Computer Network

A network is a group of interconnected computers capable of exchanging information each other. Computer networks makes a computer more powerful than a stand alone computer. The following are the need/objectives of network.

1) Resource Sharing:- The expensive resources like hardware, software etc. May be shared between computers in a network.
2) Price performance ratio :- Since, hardware and software may be shared, the cost of purchasing software license may be reduced.
3) Communication:- Computers connected in a network may be used for communicating through e-mail, chatting, video conferencing etc.
4) Reliability:- It is possible to copy additional copies of the data in some other computers in the network. Hence, failure of one computer will not cause data loss.
5) Scalability:- It is so easy to expand the network by adding more computers to the network.

Terminologies

- ➔ **Bandwidth**:- It is the amount of data that can be sent over a network in a given time. It is measured in unit bps (bits per second). The more the bandwidth, the faster is the network.
- ➔ **Noise:-** It means unwanted electrical energy that decreases the quality of a signal.
- ➔ **Node:-** It can be any computer or other devices like printer, scanner etc. Connected to a network. For example, when we connect to Internet, our computer became the node. (It is also known as client).

Data Communication System:- Data communication is the exchange of data between any two devices in a network through a medium of transmission. The following are elements of data communication systems.

- **Message:-** It is the data or information to be communicated. It can be text, picture, audio, video etc.
- **Sender:-** The device from which the message is originated.
- **Receiver:-** The devices that receives the message.
- **Medium:-** It is the physical path through which the message travels.
- **Protocol:-** It is the rules which guides and controls transmission.

Communication Medium

There should be a medium for transferring data from the sender to the receiver. It can be Guided medium (Wired connection) or Unguided medium (unwired/wireless connection).

Guided (Wired) Medium

a) Twisted Pair Cable:- It is also called **Ethernet.** It consists of four twisted pairs enclosed in a outer shield. The pairs are colour coded. If the individual pairs are not shielded, it is called **UTP (**Unshielded Twisted Pair). When the individual pairs are shielded it is called **STP** (Shielded Twisted Pair). An RJ-45 connector is used to connect both UTP/STP cable to the computer.

Characteristics of UTP :- Low cost, Thin and flexible, Easy to install, carries data upto 100 m.

Characteristics of STP :- Immunity to noise, Expensive than UTP, difficult to install.

b) Coaxial cable:- It is a copper wire surrounded by insulation and further covered by a wire mesh which is a conducting shield. The whole cable is put in a plastic jacker.

Characteristics:- Carries data to longer distances, offers higher bandwidth, less noise, less flexible and difficult to install.

c) Optic Fibre cable:- It is a long thin glass fibre. It carries light signals and hence they are very fast. It contains the following parts.

- Core:- The thin glass wire through which light travels.
- Cladding:- The outer optical material surrounding the core that reflects the light back to the core.
- Coating:- The outer jacket that covers and protects the cable.

In Optical Fibre cable, a optical transmitter converts electrical signal into light (modulation). The main light sources are LED (Light Emitting Diode) or laser diodes. At the receiving end, the optical receiver converts light back into electrical signals (demodulation).

Characteristics of OFC:- High bandwidth, carries data over a very long distance, no chance for noise, most expensive and installation is difficult.

Unguided Medium (Wireless)

In wireless communication, electro magnetic waves are used for transmitting messages. Waves in different frequencies like Radio waves, microwaves and infra red rays are used here.

a. Radio waves:- They are signals used for both short and long distance communication. These signals can even penetrate walls. It is used in mobile, FM radio, Am radio etc. The characteristics of radio waves are that they travel in any direction, inexpensive, penetrate objects, signals affected by motor or other electrical equipments, less secure and permission from authorities needed.
b. Microwaves:- They are high frequency signals that travels only in straight direction. These signals can't penetrate objects. Large towers are built and antennas are fixed on top of the tower to send and receive signals. It is inexpensive than wired media, offers easy communication in difficult environment.
c. Infra red waves:- These are used in very short distance transmission about 5 meters. They are generally used in remote, cordless mouse etc. It requires line of sight transmission. It can be used with only two devices at a time. It cannot penetrate solid objects. The longer is the distance, the weaker is its performance.

Wireless technologies using radio waves

- **Blue tooth**:- This technology is used for connecting various devices in a short distance. Cellphones, laptops, mouse, keyboard, tablets, cameras etc. May be connected using blue tooth. It does not need line of sight transmission. It can connect upto eight devices. It has a slow data transfer rate.
- **Wi-Fi:-** It uses radio waves to transmit information across a network connecting cell phones, television, radio, lap tops etc. It is a two way communication. It needs a wire less adapter with the device and wireless router. The router converts digital signals into radio signals and back. It does not need line of sight connectivity. Data transfer rate is upto 54 mbps. It can connect many devices at a time. It can be used upto 114 m.
- **Wi-Max:-** World Wide Interoperability for Microwave Access combines the benefit of broadband and wireless. It can provide high speed Internet connectivity over a long distance, say a city. It needs a base station and receivers. It can connect hundreds of users. It offers high speed. Line of sight transmission is not needed. Weather condition could interrupt signals. Needs huge power and high cost of installation and operation are the characteristics of Wi-MAX.
- **Satellite Link:-** The main component that receives signals from the earth and transmits to another area in the earth is a geostationary satellite. The devices called transponders installed in the satellite do this job. Transmission of signals from the earth is called **uplink** and transmission from satellite to earth is called **downlink**. Two different frequency signals are used for this. It is very expensive, but its coverage area is too large. Satellites are owned by government or government approved agencies. Hence, legal permission and authorisation is needed to use it.

Data Communication Devices

- **NIC (Network Interface Card)**:- NIC is a device used to connect a computer to a network. It is the hardware interface between computer and a network. It can be a separate circuit board or integrated into the motherboard. NIC cards available with Ethernet support or wi-fi support
- **Hub**:- It is used in a wired network to connect computers. The devices in a network are connected to the port of the hub using Ethernet. When a device sends some data, the hub transmits the data to all the ports in it. The device should identify the data delivered to them. It creates high traffic in the network.

- **Switch**:- A switch is similar to hub, but it transmits the message onlt to the recipient Hence, unwanted traffic in the network will be reduced. A switch stores address of devices connected to it in a table. The address in this table is used to pass the message to the right recipient.
- **Repeater**:- It is a device used in long distance communication. A signal's quality will be decreased as it travels. A repeater is used to amplify such weak signal and retransmits it to the destination.
- **Bridge**:- It can be used to segmentise a network. A network is split into different segments and each segment is interconnected using a bridge. When a data packet reaches the bridge, it passes the packet to the other side only after verifying address. It reduce traffic in a network.
- **Router**:- It is used to connect two networks of same type and protocol. It finds a best path for transmitting data packets and reduces amount of data traffic. The router can check the device address and network address. It then uses an intelligent algorithm to detect the shortest or best path for transmitting data.
- **Gateway**:- It is a device used to interconnect two different networks having different protocols. It mainly aims in protocol conversion and signal conversion.

DTE (Data Terminal Equipment)

It is a device that controls data flowing to or from a computer.

Modem:- It is a device used to connect computers using telephone line. The term Modem stands for Modulator Demodulator. It converts digital signals into analog (modulation) and analog signals into digital (demodulation). The speed of a modem is measured in bps.

Multiplexer/Demultiplexer:- Multiplexing means combining several signals together to form a single complex signal. At the receiving end, this single signal is split into different signals. It is called demultiplexing. It is used in cable tv channels.

Network topologies

It is the pattern of interconnection of computers in a network. The way in which the nodes are physically interconnected is called a **topology**. The main topologies are

Bus, Star, Ring, and Mesh

Bus Topology:- In this topology, all nodes in the network are connected to a common bus (wire). A small device called terminator is attached at both end of the bus. If a node sends a message, it travels full length of the bus. The receiver node will accept the message and the terminator removes the signal from the bus and frees the bus. The process of sending messages is called broadcasting.

It is easy to install. It requires less cable length. It is cost effective. But, failure of bus or terminator collapses the network. In this fault diagnosis is difficult. Moreover, only one node can transmit data at a time.

Star Topology:- In this, every node is directly connected to a switch. If a node wants to transmit any message, it sends it to the switch. It is more efficient compared to bus topology. It is easy to install. Easy to detect faults. Easy to expand. Failure of a switch collapses the network. It requires more cable length.

Ring Topology:- It is in the form of a circle that has no start or end. All nodes are connected using a cable that loops in a ring. Here transmission takes place only in one direction. Here, a node sends data to its neighbouring node. It in turn retransmits data to the next node. In this method, signal amplification or repeating is not needed. It requires less cable length. It is cost effective. If any node fails, the network fails. Addition of new node is difficult.

Mesh Topology:- In this topology, every node is connected to all other nodes. So, more than one path exists between two nodes. If one path fails, the network can find a different path. The failure of any node or path will not fail the network. It requires extra cable length and hence expensive. It is complex and difficult to mange.

Types of Network

PAN (Personal Area Network):- It is a network of computers, mobiles, tablets, printers etc. of an individual. It covers only a few meters. It can be set up using cables, blue tooth, infra red or even wi-fi.

LAN (Local Area Network):- It is a network of computers and other devices within a room or building or a campus. LAN is owned, controlled and managed by a single person or organisation. It can be set up using wired media or wireless media (WLAN).

MAN (Metropolitan Area Network):- It is a network that spans in a city. It is formed by interconnecting a number of LANs and other computers. All types of communication media are used to set up such a network. It may be controlled by government or large corporation.

WAN (Wide Area Network):- Just like MAN, this also connects several LAN and other computers. It spans a country or even the whole world. All types of media are used to set up such a network. **Internet** is considered as the largest WAN in the world. A network of banks, ATM etc. may also be considered as an example for WAN.

Logical classification of networks

Peer-to-Peer:- It has no dedicated servers. Several computers are connected together to share information or devices. This network is ideal for small networks.

Client-Server:- In this architecture, a high end server satisfies the request from a low configured computer called client. A server gives specific service upon request from client. The services provided by a server are file sharing, software, hardware share etc. It is suitable for centralised software management. The servers can be classified as shown below.

1) **File Server**:- A powerful computer that stores files for multiple users.
2) **Web Server:-** A computer storing web pages and files of a web site.
3) **Print Server**:- It helps printing documents from any client.
4) **Database Server**:- It stores data in database centrally.

Network protocols:- It is a set of rules that guides and controls exchange of data in a computer network. Each protocol has rules for formatting data, error checking, making connections and assuring whether data sent is received properly by the recipient

TCP/IP (Transmission Control Protocol/Internet Protocol):- It is used in both local area networks and Internet to transmit messages. In this, the message is first broken into small packets and then sent. The recipient checks for errors. It errors are found, TCP initiates retransmission. Delivery of the message to the correct device is managed by Internet Protocol. It adds and verifies address of a packet. HTTP, FTP and DNS are three sub protocols of TCP/IP.

HTTP:- It stands for Hyper Text Transfer Protocol. It is used to transfer HTML web pages from the web server to the users computer. Some times, the pre stored html file are returned from the server known as static file. In some cases, a program runs on the server and returns a dynamic page. A connection between server and client is called session.

FTP (File Transfer Protocol):- It is used for transfering files between computers using Internet. It performs uploading and downloading. FTP client software allows us to do this. It is a client server software. It is having security features such as user names and passwords. The following are examples for FTP software.

FileZilla, Cute FTP

DNS (Domain Name System):- DNS stores the domain name and its IP address. It returns the IP address for a given domain. DNS is a network system. In this, if oen DNS server cannot translate a domain name, it passes the request to another DNS until correct IP address is obtained.

Identification of Computer Over a network:- In a network, all the nodes must be uniquely identifiable For this, there are several systems.

1. Media Access Control (MAC) Address:- It is a 12 digit hexa decimal number assigned each NIC by its manufacturer. The first 6 digits of the Mac Address indicates the manufacturer and last 6 digits represents the device.
2. Internet Protocol (IP) Address:- There are two versions. IPv4 and IPv6 which uses 32 bits and 128 bits respectively.

An IP address is a group of 8/32 bits. It is a four part number separated using a dot. The first two parts represents the network and last two parts identifies the computer.

3. Uniform Resource Locator (URL):- It is a formatted text string used by web browsers. It is used to identify a network resource. Every resource in Internet has a unique URL. URL may consists of letters numbers and punctuations.

Parts of a URL

A URL has three parts called **Protocol, Domain Name and File Name.**

1. **Protocol**:- It specifies the protocol to be used for accessing content.
2. **Domain name:-** It is the identity of a web site or resource in Internet. A domain name has more than one part. A two letter country code may used.
3. **File Name**:- It is the name of the file to be opened.

Some important subdomains

.com, .edu. .gov, .mil, .net, and .org
.in, .au, .ca, .ch, .jp, .us
Egs. For domain
http://dhsekerala.gov.in http://spark.gov.in
http://finance.kerala.gov.in

Internet and Mobile Computing

Internet:- It is the largest public network in the world. It is used by people around the world for various needs like information search, email, make bill payments, online shopping, online banking, social networks etc.

History of Internet:- Vinton Grey Cerf established the TCP/IP protocol and hence he is known as **father of Internet**. Originally, Internet has developed from US military network called **ARPANET (Advanced Research Project Agency Network)**.

In 1989, **Tim Berners Lee** proposed the idea of **WWW (World Wide Web)**. He and his team invented HTTP (Hyper Text Transfer Protocol), HTML and the technology of Web Server and Web browser. Using hyper links, web developers are able to connect various web pages. A web page can contain text, sound and graphics. Later, **ICANN (Internet Corporation for Assigned Names and Numbers)** was established to implement the concept of URL (Uniform Resource Locator).

Intranet is defined as a private network similar to Internet. It is used to share information, software and services within an organisation limited to the employees of the organisation.

Extranet is a kind of Intranet made available to only some computers that are not part of the company to be used by its customers, partners etc.

Requirements for connecting to Internet

- ➔ A computer which supports TCP/IP with a Network Interface Card (NIC).
- ➔ Modem.
- ➔ Telephone Connection.
- ➔ An Internet Account given by ISP (Internet Service Provider).
- ➔ Software like browser, applications for email, chat etc.

Nowadays, in addition to desktop or laptop computers, people also uses their mobile phone or tablet to connect to Internet. Some of them has a built in modem. Some others uses a connection to a Wi-fi modem.

Types of connectivity:- Today, Internet is being used for downloading videos, software, anti virus program etc. The latest technology **cloud computing** allows us to use online software on rental basis. All these needs high speed Internet access. The speed of Internet access is measured in the following units.

1 Kbps = 1000 bits per scond
1 Mbps = 1000 Kbps
1 Gbps = 1000 Mbps

The main factor that determines speed of Internet is the type of connectivity we choose. The following are major connectivity methods.

- **Dial-up connectivity**:- It uses a telephone line and a dial-up modem to dial and connect to sever when needed. The speed of the modem in this case 56 kbps. It is a slow connection. It uses the telephone line exclusively.
- **Wired broad band connectivity**:- It is an always-on connection. It offers very high speed. The telephone line can also be used for voice communication at the same time. The following are various technologies.

a) **ISDN (Integrated Services Digital Network)**:-It can transport both voice and digital data. ISDN lines are offered as two lines; one for voice and the other for data. It offers speed upto 2 Mbps.

b) **Cable Internet**:- It offers Internet through coaxial cables laid down to home for cable television. A cable modem is used to connect to Internet. It has a speed ranges from 1 Mbps to 10 Mbps.

c) **Digital Subscriber Line (DSL)**:- It allows a user to use the copper telephone line for both voice and data. ADSL – Asymmetric DSL is one DSL service which needs a ADSL modem. It offers speed ranging from 256 kbps to 24 Mbps.

d) **Leased Line**:- It is used to connect ISPs, business and large enterprise to Internet. If offers speed from 2 Mbps to 100 Mbps. It is costly.

e) **Fibre To The Home (FTTH)**:- It uses optical fibres for data transmission. It offers very high speed Internet to the home. A Network Termination Unit (NTU) is installed in our home to connect FTTH modem and computer.

- **Wireless Broadband connectivity**:- It offers almost the same speed of a wired broadband connection.

i. **Mobile broadband**:- It is wireless Internet access using Mobile phones, USB wireless modem, tablet or other mobile devices. The modem is built into these devices. It offers Internet connectivity from anywhere any time. 2G, 3G and 4G connections are available

ii. **Wi-MAX**:- Wi-MAX can offer Internet at a high speed across a distance of 50 Kms. Connectivity is provided using USB dongles, Wi-MAX handsets etc. A Wi-MAX modem is built into these devices. It offers a speed upto 70 Mbps.

iii. **Satellite broadband**:- Here, Internet connectivity is provided using satellite. A Very Small Aperture Terminal (VSAT) dish antenna and a transceiver (transmitter and receiver) are required at user's location. A Modem is used to link computer and transceiver. It is expensive.

- **Internet Access Sharing connectivity:-** A connection can be shared.

i. **Using LAN**:- Internet connected to a computer in a LAN can be shared by other computers in LAN. This can be done by using the facility available in the Operating System or using proxy software. It can also be done by connecting computers directly to the router.

ii. **Using Wi-Fi**:- Here, Internet is made available to the Wi-Fi router. The Wi-Fi router shares Internet through a wireless network access point called **hotspot**. It is not secured. It connects about 100m.

iii. **Using Li-Fi**:- Li-Fi (Light Fidelity) is a fast optical version of Wi-Fi. It uses visible light for data transmission. It uses a bright LED (Light Emitting Diode) lamp that can transmit data and a photo diode that acts as the receiver.LED is turned on or off to carry 1 or 0. But, this flickering cannot be detected by human eye. Data rate of over 100 Mbps is possible. It can be used in hospitals and aircraft where radio waves may cause interference. It can also be used underwater. It provides greater security as light cannot penetrate walls. The main drawback is that it is line-of-sight connectivity.

Services on Internet

1. World Wide Web (WWW):- It is a system of interlinked hypertext documents accessed using Internet. It is a client-server system. Each server stores a hughe collection of documents that are accessed using a reference called URL. These documents may contain text, image, video etc. It may also contain hyper links which allows one to fetch another document. A client access these resources using a software called **browser**.

A web browser is used for fetching documents using URL. A web document is created using HTML (Hyper Text Markup Language). A browser identifies these tags and displays the page accordingly. It allows us to navigate web pages. The popular browsers are **Google Chrome, Internet**

Explorer, Mozilla FireFox, Opera, Safari etc.

Web browsing:- A web site is viewed by entering the URL in the address box of the web browser and press Enter key. The browser, then, carries out the following steps.

1. It determines the URL entered.
2. It sends a request to DNS server to get the IP address of the URL.
3. The ISP's DNS server replies with the IP address.
4. The browser then makes a TCP connection to the web server.
5. Then it sends a GET request for the required web page to the server.
6. The server returns the web page.
7. The TCP connection is released.
8. The browser processes and displays contents of the web page.

2. Search engines:- Search engines are special programs designed to find information available in Internet. The user can type a keyword and search. The program returns a list of document matching the keywords. The search engines use a software called web crawlers or spiders or robots to search the web. These software first finds possible keywords and their URL and creates an index in the search engine's web server. The search engines always searches the index. Eg; **Google, Bing, Yahoo Search, Ask etc.**

3. Email

It is a method of exchanging digital messages between computers over Internet. It allows you to contact any person in the world in a matter of seconds. The messages will be delivered instantly in the recipient's inbox. In addition to message text, you can also attach files containing documents, pictures etc. It is possible to send the same message to different persons.

The persons who wants to send and receive emails must have an email address. The following is the structure of an e-mail address.

Eg:

There are two ways to use email.

- **Web mail** :- It is an online software (web application) accessed using browsers. Gmail.com, hotmail.com etc. are examples.
- **Email client software** :- It is a software installed in client device such as computer or mobile. When the client is offline, the messages are stored in the outbox. When the device become online, a send and receive occures. The messages in the email server are stored in our computer. Popular email client software are **Microsoft Outlook** and **Mozilla Thunderbird**

Structure of an email

- ➔ To (Recipient Address) :- A box to provide email address of recipient.
- ➔ Cc (Carbon Copy) :- A box to provide secondary recipient.
- ➔ Bcc (Blind Carbon Copy) :- A box to provide third recipient. The first two recipients are unable to see this address in the message received.
- ➔ Subject :- Provides a meaningful subject for conversation.
- ➔ Content :- The facility to type your messages.
- ➔ Attachment facility :- This allows you to attach any files with your message
- ➔ Send :- Allows you to send the message.
- ➔ Reply :- When a message is being read, use this to reply to the sender.
- ➔ Forward :- When a message is being read, use this to forward to another.

Working of email

When a message is sent, it will be first delivered to the sender's email server. From there, the message is routed to recipient's email server and stored in his inbox. When the user became online, the message is delivered to him. The following are the protocols used for handling email messages.

- ✓ POP (Post Office Protocol) :- Used by email client client software.
- ✓ IMAP (Internet Message Access Protocol) :- Used by email client software

- ✓ SMTP (Simple Mail Transfer Protocol) :- Used by web mail software

Advantages of email

- ◆ **Speed:-** The message will be delivered instantly.
- ◆ **Easy to use:-** Using software, send, receive, organize mails etc. is so easy.
- ◆ **Allows attachment:-** It allows us to send files with our email message.
- ◆ **Environment friendly:-** It is paper less. So it is nature friendly.
- ◆ **Cost effective:-** Cheaper than conventional method of mail.
- ◆ **Available Anywhere Any time:-** Messages can be read at user's convenience The mail box is accessible at any time.

Limitations

- ◆ **Email carry viruses:-** Viruses send along with email messages are harmful to our computer system. The virus also illegally reads our contacts list and send this message to all email addresses in our contact list and thus spreads the virus.
- ◆ **Junk mail:-** We may receive lot of unwanted emails. Checking and deleting such junk mail is time consuming.

4. **Social Media**:- It refers to the use of mobile and web based technologies through which individuals can create, share, and modify content. In social media, interactions among people happens in virtual communities. It needs Internet. The following are various types.

1. **Internet Forums:-** In this, people can post messages and engage in conversation related to a topic or its sub topic. Each discussion on a topic is called **thread**. People can start or respond to a thread. It helps one to learn and find solutions to problems. Eg; Ubuntu forum.
2. **Social blogs**:- A blog (Web log) is discussion or informational web site of posts displayed in reverse chronological order. Some blogs provides comments on a particular subject. Some other blogs function as personal online diaries and some others are promoting a brand. Single user blog and muti user blogs are available now. Eg; Blogger.com, WordPress.com
3. **Microblogs**:- It is used to exchange short sentences. It shares what people observe in their surroundings. They are very spontanious and affect public opinion. Eg; Twitter.com
4. **Wikis**:- It allows one to add content to existing information. It is a type of content management system. All posts and editing done by users are closely monitored by others. So incorrect information, advertisement etc. Are quickly removed. Eg; wikipedia.org
5. **Social networks**:- It allows users to create personal web pages and then communicate and share content with others. We can share text, video, audio etc. Public opinion are deeply affected by discussions in social networking sites. Eg; facebook.com, linkedin.com
6. **Content communities**:- It organise and share content like photos, videos etc. Youtube.com shares videos and flickr.com shares pictures.

Advantages of social media

Bring people together:- It allows people to find long lost friends.

- **Plan and organize events:-** It allows us to organize and participate events.
- **Business promotion**:- Helps to connect with customers, implement marketing campaigns etc.
- **Social skills**:- It allows people express their views and become an agent for social change.

Limitations in use of social media

- Intrusion to privacy:- The personal information of users can be used for illegal activities.
- Addiction:- Addiction to these sites wastes valuable time.
- Spread rumours:- It spreads news quickly. It can worsen a crisis by spreading negative information at an incredible speed.

Social media interaction – Best practices

- Avoid unnecessary uploading of personal data like email, phone, address, pictures or videos.
- Set a time schedule for these sites to avoid wastage of time.

- In some social media sites like blog, wikis etc. the content that you post are public. Avoid posting content that you may regret later.
- Set your privacy levels so that you should know exactly who can see your posts and share them. The three privacy levels are private, friends and public.

Cyber Security:- Nowadays Internet is being used for a variety of tasks such as email, social media, online purchase, doing business etc. Along side, several persons loss their cash, privacy, data etc. due to several threats found in networks. Hence, every organisation should monitor its network against intrusion and other attacks. The following are major threats affecting computer network.

- **Computer Virus**:- It is a program that attach itself to another program. It spreads to other computers and affects normal operations of a computer. A virus may delete or corrupt data. A virus cannot infect a computer unless it is executed. Virus spread when the file containing virus is copied or transferred through usb drives, portable hard disks, file sharing, or through email attachment.
- **Worm**:- It is a standalone malware program that replicates itself to spread to other computers. It spreads from one computer to another its own. A worm uses data transport features of a network. Worms affects data transfer speed by consuming bandwidths, whereas viruses almost corrupt or modify files in your computer.
- **Trojan Horse**:- It seems to be a useful program but that actually damages our computer. A trojan does not replicate. It also affects the network that gives malicious users a chance to access any data from our computer through network.
- **Spam**:- They are unsolicited e-mails sents to promote a product or service. Spammers collects e-mail address from social media, customers list etc. Clicking on a link in the spam may leads you to web sites containing viruses. Some email providers groups spam separately.
- **Hacking**:- It is a technical effort to manipulate normal behaviour of a computer network and details are drawn from the hacked computer. It is performed by computer security experts (white hats) and computer criminals (black hats). White hats checks the problems in security features of a network. It is called ethical hacking. Black hats break into a secure network and destroy data in it or make the network unusable. They also steal the confidential data in the system. Another category of hackers grey hats, falls in between white hats and black hats.
- **Phishing**:- It is an identity theft occurs online. It is an attempt to acquire information such as user names, passwords, credit card details etc. by pretending to be a original web site of banks. They have URL similar to the original one. The act of creating such misleading website is called **spoofing.** Emails are sent to users to force users to open this spoofed web sites.
- **Denial of Service attack:-** It is aimed at a web server. It forces the server to stop or restart. This prevents genuine users of the web site from using that service. It can be done from a single computer called Denial of Service (DoS) attack or from multiple computers called Distributed Denial of Service (DdoS) attack.
- **Man in the middle attack**:- It refers to an attack in which a person secretly intercepts electronic messages between sender and receiver. He may capture, inserts and modifies messages during transmission. If the sender sends data without proper security, it is caught by man in the middle and both sender and receiver unaware of this. He may steal user name, passwords, pin numbers etc. A solution against this problem is to use Encrypted connects such as HTTPS and SFTP.

Preventing network attacks:- Threats to network and computers is a major issue now found in Internet. The computers must be protected from such attack. The following are different methods.

- **Firewall**:- It is a system computer hardware and software that provides security to the computer network. It controls all incoming and outgoing data traffic. It determines whether to allow data to be transmitted or not.
- **Anti virus scanners**:- Anti virus programs are used for detecting presence of virus and removes it from our computer. It maintains a list of signature of viruses known to it. When a virus is found, anti virus programs prevents it from running and transfer it to a location. This process is called **quarantine.** These files may be later deleted.
- **Cookies**:- It is a small text file created by the web server in users computer. It is used to remember user movements in the web sites, email addresses, user name etc. Browsers stores cookies for a fixed time. Cookies are data and not virus. But, hackers can easily collect data available in cookies. Cookies can act as **spyware**. So its is a best practice to disable cookies or delete cookies regularly.

Guide lines for using computers over Internet

- Do not open any e-mail attachment that you are not sure about sender.
- Download files only from reputed sites.
- Avoid clicking on pop-up advertisement.
- Use USB devices with caution. USB storage can easily spread viruses.
- Make sure the firewall is set and turned on.
- Use strong passwords. Change passwords at regular intervals
- Update virus definition in the anti virus program regularly.
- Keep regular backup of important files in DVD, portable hard disk etc.
- Be careful about giving personal data online. Requests seeking your personal details like phone number, email, credit card details etc. Should be ignored.
- Visits banks site typing URL into the address bar. Do not click any links in email to safeguard against phishing. Banks never sends SMS or email or phone call asking your bank details, so do not respond to such calls or messages.
- Check whether the site you visit is secured. Observe whether it starts with https://
- Keep a regular check on your online accounts. Regularly check online bank statements.

Mobile Computing:- It is a technology by which you will get computing capabilities and data on travel. It became the backbone of the society. It improved the living standards. It does not depend on any physical connection between the sender and receiver. It was first introduced in 1946. There are different generation of mobile services.

1. First Generation (1G):- It uses analog signals and provides only basic voice facility.
2. Second Generation (2G):- 2G introduced digital system. In this era, conversation in phones are digitally encrypted. It is possible to send MMS (Multi Media Messages). The Two popular standards of 2G are GSM (Global System for Mobile) and CDMA (Code Division Multiple Access). It also started sending data and voice together. To access data GPRS (General Packet Radio Services) and EDGE (Enhanced Data Rates for GSM users).
3. Third Generation (3G):- In 3G high data transfer rates were introduced. The handset and base station must support 3G to use it. It use WCDMA (Wideband Code Division Multiple Access) technology to send both data and voice.
4. Fourth Generation (4G):- It is also called LTE (Long Term Evolution). It provides excellent speed in network. The technology used is OFDMA (Orthogonal Frequency Division Multiple Access). 4G provides good quality images and videos than a TV.

Mobile Services

- SMS (Short Message Service):- It allows us to send text messages over mobile phones.
- MMS (Mutimedia Message Service):- It allows us to send messages

containing text, video, audio, pictures etc.

- GPS (Global Positioning System):- It is a satellite based navigation system to locate geographical position anywhere on the earth using longitude and altitude. It is used for tracking vehicle movements and analysing roots.
- Smartcards:- It is a plastic card embedded with a computer chip. SIM (Subscriber Identity Module) is a example for smartcard.

Mobile Operating System

A mobile operating system is the one used in mobile devices. The popular mobile operating systems are Android, iOS from Apple, BlackBerry OS from Black berry, Windows Phone OS from Microsoft.

Android Operating System:- It is a Linux based operating system designed for mobile phones and tablet computers. It is a concept by Open Handset Alliance, a consortium of several companies including Google, HTC, Intel, Motorola etc. The different version of Android OS are

- CupCake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Scream Sandwich, Jelly Bean, Kitkat, Lollypop, Marshmallow