

## CHAPTER

# 1

# Internet Basics

Organizations now are very wide spread ; they are working with hundreds of branches spread over wide geographical areas. This really paved the way for the emergence of computers and communication technologies. The union of both resulted in emergence of so called popular “Computer networks” which formed the basis of current of technology to keep track of data at any given instance of time.

*Computer network is an interconnection of geographically distributed multiple computers in such a way that meaningful transmission and exchange of information become possible among them.* The goal is to transfer and exchange of data between the computers.

The objectives of computer network are as follows :

1. Sharing of information
2. Sharing of resources (Hardware and software)
3. Sharing of processing load.

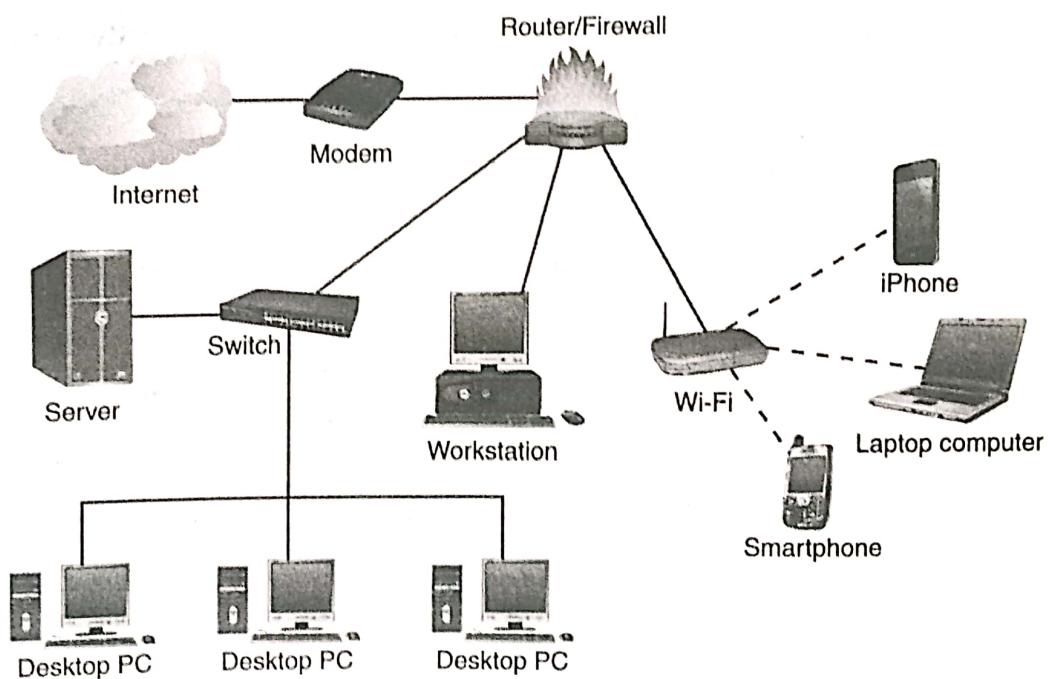


Fig. 1.1. Computer network.

## ► 1.1. INTRODUCTION TO INTERNET

The Internet is a global network of billions of computers and other electronic devices. It is the world's largest computer network, the network of networks, scattered all over the world. It is a huge network of computers that links many different types of computers all over the world. These networks are spread over various countries, various continents and are linked through satellite, via telephone lines.

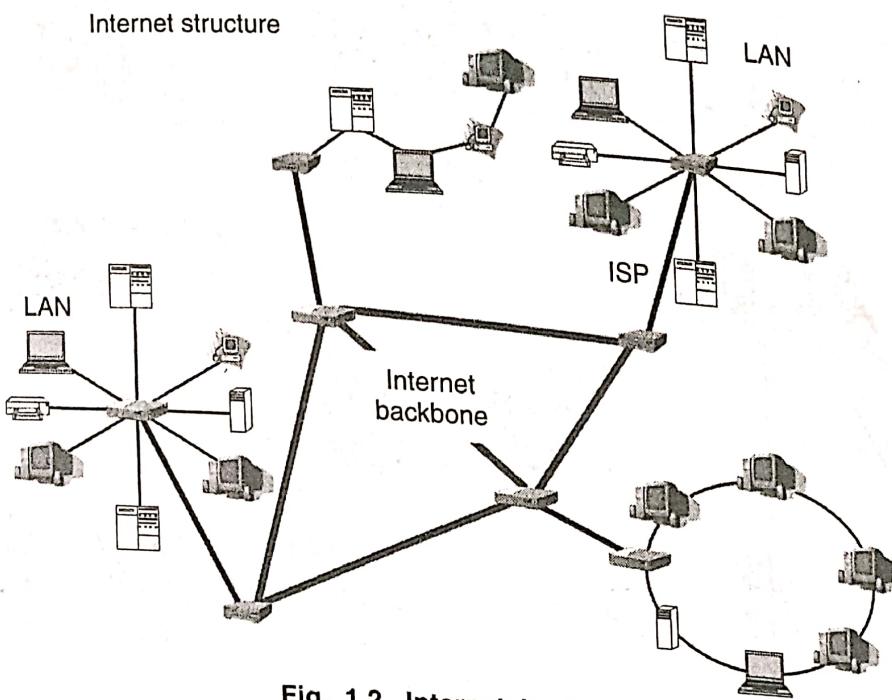


Fig. 1.2. Internet backbone.

The World Wide Web (WWW) is the most popular and promising method of accessing the Internet. WWW or Web is a repository of information spread all over the world and linked together. The World Wide Web was created in the year 1989 at the European Particle Physics Laboratory in Geneva, Switzerland, as a method for incorporating footnotes, figures and cross-reference into online hypertext documents. WWW is a hypertext document and is a specially encoded file that uses the hypertext markup language (HTML).

This language allows a document's author to embed hypertext links (also called hyperlinks or just links) in the document. Hypertext links are the foundation of the World Wide Web. The WWW provides a network of interactive documents and the software to access them. It is based on documents called pages that combine text, pictures, forms, sound, animation and hypertext links. To navigate the WWW, users "surf" from one page to another by pointing and clicking on the hyperlinks in text or graphics.

## ► 1.2. INFORMATION TECHNOLOGY AND INTERNET

Internet is a pipeline that carries data between computers. Internet can potentially link your computer to any other computer. Anyone with access to the Internet can exchange text, data files, pictures, audio, data files and programs with any other user. Physically, two networks can only be connected by a computer that attaches to both of them. A physical attachment does not guarantee to provide the inter-connection with all the machines that are to communicate. To have a viable network it is required that we are able to shuffle packets from one network

to another. Computers that interconnect two networks and pass packets from one to the other are called Internet gateways or Internet routers. *A gateway is a device that connects dissimilar networks (i.e. networks having different communication architecture).*

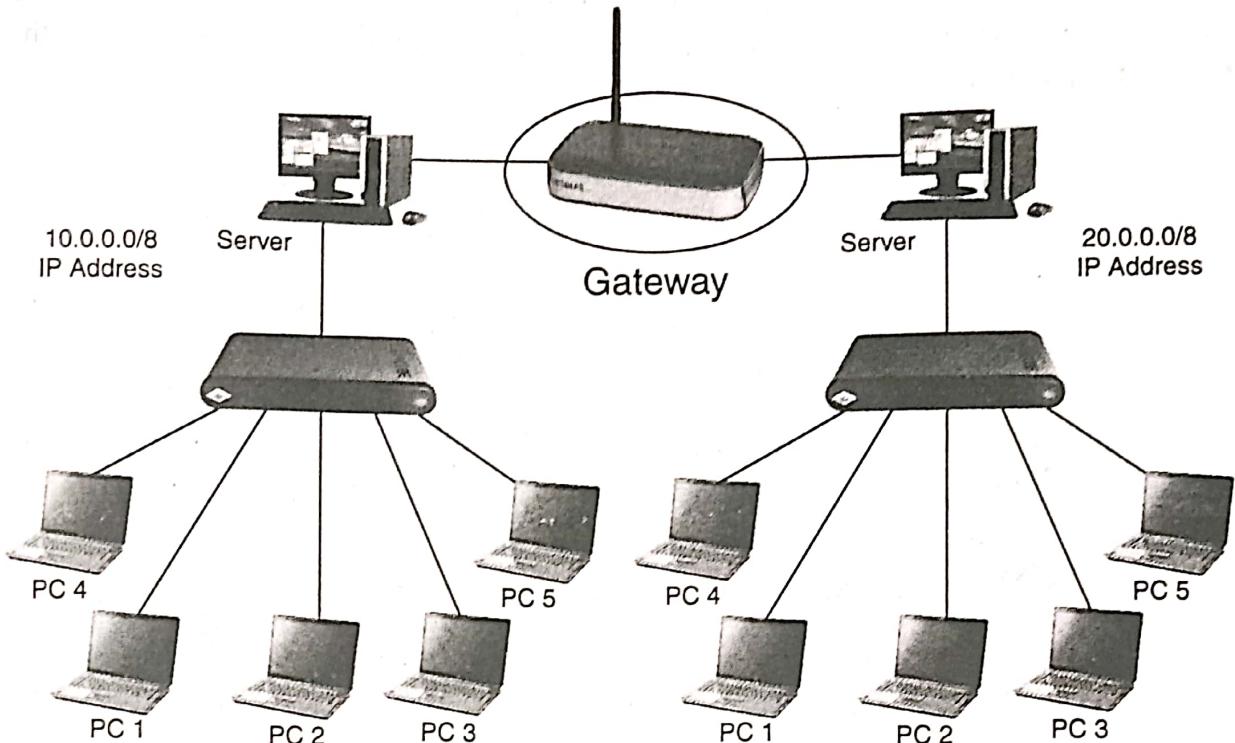


Fig. 1.3. Gateways.

The Internet works because every computer connected to it uses the same set of rules and procedures (known as protocols) to control timing and data format. The protocols used by the Internet are called Transmission Control Protocols/Internet Protocols (TCP/IP). In Internet, most of the computers are not directly connected to Internet rather they are connected to small networks which in turn are connected to Internet backbone through the gateways.

The data transfer on Internet takes place as follows :

1. The data is broken up into bits of same sized pieces called *packets*.
2. Each packet is given a number serially i.e. 1, 2, 3, 4, ..... .
3. A header is added to each packet which contains information like where the data has come from, where the data will go.
4. Each packet is sent from computer to computer until it finds its final destination. Each computer on the way decides where next to send the packet.
5. At the destination, the packets are examined. If any packets are missing or damaged, a message is sent asking for them to be re-sent. This continues until all packets have been received intact.
6. The packets are now reassembled into their original form.

On Internet, it is not necessary that all the packets will follow the same path from source to destination. A special device called **router** tries to load balance various paths that exist on networks.

### ► 1.3. APPLICATIONS OF INTERNET

Computer networks provide several important advantages to enterprises and individuals. These are as the following :

- 1. On-line communication :** The electronic mail (E-mail) service on the Internet is extensively used today by computer users around the world for faster communication with each other.
- 2. On-line journals and magazines :** The Internet has literally thousands of electronic subscriptions that can be found both for free and low cost.
- 3. On-line shopping :** The Internet has also facilitated the introduction of a new market concept that consists of virtual shops. Through the Internet people can purchase, sell, advertise and distribute products.
- 4. Worldwide video conferencing :** Businessmen and institutions use the Internet for video conferencing through which people can see each other talking on their computer screens and can hear each other's voice through a special audio device fixed in their computers.
- 5. Exchange of views on topics of common interest :** The Internet has a number of news groups. Each news group allows a group of users to exchange their views on some topic of common interest.
- 6. Individuals use the Internet for entertainment, information gathering and communications with others.**
- 7. Scientists and scholars use the Internet to communicate with colleagues, to perform research, to search the requisite information and to publish papers and articles.**
- 8. E-mail :** E-mail is an online correspondence system. Using Internet, you can send and receive instant electronic messages, which are delivered instantly to people anywhere in the world.
- 9. Access information :** The Internet is a virtual sea of information. Any kind of information on any topic is available on the Internet. The 'search engines' on the Internet can help you to find data on any subject that you need.
- 10. Online chat :** There are many 'chat rooms' on the web that can be accessed to meet new people, make new friends, as well as to stay in touch with old friends.
- 11. Downloading software :** You can download games, music, videos, movies, and a host of other entertainment software from the Internet, most of which are free.
- 12. Entertainment :** Internet offers various entertainment opportunities like music, movies, hobbies, news and more can be found and shared on the Internet.
- 13. Services :** Many services are now provided on the Internet such as online banking, job seeking, purchasing tickets for your favorite movies, guidance services on array of topics and hotel reservations.
- 14. Communities :** Communities of all types have sprung up on the Internet. It's a great way to meet up with people of similar interest and discuss common issues.

### ► 1.4. DISADVANTAGES OF INTERNET

↳ Disadvantages

The various disadvantages of Internet are as follows :

- 1. Theft of personal information :** Electronic messages sent over the Internet can be easily snooped and tracked, revealing who is talking to whom and what they are talking about. On

Internet your personal information such as your name, address, credit card, bank details and other information can be accessed by hackers.

**2. Pornography :** This is a very serious issue concerning the Internet, especially when it comes to young children. There are thousands of pornographic sites on the Internet that can be easily found.

**3. Spamming :** This refers to sending unwanted E-mails in bulk, which serve no purpose and unnecessarily choke up the entire system.

**4. Privacy and security issues :** Privacy is the main reason that non-online shoppers do not shop online.

**5. Virus threat :** Computers are mainly getting these viruses from the Internet. Virus is a program which disrupts the normal functioning of computer systems. Computers attached to Internet are more prone to virus attacks and they can end up into crashing whole hard disk, causing considerable headache.

## ► 1.5. SPECIFICATIONS AND TECHNICAL DETAILS FOR ESTABLISHING INTERNET

A network is a group of computers connected together for the purpose of sharing data with one another. Internet is global network of billions of computers and other electronic devices. The various devices needed to establish home Internet are as follows :

1. Hosts (Computer, Laptops etc.)
2. Network Interface Card (NIC)
3. Ethernet cable
4. Modem
5. Internet connection.

**1. Hosts (Computer, Laptops etc.) :** The first and foremost requirement in establishing a Internet connection is computer or laptop.

**2. Network Interface Card (NIC) :** Network interface card (NIC) provides the hardware interface between a computer and a network. The card functions as a middleman between computer and the network. The card translates computer data into electrical signals and sends through the network. Each network interface card has its unique ID.

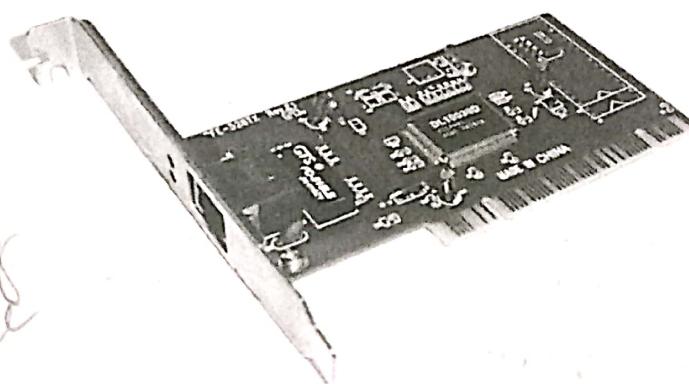


Fig. 1.4. Network interface card.

**3. Ethernet cable :** Ethernet cables connect network devices such as hubs, switch, modems, routers etc. They transmit data using the ethernet protocol. A Network Interface Card (NIC) is

installed in each computer and is assigned a unique address. An ethernet cable runs from each NIC to the central switch or hub.

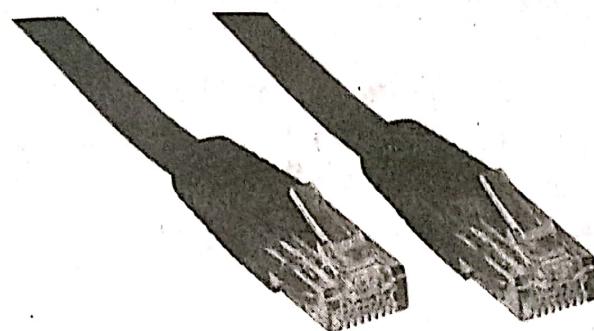


Fig. 1.5. Ethernet cable.

**4. Modem :** Modem is short for modulator-demodulator. *Modems are used for data transfer from one computer network to another computer network through telephone lines.* Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves.



Fig. 1.6. Modem.

**5. Internet connection :** To connect to the Internet, a network needs an Internet connection like 2G, 3G, 4G, 5G, Broadband, ISDN, Cable or Leased Line from Internet Service Provider (ISP). Various ISP in India are BSNL, Reliance Jio, Airtel, Vodafone, Connect etc.

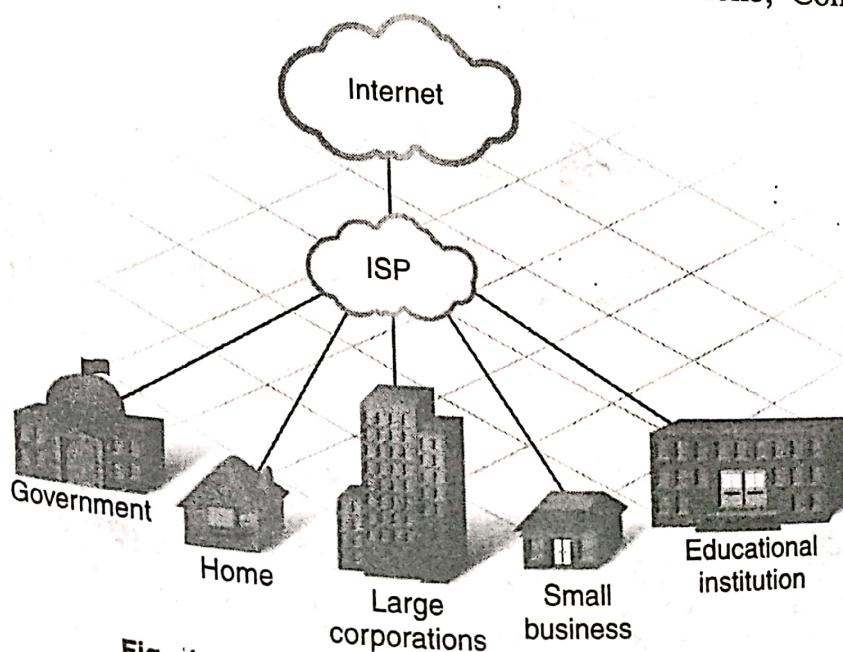


Fig. 1.7. Internet from ISP to various users.

## 1.6. NETWORKING DEVICES FOR INTERNET

The various networking devices for connecting to Internet in office and large organizations are as follows :

**1. Hubs :** It is a device that connects the cables from computers and other devices such as printers in a network. Hubs are shared bandwidth devices. The total amount of bandwidth that enters a hub is shared among all the devices connected to hub. For example, if a 24 port hub receives bandwidth of 100 MPS, it will be divided among 24 ports (Computers) and bandwidth available at each port (Computer) is  $100/24$  MBPS. Hubs are mainly used in low traffic networks.

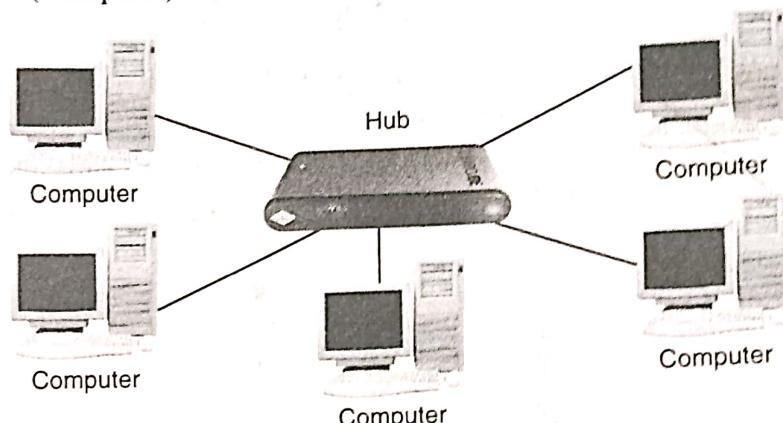


Fig. 1.8. Hub.

**2. Switch :** A switch connects the computers and other devices such as printers in a network. A switch joins multiple computers (or other network devices) together to form a single network segment. Switch is a dedicated bandwidth device. Unlike hub, the bandwidth in switch is not divided among different computers in the network. Instead each computer in the network receives the same the amount of bandwidth.

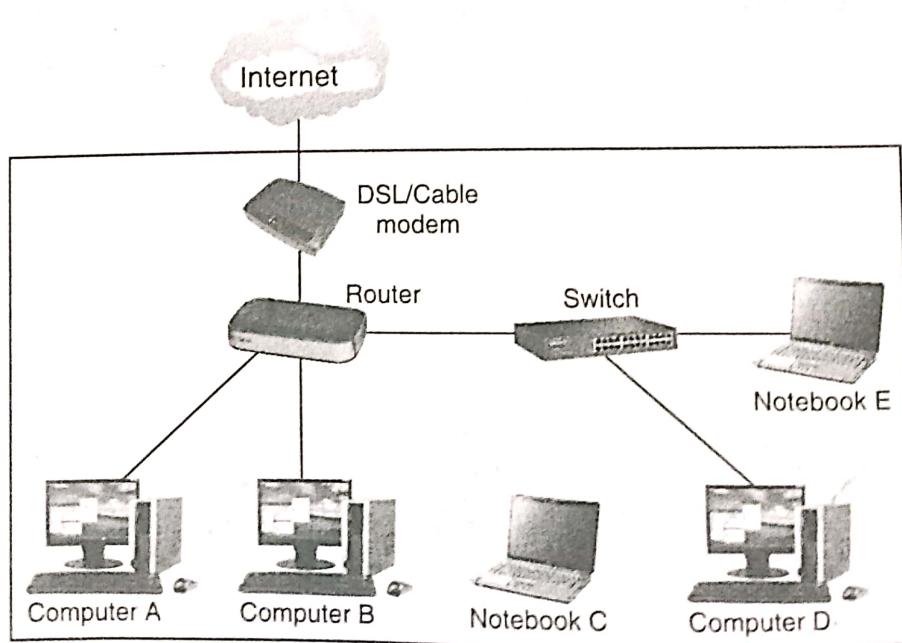
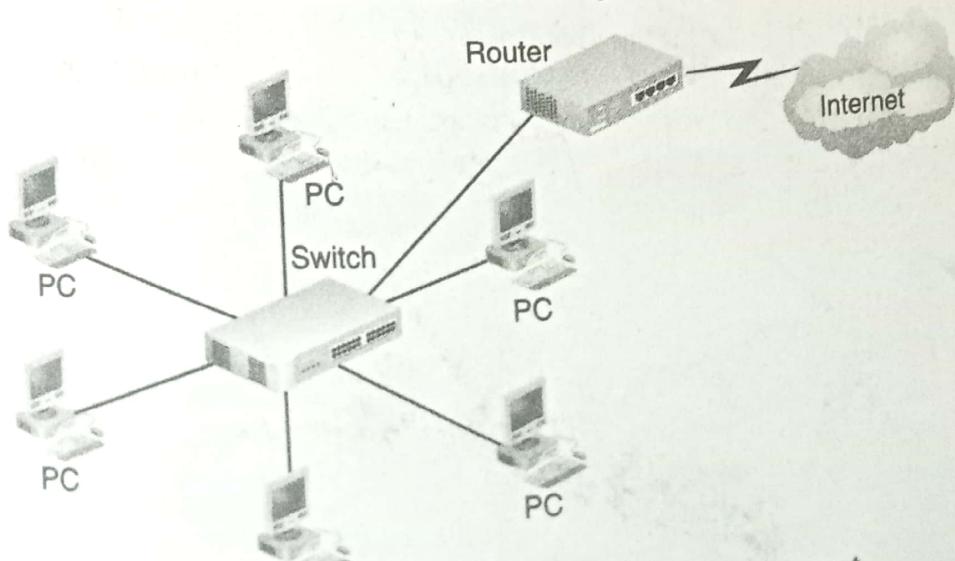


Fig. 1.9. Switch.

Differences between hub and switch are as follows :

S.No.	Hub	Switch
1.	It does not break up the network into discrete segments.	It breaks up the network into discrete segments.
2.	It is a very primitive device and is comparatively much cheaper.	It is a more sophisticated network device and is more expensive than a hub.
3.	It is a slow device as compared to switch.	Network built with switches is generally considered faster than one built with hubs.
4.	Bandwidth is shared among network elements causing slowdown.	Bandwidth is not shared and each node receives the full bandwidth and thereby, enhancing the speed.
5.	Collisions happen in hubs and that degrade speed.	Collisions don't happen in switches.
6.	It operates at physical layer.	It operates at data link layer.
7.	A hub is a "unintelligent" broadcast device – any packet entering any port is broadcast out on every port.	A switch, on the other hand, isolates ports – every received packet is sent out only to the port on which the target may be found.
8.	Hubs are half-duplex devices, i.e. both, data transmission and reception cannot take place simultaneously.	Switches are full-duplex devices, i.e. both, data transmission and reception can take place simultaneously.
9.	Network security becomes a big issue and a loophole in the case of a hub.	Network security is much better with the use of a switch, as compared to a hub.
10.	It is suitable for small networks.	It is suitable for large networks.

3. Routers : A router is a device that forwards data between computer networks. Routers select the best path to route a message, based on the destination address and origin. The router can direct traffic to prevent head-on collisions and is smart enough to know when to direct traffic.



## ► 1.7. NETWORKING TRANSMISSION MEDIA

Medium or Transmission media or Communication channel is the term used to describe the path that forms the physical channel between sender and receiver. Transmission media is what actually carries a signal from one point to another.

Communication channel (Media) can be twisted pair wire such as that used for telephone installations, coaxial cable, fiber optic cables and wireless supporting either light waves or radio waves. Wire or Fiber optic media are referred to as Bounded (Guided) media. Wireless media are referred to as Unbounded (unguided) media.

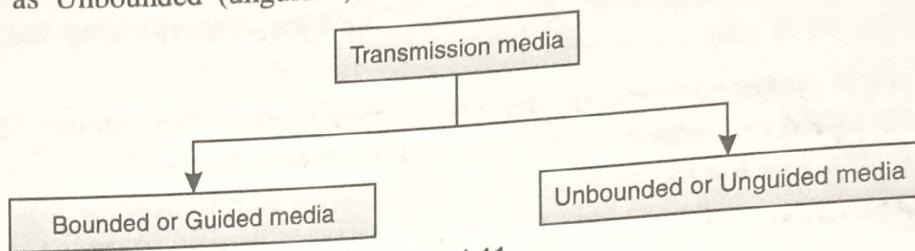


Fig. 1.11.

The various transmission media differ in the capability to support high data rates and long distance transmission.

## ► 1.8. GUIDED OR BOUNDED MEDIA

A medium such as copper wiring is referred as bounded media (or Guided media) because it holds electronic signals. Fiber optic cable is said to be bounded media as well because it holds light waves. Other media that do not physically constrain signals are considered to be unbounded media. (or unguided media)

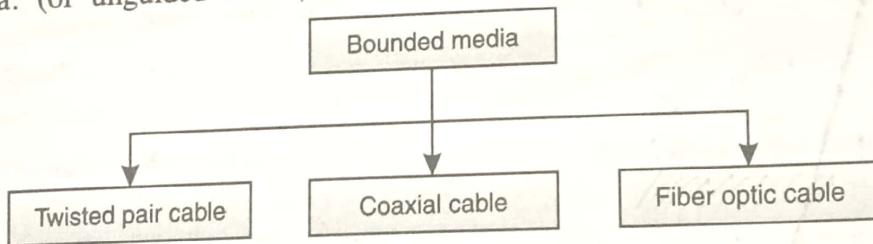


Fig. 1.12.

**1. Twisted pair cabling :** Twisted pair consists of two conductors (normally copper) each with its own plastic insulation, twisted together as shown in Fig. 1.13 below. One of the wires is used to carry signals to the receiver and the other is used as ground reference. The receiver uses the difference between the two. In addition to the signal sent by the sender on one of the wires, interference (noise) and cross-talk may affect both wires and create unwanted signals.

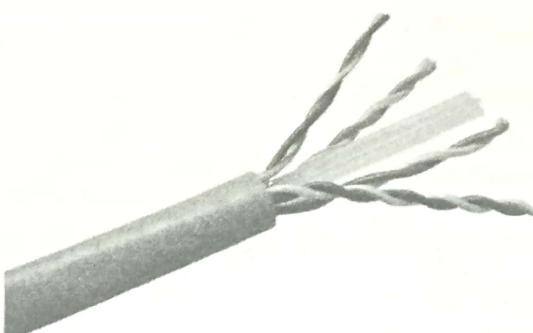


Fig. 1.13. Twisted pair cabling.

Data transmission speed upto 9600 bits per second can be achieved if the distance is not more than 100 meters. These are used in local telephone communication and for digital data transmission over short distances upto 1 km. There are two types of twisted pair cables available;

- (i) Shielded Twisted Pair (STP)
- (ii) Unshielded Twisted Pair (UTP).

(i) STP : It is used in an electrically noisy environment to limit the effects of noise absorption. STP is simply TP cabling with a foil or mesh wrap inside the outer coating. This special layer is designed to help offset interference problems. The shielding has to be properly grounded, however, or it may cause serious problems for the LAN.

(ii) UTP : It is more common of the two configurations. Twisted pair cabling with no shielding is simply called unshielded twisted pair (UTP). It is available in five categories : CAT1, CAT3, CAT4 and CAT5. *It is used in special type of LAN namely Ethernet and hence,*

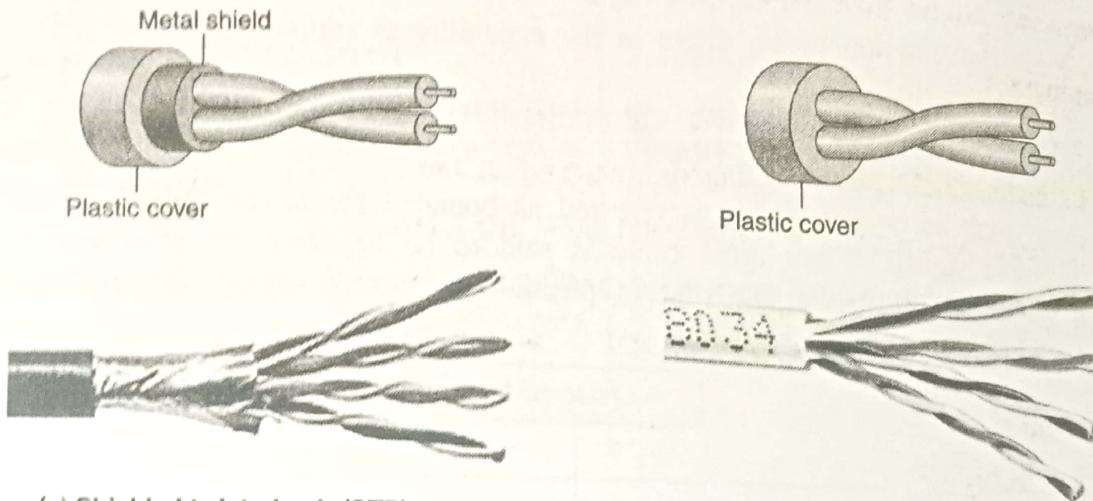


Fig. 1.14. STP and UTP.

#### Advantages :

- (i) It is cheaper and far easier to join.
- (ii) It is less susceptible to electrical interference caused by nearby equipment or wires.
- (iii) It is less likely to cause interference themselves.
- (iv) Because it is electrically "cleaner", STP wire can carry data at a faster speed.

#### Disadvantages :

- (i) It has low bandwidth.
- (ii) It is susceptible to interference and noise.

**2. Coaxial cable :** It is most commonly used transmission media for local area networks. It is suitable for applications requiring stable transmission characteristics over fairly long distances. It carries signals of higher frequency ranges than twisted pair cable. Coaxial cable is composed

of a copper conductor that serves as the "core" of the cable. This conductor is covered by a piece of insulating plastic, which is covered by a wire mesh serving as both a shield and second conductor. This second conductor is then coated by PVC or other coating.

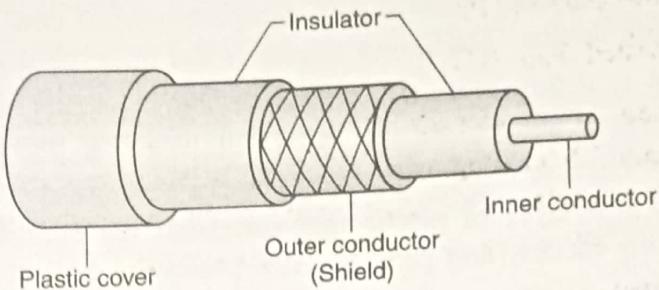


Fig. 1.15. Coaxial cable.

Coaxial cables construction and components make it superior to twisted pair for carrying data. It can carry data further and faster than twisted pair can. Coaxial cables carry signals of higher frequency ranges than twisted-pair cable

#### Advantages :

- (i) It can be used for both analog and digital transmission.
- (ii) Its better shielding allows higher transmission rate.
- (iii) Its better shielding also offers good noise immunity.
- (iv) It is less susceptible to interference and noise.
- (v) It has lower error rates as compared to twisted pair.

#### Disadvantages :

- (i) It is bulky.
- (ii) It is more expensive than twisted pair.
- (iii) It has high installation costs.

**3. Fiber optic cable :** An optical fiber or fiber optic cable is a flexible, transparent fiber made by drawing glass, which is used most often as a means to transmit light between the two ends of the fiber. These cables permit transmission over longer distances and at higher bandwidths (data rates) than wire cables.

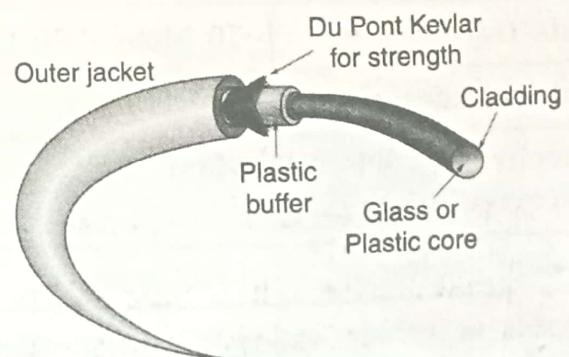
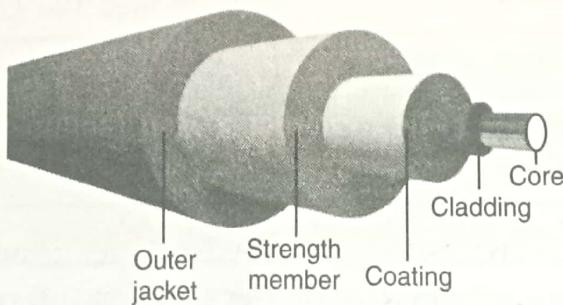


Fig. 1.16. Fiber optic cable.

	Cheapest medium.	Moderately expensive.	Expensive.
5.	Low bandwidth.	Moderately high bandwidth.	Very high bandwidth.
6.	Attenuation is very high.	Attenuation is low.	Attenuation is very low.
7.	Installation is easy.	Installation is fairly easy.	Installation is difficult.



## 1.9. MODEM

Modem is short 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 messages across phone lines.

*Modem is a device that modulates an analog carrier signal to encode digital information and also demodulates such a carrier signal to decode the transmitted information.* 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 goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data.

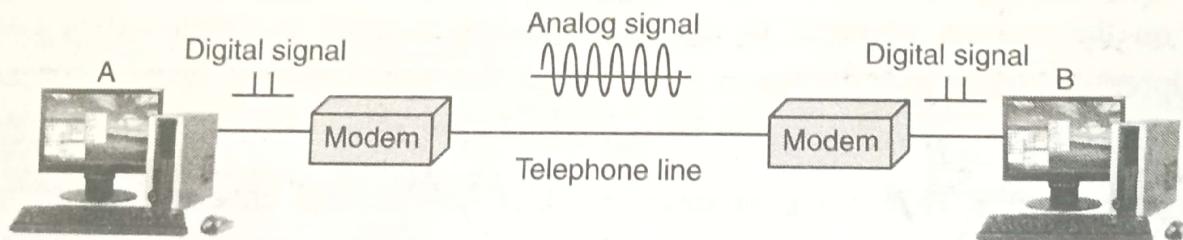
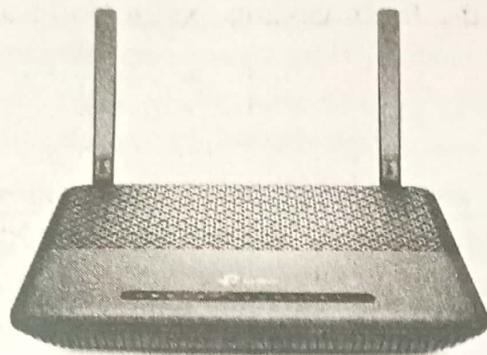


Fig. 1.17. Modulation/Demodulation.

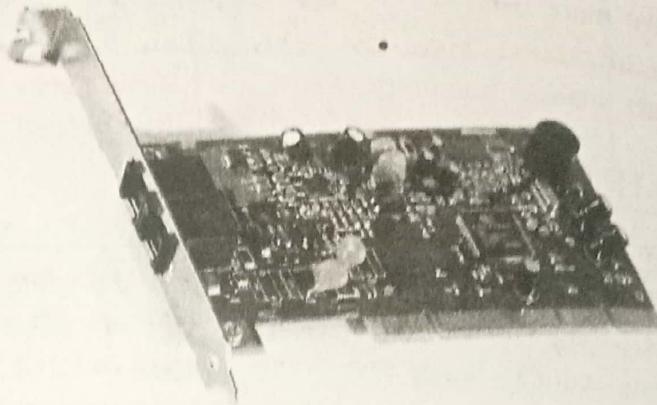
A modem is considered an input and output device because it sends data (upload/output) and receives data (download/input).

 Modems are of different types. These are as follows :

1. **External modem** : An external modem is a standalone modem that does not contain a router. It can be attached directly to a computer via USB. It will be attached to a separate router so you can share your connection with multiple network nodes around the home or office.



(a) External modem



(b) Internal modem

Fig. 1.18. Modem.

2. **Router/Modem combo** : A router/modem combo is a modem that is contained within a router, which allows multiple computers/devices to connect within one network. It is a fairly common technology now-a-days as it means networks don't need a separate modem and router.

3. **Internal modem** : An internal modem is a modem that is contained within a computer (usually by USB or as a PCI card). As most people have a range of computers and devices they want to connect to the Internet, this type of modem isn't really used anymore as it only allows the one computer to connect to the Internet.

4. **Cable, DSL, Fiber, Dial-up modems** : As well as internal and external modems, routers can also be categorized by the type of service you use to connect to the Internet. These are cable, DSL, fiber and dial-up modems. Most common are cable and DSL, although if you live in an area with fiber optic access this can really speed up your Internet.

## ► 1.10. FUNCTIONS OF MODEM

The various functions of modem are as follows :

1. **Data compression** : For reducing the amount of time, it takes for sending data and for cutting down on the amount of error in the signal, modems need to employ data compression. The data compression technique decreases the size of the signal that is needed for sending the required data.

2. **Error correction** : This is the process in which the modem checks the information they have received is undamaged. Sometimes damage of data is being noticed in the form of altered or lost data. To get rid of this issue, the modem uses error correction.

3. **Flow control** : The speed of sending information differs from modem to modem. There is a huge necessity of slowing down the speed of the fast modems so that the slow ones can

work properly. The difference of Wi-Fi speed makes the slower modem receive more data than it is capable of processing. If this starts happening the slow modems will transmit a character to the faster one. This character would be a signal to the faster modem for pausing the information transfer until the slow modem gets caught up. Similarly, when the slower modem is ready to receive more data, it will send another character to the faster modems a symbol that it is now ready to receive more data. This is how the slower and the faster modems match Wi-Fi and Internet speed.

## ► 1.11. IP ADDRESSING

Every machine on the Internet has a unique number assigned to it, called an IP address. Without a unique IP address on your machine, you will not be able to communicate with other devices, users and computers on the Internet. You can assume an IP address as if it were a telephone number, each one being unique and used to identify a way to reach you and only you.

An Internet Protocol address (IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. It designates the specific location of a device on the network. No two computers on the Internet can have the same IP address. An IP address consists of 32 bits of information. These bits are divided into four sections referred to as octets or bytes, each containing 1 byte (8 Bits).

An address space is the total number of addresses used by the protocol. If a protocol uses N bits to define an address, the address space is  $2^N$  because each bit can have two different values (0 or 1) and N bits can have  $2^N$  values. IPv4 uses 32-bit addresses, which means that the address space is  $2^{32}$  or 4,294,967,296 (more than 4 billion). There are three notations of IPv4 address :

1. Dotted decimal as in 172.16.30.56
2. Binary as in 10101100.00010000.00011110.00111000
3. Hexadecimal as in AC.10.1E.38

## ► 1.12. CLASSES OF IP ADDRESSES

IP Addresses are used to uniquely identify the hosts over a network. An IP address comprises two fields, namely the network ID and the host ID.

The network ID identifies the network to which the IP address belongs, while the host ID uniquely identifies a host on the network. The idea behind this type of division was to allocate one network ID to one organization, under which it could use the whole range of host ID's for its internal use. IPv4 addressing uses the concept of classes. This architecture is called **classful**

### ► 1.13. INTERNET DOMAIN

The Internet Domain is a way to identify and locate computers connected to the Internet. A domain name must be unique i.e. no two organizations on the Internet can have the same domain name. A domain name always contains two or more components separated by periods, called "dots". Some examples of domain names are microsoft.com, nasa.gov, bits-pilani.ac.in, etc. Once a domain name has been established, "sub-domains" can be created within domain. For example, the domain name for a large company could be "ibm.com" and within this domain, sub-domains can be created for each of the company's regional offices. The structure for this is ;

**hostname.sub-domain.second-level domain.top-level domain**

For example, sugam.delhi.ibm.com describes a single host computer name "Sugam" in the Delhi office of the IBM company. Not all domain names will have a host name and sub-domain. In addition, more than one sub-domain can be assigned. The top-level portion of a domain name describes the type of organization holding the name. The major categories of top-level domain are ;

com	Commercial entities
edu	Educational institutions
net	Organizations directly involved in the Internet operations, such as network providers and network information centres
org	Miscellaneous organizations that don't fit any other category, such as non-profit groups
gov	Government organization
mil	Military establishments
country codes	A two letter abbreviation for a particular country e.g. "in" for India, "UK" for United Kingdom or "Fr" for France

Each domain name corresponds to numeric IP (Internet Protocol) address. An IP address takes the form of four numbers, each one between 0 and 255, separated by periods. The Internet uses the numeric IP address to send data. For example, you may be connecting to WWW server with the domain name "www.microsoft.com" but as far as the network is concerned, you are connecting to web server with the IP address associated with that domain name.

### ► 1.14. DOMAIN NAME SERVER

Domain Name Server (DNS) completes the task of matching domain names to IP (Internet Protocol) address. Domain names and their corresponding IP address must be unique. The Domain names system is a collection of databases that contain information about domain names and their corresponding IP address. Domain name servers are computers that translate domain names to IP address.

The Domain Name Systems (DNS) is the phonebook of the Internet. Internet users access information online through domain names, like www.google.com or www.rediff.com. Web database stores domain name and their ip address

browsers interact through Internet Protocol (IP) addresses. DNS translates domain names to IP addresses so browsers can load Internet resources. Each device connected to the Internet has a unique IP address which other machines use to find the device. DNS servers eliminate the need for humans to memorize IP addresses such as 192.168.1.1.

### ► 1.15. TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL (TCP/IP)

TCP/IP stands for Transmission Control Protocol/Internet Protocol. *TCP/IP is actually a collection of protocols or rules, that govern the way data travels from one machine to another across networks.* TCP is a connection-based protocol, offering error correction and guaranteed delivery of data via what is known as *flow control*. Flow control determines when the flow of a data stream needs to be stopped, and previously sent data packets should be re-sent due to problems such as *collisions*, for example, thus ensuring complete and accurate delivery of the data.

Internet Protocol, the “IP” of TCP/IP is a connectionless protocol which deals only with network packet routing using the IP Datagram as the basic unit of networking information. The IP Datagram consists of a header followed by a message. The IP does the following :

1. Envelopes and addresses the data.
2. Enables the network to read the envelope and forward the data to its destination.
3. Defines how much data can fit in a single “envelope” (a packet).

The Transmission Control Protocol is the “TCP” of TCP/IP and enables network hosts to establish connections which may be used to exchange data streams. TCP also guarantees that the data between connections is delivered and that it arrives at one network host in the same order as sent from another network host. The TCP component does the following :

1. Breaks data into packets that the network can handle efficiently.
2. Verifies that all the packets arrive at the destination
3. Reassembles the data.

There are only four layers in TCP/IP reference mode ;

1. Application layer : Application layer is the topmost layer in the TCP/IP model. It is responsible for handling high-level protocols, issues of representation. This layer allows the user to interact with the application. When one application layer protocol wants to communicate with another application layer, it forwards its data to the transport layer.

2. Transport layer : The transport layer is responsible for the reliability, flow control and correction of data which is being sent over the network. The two protocols used in the transport layer are user datagram protocol and transmission control protocol.

3. Internet layer : Internet layer is also known as the network layer. The main responsibility of the Internet layer is to send the packets from any network and they arrive at the destination irrespective of the route they take.

4. Network access layer : This layer corresponds to the combination of data link layer and physical layer of the OSI model. It defines how the data should be sent physically through the network. This layer is mainly responsible for the transmission of the data between two devices

on the same network. The functions carried out by this layer are encapsulating the IP datagram into frames transmitted by the network and mapping of IP addresses into physical addresses.

### ► 1.16. INTERNET SERVICE PROVIDER (ISP)

*Internet Service Provider (ISP) is a company that provides customers with Internet access.* Data may be transmitted using several technologies including dial-up, DSL, cable modem, 3G, 4G, 5G, wireless or dedicated high-speed interconnects. They offer following services :

1. Internet access
2. Domain name registration
3. Dial-up access
4. Leased line access.

ISPs also provide other services, such as television services. The services and service combinations may be unique to each ISP. An Internet service provider is also known as an Internet access provider (IAP). The various ISP's in India are BSNL, Reliance Jio, Airtel, Vodafone, Connect etc.

### ► 1.17. INTRANET

*An Intranet is a secure and private network that shares data of application resources via Internet Protocol (IP).* An Intranet differs from the Internet, which is a public network. It may consist of many inter-linked local area networks. Typically, an Intranet includes connections through one or more gateway computers to the outside Internet. The main purpose of an Intranet is to share company information and computing resources among employees. An Intranet can also be used to facilitate working in groups and for teleconferences.

### ► 1.18. E-MAIL

*E-mail stands for Electronic Mail. It allows an Internet user to send a mail (message) to another Internet user in any part of the world.* E-mail is a text based mail consisting of lines of text and can include attachments such as audio messages, pictures and documents. An E-mail address identifies a person and the computer for purposes of exchanging electronic mail messages. It saves time and money, is fast to use and less expensive.

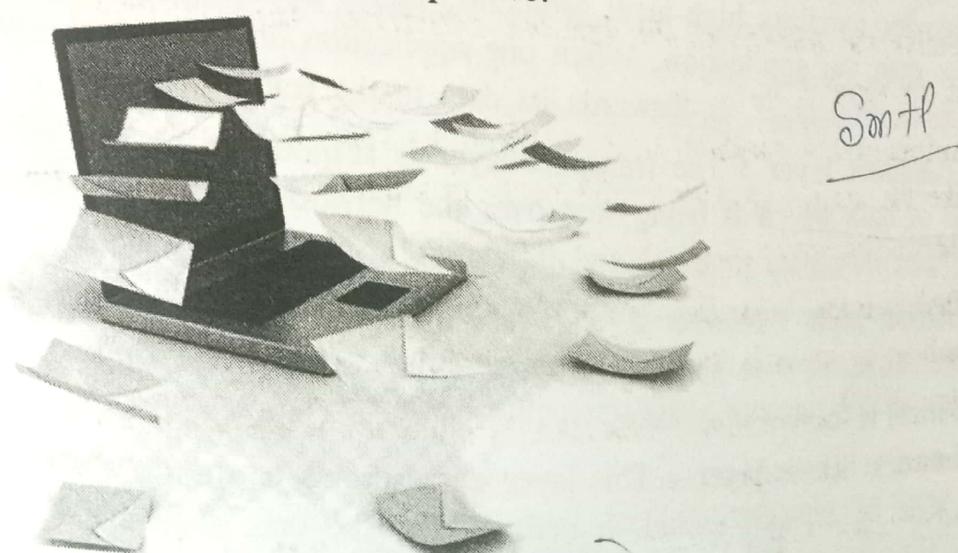


Fig. 1.20. E-mail.

SNMP - Simple network management  
Protocol

1. E-mail has created an information overload. People have to spend time filtering what is relevant and need to be read from the hundreds of mails that one receives can become a daunting task.
2. It can become a distraction and can prevent people from doing any productive work.
3. **Crowded inbox :** Over a period of time, the e-mail inbox may get crowded with mails. It becomes difficult for the user to manage such a huge chunk of mails.
4. **Need to check the inbox regularly :** In order to be updated, one has to check his E-mail account regularly.
5. E-mails may carry viruses. These are small programs that harm your computer system.

The comparison between E-mail and postal mail is as follows :

S.No.	E-mail	Postal mail
1.	<b>Fast :</b> E-mail takes few minutes to deliver messages all around the world.	<b>Slow :</b> Snail mail takes longer time to deliver messages – from four to five days to weeks depending on the destination.
2.	<b>Cheap :</b> E-mail costs just the cost of a local phone call.	<b>Expensive :</b> Snail mail costs as per the National and International tariff rates.
3.	<b>Convenient :</b> In E-mail, for sending the similar message to many people, only the address book (on the computer) needs to be ticked and the send button of the mail is to be clicked.	<b>Time consuming :</b> In postal mail, for sending the same message to many people, the same number of envelopes with addresses will have to be used each along with a copy of the message.
4.	<b>Mode of travel :</b> E-mail is passed on from one computer to another over the network. Each computer on the path routes the message further until it reaches the right destination.	<b>Mode of travel :</b> Postal mail makes stops at different postal stations which come on the way while travelling by water/road etc. till it reaches the destination.
5.	Rate independent of quality and data type. All sorts of graphics, sound, video, text image and multimedia files of any length can be sent over the Internet.	Rate depends on the weight of mailing document and the destination.
6.	<b>Legal :</b> With the advent of new cyber laws, E-mail documents are considered legal.	<b>Legal :</b> Postal mail documents are valid proofs and are legal.

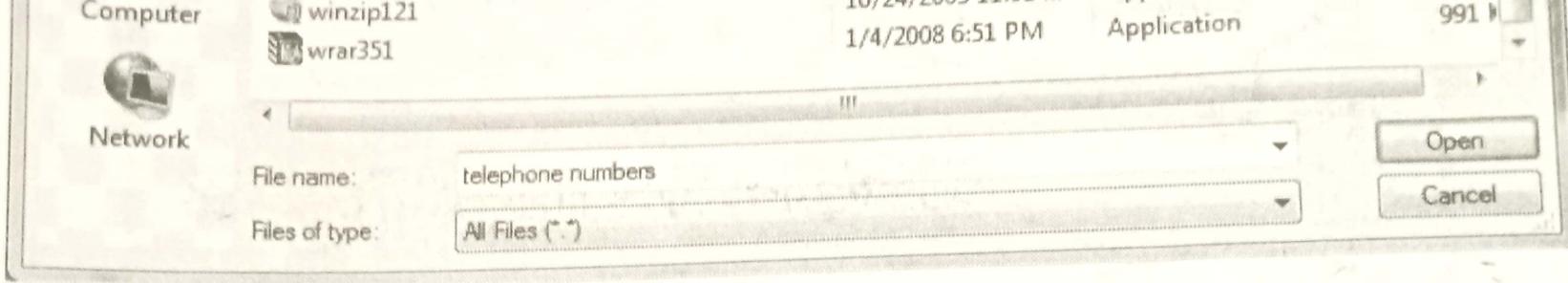


Fig. 1.28. Attaching files.

Click on the down arrow of the “Look in” Window to find the file on your computer. Click on the file to select and click Open. Gmail will automatically attach the files to your message. This may take a little time, depending on the size of your file. Once the file is attached, you'll see the name and size displayed.

6. Click Send to send the E-mail.

## ► 1.19. URL (UNIFORM RESOURCE LOCATOR)

A URL identifies a particular Internet resource e.g. a web page, a gopher server, a library catalog, an image or a text file. URLs represent a standardized addressing scheme for the Internet resources and help users locate these resources by indicating exactly where they are. Every resource available via the World Wide Web has a unique URL.

URLs consist of letters, numbers, punctuation and special characters. *The basic structure of a URL is hierarchical and the hierarchy moves from left to right.* URLs are translated into numeric addresses using the Internet Domain Name System (DNS). The numeric address is actually the

- (v) E-mail stands for .....
- (vi) A ~~router~~ is used to route data packets between two networks.
- (vii) ~~Address~~ is the process of determining the identity of a user who is attempting to access a system.
- (viii) Internet is ~~network~~ of networks.
- (ix) The ~~medium~~ is the physical path over which a message travels.
- (x) Fibre optic cables carry data and signal in the form of ~~light~~.
- (xi) Transmission media are usually categorized as ; ~~Guided~~ and ~~unguided~~ media.
- (xii) The inner core of optical fibre is ~~Glass~~ in composition.

Ans. (i) same (ii) modem (iii) Dial-up (iv) Internet (v) Electronic mail (vi) router (vii) IP address (viii) network (ix) medium (x) Light (xi) Guided, Unguided (xii) Glass.

Q.2. State whether the following statements are true or false :

- (i) FTP stands for File Transfer Protocol. ✓
- (ii) WWW stands for World Wide Web. ✓
- (iii) ISP does not help to provide connection to Internet. ✗
- (iv) TCP/IP is a communication protocol. ✓
- (v) IP address contain alphabets only. ✗
- (vi) Dial-up connections transmit data at a faster rate than broadband connections. ✗
- (vii) One can shop over the Internet even during the night. ✓
- (viii) A modem is necessary to connect to the Internet over a telephone line. ✓
- (ix) A Local Area Network connects distant computers. ✗
- (x) Internet is network of networks. ✓
- (xi) A computer network uses both hardware and software. ✓
- (xii) The second layer of TCP/IP is transport layer. ✓

Ans. (i) True (ii) True (iii) False (iv) True (v) False (vi) False (vii) True (viii) True (ix) False (x) True (xi) True (xii) True.

Q.3. What do you mean by computer network ?

Ans. Computer network is an interconnection of geographically distributed multiple computers in such a way that meaningful transmission and exchange of information become possible among them. The goal is to transfer and exchange of data between the computers. The objectives of computer network are as follows :

- (i) Sharing of information
- (ii) Sharing of resources (Hardware and software)
- (iii) Sharing of processing load.

Q.4. What is the purpose of modem ?

Ans. Modem is short 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 messages across phone lines.

**Q.5. What do you understand by video conferencing ?**

**Ans.** A video conference is a live connection between people in separate locations for the purpose of communication, usually involving audio and often text as well as video. Video conferencing provides transmission of static images, text, full-motion video images and high-quality audio between multiple locations. Video conferencing is used as a medium for communication i.e. it makes it possible to have live communication or connection between people sitting in separate locations through video which may also involve audio and text messages as well. Video conferencing helps in improving the productivity of the businesses and also eliminates the cost and time required to travel from one place to another.

**Q.6. What do you mean by ISP ?**

**Ans.** ISP stands for Internet Service Provider. Internet service provider provides the Internet connectivity to the customers. The customers who wish to have Internet connection apply to the ISP and pays a certain amount for obtaining the connection. The ISP will in turn provide the connection to the customers.

**Q.7. What do you mean by IP address ? Explain.**

**Ans.** An IP address is a unique number that identifies computers on the Internet. An IP address consists of four numbers separated by periods. Each number must be between 0 and 255. IP addresses are unique. No two computers can have the same IP address.

**Q.8. What is a computer network ? What are its advantages ?**

**Ans.** A computer network is a interconnection of geographically distributed computers in such a way that meaningful transmission and exchange of information become possible among them. The networks are needed because of following reasons :

(i) **Exchange of information** : With the networks, it is possible to exchange information at the far remote places and at a faster rate.

(ii) **Sharing of resources** : The networking of computers permit the sharing of resources e.g. user sitting at site A may be using a laser printer available at site B and user at site B may access a file that resides at site A.

(iii) **Reliability** : Networking also supports the critical function of backup. In the event a computer fails, its counterpart can assume its function and workload.

(iv) **Cost factor** : Because of sharing of resources, the networking gives better price/performance ratio.

**Q.9. Give some examples of domain names and URLs. How is a domain name different from a URL ?**

**Ans.** A domain name is a way to identify and locate computers connected to the Internet. A domain name must be unique i.e. no two organizations on the Internet can have the same domain name. A domain name always contains two or more components separated by periods, called "dots". Some examples of domain names are microsoft.com, nasa.gov, bits-pilani.ac.in, etc.

URL is the abbreviation of *Uniform Resource Locator*, the global address of documents and other resources on the World Wide Web. The first part of the address indicates what protocol to use and the second part specifies the IP address or the domain name where the resource is located.

Domain names are used to identify one or more IP addresses. For example, the domain name microsoft.com represents about a dozen IP addresses. Domain names are used in URLs to

## Internet Basics

identify particular Web pages. For example, in the URL <http://www.eagleprakashan.com/index.html>, the domain name is eagleprakashan.com

**Q.10.** Enlist the various kinds of Internet connections.

**Ans.** There are a number of ways by which a computer or electronic device can get connected to Internet. These are as the following :

- (i) Dial-up connection
- (ii) DSL
- (iii) ISDN
- (iv) Cable
- (v) Broadband connection
- (vi) Satellite Internet connection or Leased line
- (vii) Cellular Internet.

**Q.11.** What is E-mail ?

**Ans.** E-mail or Electronic mail is an electronic message sent from one computer to another. You can send or receive personal and business related messages and attachments like pictures or other documents. Just as a letter or document stops at the different postal stations along its way, E-mail is passed from one computer to another as it travels along the network. Each computer reads the E-mail address and routes it to another computer until it eventually reaches its destination. It is then stored in an electronic mail box.

**Q.12.** What are the advantages and limitations of E-mail ?

**Ans.** **Advantages of E-mail :** Advantages of E-mail are as the following :

- (i) It is very fast, saves time and money, easy to use and less expensive than post.
- (ii) Unlike the telephone, the persons communicating with each other need not to be available at the same time.

**Limitations of E-mail :** Limitations of E-mail are as the following :

- (i) E-mail has created an information overload.
- (ii) It can become a distraction and can prevent people from doing productive work.

**Q.13.** What do you mean by IP Address ?

**Ans.** An IP address is a numeric identifier assigned to each machine on an IP network. It designates the specific location of a device on the network. Every host and router on the Internet has an IP address, which encodes its network number and host number. The combination is unique, no two computers on the Internet have the same IP address. An IP address consists of 32 bits of information. These bits are divided into four sections referred to as octets or bytes, each containing 1 byte (8 Bits). An IP address comprises two fields, namely the network ID and the host ID. The network ID identifies the network to which the IP address belongs, while the host ID uniquely identifies a host on the network. In classful addressing, the address space is divided into five classes : A, B, C, D and E. Each class occupies some part of the address space.

**Q.14.** What do you mean by E-commerce ? Explain.

**Ans.** E-commerce means doing business over Internet. E-commerce refers to businesses and consumers buying and selling products online. E-commerce (e-commerce) or electronic commerce, is the

purchasing, selling, and exchanging of goods and services over computer networks. E-commerce does not only refer to the selling of physical products, it can also refer to the selling of services where payments for the services are made online. Ecommerce can be broken into four main categories : B2B, B2C, C2B and C2C.

(i) **B2B (Business-to-Business)** : Companies doing business with each other such as manufacturers selling to distributors and wholesalers selling to retailers. Pricing is based on quantity of order and is often negotiable.

(ii) **B2C (Business-to-Consumer)** : Businesses selling to the general public typically through catalogs utilizing shopping cart software. The majority of E-commerce web sites on the Internet are retail stores selling products directly to the public.

(iii) **C2B (Consumer-to-Business)** : A consumer posts his project with a set budget online and within hours companies review the consumer's requirements and bid on the project. The consumer reviews the bids and selects the company that will complete the project.

(iv) **C2C (Consumer-to-Consumer)** : There are many sites offering free classifieds, auctions, and forums where individuals can buy and sell e.g. Web sites like Quickr, OLX etc.

#### **Q.15. Explain the various classes of IP addressing.**

**Ans.** An IP address is a numeric identifier assigned to each machine on an IP network. It designates the specific location of a device on the network. Every host and router on the Internet has an IP address, which encodes its network number and host number. The combination is unique, no two computers on the Internet have the same IP address. An IP address consists of 32 bits of information. These bits are divided into four sections referred to as octets or bytes, each containing 1 byte (8 Bits). An IP address comprises two fields, namely the network ID and the host ID. The network ID identifies the network to which the IP address belongs, while the host ID uniquely identifies a host on the network. In classful addressing, the address space is divided into five classes : A, B, C, D and E. Each class occupies some part of the address space.

(i) **Class A** : This is the first class of IP addresses. Class A IP addresses are identified by first bit being zero. Consider the following network address :

0xxxxxx

If we turn the other 7 bits all off and then turn all on, we will find the Class A range of network addresses :

00000000 = 0

01111111 = 127

So, a Class A network is defined in the first octet between 0 and 127.

(ii) **Class B** : In a Class B network, the first bit of the first byte must always be turned on (i.e. 1) and the second bit must always be turned off (i.e. 0). If we turn the other 6 bits off (i.e. 0) and then all on (i.e. 1), we will find the range for Class B network as follows :

10000000 = 128

10111111 = 191

Class B addresses fall in the range from 128.0.0.0 through 191.255.255.255.

(iii) **Class C** : In a Class C network, the first 2 bits of octet are always turned on (i.e. 1), but the third bit is always off (i.e. 0). Therefore, a Class C address has first three bits as

110. If we turn the other 5 bits off (i.e. 0) and then all on (i.e. 1), we will find the range for Class C network as follows ;

$$\underline{11000000} = 192$$

$$\underline{11011111} = 223$$

Class C addresses fall in the range from 192.0.0.0 through 223.255.255.255.

(iv) **Class D** : In a Class D network, the first 3 bits of octet are always turned on (i.e. 1), but the fourth bit is always off (i.e. 0). Therefore, a Class D address has first four bits as 1110. If we turn the other 4 bits off (i.e. 0) and then all on (i.e. 1), we will find the range for Class D network as follows ;

$$\underline{11100000} = 224$$

$$\underline{11101111} = 239$$

Class D addresses fall in the range from 224.0.0.0 through 239.255.255.255. Class D are reserved for multicast addresses.

(v) **Class E** : In a Class E network, the first 4 bits of octet are always turned on (i.e. 1). Therefore, a Class E address has first four bits as 1111. If we turn the other 4 bits off (i.e. 0) and then all on (i.e. 1), we will find the range for Class D network as follows ;

$$\underline{11110000} = 240$$

$$\underline{11111111} = 255$$

Class E addresses fall in the range from 240.0.0.0 through 255.255.255.255. Class E addresses are reserved, meaning that they should not be used on IP networks.

*Q.16. Write a short note on TCP/IP.*

*10 Marks*

Ans. TCP/IP stands for Transmission Control Protocol/Internet Protocol. *TCP/IP is actually a collection of protocols or rules, that govern the way data travels from one machine to another across networks.* TCP is a connection-based protocol, offering error correction and guaranteed delivery of data via what is known as *flow control*. Flow control determines when the flow of a data stream needs to be stopped, and previously sent data packets should be re-sent due to problems such as *collisions*, for example, thus ensuring complete and accurate delivery of the data.

Internet Protocol, the "IP" of TCP/IP is a connectionless protocol which deals only with network packet routing using the IP Datagram as the basic unit of networking information. The IP Datagram consists of a header followed by a message. The IP does the following :

- (i) Envelopes and addresses the data.
- (ii) Enables the network to read the envelope and forward the data to its destination.
- (iii) Defines how much data can fit in a single "envelope" (a packet).

The Transmission Control Protocol is the "TCP" of TCP/IP and enables network hosts to establish connections which may be used to exchange data streams. TCP also guarantees that the data between connections is delivered and that it arrives at one network host in the same order as sent from another network host. The TCP component does the following :

- (i) Breaks data into packets that the network can handle efficiently.
- (ii) Verifies that all the packets arrive at the destination
- (iii) Reassembles the data.

**Q.17. Write a short note on Internet ?**

**Ans.** The Internet is a global network of billions of computers and other electronic devices. It is the world's largest computer network, the network of networks, scattered all over the world. It is a huge network of computers that links many different types of computers all over the world. These networks are spread over various countries, various continents and are linked through satellite, via telephone lines.

The World Wide Web (WWW) is the most popular and promising method of accessing the Internet. WWW or Web is a repository of information spread all over the world and linked together. The World Wide Web was created in the year 1989 at the European Particle Physics Laboratory in Geneva, Switzerland, as a method for incorporating footnotes, figures and cross-reference into online hypertext documents. WWW is a hypertext document and is a specially encoded file that uses the hypertext markup language (HTML).

This language allows a document's author to embed hypertext links (also called hyperlinks or just links) in the document. Hypertext links are the foundation of the World Wide Web. The WWW provides a network of interactive documents and the software to access them. It is based on documents called pages that combine text, pictures, forms, sound, animation and hypertext links. To navigate the WWW, users "surf" from one page to another by pointing and clicking on the hyperlinks in text or graphics.

**Q.18. What are the applications of Internet ?**

**Ans.** Computer networks provide several important advantages to enterprises and individuals. These are as the following :

- (i) **On-line communication** : The electronic mail (E-mail) service on the Internet is extensively used today by computer users around the world for faster communication with each other.
- (ii) **On-line journals and magazines** : The Internet has literally thousands of electronic subscriptions that can be found both for free and low cost.
- (iii) **On-line shopping** : The Internet has also facilitated the introduction of a new market concept that consists of virtual shops. Through the Internet people can purchase, sell, advertise and distribute products.
- (iv) **Worldwide video conferencing** : Businessmen and institutions use the Internet for video conferencing through which people can see each other talking on their computer screens and can hear each other's voice through a special audio device fixed in their computers.
- (v) **Exchange of views on topics of common interest** : The Internet has a number of news groups. Each news group allows a group of users to exchange their views on some topic of common interest.
- (vi) **Individuals** use the Internet for entertainment, information gathering and communications with others.
- (vii) **Scientists and scholars** use the Internet to communicate with colleagues, to perform research, to search the requisite information and to publish papers and articles.
- (viii) **E-mail** : E-mail is an online correspondence system. Using Internet, you can send and receive instant electronic messages, which are delivered instantly to people anywhere in the world.
- (ix) **Access information** : The Internet is a virtual sea of information. Any kind of information on any topic is available on the Internet. The 'search engines' on the Internet can help you to find data on any subject that you need.
- (x) **Online chat** : There are many 'chat rooms' on the web that can be accessed to meet new people, make new friends, as well as to stay in touch with old friends.

- Q.19.** Write down some disadvantages of Internet.
- Ans.** The various disadvantages of Internet are as follows :
- (i) **Theft of personal information** : Electronic messages sent over the Internet can be easily snooped and tracked, revealing who is talking to whom and what they are talking about. On Internet your personal information such as your name, address, credit card, bank details and other information can be accessed by hackers.
  - (ii) **Pornography** : This is a very serious issue concerning the Internet, especially when it comes to young children. There are thousands of pornographic sites on the Internet that can be easily found.
  - (iii) **Spamming** : This refers to sending unwanted E-mails in bulk, which serve no purpose and unnecessarily choke up the entire system.
  - (iv) **Privacy and security issues** : Privacy is the main reason that non-online shoppers do not shop online.
  - (v) **Virus threat** : Computers are mainly getting these viruses from the Internet. Virus is a program which disrupts the normal functioning of computer systems. Computers attached to Internet are more prone to virus attacks and they can end up into crashing whole hard disk, causing considerable headache.

**Q.20.** Differentiate between hub and switch.

**Ans.** Differences between hub and switch are as follows :

S.No.	Hub	Switch
1.	It does not break up the network into discrete segments.	It breaks up the network into discrete segments.
2.	It is a very primitive device and is comparatively much cheaper.	It is a more sophisticated network device and is more expensive than a hub.
3.	It is a slow device as compared to switch.	Network built with switches is generally considered faster than one built with hubs.
4.	Bandwidth is shared among network elements causing slowdown.	Bandwidth is not shared and each node receives the full bandwidth and thereby, enhancing the speed

## Review Questions

1. What do you mean by computer network ? Why it is used ?
2. What do you mean by Internet ? Write the uses of Internet.
3. What do you mean by modem ? Why modem is used ? Explain.
4. What is the significance of transmitter and receiver in a wireless communication ? Explain.
5. What is the purpose of leased line ? Explain.
6. What is the purpose of TCP/IP explain.
7. What do you mean by FTP ? Explain.
8. What is the purpose of E-commerce ? Explain.
9. What is the difference between broadband and dial-up connection ? Explain.
10. What is the difference between 3G and 4G ? Explain.

# Internet Connectivity

The Internet is a **global network** of billions of computers and other electronic devices. It is the world's largest computer network, the network of networks, scattered all over the world. It is a huge network of computers that links many different types of computers all over the world. These networks are spread over various countries, various continents and are linked through satellite, via telephone lines. There are a number of ways by which a computer or electronic device can get connected to Internet. These are as the following.

## ► 2.1. INTERNET THROUGH WIRED CONNECTION

### ■ 2.1.1. Dial-up Connection

A dial-up connection is a temporary connection, set up between your computer and ISP server. To make a dial-up connection you need ;

1. Computer
2. Modem
3. An account from ISP.

Internet Service Provider (ISP) is a company that provides access to the Internet. Dial-up is an analog connection because data is sent over an analog, public telephone network. The modem converts received analog data to digital and vice-versa.

This connection is established by dialing the telephone numbers of ISP through your modem. After dialing the number you have to enter a **Username** and **Password** provided to you by ISP

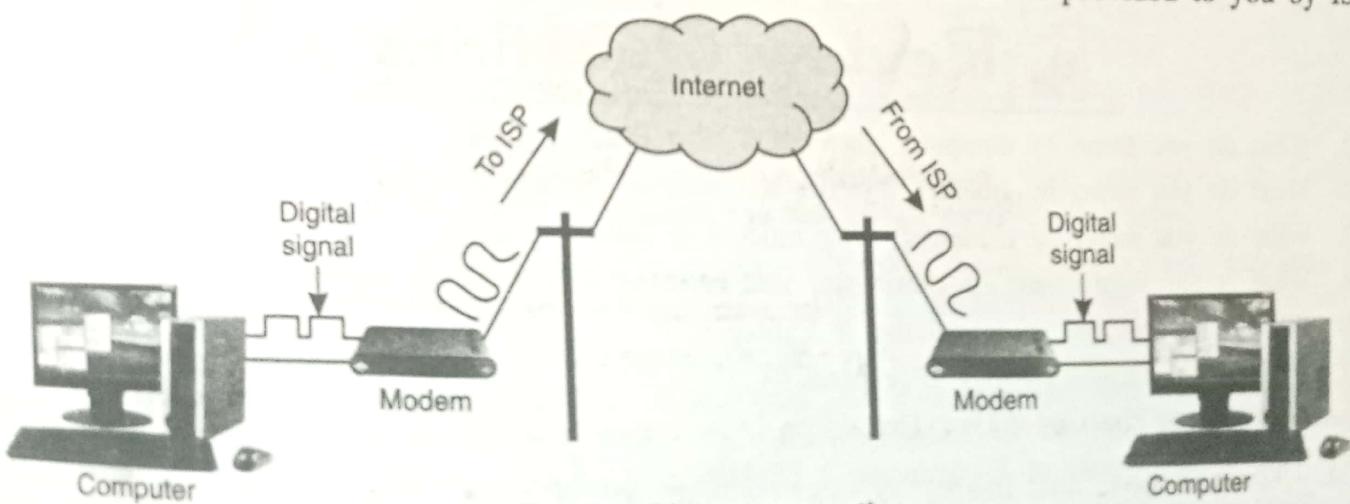


Fig. 2.1. Dial-up connection.

and then connection is made to the server of ISP. The server of ISP is connected to Internet and in this way your PC gets connected to Internet. Dial-up connection is economical but is very slow. Dial-up connection makes the Internet available to you as long as you remain connected. As soon as you disconnect your computer from ISP server, the Internet is not available any more. The various ISP's are VSNL (Videsh Sanchar Nigam Limited), MTNL (Mahanagar Telephone Nigam Limited), BSNL (Bharat Sanchar Nigam Limited) etc. Dial-up access is cheap but slow connection. Speed of dial-up connection varies from 28 kbps to 56 kbps.

**Advantages :** The various advantages of dial-up connection are as the following :

1. It is a low price connection.
2. It is easily available.
3. It provides secure connection.
4. It is easy to setup.

**Disadvantages :** The various disadvantages of dial-up connection are as the following :

1. The quality of the connection is not always good.
2. The speed of connection is very slow.
3. It requires phone line.
4. Your phone line is occupied when you are connected to the Internet.
5. Sometimes, you may get a busy signal when calling the access numbers of ISP.

### ■ 2.1.2. DSL

DSL stands for Digital Subscriber Line. DSL is a very high-speed connection that uses the same wires as a regular telephone line. A DSL line is an "always-on" connection provided through phone line. Speed of DSL Internet varies from 128 kbps to 8 Mbps.

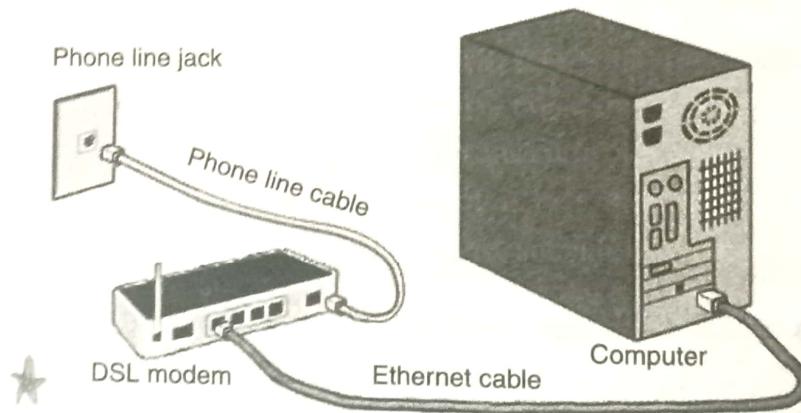


Fig. 2.2. DSL connection.

**Advantages :** The various advantages of DSL are as the following :

1. You can leave your Internet connection open and still use the phone line for voice calls.
2. The speed is much higher than dial-up connection.

44

3. DSL doesn't necessarily require new wiring ; it can use the phone line you already have.
4. It has high bandwidth.

**Disadvantages :** The various disadvantages of DSL are as the following :

1. A DSL connection works better when you are closer to the provider's central office. The farther away you get from the central office, the weaker the signal becomes.
2. The connection is faster for receiving data than it is for sending data over the Internet.
3. This service is not available everywhere.
4. It is distance dependent.

### ■ 2.1.3. ISDN

Integrated Services Digital Network (ISDN) is an international communications standard for sending voice, video and data over digital telephone lines or normal telephone wires. ISDN speeds range from 64 kbps to 128 kbps. ISDN establishes a connection to your service provider when you access the Internet. However, ISDN is not easy to install and troubleshoot and requires you to have an ISDN box installed by your telephone company.

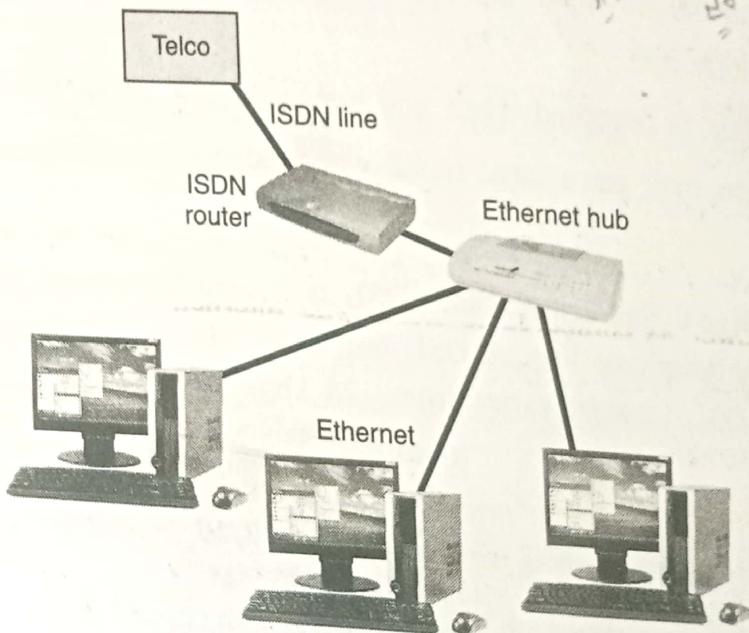


Fig. 2.3. ISDN connection.

**Advantages :** The advantages of ISDN are as the following :

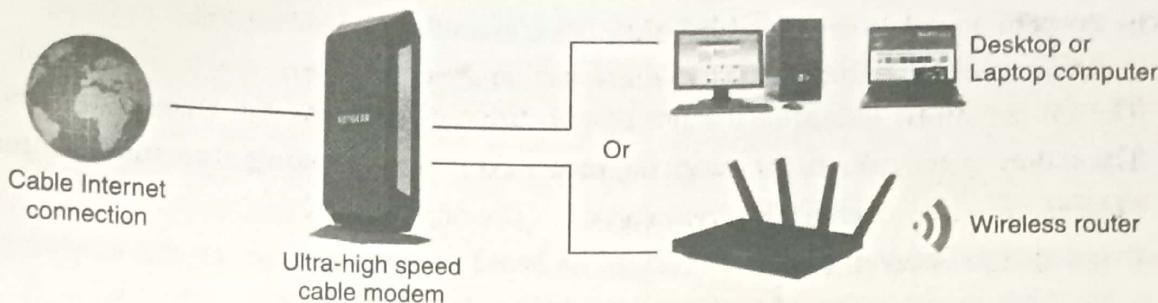
1. It provides symmetrical transfer rates and the transmit rate is the same as the receiver rate.
2. It is competitively priced as compared to other technologies.

**Disadvantages :** The disadvantages of ISDN are as the following :

1. The disadvantage of ISDN lines is that it is very costly than the other typical telephone system.
2. ISDN requires specialized digital devices just like telephone company.

### ■ 2.1.4. Cable

Cable provides Internet access using the same cables that transmit cable television. Cable connections are faster than dial-up and DSL connections.



**Fig. 2.4. Cable connection.**

A cable is similar to a DSL line. Speed of cable Internet varies from 512 kbps to 100 Mbps. Cable connections are considered one of the best types of Internet connection available to the home user.

**Advantages :** The advantages of cable Internet are as the following :

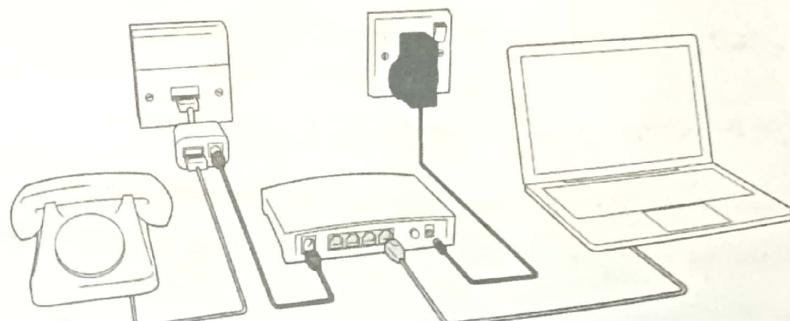
1. It operates without a phone line, so you always have an on connection, which means you can stay connected at all times.
2. It is much faster than some of the other types of broadband Internet such as dial-up, satellite and DSL.
3. It supports activities such as online gaming.

**Disadvantages :** The disadvantages of cable Internet are as the following :

1. Its speed is slower as compared to fibre-optic Internet.
2. It is not available in all places.

### ■ 2.1.5. Broadband Internet

Broadband stands for Broad Bandwidth. Broadband or High speed Internet is the term given to an Internet connection at or above 256 kbps. Broadband is a type of data transmission in which a single medium or wire can carry several channels or communication paths at once. Broadband connections are always on. That means if your computer is on, you will be connected to the Internet with no dial-up involved. For a broadband connection you need the following device : Telephone line, Modem and Computer. Broadband connection is of two types ; Copper



**Fig. 2.5. Broadband connection.**

**Disadvantages :** Some disadvantages of leased line are as the following :

- (i) Installations can typically take long time.
- (ii) More expensive than broadband.

#### Comparison between leased line and broadband Internet :

S.No.	Leased Line Internet	Broadband Internet
1.	A leased line is a dedicated connection between your premises and local Internet service provider.	Broadband is not a dedicated connection between your premises and local Internet service provider.
2.	It is fixed bandwidth and offers identical upload and download speeds and is not subject to contention with other users.	It is variable bandwidth, asymmetric, meaning faster for downloads than for uploads and subject to contention with other users.
3.	Leased line connectivity is not shared with multiple users. It is a dedicated line. A 2 Gbps Internet leased line gives 2 Gbps of performance as it is a dedicated connection without any sharing.	Broadband connectivity is shared with multiple users in an area. Broadband plans generally denote the best bandwidth that can be attained and not the assured bandwidth levels. A 2 Gbps broadband connection will give speed upto 2 Gbps and it will not always be 2 Gbps because it is a shared connection.
4.	Leased line is a costly connection.	Broadband is a cheap connection.

## ► 2.2. INTERNET THROUGH WIRELESS CONNECTION

Wireless Internet service is a type of Internet service that provisions connectivity through wireless means. It provides Internet connectivity service to end users and organizations over a wireless communication network.

### ■ 2.2.1. Mobile Internet

Mobile Internet provides wireless Internet access through mobile phones. The speeds vary depending on the provider, but the most common are 3G and 4G speeds. A 3G is a term that describes a third generation cellular network obtaining mobile speeds of around 2.0 Mbps. 4G is the fourth generation of cellular wireless standards. The goal of 4G is to achieve peak mobile speeds of 100 Mbps.



Fig. 2.7. Mobile Internet.

**48**

Advantages : Some advantages of mobile Internet are as the following :

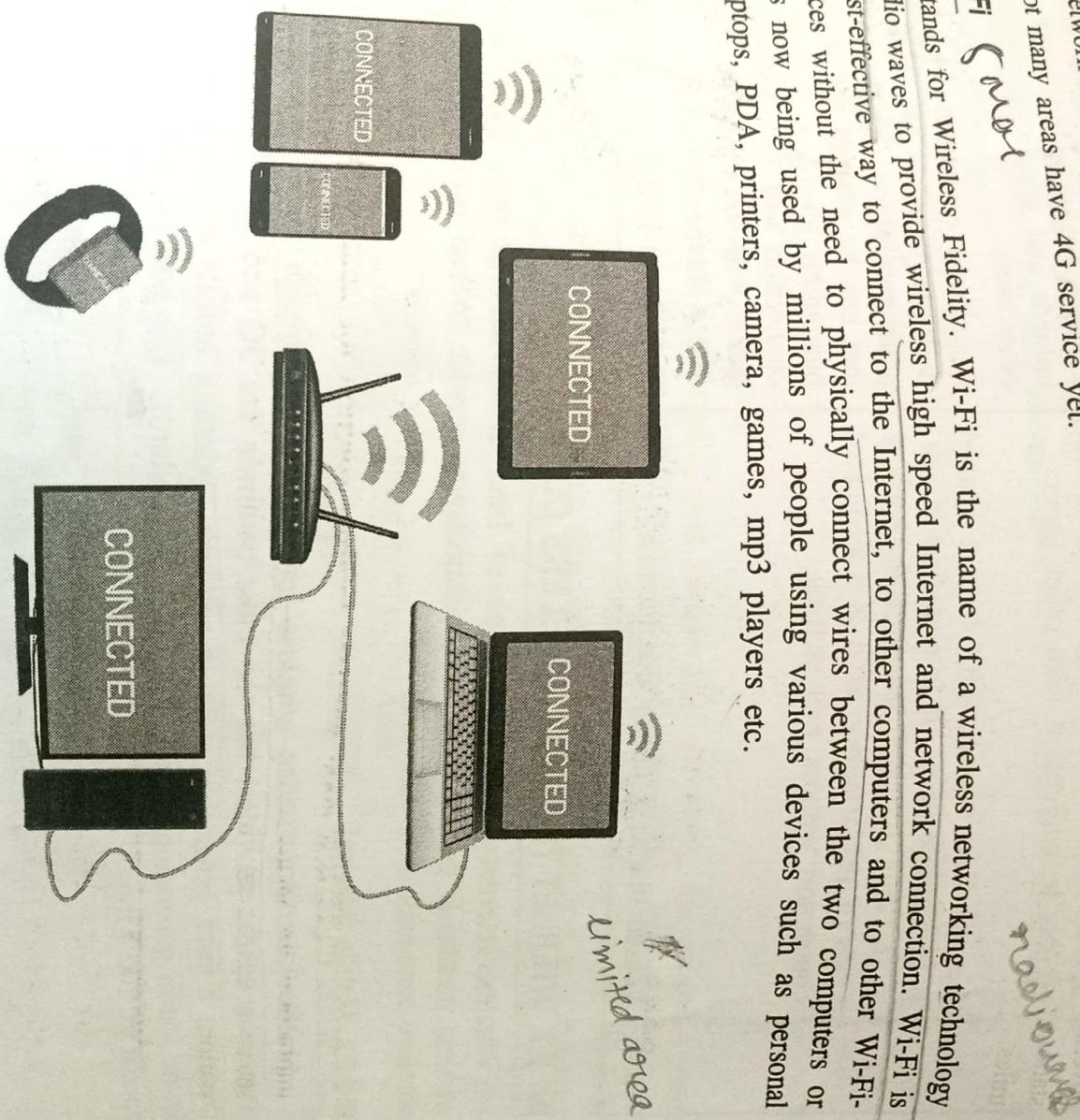
- Machine-to-machine communication.
- Maintain high bandwidth rates while physically moving.
- Stay connected to the Internet without any disruption.
- Stay connected to services and applications.
- Have easier access to user-customizations.

Disadvantages : Some disadvantages of mobile Internet are as the following :

- Network has more complex security issues.
- Not many areas have 4G service yet.

### ~~2.2.2. Wi-Fi~~ ~~Cloud~~

Wi-Fi stands for Wireless Fidelity. Wi-Fi is the name of a wireless networking technology that uses radio waves to provide wireless high speed Internet and network connection. Wi-Fi is a simple, cost-effective way to connect to the Internet, to other computers and to other Wi-Fi-enabled devices without the need to physically connect wires between the two computers or devices. It is now being used by millions of people using various devices such as personal computers, laptops, PDA, printers, camera, games, mp3 players etc.



**Fig. 2.8. Wi-Fi Internet.**

**Advantages** : Some advantages of Wi-Fi are as the following :

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

**Disadvantages :** Some disadvantages of Wi-Fi are as the following :

- (i) As the number of computers using the network increases, the data transfer rate to each computer will decrease accordingly.
- (ii) Security is more difficult to guarantee and requires configuration.
- (iii) Devices will only operate at a limited distance from an access point.

### ■ 2.2.3. WiMAX

WiMAX stands for Worldwide Interoperability for Microwave Access. WiMAX is a standards-based wireless technology that provides high-throughput broadband Internet connections over long distances. It is similar to the Wi-Fi standard, but supports a far greater range of coverage. While a Wi-Fi signal can cover a radius of several hundred feet, a fixed WiMAX station can cover a range of upto 30 miles. Mobile WiMAX stations can broadcast upto 10 miles.

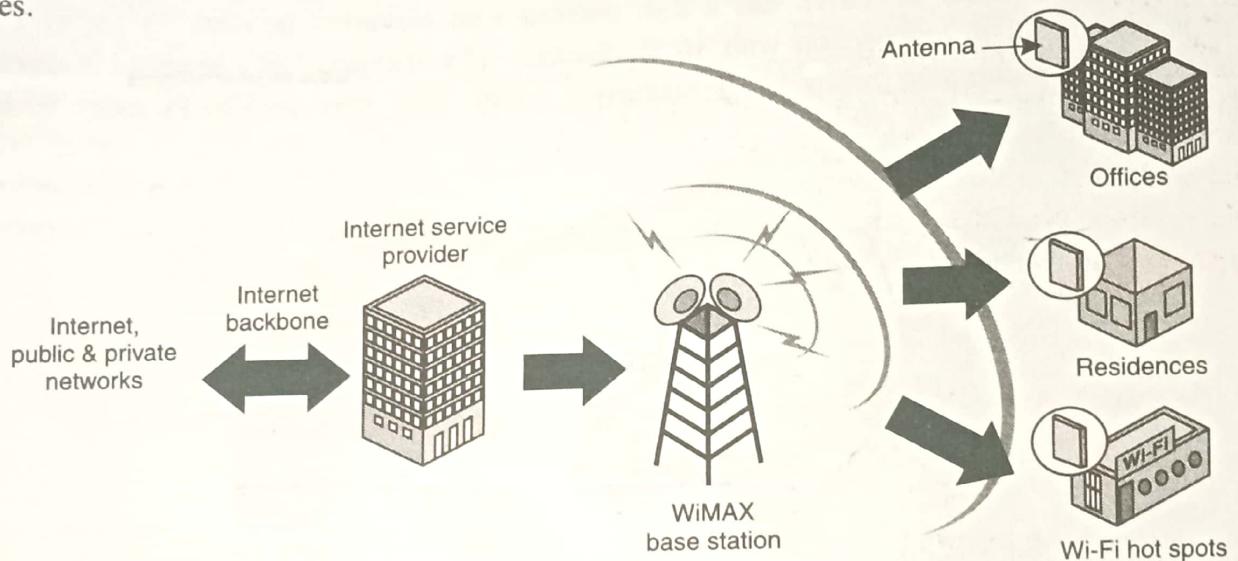


Fig. 2.9. WiMAX Internet.

While Wi-Fi is a good wireless Internet solution for home networks and coffee shops, it is impractical for larger areas. In order to cover a large area, multiple Wi-Fi repeaters must be set up at consistent intervals. WiMAX, on the other hand, can cover several miles using a single station.

**Advantages :** Some advantages of WiMAX are as the following :

- (i) Single station can serve hundreds of users.
- (ii) Much faster deployment of new users as compared to wired networks.
- (iii) Speed of 10 Mbps at 10 kilometers with line-of-site.
- (iv) It is standardized and same frequency equipment should work together.

**Disadvantages :** Some disadvantages of WiMAX are as the following :

- (i) Line of site is needed for longer connections.
- (ii) Weather conditions like rain could interrupt the signal.

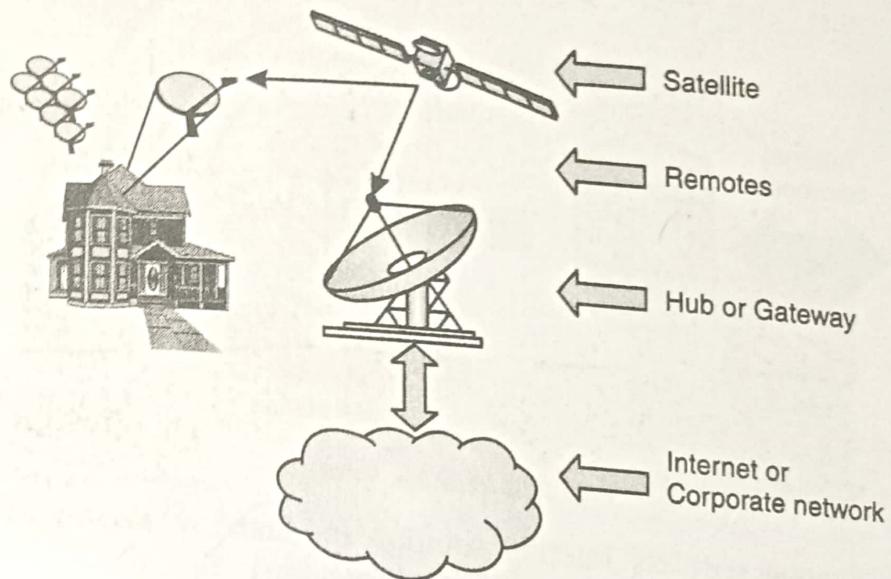
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- (iii) Other wireless equipment could cause interference.
- (iv) Multiplied frequencies are used.
- (v) WiMAX is very power intensive technology and requires strong electrical support.
- (vi) Big installation and operational cost.

#### ■ 2.2.4. VSAT

VSAT stands for Very Small Aperture Terminal. VSAT is used for many applications which include Internet access, distance education, telemedicine, telephony, banking, video conferencing and more. It makes use of already launched satellites to provide all these facilities. The interface to satellite is through disc antenna and various bands are in use.

VSAT is a two way, low cost, ground micro-station for transmitting data to and from communication satellites. A VSAT has a dish antenna with diameters between 75 cm to 1 m, which is very small in comparison with 10 m diameter of a standard GEO antenna. It accesses satellites in geosynchronous orbits or geostationary orbits. Data rates in VSATs range from 4 kbps to 16 Mbps.



**Fig. 2.10. VSAT.**

The most common frequency bands which VSAT use are C band, Ku band and Ka band.

**Advantages :** The various advantages of VSAT are as the following :

1. VSAT services are deployed in hours or minutes.
2. It can be available anywhere.
3. VSAT terminals are cheaper.
4. VSAT provides same quality of service and speed at all the locations across the entire VSAT network.
5. VSAT services are independent of other wired and wireless mediums used as transmission network service provider.

~~Disadvantages~~ : The various disadvantages of VSAT are as the following :

1. VSAT services get affected in bad weather conditions.
2. The malfunctioning of satellite and Hub station (in case of star topology) will lead to disruption of VSAT services.

### ■ 2.2.5. RF link Internet

RF stands for Radio Frequency. Transmission through RF is good because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, RF signals can travel even when there is an obstruction between transmitter and receiver.

Wireless RF is good for providing high-speed links (upto 100 Mbps) between offices in a multi-site organization. It is also a very effective solution in providing broadband speeds to remote locations or where cabling isn't easy or available. This technology will permit linking of company sites together for faster server/E-mail/file access, or even CCTV access. Wireless RF can also be used for a company's primary Internet connection. The benefits of this system are for those customers who suffer because of their remote location.

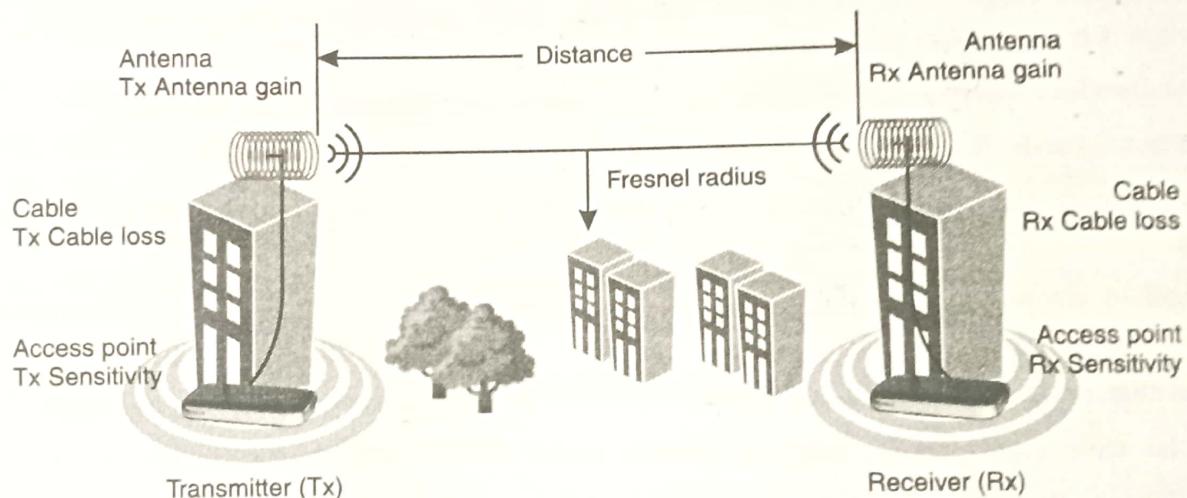


Fig. 2.11. RF link Internet.

**Advantages :** The various advantages of RF link Internet are as the following :

1. Its installation is fast.
2. It efficiently uses resources.
3. It is less susceptible to disruption.
4. Its capacity can be added, removed or reallocated more easily.
5. It enables us to easily move PCs.

**Disadvantages :** The various disadvantages of RF link Internet are as the following :

1. Its cost is high.
2. This technology is newer and more expensive for some applications.

# Important and Expected Questions

**Q.1.** Fill in the blanks.

- (i) Internet is a global network of billions of computers and other electronic devices.
- (ii) Dial-up is a temporary connection set-up between your computer and ISP server.
- (iii) Internet Service Provider is a company that provides access to the Internet.
- (iv) DSL stands for Digital Subscriber Line.
- (v) Broadband stands for broadband.
- (vi) ISP stands for Internet Service Provider.
- (vii) VSAT stands for Very Small Aperture Terminal.
- (viii) ISDN is a normal telephonic network system.
- (ix) Wi-Fi stands for wireless fidelity.
- (x) RF stands for Radio frequency.

**Ans.** (i) Internet (ii) Dial-up (iii) Internet Service Provider (iv) Digital Subscriber Line (v) Broad Bandwidth (vi) Internet Service Provider (vii) Very Small Aperture Terminal (viii) normal (ix) Wireless Fidelity (x) Radio Frequency.

**Q.2.** State whether the following statements are true or false.

- (i) ISP does not help to provide connection to Internet. ✗
- (ii) Dial-up connections transmit data at a faster rate than broadband connections. ✗
- (iii) VSAT stands for Very Small Aperture Terminal. ✓
- (iv) Wi-Fi is a wireless technology which enables connection between two devices only. ✗
- (v) RF stands for Radio Frequency. ✓

**Ans.** (i) False (ii) False (iii) True (iv) False (v) True.

**Q.3.** What do you mean by dial-up connection ? Explain.

**Ans.** A dial-up connection is a temporary connection, set-up between your computer and ISP server. To make a dial-up connection you need.

- (i) Computer
- (ii) Modem
- (iii) An account from ISP.

Internet Service Provider (ISP) is a company that provides access to the Internet. Dial-up is an analog connection because data is sent over an analog, public telephone network. The modem converts received analog data to digital and vice-versa.

**Q.4.** What are the advantages and disadvantages of dial-up connection ? Explain.

**Ans.** The advantages of dial-up connection are as the following :

- (i) It is a low price connection.
- (ii) It is easily available.

(iv) It is easy to set-up.

The disadvantages of dial-up connection are as the following :

- (i) The quality of the connection is not always good.
- (ii) The speed of connection is very slow.
- (iii) It requires phone line.

(iv) Your phone line is occupied when you are connected to the Internet.

**Q.5. Briefly explain the following : (i) DSL (ii) ISDN.**

**Ans.** (i) **DSL** : DSL stands for Digital Subscriber Line. DSL is a very high-speed connection that uses the same wires as a regular telephone line. A DSL line is an “always-on” connection provided through phone line. Speed of DSL Internet varies from 128 kbps to 8 Mbps.

(ii) **ISDN** : Integrated Services Digital Network (ISDN) is an international communications standard for sending voice, video and data over digital telephone lines or normal telephone wires. ISDN speeds range from 64 kbps to 128 kbps. ISDN establishes a connection to your service provider when you access the Internet. However, ISDN is not easy to install and troubleshoot and requires you to have an ISDN box installed by your telephone company.

**Q.6. What is broadband Internet ? Explain.**

**Ans.** Broadband stands for Broad Bandwidth. Broadband or High speed Internet is the term given to an Internet connection at or above 256 kbps. Broadband is a type of data transmission in which a single medium or wire can carry several channels or communication paths at once. Broadband connections are always on. For a broadband connection you need the following device ; Telephone line, Modem and Computer.

The various advantages of broadband Internet are as the following :

- (i) Its connection speed is upto 100 times faster than dial-up connection.
- (ii) It is convenient because the Internet connection is always on.
- (iii) It offers unlimited access and you won't be charged based on the connection duration.
- (iv) It not only gives you high speed Internet access, but it can also provide cheap phone services via VoIP technology.

The disadvantages of broadband Internet are as the following :

- (i) It has high monthly fee as compared to dial-up Internet access.
- (ii) It has higher security risk than dial-up connection. A personal firewall is needed to protect your computer.

**Q.7. What do you mean by leased line and mobile Internet ? Explain.**

**Ans.** Leased line is a satellite connection and it does not require cable or phone lines. It connects to the Internet through satellites orbiting the Earth. A satellite or leased line is a dedicated connection to Internet and is available 24 hours a day. It is the secure, dedicated and most expensive level of Internet connection. With leased connection, your computer is dedicatedly and directly connected to the Internet using high speed transmission lines.

Mobile Internet or Cellular technology provides wireless Internet access through cell phones. The speeds vary depending on the provider, but the most common are 3G and 4G speeds. A 3G is

a term that describes a third generation cellular network obtaining mobile speeds of around 2.0 Mbps. 4G is the fourth generation of cellular wireless standards. The goal of 4G is to achieve peak mobile speeds of 100 Mbps.

~~Q.8.~~

What do you mean by VSAT ? Explain.

~~Ans.~~

VSAT stands for Very Small Aperture Terminal. VSAT is used for many applications which include Internet access, distance education, telemedicine, telephony, banking, video conferencing and more. It makes use of already launched satellites to provide all these facilities. The interface to satellite is through disc antenna and various bands are in use.

The advantages of VSAT are as the following :

- (i) VSAT services are deployed in hours or minutes.
- (ii) It can be available anywhere.
- (iii) VSAT terminals are cheaper.
- (iv) VSAT provides same quality of service and speed at all the locations across the entire VSAT network.
- (v) VSAT services are independent of other wired and wireless mediums used as transmission network service provider.

The disadvantages of VSAT are as the following :

- (i) VSAT services get affected in bad weather conditions.
- (ii) The malfunctioning of satellite and Hub station (in case of star topology) will lead to disruption of VSAT services.

~~Q.9.~~ Write a short note on RF link.

~~Ans.~~ RF stands for Radio Frequency. Transmission through RF is good because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, RF signals can travel even when there is an obstruction between transmitter and receiver.

Wireless RF is good for providing high-speed links (upto 100 Mbps) between offices in a multi-site organization. It is also a very effective solution in providing broadband speeds to remote locations or where cabling isn't easy or available. This technology will permit linking of company sites together for faster server/E-mail/file access, or even CCTV access. Wireless RF can also be used for a company's primary Internet connection. The benefits of this system are for those customers who suffer because of their remote location.

~~Q.10.~~ What are the ISDN interfaces ? Explain each interface briefly.

~~Ans.~~ Integrated services digital network (ISDN) is an international communications standard for sending voice, video and data over digital telephone lines or normal telephone wires. ISDN speeds range from 64 kbps to 128 kbps. ISDN establishes a connection to your service provider when you access the Internet. However, ISDN is not easy to install and troubleshoot and requires you to have an ISDN box installed by your telephone company. The advantages of ISDN are as follows :

- (i) It provides symmetrical transfer rates : the transmit rate is the same as the receiver rate.
- (ii) It is competitive priced as compared to other technologies.

# World Wide Web (WWW)

## ► 3.1. WORLD WIDE WEB

The World Wide Web (WWW) is the most popular and promising method of accessing the Internet. WWW or Web is a repository of information spread all over the world and linked together. The World Wide Web (The Web or WWW) was created in 1989 at the European Particle Physics Laboratory in Geneva, Switzerland, as a method for incorporating footnotes, figures and cross-reference into online hypertext documents. WWW is a hypertext document and is a specially encoded file that uses the hypertext markup language (HTML).

This language allows a document's author to embed hypertext links (also called hyperlinks or just links) in the document. Hypertext links are the foundation of the World Wide Web. The WWW provides a network of interactive documents and the software to access them. It is based on documents called pages that combine text, pictures, forms, sound, animation and hypertext links. To navigate the WWW, users "surf" from one page to another by pointing and clicking on the hyperlinks in text or graphics.



## ► 3.2. EVOLUTION OF WWW

The evolution of WWW is as the following :

### 1. Web 1.0 : The World Wide Web (1990 – 2000)

- (i) Remained limited mostly to static web sites.
- (ii) Mostly publishing/brochure. Limited to reading only for the majority.
- (iii) Proprietary and closed access.
- (iv) Corporations mostly, no communities.
- (v) HTTP and HTML.

### 2. Web 2.0 : The Social Web (2000 – 2010)

- (i) Publishing as well as participation.
- (ii) Social media, Blogging and Wikis.

### 3.4. DIFFERENCE BETWEEN WWW AND INTERNET

Most of the people use the words *Internet* and *WWW interchangeably*. Internet is an interconnection between millions of computers scattered around the globe. These networks are connected with each other by the means of underground cables, satellite links and sub-oceanic cables etc. The word "Internet" actually refers to the entire hardware infrastructure present in the network. Such hardware includes computer systems, routers, cables, bridges, servers, cellular towers, satellites and other pieces. All these pieces of hardware operate under the Internet Protocol (IP). Different computing devices in the Internet are identified by their IP addresses.

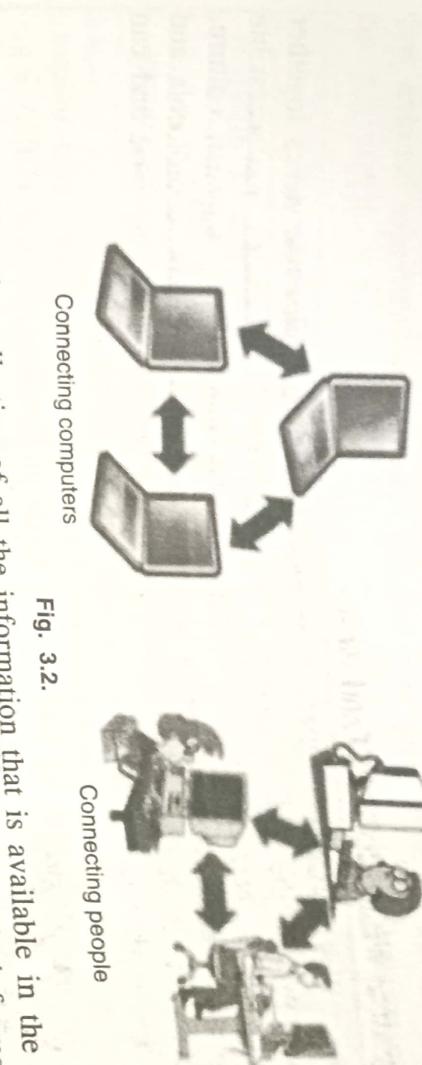


Fig. 3.2.

The WWW is the collection of all the information that is available in the Internet. All the text, images, audio and videos online form the WWW. Most of this information is accessed through web sites and we identify web sites by their domain names. There is huge amount of information available in the WWW.

### 3.5. WEB PAGE

The documents residing on web sites are called web pages. A web page is a single unit of information, often called a document that is available via the world wide web (WWW). A web page can be longer than one computer screen and can use more than one piece of paper when it is printed out.

Web page is created using HTML (Hypertext Markup Language). It consists of standardized codes or tags that are used to define the structure of information on a web page. A collection of related web pages is called a web site. Web sites are housed on Web servers, Internet host computers that often store thousands of individual pages. Copying a page onto a server is called posting the page, but the process may also be referred to as publishing or uploading.

### 3.6. WEB SITE

Web pages are documents written in HTML and are translated by your web browser like Google Chrome, Mozilla Firefox, Microsoft Edge etc. These web pages are stored on a central computer called **web server**. The web pages are linked together (Using Hypertext and Hyperlink) to form a single interface. Web pages can either be static or dynamic.

1. Static pages show the same content each time they are viewed.
2. Dynamic pages have content that can change each time they are accessed.

A collection of related web pages is called a web site. Web sites are housed on web servers that store thousands of individual pages. Web sites can be created and maintained by an individual, group, business or organization to serve a variety of purposes. Together, all publicly accessible web sites constitute the World Wide Web (WWW). Even a single individual can also create and maintain his/her own web site to promote certain ideas. Popular web sites are [www.cbse.nic.in](http://www.cbse.nic.in), [www.google.com](http://www.google.com), [www.ndtv.com](http://www.ndtv.com), [www.espnstar.com](http://www.espnstar.com), [www.cnn.com](http://www.cnn.com), [www.indiatimes.com](http://www.indiatimes.com), etc. When you visit a web page *i.e.*, downloads a page from the web server to your computer for viewing is called "hitting" the web site. Web masters measure their sites success by the number of hits they receive in a given time. Loading a web page onto a server is called posting the page. Web page is not the same thing as a web site. The various differences is called posting page and web site are as the following :

S.No.	Web page	Web site
1.	A web page is a single page of information on a web site.	A web site is a collection of different web pages connected by links.
2.	It is a content that is to be displayed on a web site.	It is a place used to display the content.
3.	Multiple web pages can have the same name if they reside in different documents.	Each and every web site have unique Uniform Resource Locator (URL) e.g. <a href="http://www.cbse.nic.in">www.cbse.nic.in</a>
4.	Web page address depends on web site address.	Web site address doesn't rely upon web page address.

### 3.7. WEB SERVER

*The viewers on request.* Web server is also called WWW server. To display information on web, it is necessary to access a web server. It is the job of a web server to accept request from users and send the requested information. For example ; Apache, IIS (Internet Information Server), Nginx etc.

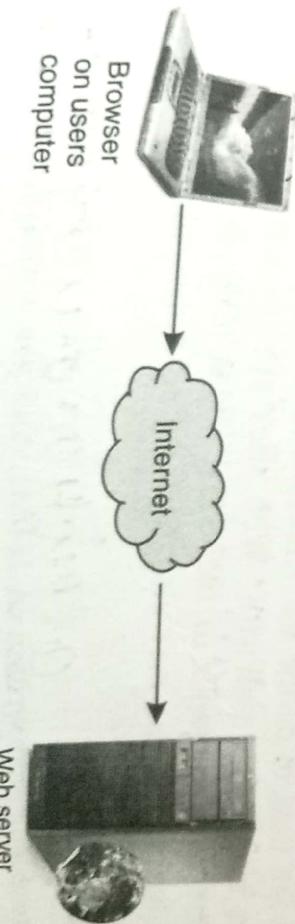


Fig. 3.3. Web server.

The features of web server are as the following :

- 1. Servicing web pages :** The main feature of web server is to provide web pages to the users on request using Hyper Text Transfer Protocol (HTTP).

**2. Large data storage support :** Data storage support is one of the primary features of web server. Every web server supports large storage space for storing data of multiple web sites.

**3. Virtual hosting :** Virtual hosting is a type of web hosting service in which a web server is used to host other software based virtual web servers, web sites, data, applications and other services.

**4. Server-side web scripting :** This feature of web server enables the user to create dynamic web pages. The popular server-side scripting languages include Perl, Ruby, Python, PHP, ASP etc.

### ► 3.8. HTTP <sup>Protocol</sup>

HTTP is short for Hypertext Transfer Protocol. It is the set of rules or protocols that governs the transfer of hypertext between two or more computers. HTTP is a protocol used mainly to access data on the world wide web. The protocol transfers data in the form of plain text, hypertext, audio, video and so on. However, it is called the hypertext transfer protocol because its efficiency allows its use in a hypertext environment where there are rapid jumps from one document to another. HTTP is based on the client/server principle.

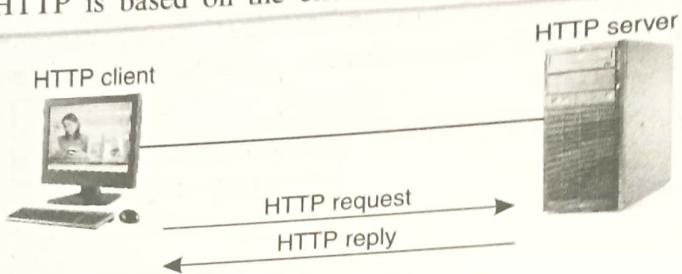


Fig. 3.4. HTTP.

HTTP allows client to establish a connection to server and make a request. The server accepts the connection initiated by the client and sends back a response. An HTTP request identifies the resource that the client is interested in and tells the server what "action" to take on the resource.

When a user selects a hypertext link, the client program on their computer uses HTTP to contact the server, identify a resource and asks the server to respond with an action. The server accepts the request and then uses HTTP to respond to or for, the action.

### ► 3.9. HTTPS <sup>SSL/TLS</sup>

*Secure Communication*

Hypertext Transfer Protocol Secure (HTTPS) is a widely used communications protocol for secure communication over a computer network, with especially wide deployment on the Internet. Technically, it is not a protocol in itself ; rather, it is the result of simply layering the Hypertext Transfer Protocol (HTTP) on top of the SSL/TLS protocol, thus adding the security capabilities of SSL/TLS to standard HTTP communications.

HTTPS provides authentication of the web site and associated web server that one is communicating with, which protects against man-in-the-middle attacks. Additionally, it provides

The difference between HTTP and HTTPS is as the following :

S.No.	HTTP	HTTPS
1.	HTTP stands for Hypertext Transfer Protocol.	HTTPS stands for Hypertext Transfer Protocol Secure.
2.	It is less secure as the data can be vulnerable to hackers.	It is designed to prevent hackers from accessing critical information. It is secure against such attacks.
3.	It's good for web sites designed for information consumption like blogs.	It is for web sites that collect private information such as credit card number, aadhar number, bank account number and other personal details.
4.	It doesn't require any additional technology for data transfer.	It requires SSL (Secure Sockets Layer) certificates for secure data transfer.

### 3.10. NAVIGATION TOOLS

Web browser is a navigation tool. Web browser is a software program that allows a user to locate, access and display web pages. Browsers are used primarily for displaying and accessing web sites on the Internet, as well as other content created using Hypertext Markup Language (HTML) and Extensible Markup Language (XML) etc.

Browsers translate web pages and web sites delivered using Hypertext Transfer Protocol (HTTP) into human readable content. They also have the ability to display other protocols and prefixes, such as secure HTTP (HTTPS), File Transfer Protocol (FTP), E-mail handling (mailto:), and files (file:). In addition, most browsers also support external plug-ins required to display active content, such as in-page video, audio and flash content.

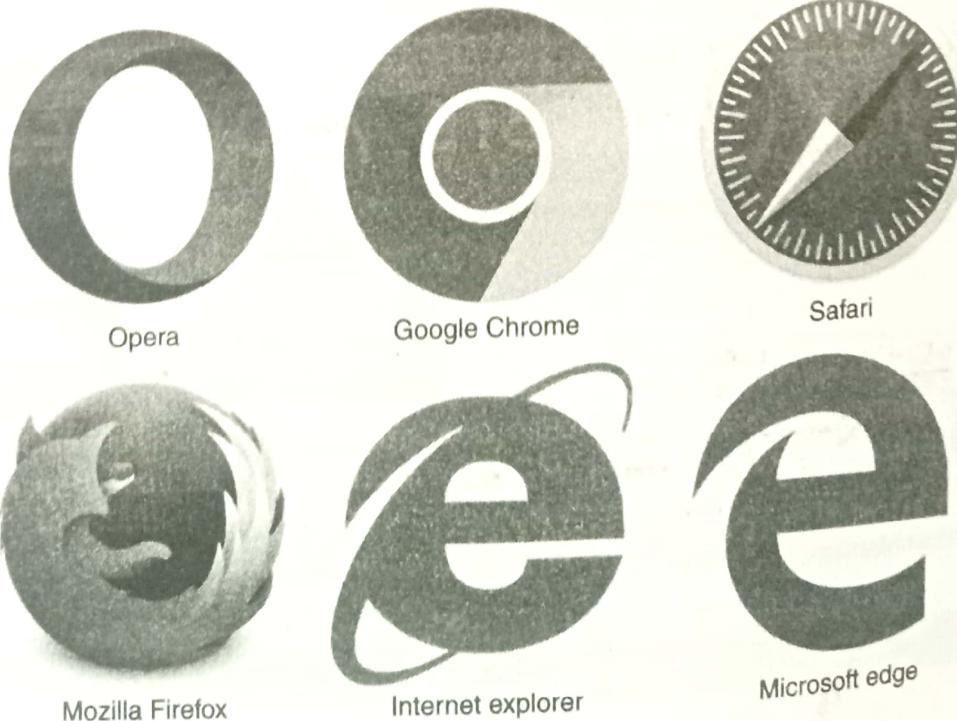
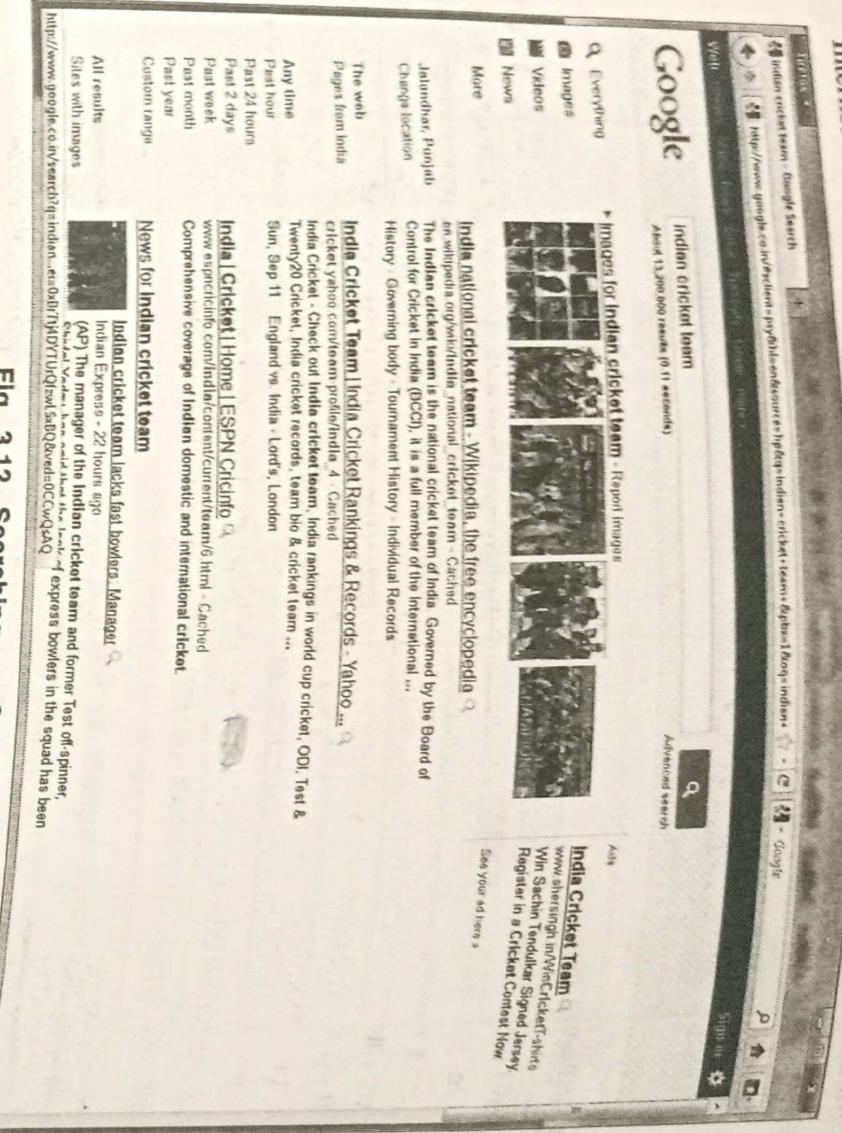


Fig. 3.7. Web browser.

- (ii) Enter the word or combination of words or symbols with words, based on which the Internet is to be searched.



**Fig. 3.12. Searching on Google.**

A Search engine works in three parts as shown below ;

- First part is the spider which is also called the crawler or bot. This spider part visits a web page, reads it and then follows links to other pages within the site. This process is often referred to as crawling or spidering.
- The content that spider find is sent to its database or index as it is popularly known. This index is like a huge book that contains a copy of web page or cache, that the spider finds out. This constitutes second part of a search engine.
- A program that receives your search request, compares it to the entries in the index and returns results to you.

### 3.17. PROXY SERVERS

*Proxy server acts as an intermediary between the two ends of a client/server network connection.* Proxy servers interface with network applications, most commonly web browsers and (Intranet) devices. Proxy server is an intermediary server between client and the Internet. Proxy servers offer the following basic functionalities :

- Firewall and network data filtering.
- Network connection sharing.
- Data caching.

*Intranet - Private network*

The purpose of proxy server is as follows :

1. Monitoring and filtering
2. Improving performance
3. Translation
4. Accessing services anonymously
5. Security.

### 3.18. FIREWALL

(Software)

A firewall is a part of a computer system or network that is designed to block unauthorized access while permitting authorized communications. Firewalls can be implemented in either hardware or software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially Intranets. It is a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria. Firewalls can be implemented in either hardware or software, or a combination of both. All messages entering or leaving the Intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.

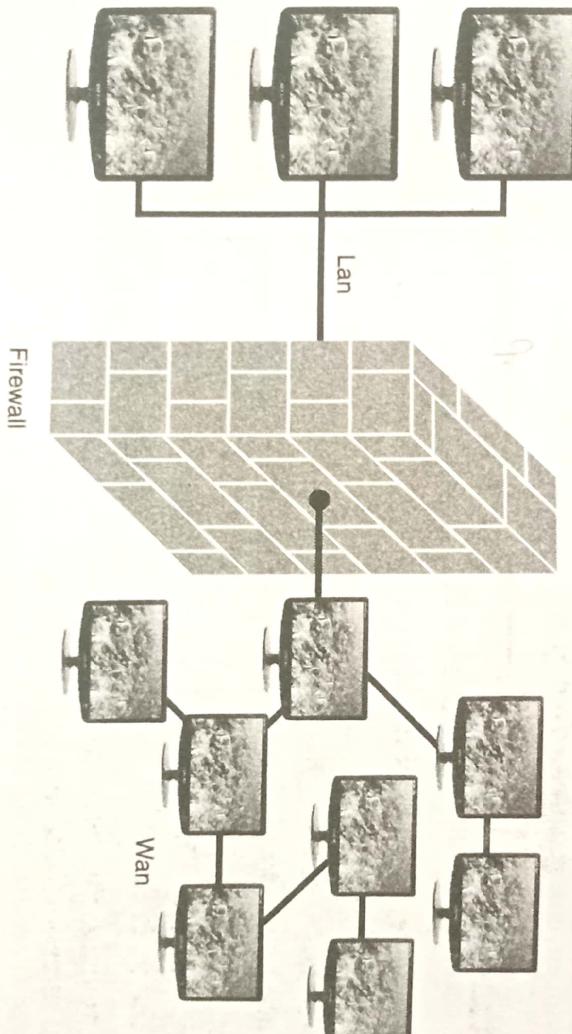


Fig. 3.13. Firewall.

### 3.19. NETWORK PROTOCOLS

1. **ICMP** : ICMP stands for Internet Control Message Protocol. It is an Internet layer protocol used by network devices to diagnose network communication issues. ICMP is mainly used to determine whether or not data is reaching its intended destination in a timely manner.

The primary purpose of ICMP is for error reporting. When two devices connect over the Internet, the ICMP generates errors to share with the sending device in the event that any of the data did not get to its intended destination.

**Q.3.** Define the following terms :

- (i) Web Server
- (ii) World Wide Web
- (iii) Web Browser.

**Ans.** (i) **Web Server** : A Web server refers to a location (computer) on the Internet that contains information in the form of web pages. To display HTML pages on web, it is necessary to access a Web server. It is the job of a Web server to accept connections from Web browsers all over the Internet and when requested, send them the HTML documents that are available from our site. This is done using the HTTP protocol.

(ii) **World Wide Web** : The World Wide Web, also referred to as the WWW or simply "the web" is the universe of information available via hypertext transfer protocol (HTTP). WWW or web is a repository of information spread all over the world and linked together. WWW provides a network of interactive documents and the software to access them. WWW uses the concept of hypertext and hypermedia.

(iii) **Web browser** : A browser is a piece of software that acts as an interface between the user and the inner working of the Internet, specifically the World Wide Web. Browsers are also referred to as web clients or universal clients, because in the client/server model, the browser functions as the client program. The browser acts on behalf of the user and does the following :

- (a) Contacts a web server and sends request for information.
- (b) Receives the information and then, displays it on the user's computer.

A browser can be graphical or text-based and can make the Internet easier to use and more intuitive.

**Q.4.** Write the purpose of search engine. Give example of any one search engine.

**Ans.** A search engine is an interactive tool to help people locate information available via the world wide web. Search engines are actually databases that contain references to thousands of resources. <http://www.google.com> is an example of search engine.

**Q.5.** What do you mean by proxy server ? Explain.

**Ans.** Proxy server acts as an intermediary between the two ends of a client/server network connection. Proxy servers interface with network applications, most commonly web browsers and servers. Inside corporate networks, proxy servers are installed on specially designated internal (Intranet) devices. Proxy server is an intermediary server between client and the Internet. Proxy servers offer the following basic functionalities :

- (i) Firewall and network data filtering.
- (ii) Network connection sharing.
- (iii) Data caching.

**Q.6.** What is a web browser ? Name any two web browsers.

**Ans.** A Web browser is a piece of software that acts as an interface between the user and the inner working of the Internet, specifically the world wide web. Browsers are also referred to as web clients or universal clients, because in the client/server model, the browser functions

## World Wide Web (WWW)

75

as the client program. The two popular web browsers are ; Internet Explorer and Netscape Navigator.

### Q.7. Differentiate between web site and web page.

Ans. The difference between web site and web page is as follows :

S.No.	Web page	Web site
1.	A web page is a single page of information on a web site.	A web site is a collection of different web pages connected by links. It is a place used to display the content.
2.	It is a content that is to be displayed on a web site.	
3.	Multiple web pages can have the same name if they reside in different documents.	Each and every web site have unique Uniform Resource Locator (URL) e.g. www.cbse.nic.in
4.	Web page address depends on web site address.	Web site address doesn't rely upon web page address.

### Q.8. Differentiate between HTTP and HTTPS.

Ans. The difference between HTTP and HTTPS is as follows :

S.No.	HTTP	HTTPS
1.	HTTP stands for Hypertext Transfer Protocol.	HTTPS stands for Hypertext Transfer Protocol Secure.
2.	It is less secure as the data can be vulnerable to hackers.	It is designed to prevent hackers from accessing critical information. It is secure against such attacks.
3.	It's good for web sites designed for information consumption like blogs.	It is for web sites that collect private information such as credit card number, aadhar number, bank account number and other personal details.
4.	It doesn't require any additional technology for data transfer.	It requires SSL (Secure Sockets Layer) certificates for secure data transfer.

### Q.9. Explain W3C model in detail.

Ans. The World Wide Web Consortium (W3C) is an international community that works together for the long-term growth of the Web. It aims to ensure that the web is available and accessible to everyone, regardless of their hardware, software, network infrastructure, language, culture, location, or physical or mental ability. This is done through the development of protocols and guidelines that enable the furthering of the W3C's vision that the Web is for everyone and can enable participation and sharing of knowledge by people on a global scale. The organization is guided by its open standards principles. The five fundamental principles are as follows :

- (i) Due process
- (ii) Broad consensus
- (iii) Transparency
- (iv) Balance
- (v) Openness.



Standards developed by the consortium include :

- (i) CGI
- (ii) CSS
- (iii) DOM
- (iv) HTML
- (v) HTTP
- (vi) XHTML
- (vii) XML.

**Q.10. What is a firewall ? Explain its various functions.**

**Ans.** A firewall is a part of a computer system or network that is designed to block unauthorized access while permitting authorized communications. Firewalls can be implemented in either hardware or software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially Intranets. It is a device or set of devices configured to permit, deny, encrypt, decrypt, or rules and other criteria. Firewalls can be implemented in either hardware or software, or a combination of both. All messages entering or leaving the Intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria.

**Q.11. Write short notes on the following : (i) ICMP (ii) UDP.**

**Ans. (i) ICMP :** ICMP stands for Internet Control Message Protocol. It is an Internet layer protocol used by network devices to diagnose network communication issues. ICMP is mainly used to determine whether or not data is reaching its intended destination in a timely manner. The primary purpose of ICMP is for error reporting. When two devices connect over the Internet, the ICMP generates errors to share with the sending device in the event that any of the data did not get to its intended destination.

A secondary use of ICMP protocol is to perform network diagnostics ; the commonly used terminal utilities traceroute and ping both operate using ICMP. The traceroute utility is used to display the routing path between two Internet devices. The routing path is the actual physical path of connected routers that a request must pass through before it reaches its destination. The journey between one router and another is known as a 'hop' and a traceroute also reports the time required for each hop along the way. This can be useful for determining sources of network delay.

**(ii) UDP :** User Datagram Protocol (UDP) is a transport layer protocol. UDP is a part of Internet protocol suite, referred as UDP/IP suite. Unlike TCP, it is unreliable and connectionless protocol. So, there is no need to establish connection prior to data transfer.

UDP is a communication protocol used across the Internet for especially time-sensitive transmissions such as video playback or DNS lookups. It speeds up communications by not requiring handshake and allowing data to be transferred before the receiving party agrees to the communication. This allows the protocol to operate very quickly and also creates an opening for exploitation.