

Digital Network Essentials

2.1 Internet Fundamentals :

The internet is a network of computer networks that makes it possible for any computer connected to it to send and receive data from any other computer connected to it. Internet is a network of networks scattered all over the world.

Internet is an inter-connection of a large number of heterogeneous computer networks all over the world that can share information back and forth. These inter-connected networks exchange information by using the same standards and protocols.

Internet can be defined as global connection of computers that are linked by various communication media like cables, optical fibers, telephone lines etc. to make communication possible.

Nobody owns the internet. It is open for everyone who can access it, so there is no centralised control. We must know the address of destination and appropriate hardware and software to make communication possible. The openness of the internet is making it popular day by day. Any user can avail the resources available on the internet. Beside this, there are number of features which are making internet popular :

- It is available easily and everywhere.
- It acts as a large storehouse of information with a number of search engines available. Any user can log in and search any topic of his/ her choice.
- It can be used for shopping the product on-line. In addition, it is useful for business, personal matter etc.
- It is cheaper. The relative cost of the communication with people through email or searching some information on internet is very cheap.

2.1.1 History of Internet :

The internet has its roots in the ARPANET system of the Advanced Research Project Agency of the US Department of Defence. ARPANET was the first WAN and had only four sites in 1969. The internet evolved from the basic idea of ARPANET for interconnecting computers and was initially used by research organizations and universities to share and exchange information. In 1989 US government lifted restriction

on the use of internet and allowed it to be used for commercial purpose as well. It now interconnects more than 50 million users in more than 150 countries around the world.

2.1.2 Use of internet :

Internet is treated as one of the biggest invention. It has large number of practical uses. Some of them are :

- i) Sending messages to and receiving message from other internet user through electronic mail.
- ii) Finding books and other resources stored in libraries all over the world.
- iii) User can get information regarding availability of jobs in various sectors using various sites like monster.com, nauk.com. etc.
- iv) Internet provides knowledge and information in the field of health and medication. People can order medicine using website like netmeds.com.
- v) Using internet we can book hotels, trains, air ticket from the sites like makemytrip.com, cleartrip.com, etc.
- vi) Internet is used in shopping these days. We can buy and sell anything over the sites like amazon.com, flipkart.com, etc.

2.1.3 Disadvantages of Internet :

- The computer virus get downloaded and spread over the network easily.
- The cyber fraud may take place over the internet.
- Privacy is the biggest issue over the internet.
- Messages sent across the internet can easily be tracked and intercepted by the hackers.

2.2 Working of Internet :

In order, for internet to work in connecting many different types of computers, softwares, files and standardized rules called Protocol must be used, that define how computers communicate. Two protocols used for the communication are Internet Protocol (IP) and Transmission Control Protocol (TCP). When a message is sent from one computer to another the TCP first divides the message into small manageable units called Packets. Each Packet contains data itself, the address of sender and receiver along with sequencing information to make sure that data reassemble correctly when it arrives at the

destination.

The IP protocol appends the IP address of source and destination computer to each packet. Then it transport data stored in packets along different routes using router. Sometimes packets arrive out of order at destination. Here TCP puts the packet back in order and then re assemble them into the original message.

The entire set of communication Protocols is known as the TCP/ IP protocol suite.

In addition to TCP and IP, some common protocols that form the part of TCP/ IP protocol suite are :

- HTTP- Hyper Text Transfer Protocol- used for accessing world wide web.
- FTP- File transfer Protocol- used for transferring files from one computer to another
- SMTP- Simple Mail Transfer Protocol- used for transferring email messages.
- Telnet- Protocols used to login remote computer.

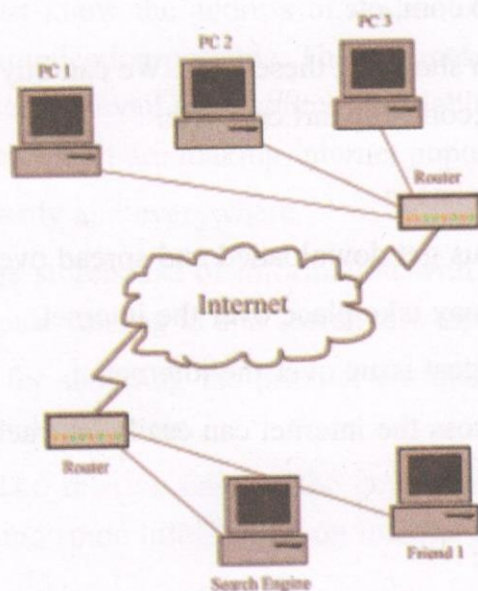


Figure 2.1 Internet Structure

2.3 Web Browser :

A web browser is a software application for accessing information on the World Wide Web. The primary function of web browser is to render HTML, the code used to design or “mark up” web pages. Common web browser include Microsoft internet

explorer, Google chrome, Mozilla Firefox, Apple Safari. Earlier browser such as Mosaic and Netscape Navigator were simple applications that rendered HTML, processed form input and supported bookmark. Today's browsers are far more advanced, supporting multiple types of HTML, dynamic java script and encryption used by secure websites.



Figure 2.2 Web Browser

In addition, most browser also support external Plug-ins required to display active content such as in page video, audio, game content.

Web browsing is the act of looking through a set of information quickly, without a specific sense of purpose. Browsing in the context of internet typically means using a web browser.

Exploring and navigating the web is known as web browsing or net surfing. While web browsing user either download or upload to content.

Uploading means data is being sent from your computer to the internet.

Downloading means your computer is receiving data from the internet.

To visit a site on the Net, you need to specify the address of the site or its URL to the browser. The browser fetches the home page of the site addressed by you, from the server.

2.4 Multimedia on the web :

Multimedia refers to any application that combines text with graphics, animation; audio, video, virtual reality etc. Web pages often contain multimedia elements of different types and formats to enhance the appearance of web pages.

- Many web pages use colourful graphical designs and images to convey messages. JPEG, GIF are common formats which are used by many websites.
- Animation can make web pages more visually interesting and draw attention to important information or links.
- Simple applications on the web consist of individual audio files available for download to a computer or device. Once downloaded, you can play the content of these files.
- You can view video clips or watch live video on the web. MPEG, MP4 are the formats used by many websites.

2.5 Web Search Engines :

A web search engine is an application on the WWW that helps user to locate the websites containing useful information and references to such information. To search a web page using search engine the steps are:

- Open the home page of the search engine
- Type the desired information in the search box provided by the search engine
- Now click search button

The search engine searches for the requested information and return the result to the user. The user can quickly locate the requested information from the vast ocean of information available on the internet.

Some popular search engines are: Google, Bing, Ask, Yahoo, Khoj, Guruji etc.



Figure 2.3 Various Search Engines

The search engine works with the help of the following three elements :

- i) *Spider or web crawler* : The search engine use a software called spider which comb the internet looking for the documents and their web addresses. This process is called web crawling.
- ii) *Indexing software and database* : The list of documents and web addresses collected by spider are sent to the indexing software. The indexing software extract information from the document and web addresses, prepares an index of it and store in a database.
- iii) *Search algorithm* : When you perform search by entering keywords, the search engines software searches its database using search algorithm. After that it displays the matching documents.

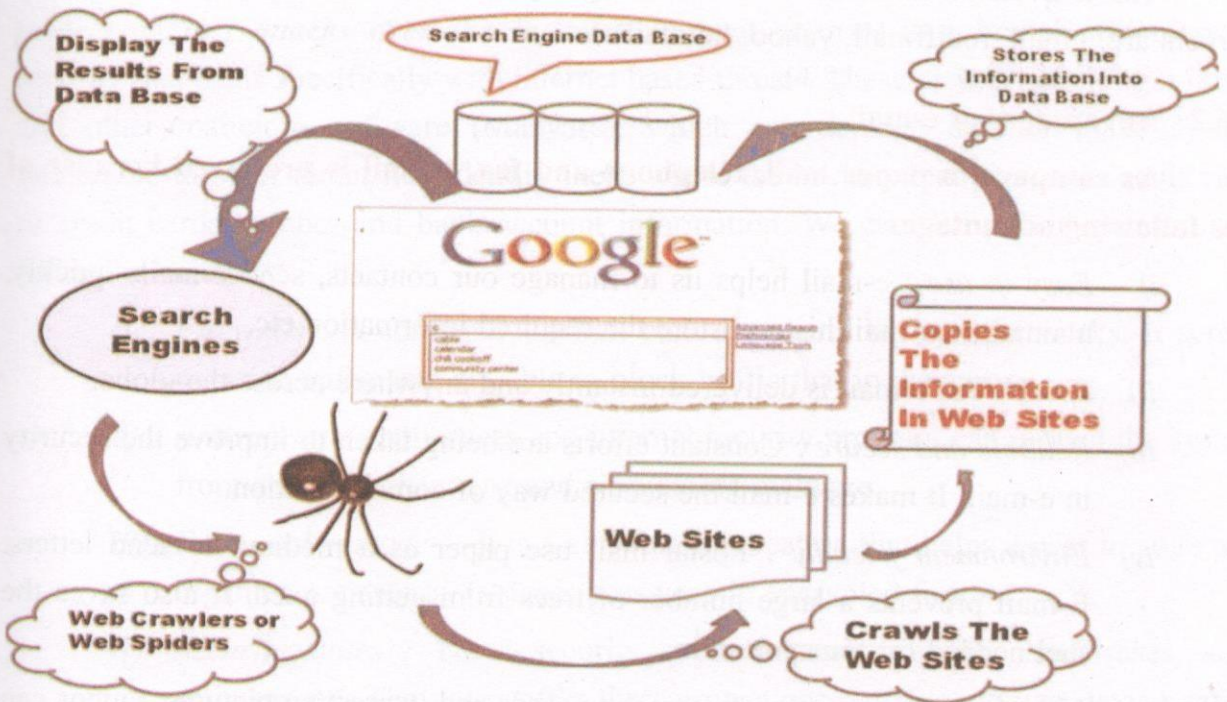


Figure 2.4 Working of Search Engine

2.6 E-mail :

The electronic mail service (known as e-mail) allows an internet user to send a message to another internet user in any part of the world in a near-real-time manner. E-mail messages are generally sent from and received by email servers. Once a server has

received a message, it directs it to specific computer that the mail is addressed to. Messages in e-mail service can contain not only text document but also images, audio and video data.

2.6.1 E-mail address :

To send and receive email the user must have e-mail account and address. Email address is like: *username@ hostname*.

gulshan.nadda@ gmail.com

Here,

- *gulshan.nadda* is the user name who is going to send or receive messages
- *gmail.com* is the host name, or network that services your e-mail.

The user can create email account using any e-mail server. Some popular e-mail servers are: gmail, rediffmail, yahoo, hotmail etc.

2.6.2 Advantages of e-mail :

As compare to paper mail, telephone and fax, e-mail is preferred because of the following advantages :

- Easy to use* : e-mail helps us to manage our contacts, send e-mails quickly, maintain our mail history, store the required information etc.
- Speed* : An e-mail is delivered instantly and anywhere across the globe.
- Reliable and secure* : Constant efforts are being taken to improve the security in e-mail. It makes e-mail the secured way of communication.
- Environment friendly* : Postal mail use paper as a medium to send letters. E-mail prevents a large number of trees from getting axed. It also saves the fuel needed for transportation.
- Use of graphics* : Colourful greeting cards and interesting pictures, videos can be sent through e-mail.
- Easy to prioritize* : e-mail comes with a subject line, so it is easy to prioritise them and ignore the unwanted one.
- Inexpensive* : As compared to telephone calls, faxes, postal mails, e-mail is less expensive.

2.6.3 Disadvantages of e-mail:

- i) E-mail may carry viruses, which can cause harm to your computer.
- ii) You need to check Inbox regularly to remain updated.
- iii) The e-mail Inbox gets crowded with mails after a period of time. It becomes difficult to manage these e-mails.
- iv) Junk mails are the major issue now-a-days. The user has to spend time to find out the useful mail.
- v) E-mails are less personal compared to many other forms of communication such as talking over phone or meeting face to face.

2.7 Internet Security :

Internet security is defined as a process to create rules and action to take to protect against attacks over the internet. Internet security is a branch of computer security that deals specifically with internet based threats. These includes hacking, viruses and other malicious software (Malware), which can damage data or make system vulnerable to other threat like identity theft, where the hacker steal personal details such as credit cards number and bank account information. We can secure our system using following methods:

- i) *Firewalls* : A computer firewall controls access between networks. It screen network traffic and are able to block traffic that in dangerous.
- ii) *Antiviruses* : Antiviruses and internet security program can protect the system from attack by detecting and eliminating malware.
- iii) *Password manager* : It is a software application that helps a user to store and organize passwords. It stores password in encrypted format.
- iv) *Security suites* : These security suites contain firewalls, antiviruses, anti-spyware etc. They also offer theft protection, portable storage device safety check, private internet browsing. Some available suites are McAfee, Quick Heal Internet Security, etc.

2.8 Communication and its Basic Elements :

Communication is the process of transferring message from one point to another. The three basic elements of any communication process are :

- i) A **sender (source)**, which creates the message to be transmitted.

- ii) A **medium**, which carries the message.
- iii) A **receiver (sink)**, which receives the message.

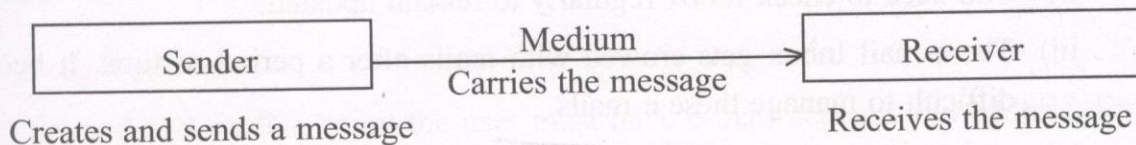


Figure 2.5 Elements of Communication System

2.9 Networking :

In the world of computers, *networking is a practice of linking two or more computing devices together in order to share resources, exchange of files or allow electronic communication.* Networking involves designing, implementing, upgrading, managing the computer networks.

2.10 Computer networks :

Computer has become the integral part of every organization. These computers may be located at different locations within a building/ campus/organization. Each computer may perform different set of task and may work in a different environment without interacting with each other. This may result in overlapping of same task/work of computations. If computers are connected by a network, many of the overlapping tasks will be minimized and we will be able to extract information from each computer and share the existing information.

Computer network is a collection of interconnected independent computers and peripherals connected by communication facilities for exchanging information and sharing resources. A computer network can be anything ranging from two interconnected computers to thousands of interconnected computers.

In other words, *A computer network is interconnection of geographically distributed multiple computers so that a meaningful transmission and exchange of information may take place among them.*

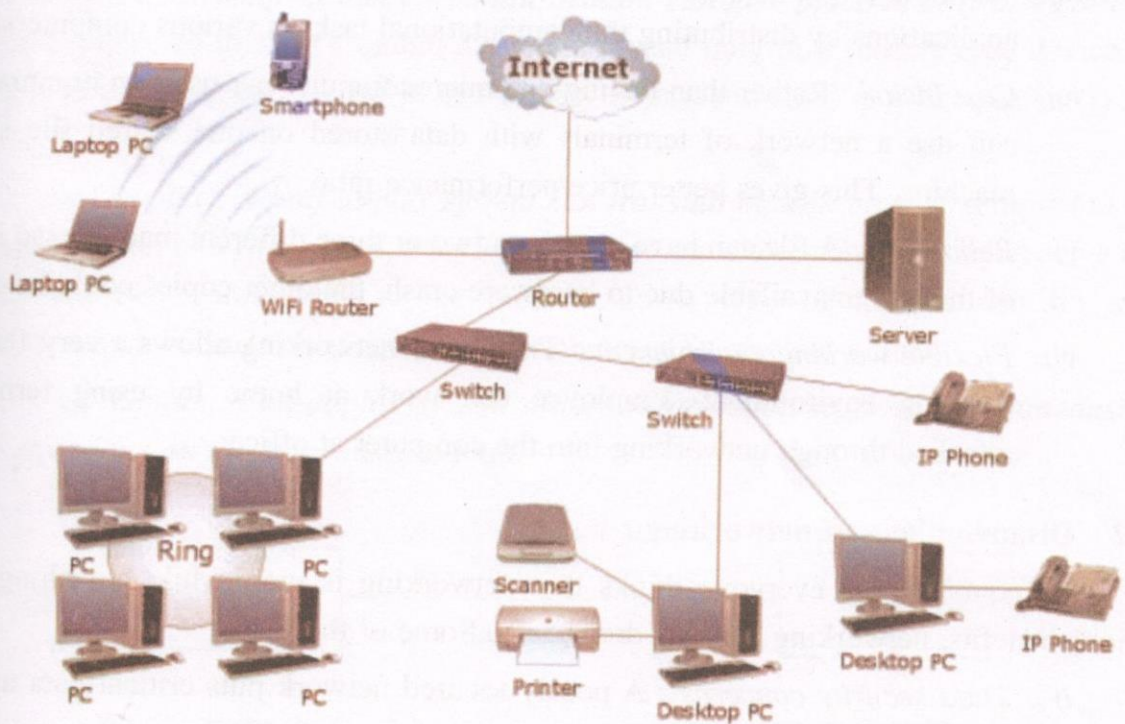


Figure 2.6 Computer Network

2.11 Need of Computer Network :

A computer in itself is useful but several computers connected with each other can be even more useful. Some benefits causing the need of computer networks are:

- i) *Sharing of resources* : Computer network not only provide the ability to share information but also the resources. Resources can either be hardware resources (like printer, scanner, CD ROM, Fax machine) or software resources (like application program) for example: using a computer network, an expensive laser printer can be shared among various employees in a department of a company instead of giving each employee a separate laser printer.
- ii) *Connecting and communication* : Networks connect computers and users of those computers. Once they are connected it is possible for the user to communicate with each other. Since the modern organizations are widely dispersed with offices geographically apart, networking provides communication among them.

- iii) *Improved performance* : Network's performance can be increased for some applications by distributing the computational task on various computers.
- iv) *Cost factor* : Rather than having one microcomputer per user, an organization can use a network of terminals with data stored on one shared file server machine. This gives better price/performance ratio.
- v) *Reliability* : A file can have copies on two or three different machines, so if one of them is unavailable due to hardware crash, the other copies could be used.
- vi) *Flexible working environment* : The use of networking allows a very flexible working environment. Employee can work at home by using terminals attached through networking into the computer at office.

2.12 Disadvantages of networking :

Of course today everyone thinks that networking is worthwhile but along with various benefits, networking has few drawbacks. Some of these are:

- i) *Data security concerns* : A poorly secured network puts critical data at risk. For example when files are shared among users then there is always a threat that unauthorized users can alter or use the sensitive data.
- ii) *Network hardware, software cost* : To set up a network requires investment in hardware and software.
- iii) *Threat of virus* : The effect of viruses on the network is more as compared with standalone systems because viruses can easily spread from one computer to another over network.
- iv) *Illegal use* : Network brings certain problems like illegal or illicit material, software piracy and illegal use of computer resources.

2.13 Data Communication Fundamentals

2.13.1 Data Transmission Modes:

There are three modes of transmitting data from one point to another. These are :

- i) Simplex
- ii) Half duplex
- iii) Full duplex

Simplex : In *simplex mode, communication can take place in only one direction.* Devices connected to such a circuit are either a send only or a receive only device. For example, a data collection terminal of a factory floor (send only) or a line printer (receive only)

Half Duplex : *A half-duplex system can transmit data in both directions but only in one direction at a time.* Thus, a half- duplex line can alternately send and receive data. It requires two wires. This is the most common type of transmission for voice communication because only one person is supposed to speak at a time.

Full-duplex : *Full-duplex system allows information to flow simultaneously in both directions on the transmission path.*

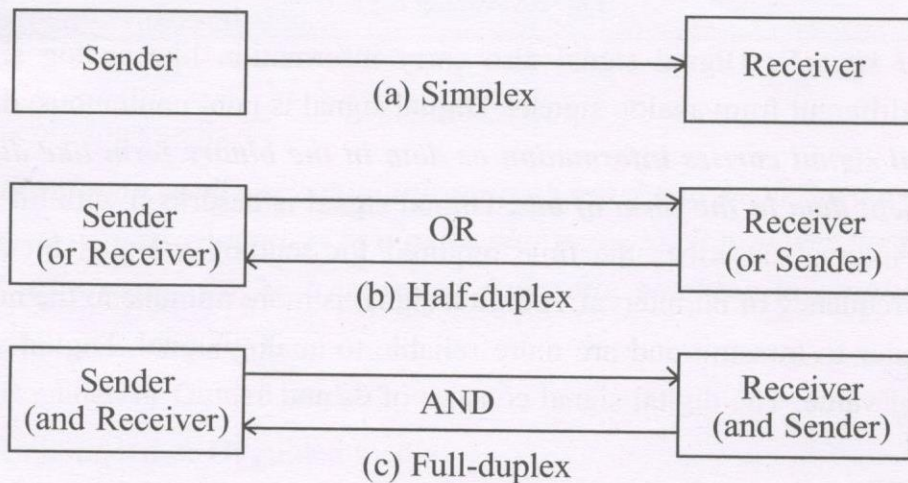


Figure 2.7 Data Transmission Modes

2.13.2 Analog Signal and Digital Signal:

To transmit information over a network electric signal are used. The electric signals can be of two types :

- *Analog signals*
- *Digital signals*

Analog signals : *Analog signal is a kind of continuous wave form that changes over time.* An analog signal is described using amplitude, period or frequency and phase. Amplitude marks the maximum height of the signal. Frequency marks the rate at which signal is changing. An analog signal is not immune to noise hence, faces distortion and

decreases the quality of transmission. The human voice is the best example of an analog signal.

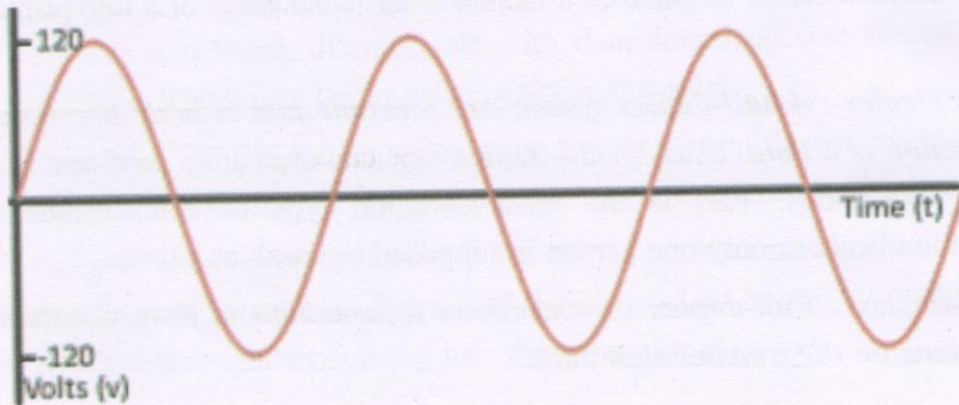


Fig. 2.8 Analog Signal

Digital signal : Digital signal also carry information like analog signal but is somewhat is different from analog signals. Digital signal is non- continuous, discrete time signal. **Digital signal carries information or data in the binary form like digital signal which represent data in the form of bits.** Digital signal is described with bit rate and bit interval. Bit interval describes the time required for sending a signal bit and bit rate describe the frequency of bit interval. A digital signal is more immune to the noise. Digital signal are easier to transmit and are more reliable to analog signal. Digital signal has a finite range of value. The digital signal consists of 0s and 1s.

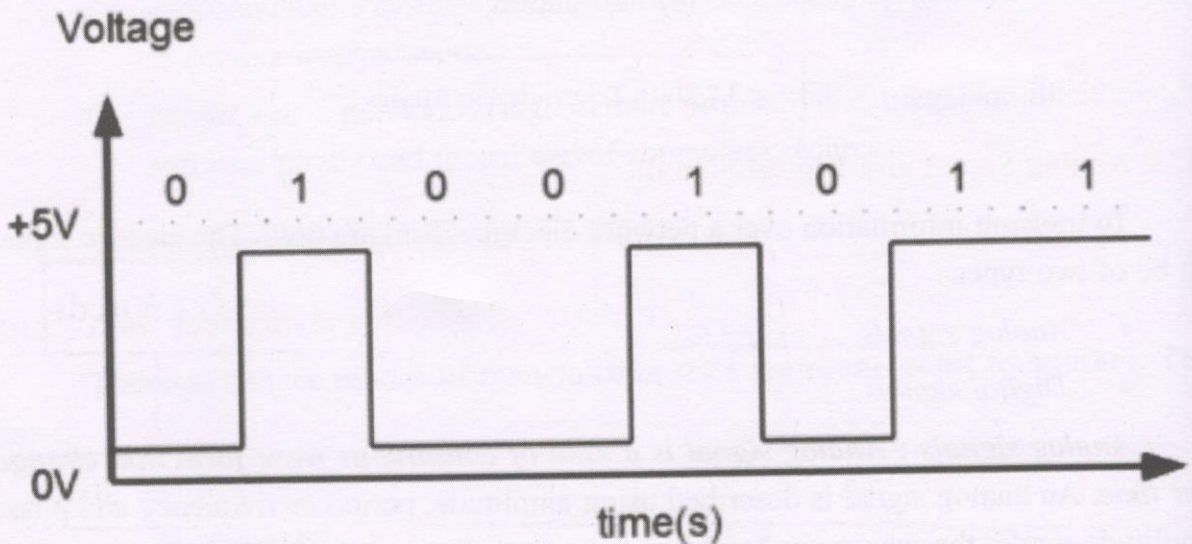


Fig. 2.9 Digital Signal

DIFFERENCE BETWEEN ANALOG SIGNAL AND DIGITAL SIGNAL

Differences	Analog Signal	Digital Signal
Signal	Analog signal is a continuous signal which represent physical measurement	Digital signal are discrete time signal generated by digital modulation
Waves	Denoted by Sine waves	Denoted by square waves
Examples	Human voice in air, analog electronic devices	Computer, CDs, DVDs, and other digital devices
Representation	Use continuous range of values to represent information	Use discontinuous values to represent information
Response to noise	More likely to get affected and reducing accuracy	Less affected since noise response are analog in nature
Uses	Can be used in analog devices only. Best suited for audio and video transmission.	Best suited for computing and digital electronics.

2.14 Transmission media :

A transmission media or communication channel may be defined as the medium which connects various computers in a particular network. It provides the path through which a bit of stream can be transferred from one machine to another. It can be categorized into two categories:

- i) Bounded or Guided media
- ii) Unbounded or Unguided media

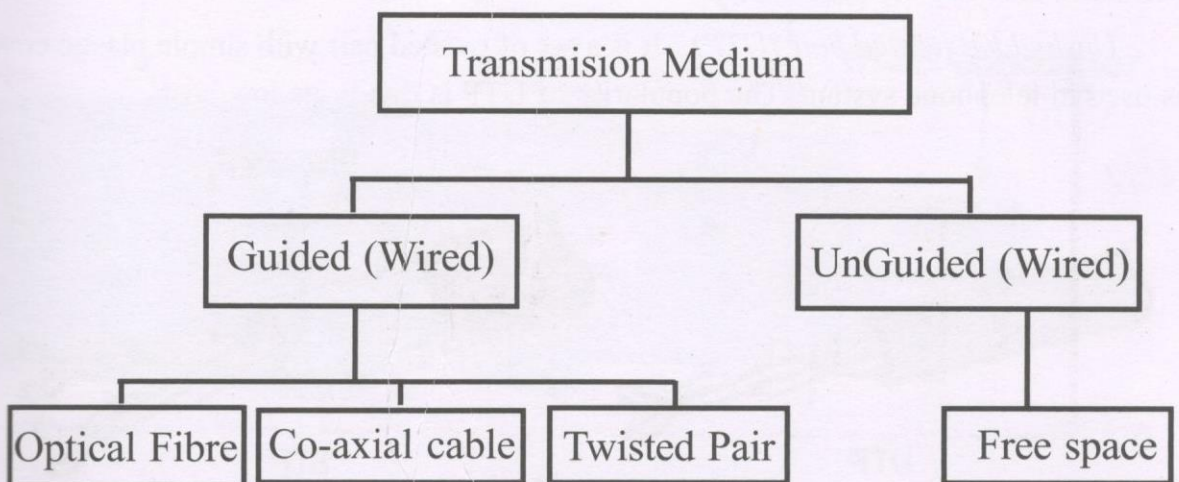


Fig. 2.10 Transmission Media

2.14.1 Guided Media :

A guided media may be defined as transmission medium in which the signals travel through a physical media which is shielded on the outside by some material. Twisted pair, coaxial cable and fiber optics are some of its examples. These are good for LANs because they offer high speed, good security and low cost. However, these cannot be used for very long distance.

Types of guided media :

a) **Twisted pair cable :** A twisted pair is least expensive and most widely used guided transmission media. A twisted pair cable consists of two insulated copper wires. The wires are twisted together like a DNA molecule. The purpose of twisting the wire is to reduce the electric interference from similar pair close by. The most common application of twisted pair is in telephone system. The telephones are connected by twisted pair. Moreover they can run for kilometres without amplification. Twisted pair support transmission speed up to 1 gigabyte per second and even faster. It is of two types:

- i) Shielded twisted pair (STP)
- ii) Unshielded twisted pair (UTP)

Shielded twisted pair (STP) : STP is simply TP cabling with foil or mesh wrap inside the outer coating. This special layer is designed to reduce interference problem. These are expensive as compare to UTP. The transmission rate of up to 500 mbps can be achieved at 100m using STP.

Unshielded twisted pair (UTP) : It is a set of twisted pair with simple plastic cover. It is used in telephone system. The popularity of UTP is due to its low cost.

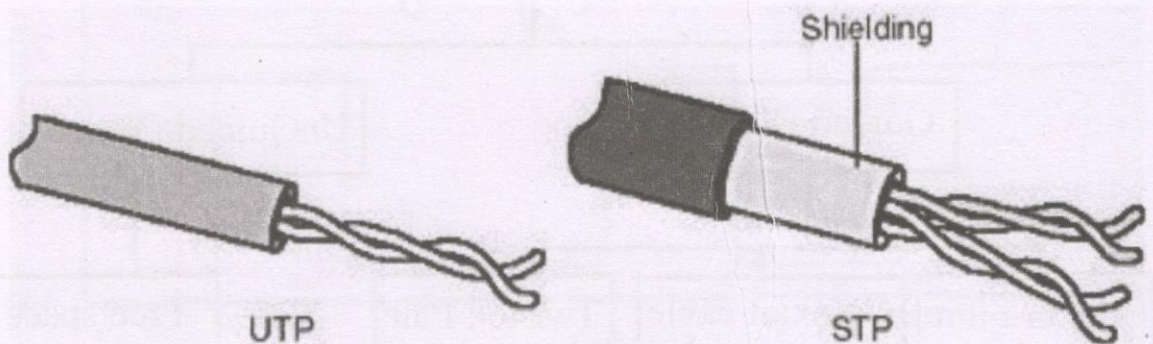


Fig 2.11 Unshielded and Shielded Twisted Pair Cable

Advantages of twisted pair cable :

- i) It can be installed easily and is relatively cheap.
- ii) It can accommodate up to 1000 devices.
- iii) It has low noise immunity so it is appropriate and stable for voice communication.

Disadvantages of twisted pair cable :

- i) Unsuitable for very high speed data transmission
- ii) Some standards for twisted pair are new and therefore cannot support data networking.

b) Coaxial cable : Coaxial cable is another transmission media which is sometimes called “coax” because it includes one conductor that carries the signals surrounded by another concentric conductor, both running along the same axis. The coaxial cable provides better shielding than twisted pairs, so it can cover longer distance at higher speed. *A coaxial cable consists of single copper wire in the centre of cable, surrounded by an insulating material. The insulator is encased by a wire mesh shield closely woven. This outer conductor is covered with protective plastic sheath.* It gives a high bandwidth and excellent noise immunity.

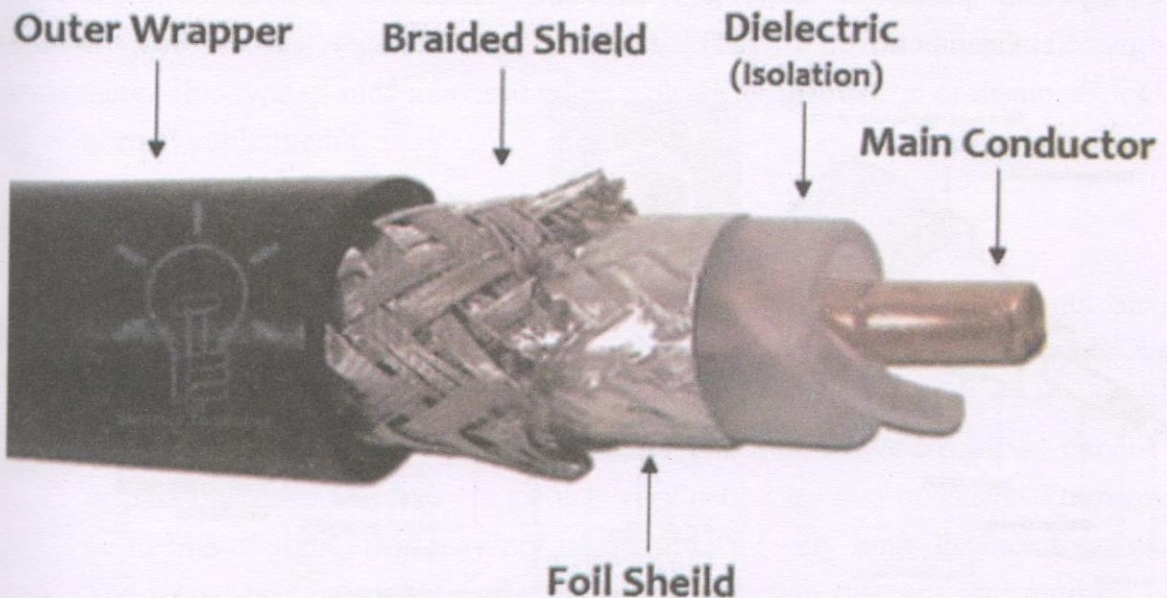


Fig 2.12 Coaxial Cable

Advantages :

- Supports high bandwidth than twisted pair.
- It is more resistant to signal interference.
- It can be used for both analog and digital transmission.
- Heavier coaxial cable resists rough treatment.

Disadvantages :

- Some coaxial cables are expensive, bulky.
- It has high installation costs.
- Terminations and connectors must be done properly.

c) **Fibre optic cable :** *Optical fibre consists of thin strands of glass which carry light from a source at one end of fibre to a detector at other end. The light sources used are either light emitting diodes (LED's) or Laser diodes (LDs).*

The fibre consists of three pieces :

- i) The core, the glass or plastic through which light travels.
- ii) The cladding, which is a covering of the core that reflects light back to the core.
- iii) The protective coating, which protects the fibre cable from hostile environment.

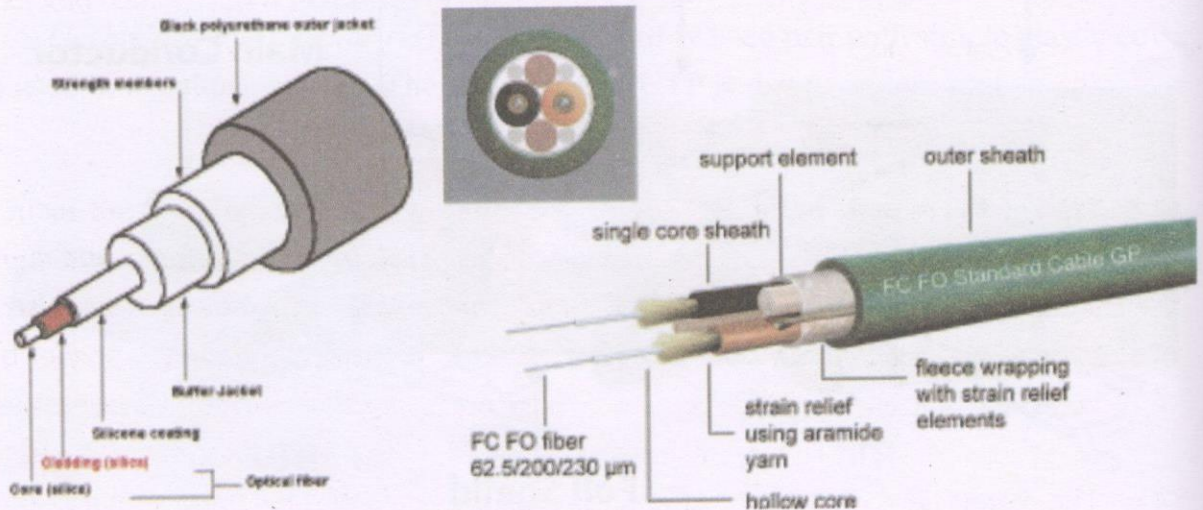


Fig. 2.13 Fiber Optics Cable

Advantages :

- It is immune to electrical and magnetic interference i.e., noise in any form because the information is travelling on a modulated light beam.
- They have much greater bandwidth with metal cables.
- Data is transmitted digitally rather than analogically.
- An optical fibre cable is lighter, smaller and easier to handle than a copper cable.

Disadvantages:

- These are expensive to install.
- Connecting two fibres together is a difficult process.
- They are quite fragile and need special care to make them sufficiently robust for an office environment.

2.14.2 Unguided Media:

An unbounded or unguided media also referred as wireless, it does not use any physical medium as transmission medium. They transmit signals through the atmosphere. This type of media is used when a physical obstruction or distance blocks the use of normal cable media.

The types of unbounded media :

- a) **Microwave :** It is a popular way of transmitting data since it does not incur the expense of laying cables. *Microwave system use very high frequency radio signals to transmit data through space. The microwave transmission consists of transmitter, receiver and the atmosphere.* The microwave frequency cannot bend or pass obstacles like hill. Hence it is very necessary that microwave transmission be in line-of-sight. This may not be possible for very long distance transmission. The signal become weaker after travelling a certain distance and requires power amplification.

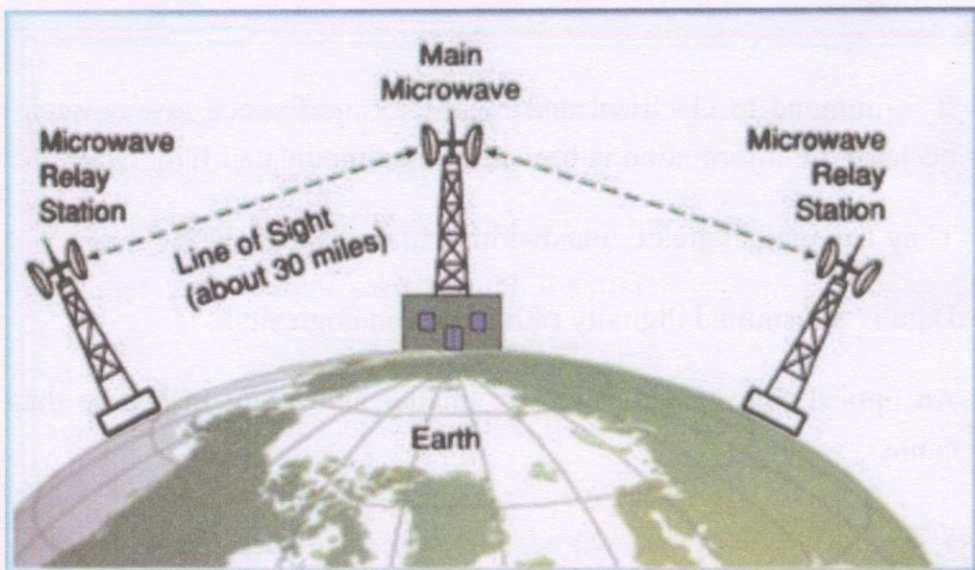


Fig. 2.14 Microwave Transmission

Advantages :

- It offers easy communication over difficult terrain.
- Microwave has the ability to communicate over oceans.
- It proves cheaper than digging trenches for laying cables.

Disadvantages :

- It is an insecure communication
- Microwave transmission got affected due to rain or thunderstorms etc.
- Bandwidth allocation is extremely limited in case of microwave.

b) **Radio wave :** *The transmission making use of radio frequencies is termed as radio wave transmission.* Radio waves are easy to generate, can travel long distances. They can penetrate building easily. Radio waves are omnidirectional. Both the transmitter and receiver use antennas to radiate and capture the radio signals.

Advantages :

- Radio wave transmission offers mobility.
- It proves cheaper than digging trenches for laying cables.
- It can travel long distance.

Disadvantages :

- It is an insecure communication.
- It also gets affected due to rain and thunderstorm.

c) **Satellite** : The main problem with microwave communication is that the curvature of the earth, mountains and other structures, which often block the line of sight. Due to this reason, several repeaters are required for long distance transmission which increases the cost of data transmission between two points. This problem is overcome by using satellite. ***In satellite communication, the earth station consists of a satellite dish that functions as an antenna and communication equipment to transmit and receive data from the satellite passing overhead.*** A number of satellites, owned by both government and private organization have been placed in stationary orbit about 36000 km above the earth's surface. These satellite acts as relay station for communication station.

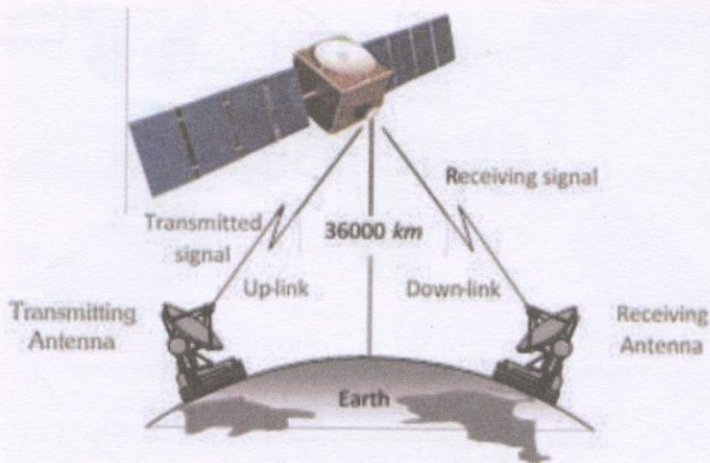


Fig. 2.15 Satellite Transmission

Advantages :

- The area coverage through satellite transmission is quite large.
- The heavy usage of intercontinental traffic makes the satellite commercially attractive.

Disadvantages :

- The initial cost of placing a satellite into its orbit is very high.
- Overcrowding of available bandwidth due to low antenna gains.

- d) **Wi-Fi** : Wi-Fi stands for wireless fidelity. Wi-Fi is wireless technology which enables connection between two or more devices wirelessly for data sharing purpose. A wireless network uses radio waves. In wireless communication a computer's wireless adapter translates data into a radio signal and transmits it using an antenna. On another computer a wireless router receives the signal and decodes it.

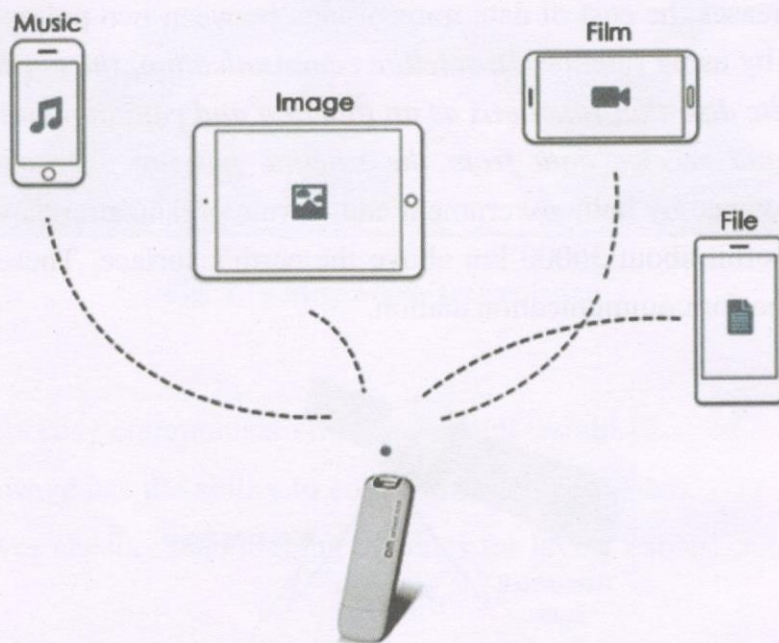


Fig. 2.16 Wi-Fi Transmission

Advantages :

- It is easier to add or remove work stations.
- Installation is fast and easy.
- Access to the network can be from anywhere within the range of an access point.

Disadvantages :

- As the number of computer using network increases, the data transfer rate will decrease accordingly.
- Security is more difficult to guarantee.
- Device will only operate at a limited distance from an access point.

e) **Bluetooth :**

Bluetooth is a wireless LAN technology designed to connect devices of different types like phones, note books, camera, printer etc. It is an open wireless protocol for exchanging data over short distances. Bluetooth creates a short distance PAN to connect and sync data between devices.

A Bluetooth network is called a **piconet** or small net. A piconet can have up to eight stations. One of which is called primary and rest are called secondaries.



Fig. 2.17 Bluetooth Transmission

Advantages :

- It is widely used.
- It is available free of cost.
- Devices used are wireless.
- Consume very less energy.

Disadvantages :

- Data rate and security
- It is not designed to carry heavy traffic loads.
- Mostly dependent on battery.

2.15 Network Classification :

Network plays an important role in today's business and home communication needs. Because people need to communicate over longer as well as shorter distances, the geographical size of data communication network is very important. There are four types of networks. These are:

- i) LAN- Local Area Network
- ii) WAN- Wide Area Network
- iii) MAN- Metropolitan Area Network
- iv) PAN- Personal Area Network

2.15.1 Local Area Network (LAN)

A LAN is a computer network with in a small geographical area such as a home, office building, school, computer laboratory or group of building.

A LAN is composed of inter-connected workstations and personal computers which are capable of accessing and sharing data and devices such as printer, scanner and data storage devices, anywhere on the LAN.

In a typical LAN configuration, one computer is designated as the file server. It stores all software that controls the network, along with software that can be shared by computers attached to the network. Computer connected to file server are called the workstation.

The typical characteristics of LAN are :

- They are private network.
- They spans small coverage area (generally less than 2 km)
- They have low error rates.
- They have high bandwidth, ranging from 1 mbps to 100 mbps.
- It generally uses guided communication media.

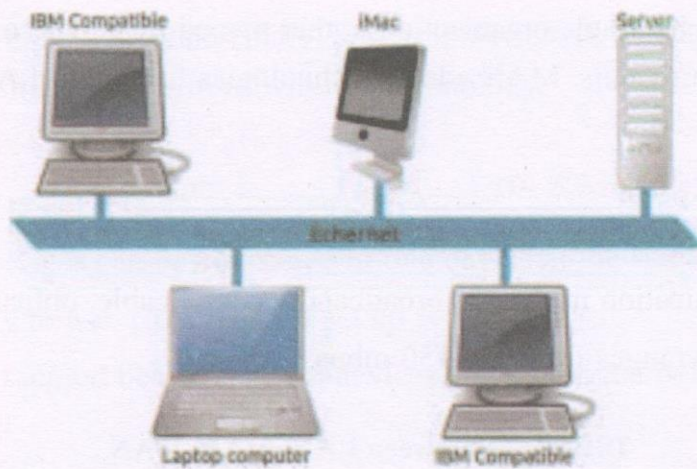


Fig. 2.18 Local Area Network

2.15.2 Wide Area Network (WAN)

The WAN is a network that covers a wide geographical area such as a country, continent or even a whole world. WAN's are used to connect multiple LAN's and other types of network that are relatively far apart.

When two or more networks are connected together to form a bigger network, the resulting network is called an "inter-network" or "internet". Internet is the world's largest WAN. WANs may link computer by means of cables like optical fibres. But usually WANs are wireless connecting different computers by means of radio waves, microwaves, communication satellites. Bridges, router, and gateways are hardware used to connect different computer in WAN.

Some characteristics of WAN are :

- It covers larger geographical area.
- It allows high speed exchange of information.
- It allows sharing of software and resources and resources with connecting workstations.

2.15.3 Metropolitan Area Network (MAN)

Metropolitan Area Networks are the network that spread over a city. A MAN is a network that interconnects user in a geographical area larger than covered by LAN or smaller than the area covered by WAN. A MAN generally covers an area ranging between 5-50 km in diameter. It is larger than LAN but smaller than WAN. A MAN is

generally not owned by single organization, rather owned by either consortium of user or by network service providers. MAN adopts technologies from both LAN as well as WAN to serve its purpose.

Some features of MAN are :

- It covers town and cities generally.
- Communication media are broadband, coaxial cable, optical fibre etc.
- Data rate ranges from 30- 150 mbps.

Difference between LAN, MAN, WAN

Basis of comparison	LAN	MAN	WAN
Expands to	Local Area Network	Metropolitan Area Network	Wide Area Network
Meaning	A network that connects a group of computers in a small geographical area	It covers relatively large regions such as cities, towns	It spans large locality and connects countries together like internet.
Ownership of network	Private	Private or public	Private or public
Design and maintenance	Easy	Difficult	Difficult
Speed	High	Moderate	Low
Fault tolerance	More tolerant	Less tolerant	Less tolerant
Used for	Colleges, School, Hospital	Small Towns, Cities	Country, Continent
Allows	Single pair of devices to communicate	Multiple computer can simultaneously interact	A large group of computers communicate at the same time

2.15.4 Personal Area Network (PAN)

Personal area network covers a very small area, usually a small room. The reach of a PAN is typically a few meters. PAN can be used for communication among the personal devices themselves. The best known wireless PAN network technology is Bluetooth and the most popular wired PAN is USB. For example, a person travelling with

laptops, a personal digital assistant (PDA) and a printer could connect without having to plug anything in, using some form of wireless technology.

Some features of the PAN are :

- PAN does not require extra space or wires.
- Many devices can be connected to one device at the same time.
- It is easy to use. No advanced set up is required.
- PAN is secured because all the devices are authorized before data sharing.

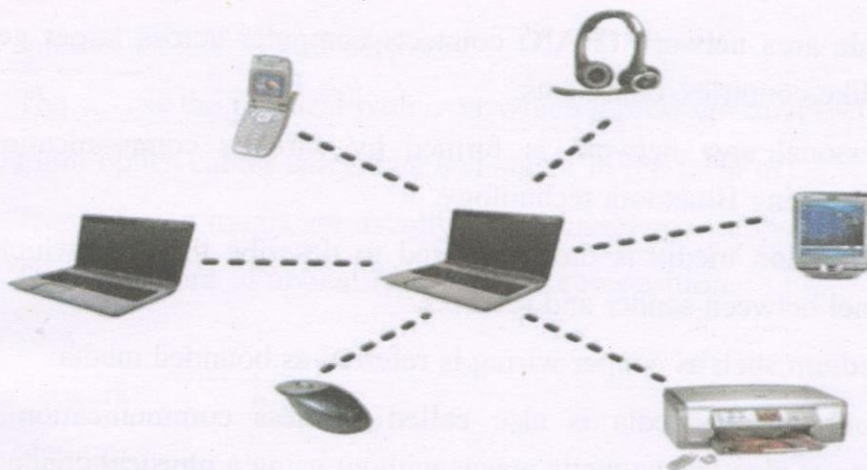


Fig. 2.19 Personal Area Network

SUMMARY

- Internet is a huge network of computer that links many different types of computer all over the world.
- A set of rules is called a protocol.
- A web browser is a software application for retrieving, presenting and travelling information resources over World Wide Web.
- A search engine is an interactive tool to help people locate information via World Wide Web.
- The e-mail allows an internet user to send a mail to another internet user in any part of the world.
- Internet security is the ability to protect information and system resources from unauthorized access.

- A computer network is a inter connection of geographically distributed multiple computer, to achieve the meaningful transmission and exchange of information.
- Data communication is the transfer of data from one device to another using transmission medium.
- A small computer network that is confined to a localised area like building, an office etc. is called LAN.
- A network spread over a city is called MAN.
- A wide area network (WAN) connects computer across larger geographical area like countries, continents.
- A personal area network is formed by wireless communication between devices using Bluetooth technology.
- Transmission media is the term used to describe the path which acts as a channel between sender and receiver.
- A medium such as copper wiring is referred as bounded media.
- An unbounded media is also called wireless communication because it transports electro- magnetic waves without using a physical conductor.

EXERCISE

Q1. State true or false :

- WWW stands for World Wide Web.
- ISP does not help to provide connection to internet.
- WAN stands for wide area network.
- Internet explorer is not a web browser.
- TCP/ IP is a communication protocol.
- Google is not a search engine.
- Bluetooth is a guided media.
- A LAN uses satellite communication.

Solutions :

- True
- False

- iii) True
- iv) False
- v) True
- vi) False
- vii) False
- viii) False

Q2. Fill in the blanks :

- i) Internet is.....of networks.
- ii) The.....is the physical path over which a message travel.
- iii) Fibre optics cables carry data and signal in the form of
- iv) Transmission media are usually categorised as.....and media.
- v) The inner core of optical fibre is.....in composition.

Answers :

- i) Network
- ii) Medium
- iii) Light
- iv) Guided, unguided
- v) Glass

Q3. What is internet ? What are its features ?

Q4. What is web browsing ? Explain.

Q5. What is web search engine ? Name any five popular web search engines.

Q6. Explain the working of search engine.

Q7. What is email ? What are its advantages and disadvantages?

Q8. How e-mail is different from traditional mail?

Q9. What is computer network? What are its advantages?

Q10. What do you mean by transmission media? Explain its types.

Q11. What are the basic elements of communication?

Q12. Differentiate between guided and unguided media

Q13. Write a note on :

- a) Coaxial cable
- b) Optical fibre
- c) Bluetooth

Q14. What are the different types of network ? Explain.

Q15. Differentiate between LAN, WAN and MAN.

—End—