Chapter : 6 www,Internet

Introduction to Internet:-

Internet is an interconnection between several computers of different types belonging to various networks across the world. **It is a network of networks. Millions of people use the Internet to search and share information and idea, etc.**

Communication is one of the most popular uses of the Internet. The Internet is making it easier for people to communicate with one another using computers. **The most popular way of communication on the Internet is the electronic mail (e-mail).** With e-mail topping the list of all the technologies also include e-mail discussion groups, usenet news, chat groups, and so on.

The Internet provides a capability so powerful that it can be used for almost any purpose that depends on information. It is accessible by every individual who connects to one of its constituent networks. It allows people to work collaboratively at many different locations. It supports access to digital information by many applications, including the World Wide Web (WWW).

History of Internet:-

The Internet, popularly called the Net, was created in 1969 for the U.S. defense department. Funding from the Advanced Research Projects Agency (ARPA) allowed researchers to experiment with methods for computers to communicate with each other. Their creation, the **Advanced Research Projects Agency Network (ARPANET),** originally linked only four separate computer sites at **U.S. universities and research institutes, where it was used primarily by scientists.**

The National Science Foundation (NSF) assumed responsibility for linking these users of ARPANET, which was dismantled in 1990. The NSF Network (NSFNET) now serves as the technical backbone for all Internet communications in the United States.

Features of the Internet

1. www : it is a part of the Internet
2. Mail anywhere in the world in a moment with the fastest mailing service of the world called "email".
3. Transfer files to anywhere in the world.
4. Find any information about any people, product, institution, country etc.
5. Call anywhere in the world.
6. Watch TV
7. Connect to people in just a moment
8. Do shopping
9. Discuss & receive suggestions on our problems.
10. Make an application for admission
11. Pay our telephone bills. Etc
12. Enjoy Movies/Music.
13. Play online games

Internet Services:-

Internet services are referred as the facility you are availed through internet. There are many kind of internet facility we are availed now days.

1. Online Transaction
2. Searching
3. Ticket Booking
4. Online Application
5. E-Communication
6. Weather forecasting
7. E-Commerce
8. E-Governance

Basics of Computer Networks:-

Computer Network is a group of computers connected with each other through wires, optical fibers or optical links so that various devices can interact with each other through a networks.

A network is a group of computers connected in some fashion in order to share resources. A group of computes in a network would provide greater storage capacity and processing power than that by stand-alone independent machine.

Types of Network:

There are many types of Network:-

1. LAN
2. MAN
3. WAN
4. PAN
5. CAN

LAN (Local Area Network):-

LAN is a group of computers located in the same room, on the same floor, or in the same building that are connected to form a single computer network. LANs allow users to share storage devices, printers, applications, data, and other network resources. They are limited to a specific geographical area, usually less than one kilometer in diameter.

MAN (MetroPolitan Area Network):-

A **Metropolitan Area Network** or **MAN is consisting of a computer network across an entire city, college campus, or a small region**. This type of network is large than a LAN, which is mostly limited to a single building or site. Depending upon the type of configuration, this type of network allows you to cover an area from several miles to tens of miles.

WAN (Wide Area Network):-

WAN (Wide Area Network) is another important computer network that which is spread across a large geographical area. WAN network system could be a connection of a LAN which connects with other LAN's using telephone lines and radio waves. It is mostly limited to an enterprise or an organization.

A Wide Area Network (WAN) is a much larger network than LAN and MAN. It often covers multiple contries or contenants. It is quiet expensive and a single organization may not have own it. Satellite is used to manage WAN.

PAN (Personal Area Network):-

PAN (Personal Area Network) is a computer network formed around a person. It generally consists of a computer, mobile, or personal digital assistant. PAN can be used for establishing communication among these personal devices for connecting to a digital network and the internet.

Servers:-

Servers are computers that hold shared files, programs and the network operating system. Servers provide access to network resources to all the users of the network. **A server is a software or hardware device that accepts and responds to requests made over a network**. The device that makes the request, and receives a response from the server, is called a client. On the Internet, the term "server" commonly refers to the computer system that receives requests for a web files and sends those files to the client.

Client:-

Clients are computers in a network other than the server. **They request to the server and then receive services from the server**. These are also known as workstations or nodes and have a specific address or name on the network.

Transmission Media:-

These are used to connect computers in a network. E.g. twisted pair wires, coaxial cables and optical fiber cables. These are also known as channels, links or lines.

Network Interface Card (NIC):-

Each computer on a network has a special circuit card attached to its motherboard which is called NIC. It is used to prepare and send data, receive data and control the flow of data between computers.

Local Operating System:-

It allows access to files, local printer and to one or more disks located on the computer.

e.g. Windows, MS-DOS, Linux etc.

Network Operating System:-

The network operating system is a program that runs on computers and servers, and allows the computers to communicate over the network.

Network Devices:-

Networking hardware, also known as network equipment or computer networking devices, are electronic devices which are required for communication and interaction between devices on a computer network. Specifically, they mediate data transmission in a computer network.

There are many types of Network Devices

Hub:-

It is a centralized network connection to multiple computers with a central node or server. It has ports to join all the network channels. A Hub can be used to connect 4, 8, 16, 24 computers. **Hub works on Half duplex and it is used in small network. It Broadcast to all connected computers.**

Switch:-

A switch is a network device that selects a path or circuit for sending a data unit to its next destination. In smaller networks, a switch is not required. **It is required in large internetworks,** where there can be multiple ways of transmitting a message from a sender to a destination. **Switch works on Full duplex.**

Router:-

Routers are used to find a route for the messages to travel in large networking or while connecting two or more networks, these can be used in place of a switch in large networks. These can be wired or wireless.

Routers are devices containing software that help in determining the best path out of the available paths for a particular transmission. They consist of a combination of hardware and software. The hardware includes the physical interfaces to the various networks in the internetwork. The two main pieces of software in a router are the operating system and the routing protocol.

Repeater:-

A repeater is an electronic device that amplifies the signal it receives. You can think of repeater as a device which receives a signal and retransmits it at a higher level or higher power so that the signal can cover longer distances, more than 100 meters for standard LAN cables. Repeaters work on the Physical layer.

Bridge:-

Bridges are devices that can transmit data between two heterogeneous LANs. Bridges divide a large network into smaller segments. It connects two LAN network or may divide a big or busy network into small network.

Gateway:-

A gateway is also used to connect two networks but unlike a bridge that connects similar networks, it connects two networks working different models.

Modem:-

A **modem (modulator-demodulator)** is a device that modulates an analog signal to digital information. It also decodes carrier signals to demodulates the transmitted information. The technique by which is **digital signal is converted t its analog form is known as modulation**. The reserse process, i.e. the conversion of **analog signal to its digital form at the destination device is called demodulation**.

Network Topology:-

Topology is the method in which networks are physically connected together. Topology determines the complexity of connecting computers and, therefore, the cost of network cable installation. Topology also determines the strategy for physically expanding the network in future.

There are many types of topology

1. **Bus Topology**
2. **Ring Topology**
3. **Start Topology**
4. **Mesh Topology**
5. **Tree Topology**

Bus Topology:-

Bus topology is a network type in which every computer and network device is connected to a single cable. When it has exactly two endpoints, **then it is called Linear Bus topology.**

Features of Bus Topology:

- The data signal is available to all computers connected to the bus.
- It carries the address of the destination computer.
- Bus topology is good for connecting 15-20 computers.
- Each computer on the network checks the destination address as the data signal travels through the bus.

Advantage of Bus Topology:-

- Bus topology cost is very low
- Required less cable length compared to other networks such as start topology.
- Easy to connected computer peripheral to a linear bus.
- It is easy to extend a bus.
- It works well for small networks.

Disadvantages of Bus Topology:-

- If there is a break in the main cable, the entire network will be shut down.
- If network gets heavy traffic, a node's performance of the network falls.
- The length of cable is limited.
- It is difficult to troubleshoot a bus.

Ring Topology:-

It is called ring topology because it forms a ring as each computer is connected to the other computer, with the last one connected to the first.

Note:- In Ring topology, computers are arranged in a circle. Data travels around the ring in one direction, with each device n the ring acting as a repeater. **Ring networks typically use a token-passing protocol.**

Features of Ring Topology:-

- Ring network does not have terminated ends
- The computers or devices are connected in the ring using twisted pair cables, coaxial cables or optic fibers.
- The protocols used to implement ring topology are **Token Ring and Fiber Distributed Data Interface.**
- Bit-by-bit data is transferred in a sequential manner.

Advantages of Ring Topology:-

- It is a more reliable network, because the communication system is not dependent on the single host computer.
- Easy to install and the maintenance is much easier compared to the bus network.
- Adding components such as nodes will not affect the performance of network.
- Because every computer is given equal access to the token, no one computer can monopolize the network.
- Troubleshoot is easy because cable faults can be easily located.

Disadvantages of Ring Topology:-

- Failure of one computer on the ring affects the whole network.
- Adding or removing devices to the networks would slow down the network activity.
- It is difficult to troubleshoot because it required special equipment to default the cable faults.
- If any one of the node fails, it disturbs all other networks.

Star Topology:-

A Star network, every host is connected to a central connection point, like a hub or a Switch. The connection between a node and hub device is a point-to-point. The device takes a signal from any node and passes it to all other nodes in the network. It works as a server and it controls the entire function of the network. It is used to connect a computer through Coaxial cable.

Features of Star Topology:-

- Every node has its own dedicated connection to the hub.
- Hub acts as a repeater for data flow.
- Can be used with twisted pair, optical fiber or coaxial cable.
- The data signal is transmitted from the source computer to the destination computer via the hub or switch.
- The common protocols used in star topology are Ethernet, Token Ring, and Local Talk.

Advantages of Star Topology:-

- It is much easier to modify or add new computers to a star network without disturbing the rest of the network.
- Single computer failures do not necessarily bring down the whole star network.
- Easy to manage and maintain the network because each node has separate cable.
- It supports a high-speed data bandwidth of approximately 100 Mbps.
- Cost effective as it uses inexpensive coaxial cable.

Disadvantages of Star Topology:-

- If the central hub goes down, then all other connected nodes will not be able to communicate with each other.
- It requires more wires compared to the ring and bus topology because it is expensive to use.
- If the hub gets failed then all the connected nodes will not be able to communicate with each other.

Mesh Topology:-

In a Mesh topology, every node has point-to-point connection to the other node. **All the computers are interconnected to each other in a network**. This type of mesh topology is very expensive and it is difficult to establish the connections. **The connection in mesh topology can be used in wireless network.**

Features of Mesh Topology:-

- In a mesh network topology, each of the network node, computer and other devices, are interconnected with one other.
- Every node not only send its own signals but also relays data from other nodes.
- This type of topology is very expensive as there are many redundant connections.
- The internet is an example of mesh topology.

Advantages of Mesh Topology:-

- The networks are very reliable because if any link breaks, it will not affect the other connected computers.
- There is no link between point-to-points because it is secure.
- Fault is diagnosed easily.
- It is very fast communication between the nodes.

Disadvantages of Mesh Topology:-

- It requires space to run the cables.
- Installation process is difficult, as each node is connected to every node.
- It requires number of cables and Input-output ports for communication.
- The Management of mesh network is very large and difficult to maintain and manage. If not monitored carefully, then the communication link in the network fails.

Tree Topology:-

It has a root node, and all other nodes are connected to it, forming a hierarchy. It is also called hierarchical topology. It should have at least three levels to the hierarchy.

Features of Tree Topology:-

- It combines characteristics of linear bus and star topologies.
- It is arranged in a group of star workstations connected to a linear bus backbone cable.
- The top-level node in tree topology is known as a root node, and all other nodes are hierarchy of the root node.

Advantages of Tree Topology:-

- Point-to-point connection of each computer is connected to each part of hub network.
- It is easy to add computer by extending the cables to connect computers.
- Error detection is an easy process.
- Fast expansion of nodes.

Disadvantages of Tree Topology:-

- If any faults occur in the node, it is difficult to maintain.
- Requires high cost devices for broadband transmission.
- If new or more nodes are added, then it becomes difficult to reconfigure.
- Failure in the main bus cable will damage the overall network.

Protocol:-

Different types of networking operating systems use different languages to control the communication process languages to control the communication process between the computers. These languages are called Network Protocols.

A protocol is a set of rules that governs the communications between computers on a network. There are many protocols, each one governing the way a certain technology works.

TCP (Transmission Control Protocol):-

TCP is used for communication over a network. It is a connection-based protocol. The data is broken down into small packets and then sent to the destination. It is one of the most important protocols that function at the transport layer of the OSI model.

IP (Internet Protocol):-

IP is also known as TCP. It is an addressing protocol. The IP addresses in packets help in routing them through different nodes in a network until they reach their right destination. The IP protocol was developed in 1970. IP works on Network layer of OSI model. **It is also known as connectionless protocol.**

HTTP (HyperText Transfer Protocol):-

HTTP is used for transmitting and displaying information in the form of web pages on browsers. It is basically used for downloading files, media, text and various other forms from the server in a secure way. It works at the application layer and makes use of TCP protocol for the purpose of transfer of data.

FTP (File Transfer Protocol):-

FTP is used for file transfer (uploading and downloading) over the Internet. It works at the Application layer of the OSI model.

POP (Post Office Protocol):-

The most common protocol for receiving mail is Post Office Protocol (POP). It is now in version 3, so it is called POP3. POP3 is an application layer protocol that allows the client to retrieve and download emails from the server. It is simple to connect to the server to download emails. Once you have downloaded them it is easy to read them offline.

SMTP (Simple Mail Transfer Protocol):-

SMTP is used for email. It is used for the purpose of transmission of emails over the network. Not only can it transfer emails within networks, but it can also transfer them between different networks.

Ethernet:-

It is the most popular protocol used for LAN communication. It transfers the information in digital packets. If any computer wants to use this protocol, it must contain Ethernet Network Interface Card. This card is a unique address code fixed in the microchip.

UDP (User Datagram Protocol):-

It is usually known as User Datagram Protocol. It is the transport layer of the OSI model. It is a connectionless protocol which enables the transfer of data over the network.

Telnet:-

It is a set of rules for connecting one system with another. **The connecting process is termed as a remote login.** The system which requests for connection is the local computer, and the system which accepts the connection is the remote computer.

HTTPS (Hyper Text Transfer Protocols Secure):-

Hyper Text Transfer Protocol Secure (HTTPS): HTTPS is abbreviated as Hyper Text Transfer Protocol Secure is a standard protocol to secure the communication among two computers one using the browser and other fetching data from web server.

WWW (World Wide Web):-

The world wide web is the part of the Internet that contains websites and webpages. It was invented in 1989 by Tim Berners-Lee at CERN, Geneva, Switzerland. It is basically a system of Interne servers that supports specially formatted documents. The documents are formatted in a markup language called Hyper Text Markup Language (HTML) that supports links to other documents as well as graphics, audio and video files.

The WWW is essentially a huge client-server system with millions of servers distributed worldwide. Each server maintains a collection of documents; each document is stored as a file. The server accepts requests for fetching a document and transfers it to the client.

Website Address:-

A website is a collection of web pages associated with a particular person, business, government, school and organization. Websites are stored on Web server, a special computer that makes web pages available for people to browse. Websites can consist of only a few web pages or many hundreds of web pages or many hundreds of web pages.

A website address is known as a URL. It is an Internet name that points to a location where a file, directory or website page is hosted. **The first page of the website is called the Home page.**

Web Page:-

A web page is an electronic document written in computer language called Hypertext Markup Language (HTML). It contains text, links or tags that will display graphics, video, audio, and downloaded files and other web pages. Each web page has a unique address, called a Uniform Resource Locator (URL) that identifies its location on the network.

URL (Uniform Resource Locator):-

Uniform Resource Locators, or URLs are the unique addresses of Internet resources. A URL is divided into four parts. URLs contain information about the access method to use and also about the resource itself. They are used by web browsers to connect you directly to a specific document or page on the WWW. You do not have to know where that resource is located physically.

Every page on the web has a unique address called URL.

1. Transfer Protocol 2. Server Name 3. Directory path 4. File Name

http://www.tabasco.com/html/ap_pendix.html

Absolute URL:-

A fully qualified URL that specifies the location of a resource that resides on the Internet is called an absolute URL. It is the complete path including the domain – filename.

Example:- http://www.ibdhost.co/images/logo.gif This type of URL is what you must use when you want to link a file that is on another server.

Relative URL:-

A partially qualified URL is the one that specifies a resource on the Internet whose location is relative to the starting point specified by an absolute URL.

The relative URL points to a file or directory in relation to the present file or directory (folder). Relative URLs help in website maintenance. It is easy to move a file from one directory (folder) to another, or a website from one domain name to another.

Domain Name:-

Most organizations use domain names that are easy to remember. Each domain name ends with an identifier that tells you what type of website it is.

Current Domain Identifiers	
.com	Commercial business
.edu	Educational Institutions
.gov	Government entities
.net	Internet Service Providers
.mil	Military sites
.org	Organizations that do not fit any other category

Current Domain Identifiers	
.in	For India
.jp	For Japan
.ca	For Canada
.uk	For United Kingdom

ISP and Role of ISP:-

An Interne Service Provider is a company which allows you to connect to the Internet. It provides the gateway to the internet and everything that you do online. You also connect to an ISP by using a PC modem to dial into the ISP modems over a standard telephone line. Your modem connects to a single modem among a bank of modems at your ISP. This a called a dial-up connection.

Some of the popular ISPs in India are:

BSNL

MTNL

Airtel

Jio

VI

Circuit-Switched Services:-

A temporary switched circuit is established through the telecommunications system for the duration of the communication session. When the connection is terminated, the carrier switches are freed up for other uses.

Example:- ISDN (Integrated Services Digital Network)

Packet Switched Services:-

These are dedicated or dial-up connections to a public packet-switching network, such as **X.25**, a public frame-relay network, or even a virtual private Network (VPN).

IP Address:-

IP stands for Internet Protocols. It is a numerical label or value that is used to uniquely identify a computer on the Internet that uses the Internet protocol for communication. **The address is made up of 32-binary bits in an IP address**. The numbers are grouped into four octets and are separated by dots. Each octet consists of 8 bits each, that is, 4*8=32 bits. In a decimal format, each octet has a minimum value of 0 and maximum value of 255. It starts from 0.0.0.0 and the end is 255.255.255.255 in a decimal format.

In IP addressing scheme, a static IP address is permanent address which will never change, whereas a dynamic IP address device changes its IP address every time when accessing internet.

The 32-bit IP address is grouped into eight bits, each separated by dots, and represented in decimal format (known as dotted decimal notation).

Important Point:-

i. IP Address is divided into 4 parts

ii. Each Part is known as octet

iii. Each octet is equal to 8 bit

iv. Each part is separated by . (dot)

v. IP Address is of 32

vi. IP address is divided into 4 bytes

Note:- IP Address range available 0-255

Class of IP Address:-

Class	Range	Identify	Subnet Mask	Net Id	Host Id	No. of Nid	No. of Hid
A	0-126	0	255.0.0.0	1	3	126	16777214
B	128-191	10	255.255.0.0	2	2	16382	65534
C	192-223	110	255.255.255.0	3	1	2097150	254
D	224-239	1110	Reserved for Multicasting				
E	240-255	1111	Experimental; used for research				

Note:-

1. (127.0.0.1) is Loop Back Ip Address

2. Class C IP Address is used by smaller and mid sized network (companies).

3. Class A IP Address networks are only used by Large

4. IP address is identify by the first byte

IPv6:-

IPv6 is the latest level of the Internet Protocol and is now included as part of the IP support in many products including the major computer operating systems. IPv6 is a set of specifications from the Internet Engineering Task Force (IETF). IPv6 was designed as an evolutionary set of improvements to the current IP version 4.

The most obvious improvement in IPv6 over the IPv4 is that IP addresses are lengthened from 32 bits to 128 bits. This extension will take care of future growth of the Internet. **The 128 bit address is divided in to 16 bits**, and each 16 bit block is converted to a 4 digit hexadecimal number and separated by colons.

MAC Address:-

Mac stands for Media Access Control. It is a unique identifier assigned to a network interface card (NIC) by the manufacturer. It is used to connect to the Ethernet network, and it has its own unique MAC address. The MAC addresses are assigned permanently to adapters and cannot be changed as they are a unique identification of the hardware interface of network. They are the physical addresses. This address is sent to your local network, i.e., to your router or ISP, where it is used to route information to your computer and serves as identification print on your network.

MAC address is a 48 bit hexadecimal address. The format of a MAC address is MM:MM:MM:SS:SS:SS, where MM:MM:MM: the first 3 byte include address of the manufacturer, and the second half is the serial number of NIC card. MAC address of each computer on a network is unique. MAC address is used at the data link layer of OSI/TCP/IP model.

IMEI:-

An **International Mobile Equipment Identity (IMEI)** number is a globally unique identification or serial number that is given to all mobile phones and smart phones. **It is a 15 digit number assigned to all cellular devices,** which identifies your device within the mobile network. We can use this number to present a mobile phone from being used by another person or phone company if it has been lost or stolen.

The IMEI can be displayed on the screen of the phone by entering ***#06#** into the keypad on most phones. It can also be printed behind the battery of the phone.

Modes of Connecting Internet:-

There are different types of Internet Access techniques like Hotspot, Wireless fidelity (Wi-Fi), LAN cable, Broadband and USB Tethering.

Hotspot:-

A hotspot is a physical location where people get Internet access using Wi-Fi technology via a wireless local area network, using a router connected to an ISP. Many places offer free Wi-Fi hotspot as a public service, including airports, restaurants and hotels to attract customers.

Using a hotspot can be a security threat to your personal data. Anyone can set up a malicious hotspot that will unencrypt data sent through it. Another way attackers can access your personal information is to eavesdrop on a legitimate Wi-Fi hotspot and watch for unencypted data being transmitted. Today, most smartphones can be configured to create a Wi-Fi hotspot, allowing computers and tablets to connect to the Internet using the Wi-Fi signal generated by the smartphone.

LAN Cable:-

The LAN is used to connect two desktop PCs along with the internet connection method. The LAN internet connection is used to create a local area network for sharing the internet and files/folders.

Wi-Fi Connection:-

Wireless Internet access sometimes referred to as a "hot Spot" is a local area network run by radio waves rather than wires. It is broadcast from a central hub, which is a hard-wired device that actually brings in the Internet connection.

Wi-Fi is a wireless networking technology that allows devices such as computers (laptops and desktops), mobile devices (smart phones and wearables), and other equipment (printers and video cameras) to interface with the Internet. It allows these devices–and many more–to exchange information with one another, creating a network. Internet connectivity occurs through a wireless router. When you access Wi-Fi, you are connecting to a wireless router that allows your Wi-Fi-compatible devices to interface with the Internet.

Broadband Connections:-

Broadband refers to various high-capacity transmission technologies that are used to transmit data, voice, and video across long distances and at high speeds. Common mediums of transmission include coaxial cable, fiber optic cable, and radio waves.

Broadband is always connected and removes the need for dial-up. Its importance is far-reaching; it allows for high-quality and quick access to information, teleconferencing, data transmission, and more, that can be used in a variety of capacities, from healthcare to education to technological development. It gives a high-speed internet access of minimum 512 Kbps and up to a maximum of 100 Mbps.

USB Tethering:-

You can share your phone mobile data to access Internet with other devices, like your laptop, through tethering. You can tether using a Bluetooth or Wi-Fi connection: however USB Tethering has the fastest speed to share your phone mobile data with other devices.

Web Browsers:-

A web browser is a software application which enables a user to display and view web pages such as images, videos, music and other information. Text and images on a web page can contain hyperlinks which allow a user to quickly and easily access information provided on many web pages at many websites.

Some popular web browsers:-

Internet Explorer	Microsoft Edge	Mozilla Firefox
Opera Mini	Google Chrome	Netscap Navigator
Lynx	Chromium	Epic
Apple Safari	Brave	Vivaldi
Avant	NCSA Mosaic	

Search Engine:-

A web search engine is used to search for information on the Internet. The search results are generally presented in a list and are often called hits. The information may consist of web pages, images, text and other types of files.

How Search Engine Works?

Search Engine is the software program that helps users find information stored on a personal computer, or a network of computers, such as the Internet. A user enters a keyword or a phrase. The search engine retrieves a list of web sites.

A search engine makes search in the following order

Web Crawling:-

Search engine works by matching the required information from different websites and storing many web pages. These pages are then retrieved by a Web crawler (also known as a spider).

The contents of each page are then analyzed to check how it should be indexed. Data collected on web pages is stored in an index database for use in later queries. The purpose of an index is to get information as quickly as possible.

Indexing:-

The indexing software collects the document as well as URLs from the agent. The software then extracts information from the documents and indexes. It each search engine extracts and indexes different types of information.

Search Algorithm:-

Search using Boolean operators allow you to combine words and phrases using the words AND, OR and NOT to specify the search more accurately. When we perform the search by entering keywords, the search engine searches its database using search algorithm

Some popular Search Engine:-

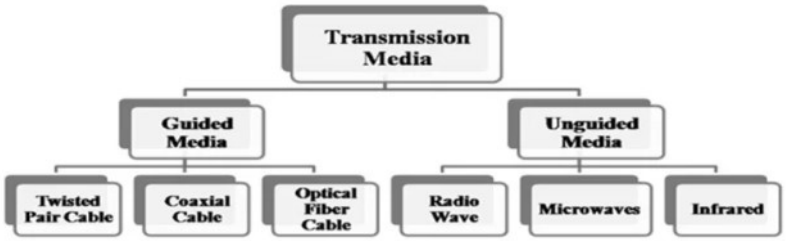
1. Google	2. Microsoft Bing	3. Yahoo	4. Baidu
5. Yandex	6. DuckDuckGo	7. Ask.com	8. Ecosia
9. Aol.com	10. Internet Archive	11.Excite	12. Lycos
13. Hotbot	14. Alta Vista	15. Web Crawler	16. MSN

Transmission Media:-

A transmission medium is a physical path between the transmitter and the receiver i.e it is the channel through which data is sent from one place to another. A communication channel that is used to carry the data from the transmitter to the receiver through the electromagnetic signals.

Types of Transmission Media:-

Transmission media is classified into two types namely wired media (Guided Media) & wireless media (Unguided Media).



Guided Media:-

This kind of transmission media is also known as wired otherwise bounded media. In this type, the signals can be transmitted directly & restricted in a thin path through physical links.

The main features of guided media mainly include secure, high-speed, and used in small distances. This kind of media is classified into three types which are discussed below.

Twisted Pair Cable:-

It includes two separately protected conductor wires. Normally, some pairs of cables are packaged jointly in a protective cover. This is the most frequently used type of transmission media and it is available in two types.

UTP (Unshielded Twisted Pair):-

This UTP cable has the capacity to block interference. It doesn't depend on a physical guard and used in telephonic applications. The advantage of UTP is a low cost, very simple to install, and high speed. The disadvantages of UTP is liable to exterior interference, transmits in fewer distances, and less capacity.

STP (Shielded Twisted Pair):-

STP cable includes a particular jacket for blocking outside interference. It is used in rapid data rate Ethernet, in voice & data channels of telephone lines. The main advantages of STP cable mainly include good speed, removes crosstalk. The main disadvantages are hard to manufacture as well as install, It is expensive and bulky also

Coaxial Cable:-

This cable contains an external plastic cover and it includes two parallel conductors where each conductor includes a separate protection cover. This cable is used to transmit data in two modes like baseband mode as well as broadband mode. **This cable is widely used in cable TVs & analog TV networks.**

The advantages of the coaxial cable include high bandwidth, noise immunity is good, low cost and simple to install. The disadvantage of this cable is, the failure of cable can disturb the whole network

Optical Fibre Cable:-

This cable uses the notion of light reflected through a core that is made with plastic or glass. The core is enclosed with less thick plastic or glass and it is known as the cladding, used for large volume data transmission.

The main advantages of this cable include lightweight, capacity & bandwidth will be increased, signal attenuation is less, etc. The disadvantages are high cost, fragile, installation & maintenance is difficult and unidirectional.

Unguided Media:-

It is also known as unbounded otherwise wireless transmission media. It doesn't require any physical medium to transmit electromagnetic signals. The main features of this media are less secure, the signal can be transmitted through air, and applicable for large distances. There are three types of unguided media which are discussed below.

Radiowaves

These waves are very easy to produce as well as penetrate through buildings. In this, the transmitting & receiving antennas no need to align. The frequency range of these waves ranges from 3 kHz to 1GHz. These waves are used in AM & Fm radios for transmission. These waves are classified into two types namely Terrestrial & Satellite.

Microwaves

It is a sightline transmission which means the transmitting & receiving antennas need to align correctly with each other. The distance which is covered through the signal can be directly proportional to the antenna's height. The frequency range of microwaves ranges from 1GHz to 300GHz. These are extensively used in TV distribution & mobile phone communication

Infrared Waves

Infrared (IR) waves are used in extremely small distance communication as they cannot go through obstacles. So it stops intrusion between systems. The range of frequency of these waves is 300GHz to 400THz. These waves are used in TV remotes, keyboards, wireless mouse, printer, etc.

Connector:-

The part of a cable that plugs into a port or interface to connect one device to another. Most connectors are either *male* (containing one or more exposed pins) or *female* (containing holes in which the male connector can be inserted).

Registered Jack 45 (RJ45)

The cable connector that is found on almost all UTP and STP cables is a Registered Jack 45 which is mostly commonly referred to as RJ45. This type of connector resembles the older RJ11 connectors that most people are familiar with from wired telephones. below shows an example of a RJ45 connector:

Straight Tip (ST)

The Straight Tip (ST) connector is often seen on the end of a multi-mode cable; it has been commonly seen along with the SC connector for the last 20 years but is being slowly replaced by multi-fiber connectors (LC and MTP). below shows an example of a ST connector:

Subscriber Connector (SC)

The Subscriber Connector (SC) can be seen commonly on MMF or SMF; as with SC connectors, the ST connector is slowly being replaced by multi-fiber connectors. below shows an example of an SC connector:

Lucent Connector (LC)

The Lucent Connector (LC) was developed for high-density deployments where multiple fibers would be terminated within a confined space. Unlike the SC and ST connectors, the LC connector is always duplex connecting a pair of fibers at a time. below shows an example of a LC connector:

BNC

BNC connector is a series of connectors used for connecting thinnet coaxial cabling to various networking components. BNC connectors use a twist-and-lock mechanism that provides a secure connection between network cabling and components. BNC connectors are typically used on 10Base2 Ethernet networks

1. Cross Cable:-

A crossover cable is a type of cable installation that is used for the interconnection of two similar devices. It is enabled by reversing the transmission and receiving pins at both ends, so that output from one computer becomes input to the other, and vice versa.

Crossover cables are used when:

1. Connecting a computer to a computer
2. Connecting a router to a router
3. Connecting a switch to a switch
4. Connecting a hub to a hub and
5. Connecting a router to a PC because both devices have the same components

2. Straight Cable:-

A straight through cable is a type of twisted pair cable that is used in local area networks to connect a computer to a network hub such as a router. This type of cable is also sometimes called a patch cable and is an alternative to wireless connections where one or more computers access a router through a wireless signal.

This type of cable is used to connect the following devices:

1. computer to hub
2. router to switch
3. Connecting a router to a hub
4. Connecting a computer to a switch
5. Connecting a LAN Port to a switch or computer
6. Connecting other dissimilar networking equipment

Applications of Internet

Internet services allow us to access huge amount of information. Application of Internet can be classified in 4 categories.

1. Communication services:

Communication services offer an exchange of information with individual or groups. Some communication services is under below

1. Electronic mail
2. Telnet
3. News Group
4. Internet Relay Chat (IRC)
5. Mailing List
6. Internet Telephony (VoIP)
7. Instant Messaging

Information Retrieval Services:-

These services offer access to information available over the internet. These are as follows

1. File Transfer Protocol (FTP)
2. Archie
3. Gopher

3. Web Services:-

Web services allow the exchange of information between applications on the web.

1. Video conferencing
2. E-learning
3. E-banking
4. E-Commerce
5. E-Reservation
6. Social Networking

Transmission:-

Data transmission refers to the process of transferring data between two or more digital devices. Data is transmitted from one device to another in analog or digital format. Basically, data transmission enables devices or components within devices to speak to each other. **data transmission**, sending and receiving data via cables (e.g., telephone lines or fibre optics) or wireless systems.

Transmission Modes:-

Transmission mode means transferring data between two devices. It is also known as a communication mode. Buses and networks are designed to allow communication to occur between individual devices that are interconnected. There are three types of transmission mode:-

1. Simplex Mode
2. Half duplex Mode
3. Full duplex Mode

Simplex mode:-

In this type of transmission mode, data can be sent only in one direction i.e. communication is unidirectional. We cannot send a message back to the sender. Unidirectional communication is done in Simplex Systems where we just need to send a command/signal, and do not expect any response back.

Examples of simplex Mode are loudspeakers, television broadcasting, television and remote, keyboard and monitor etc.

Half duplex mode:-

Half-duplex data transmission means that data can be transmitted in both directions on a signal carrier, but not at the same time.

Example of half duplex is a walkie- talkie in which message is sent one at a time but messages are sent in both the directions.

Full duplex mode

In full duplex system we can send data in both the directions as it is bidirectional at the same time in other words, data can be sent in both directions simultaneously.

Example of Full Duplex is a Telephone Network in which there is communication between two persons by a telephone line, using which both can talk and listen at the same time.

Method of Transmission:-

Unicast:-

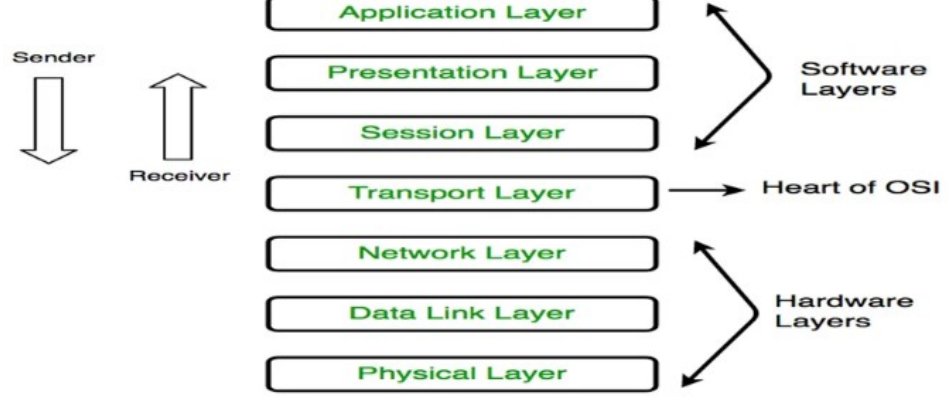
Unicast is the term used to describe communication where a piece of information is sent from one point to another point. In this case there is just one sender, and one receiver.

Multicast

Multicast is the term used to describe communication where a piece of information is sent from one or more points to a set of other points. In this case there is may be one or more senders, and the information is distributed to a set of receivers (theer may be no receivers, or any other number of receivers).

Broadcast

Broadcast is the term used to describe communication where a piece of information is sent from one point to all other points. In this case there is just one sender, but the information is sent to all connected receivers.



About Lesson

OSI Model:-

OSI stands for **Open Systems Interconnection**. It has been developed by ISO – '**International Organization of Standardization**', in the year 1984. It is a 7 layer architecture with each layer having specific functionality to perform. **All these 7 layers work collaboratively to transmit the data from one person to another across the globe**. In the OSI reference model, the communications between a computing system are split into seven different abstraction layers: Physical, Data Link, Network, Transport, Session, Presentation, and Application.

7. Application Layer

The application layer is used by end-user software such as web browsers and email clients. It provides protocols that allow software to send and receive information and present meaningful data to users. A few examples of application layer protocols are the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol (POP), Simple Mail Transfer Protocol (SMTP), and Domain Name System (DNS). Some Protocol used:- FTP, SMTP, TFTP, HTTP, DNS, TCP/IP etc

6. Presentation Layer

The presentation layer prepares data for the application layer. It defines how two devices should encode, encrypt, and compress data so it is received correctly on the other end. The presentation layer takes any data transmitted by the application layer and prepares it for transmission over the session layer. Presentation layer is also called the **Translation layer**.

5. Session Layer

The session layer creates communication channels, called sessions, between devices. It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when communication ends. The session layer can also set checkpoints during a data transfer—if the session is interrupted, devices can resume data transfer from the last checkpoint. This layer is responsible for establishment of connection, maintenance of sessions, authentication and also ensures security.

4. Transport Layer

The transport layer takes data transferred in the session layer and breaks it into "segments" on the transmitting end. The transport layer carries out flow control, sending data at a rate that matches the connection speed of the receiving device, and error control, checking if data was received incorrectly and if not, requesting it again. examples of the transport layer is TCP or the Transmission Control Protocol. It is responsible for the End to End Delivery of the complete message. Transport Layer is called as **Heart of OSI** model. Data in the Transport Layer is called as **Segments**. Transport layer transfer the data and system with the help of **TCP & UDP protocol**

3. Network Layer

The network layer has two main functions. One is breaking up segments into network packets, and reassembling the packets on the receiving end. The other is routing packets by discovering the best path across a physical network. The network layer uses network addresses (typically Internet Protocol addresses) to route packets to a destination node.

Some protocol use- IP, RARP, ARP, ICMP

- Segment in Network layer is referred as **Packet**.
- Network layer is implemented by networking devices such as routers.

2. Data Link Layer

The data link layer establishes and terminates a connection between two physically-connected nodes on a network. It breaks up packets into frames and sends them from source to destination.

Data Link Layer is divided into two sub layers :

1. Logical Link Control (LLC)
2. Media Access Control (MAC)

Logical Link Control (LLC), which identifies network protocols, performs error checking and synchronizes frames, and Media Access Control (MAC) which uses MAC addresses to connect devices and define permissions to transmit and receive data.

1. Packet in Data Link layer is referred as **Frame**.
2. Data Link layer is handled by the NIC (Network Interface Card) and device drivers of host machines.
3. Switch & Bridge are Data Link Layer devices.

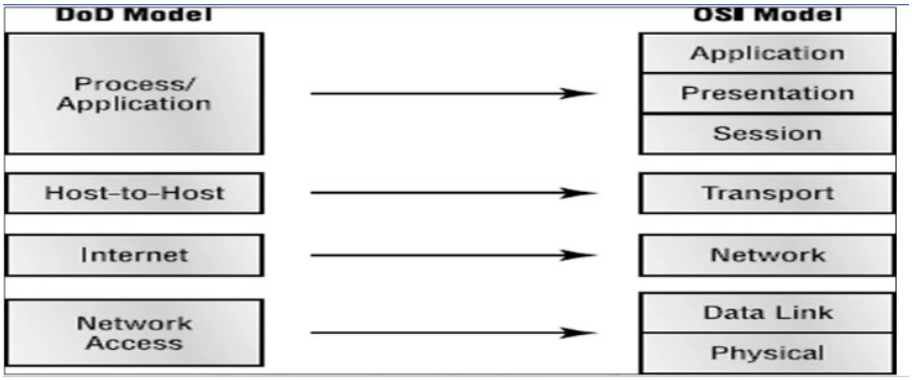
1. Physical Layer

The physical layer is responsible for the physical cable or wireless connection between network nodes. It defines the connector, the electrical cable or wireless technology connecting the devices, and is responsible for transmission of the raw data, which is simply a series of 0s and 1s, while taking care of bit rate control.

The lowest layer of the OSI reference model is the physical layer. It is responsible for the actual physical connection between the devices. The physical layer contains information in the form of **bits.**

Hub, Repeater, Modem, Cables are Physical Layer devices.
Network Layer, Data Link Layer and Physical Layer are also known as **Lower Layers** or **Hardware Layers**.

Examples of hardware in the physical layer are network adapters, ethernet, repeaters, networking hubs, etc.



About Lesson

DOD Model:-

The first layered protocol model we will study is the 4-layer DoD Model. This is the model originally designed for the Internet, and is important because all of the Internet's core protocols adhere to it.

The Department of Defense Four-Layer Model was developed in the 1970s for the DARPA Internetwork Project that eventually grew into the Internet. The core Internet protocols adhere to this model, although the OSI Seven Layer Model is justly preferred for new designs.

The four layers in the DoD model, from bottom to top, are:

1. The **Network Access Layer** is responsible for delivering data over the particular hardware media in use. Different protocols are selected from this layer, depending on the type of physical network.
2. The **Internet Layer** is responsible for delivering data across a series of different physical networks that interconnect a source and destination machine. Routing protocols are most closely associated with this layer, as is the IP Protocol, the Internet's fundamental protocol.
3. The **Host-to-Host Layer** handles connection rendezvous, flow control, retransmission of lost data, and other generic data flow management. The mutually exclusive TCP and UDP protocols are this layer's most important members.
4. The **Process Layer** contains protocols that implement user-level functions, such as mail delivery, file transfer and remote login.

Port No.:-

Port number is the part of the addressing information used to identify the senders and receivers of messages in computer networking. Different port numbers are used to determine what protocol incoming traffic should be directed to. Port number identifies a specific process to which an Internet or other network message is to be forwarded when it arrives at a server. Ports are identified for each protocol and It is considered as a communication endpoint.

Ports are represented by 16-bit numbers. **0 to 1023 are restricted port numbers** are as they are used by well-known protocol services. **1024 to 49151 are registered port numbers** means it can be registered to specific protocols by software corporations and in last **49152 to 65536 are used as private ports** means they can be used by anybody.

Sr. No.	Name	Port No.
1	*FTP*	*20, 21*
2	*Telnet*	*23*
3	*SMTP*	*25*
4	DNS	53
5	DHCP	67, 68
6	*HTTP*	*80*
7	*POP3*	*110*
8	IMAP4	143