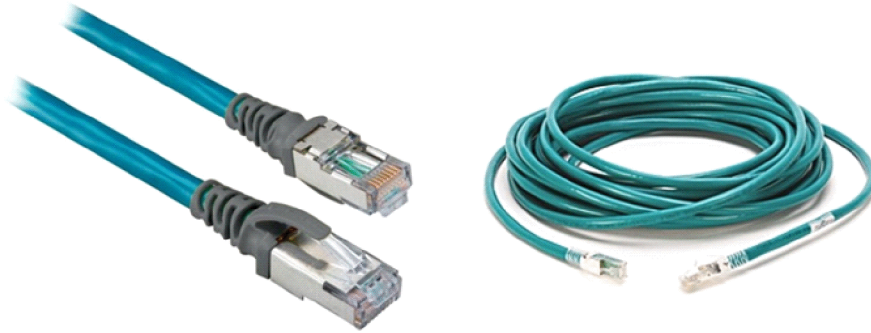


Diagram 3.30 RJ - 45 Connector

RJ - 45 (Registered Jack - 45) connector is a physical connecting device, which is like cable in appearance. It is used for connecting various tele-communication and data apparatus with each other at local or remote places. This is single line connector, which has 8 pins. RJ - 45 connector is generally used in networking cabling and in telephone applications.

## 8. Ethernet Card

It is also called Network Interface Card (NIC). Actually it is a LAN adaptor. It is fixed in the slot of mother board for connecting a computer with LAN. Computer is connected with LAN by connecting this card through cable.

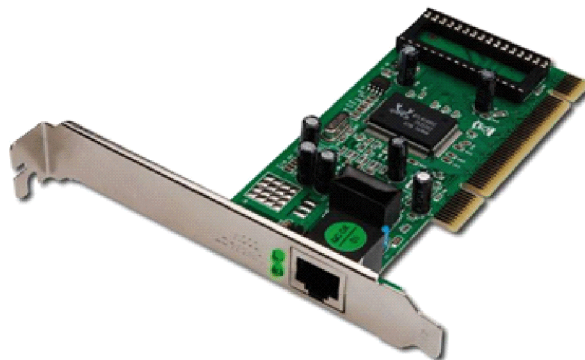


Diagram 3.31 Ethernet Card

Network Interface Card makes a physical connection between computer and network. This also amplifies the data signals.

## 9. Node

Any device or apparatus connected with LAN like computer, printer, plotter, modem etc. is known as node. Every node has a unique address. A node can make communication with any node within the LAN.

## 10. Hub

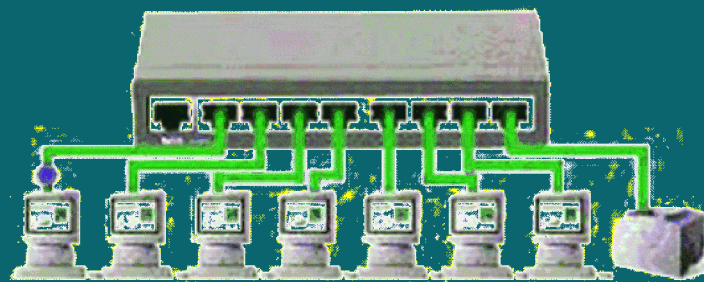


Diagram 3.32 Hub

This is an important component of LAN, which works as a central point in LAN. All the nodes of the LAN are connected with hub through cable. All the data signals in communication taking place between any two parts of the LAN, pass through hub. Hub generally are of following types.

- (I) Dumb Hub - This hub only sends the signals from one node to another node.
- (II) Smart Hub - This works as network management along with transmission of signals.
- (III) Intelligent Hub - It has the capability of managing all kinds of network as well as can connect more than one LAN and provides the facility of more than one topology.

## 11. Backbone

It is a high band width link, by which several nodes and hubs can be connected. So much data can pass through this. A campus wide network can be established by connecting different LANs of a big institute or a large building through backbone. All the data transport between two networks passes through backbone.

## 12. Switch

Like hub, switch is such a device which connects the different nodes (computers and other devices) with each other, but its working mechanism is different from simple hub. Where in a hub data or information received from a source is sent to all the devices connected with it, in switch the data or information received from a source is only sent to destination computer or destination device according to their destination addresses.

### Important Points

1. Full utilization of a computer is only when, it is connected with other computers.
2. The exchange of information and data from one computer to another computer is known as Data Communication.
3. It takes too much time in exchange of information using traditional means of communication, and their cost are also increasing continuously. When the communication takes place with lighting speed with the help of computers and it costs less too.
4. For data communication it is necessary to have a physical medium between sender and receiver. The medium is known as transmission medium or communication channel
5. Transmission media are generally divided into two groups: (1) Wired Media and (2) Wireless Media.
6. Twisted pair cable, coaxial cable and optical fiber cable are the main wired media.
7. Radio waves, Microwaves, satellite communication, infrared rays, Wi-Fi, Bluetooth are main wireless media.
8. Generally electrical signals are used for data communication. These signals are of two types: 1. Analog and 2. Digital.
9. When several independent computers are connected with each other for data communication, this arrangement is known as computer network.

10. The main object of the network is to share and work together on all the devices within it like computer, apparatus, data and program.
11. There are three main categories of computer network: LAN, MAN and WAN.
12. The main object of the network is to share and work together on all the devices within it like computer, apparatus, data and program

### **Exercerie**

#### **Multiple choice questions**

1. Oldest and Maximum usable transmission media is -  
 (a) Coaxial Cable                      (b) Optical Fiber Cable  
 (c) Twisted Pair                      (d) Name of these
2. WAN Means -  
 (a) Wire And Network              (b) Wire Accessible Network  
 (c) Widely Accessible Network (d) Wide Area Network
3. Which transmission medium is the fastest from the following?  
 (a) Twisted Pair                      (b) Coaxial Cable  
 (c) Optical Fiber Cable              (d) Cellular Phone
4. Which of the following medium is not made with metal wire?  
 (a) Twisted Pair                      (b) Coaxial Cable  
 (c) Optical Fiber Cable              (d) None of these
5. The surface of glass on the core of optical fiber cable is known as -  
 (a) YOKE      (b) Clade      (c) Cap                      (d) Pipe
6. In which transmission the wave goes into all directions.  
 (a) Radio Link Transmission      (b) Microwave Transmission  
 (c) Infrared Transmission              (d) Satellite Transmission
7. How many minimum transmission satellite can transmit signals on whole earth?  
 (a) Two                      (B) Three              (c) Four                      (d) Five
8. Which medium is used to connect wireless mouse, keyboard to computer./  
 (a) Bluetooth                      (b) Infrared

- (c) Microwave                      (d) Radio Link Waves
9. What is the name of network spreader in the small region?  
(a) LAN            (b) MAN            (c) WAN            (d) None of these
10. Which of the following is a transmission media?  
(a) Modem            (b) Hub                      (c) Bridge            (d) None of these

### **Very Short type of Questions**

1. Which is the Oldest and Maximum usable transmission media?
2. What is the full name of WAN?
3. Give the name of fastest transmission medium?
4. The stick layer on the core of the optical fiber cable is called?
5. Write one main work of Repeater.
6. Transmission satellite is placed at what height?
7. Write the full name of Wi-Fi?
8. The device which converts Analog to Digital and Digital to Analog signal is known as?
9. Write the name of Network which is used to cover a big town.
10. In which topology the nodes are connected in hierarchical order?

### **Short Type Question**

1. Write the names of different wi-fi transmission medium.
2. What is cross talk?
3. Where co-axial cable is used?
4. Write the uses of Bluetooth.
5. Why we placed a microwave tower on maximum height?
6. Write the difference between Analog and Digital transmission.
7. Write two characteristics of LAN.
8. Write the characteristics of Nodes in Star topology.
9. Write work and characteristics of Router.
10. What is the difference between switch and hub?

**Essay type questions**

1. Explain the structure and working principal of cable.
2. What is satellite transmission? Write the uses and characteristics of it.
3. Write the objectives and uses of computer network.
4. What is network topology? Write the name and characteristics of different topology.
5. Write short not on following
  1. Modem
  2. WAN
  3. Gateway
  4. Bridge
  5. Wi-fi