UNIT-I

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1. What is a protocol? List the three key elements of a protocol?

Answer:

Protocol is a set of rules that governs communication. The key elements of protocol are syntax, semantics and timing.

Syntax:

Syntax refers the structure and format of the information data.

Semantics:

Semantics refers to the meaning of each section of bits. It does an route identify the route to be taken or the final destination of the message.

Timing:

Timing refers to two characteristics: when data should be sent and how fast it should be sent.

2. With relevant examples differentiate between simplex, half duplex, and full duplex communication.

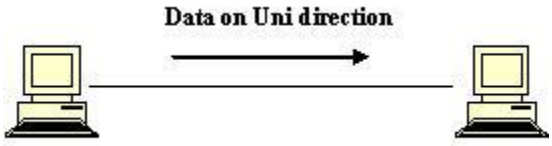
Answer:

Communication system is a system composed of two connected parties or devices which can communicate with one another in one way or two way directions.

The communication between two devices can be simplex or half duplex or full duplex.

Simplex:

Communication is unidirectional. A simplex communication is one where all signals can flow in only one direction. These type of systems are often employed in broadcast networks, where the receivers do not need to send any data back to the transmitter/broadcaster.

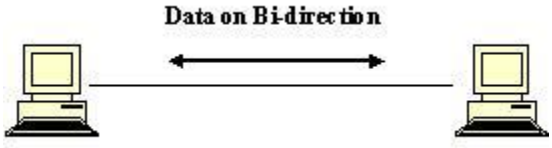


Duplex:

A duplex communication system is a system composed of two connected parties or devices which can communicate with one another in both directions.

Half-Duplex:

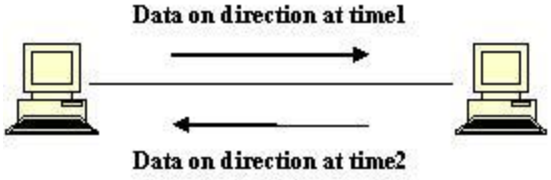
A half-duplex system provides for communication in both directions, but only one direction at a time. Once a party begins receiving a signal, it must wait for the transmitter to stop transmitting, before replying.



Example: "walkie-talkie"

Full-Duplex:

A full-duplex, or sometimes double-duplex system allows communication in both directions, and unlike half-duplex, allows this to happen simultaneously.



Example: Telephone, Mobile Phone.

3. A network has n devices. Determine the number of cable links required for a mesh, ring, bus and star topology.

Answer:

Cable links required to make communication between 'n' network devices.

- Links required for mesh topology = n(n-1)/2
- Links required for ring topology = n-1
- Links required for star topology = n

4. Explain how guided media differ from unguided media? Briefly explain any three methods used for data transmission using guided media and two methods used for data transmission using unguided media.

Telecommunication links can broadly be classified into two categories, namely, guided media (wired) and unguided media(wireless). Both media are used for short distance (LANs, MANs) and long distance (WANs) communication.

Guided Media or Wired links:

Examples of Wired Media

As the name indicates, in guided media

Electrical/Optical signals are passed through a solid medium (different types of cables/wires)

As the path traversed by the signals is guided by the size, shape and length of the wire, this type of media is called guided media. Also, in guided media, the signals are confined within the wire and do not propogate outside of the wire/media.

E.g., Copper Unshielded Twisted Pair (UTP), Copper Shielded Twisted Pair (STP), Copper Co-axial cables, Fiber Optic Cables.

Twisted Pair Copper:

It is the most widely deployed media type across the world, as the last mile telephone link connecting every home with the local telephone exchange is made of twisted pair copper. These telephone lines are reused as last mile DSL access links to access the internet from home.

They are also used in Ethernet LAN cables within homes and offices.

They support low to High Data Rates (in order of Giga bits)

However, they are effective only upto a maximum distance of a few kilometres/miles, as the signal strength is lost significantly beyond this distance.

They come in two variants, namely UTP (unshielded twisted pair) and STP (shielded twisted pair). Within each variant, there are multiple sub-variants, based on the thickness of the material (like UTP-3, UTP-5, UTP-7 etc.)

E.g. DSL, 10/100/1000Mbps Ethernet cables

Co-axial Cables:

Co-axial copper cables have an inner copper conductor and an outer copper shield, separated by a di-electric insulating material, to prevent signal losses.

It is primarily used in cable TV networks and as trunk lines between telecommunication equipments.

It serves as an internet access line from the home.

It supports medium to High Data Rates

It has much better immunity to noise and hence signal strength is retained for longer distances than in copper twisted pair media.

Fiber Optic Cables:

Here, information is transmitted by propogation of optical signals (light) through fiber optic cables and not through electrical/electromagnetic signals. Due to this, fiber optics communication supports longer distances as there is no electrical interference.

As the name indicates, fiber optic cables are made of very thin strands of glass (silica).

As they support very high data rates, fiber optic lines are used as WAN backbone and trunk lines between data exchange equipments.

They are also used for accessing internet from home through FTTH (Fiber-To-The-Home) lines.

Additionally, they are used even for LAN environment with different LAN technologies like Fast Ethernet, Gigabit Ethernet etc. using optical links at the physical layer.

OC-48, OC-192, FTTC, HFC are examples of Fiber Optical links.

Unguided Wireless Media:

Here information is transmitted by sending electromagnetic signals through free space and hence the name unguided media, as the signals are not guided in any specific direction or inside any specific medium.

All unguided media transmission are classified as wireless transmission.

Wireless transmission can be used as the medium in both LAN and WAN environments, as illustrated in the diagrams below:

Two laptops communicating within a LAN using a wireless Access Points

Two laptops communicating via. a long distance WAN using a WiMax Wireless transmission network

Different forms of wireless communication used in the internet vary mainly based on the following attributes:

Distance separating the end stations

Frequency spectrum used by the electromagnetic signals

Line Encoding technique used

Based on these attributes, a wide variety of wireless PHYs and different types of antennaes are used in wireless communication.
The diagram given below illustrates different types of antennaes typically used in wireless communication

Different Types of Antennaes Used in wireless communication

As illustrated in the diagram, antennaes can be of many sizes and shapes. Some of them are point to point antennaes while others are omni-directional antennaes. Even satellites act as giant antenaes in the sky, by receiving and transmitting signals generated from the earth.

Wi-Fi, Wi-Max. 3G are example wireless networks used for internet communication

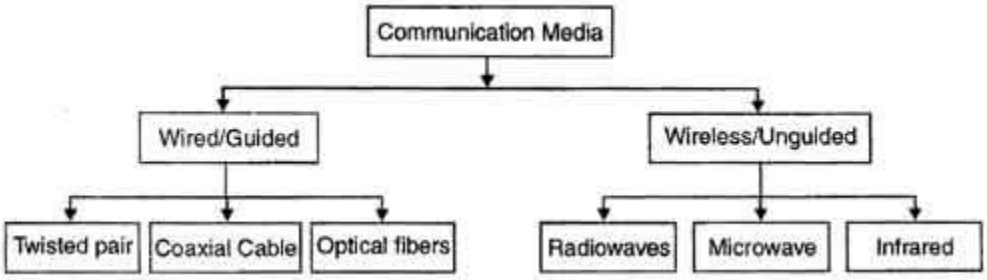
5. Write short notes on transmission media.

Answer:

Transmission media is broadly classified into two groups.
1. Wired or Guided Media or Bound Transmission Media
2. Wireless or Unguided Media or Unbound Transmission Media

Wired or Guided Media or Bound Transmission Media: Bound transmission media are the cables that are tangible or have physical existence and are limited by the physical geography. Popular bound transmission media in use are twisted pair cable, co-axial cable and fiber optical cable. Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost etc.

Wireless or Unguided Media or Unbound Transmission Media: Unbound transmission media are the ways of transmitting data without using any cables. These media are not bounded by physical geography.This type of transmission is called Wireless **communication.** Nowadays wireless communication is becoming popular. Wireless LANs are being installed in office and college campuses. This transmission uses Microwave, Radio wave, Infra red are some of popular unbound transmission media.



6. Identify the 5 components of data communication systems.

Answer:

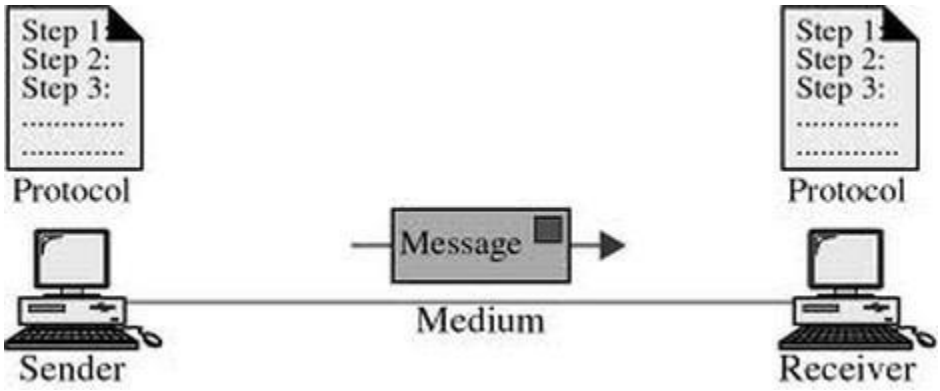
Definition:

The process of transferring data from one location to another is called data Communication. In this process, data is transmitted from one location to another by using transmission media.

Components of Data Communication

The basics components or elements of data communication system are as follows:

1. Message
2. Sender
3. Receiver
4. Transmission Medium or Communication Channel
5. Protocol



The five components are :

1. Message - It is the information to be communicated. Popular forms of information include text, pictures, audio, video etc. Text is converted to binary, number is not converted, image is converted to pixels, etc.

2. Sender - It is the device which sends the data messages. It can be a computer, workstation, telephone handset etc.

3. Receiver - It is the device which receives the data messages. It can be a computer, workstation, telephone handset etc.

4. Transmission Medium - It is the physical path by which a message travels from sender to receiver. Some examples include twisted-pair wire, coaxial cable, radio waves etc.

5. Protocol - It is a set of rules that governs the data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating.

7. Explain the basic network topologies and site one advantage of each type.

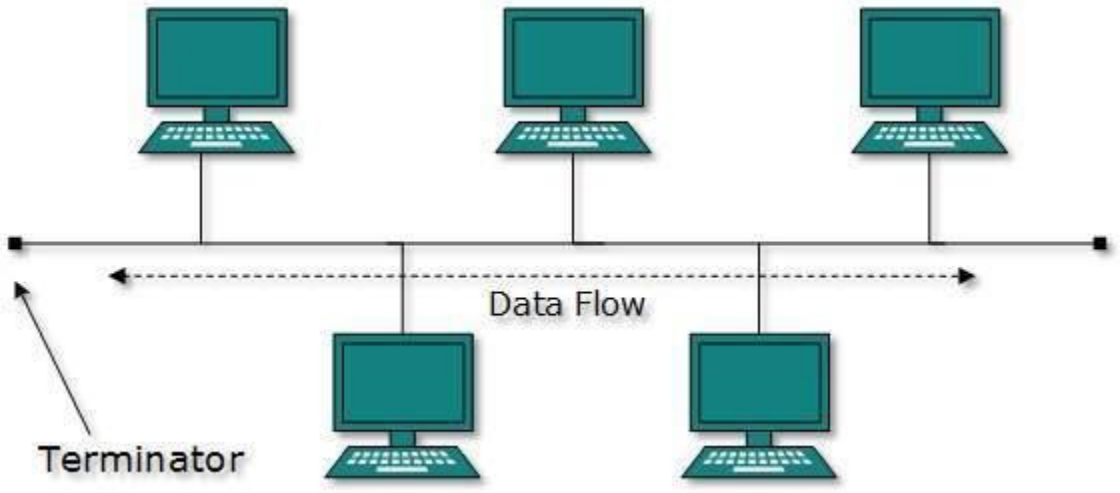
Answer

Definition:

A Network Topology is the arrangement with which computer systems or network devices are connected to each other.
Network topologies are categorized into the following basic types:

- Bus Topology
- Ring Topology
- Star Topology
- Mesh Topology
- Tree Topology
- Hybrid Topology

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



Features:

1. It transmits data only in one direction.
2. Every device is connected to a single cable.

Advantages:

1. It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.
4. It is easy to understand.
5. Easy to expand joining two cables together.

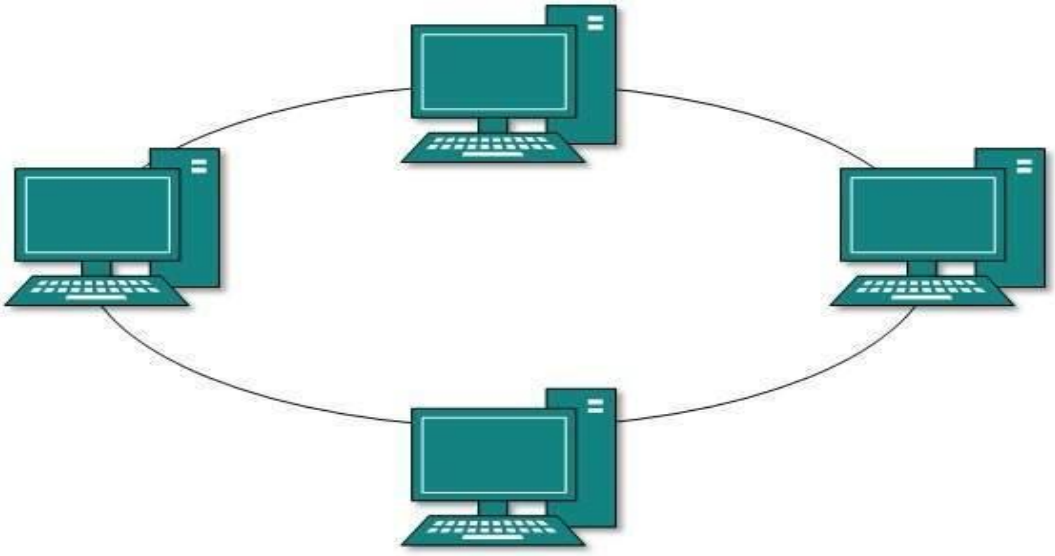
Disadvantages:

1. Cables fails then whole network fails.
2. If network traffic is heavy or nodes are more the performance of the network decreases.
3. Cable has a limited length.

4. It is slower than the ring topology.

Ring Topology:

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each device.



Features:

1. A number of repeaters are used for Ring topology with large number of nodes
2. The transmission is unidirectional.
3. Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

Advantages:

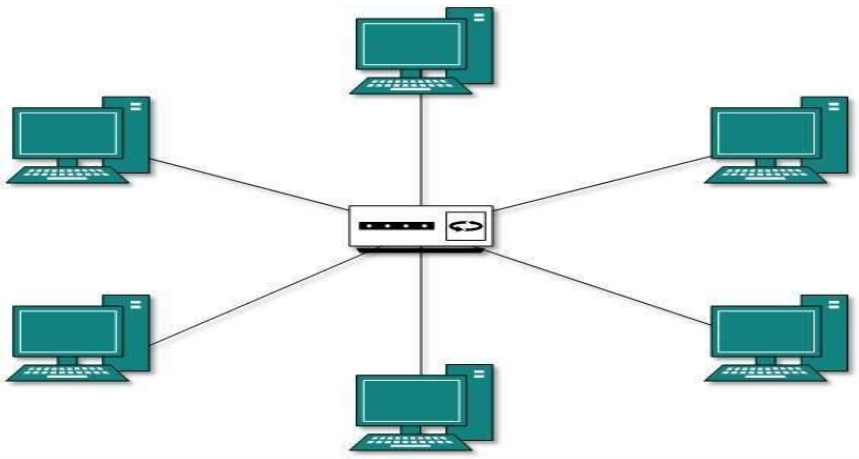
1. Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
2. Cheap to install and expand.

Disadvantages:

1. Troubleshooting is difficult in ring topology.
2. Failure of one computer disturbs the whole network.

Star Topology :

In this type of topology all computers are connected to a single hub through a cable.This hub is a central node and all other nodes are connected to the central node.



Features:

1. Every node has its own dedicated connection to the hub.
2. Hub acts as a repeater for data flow.
3. Can be used with twisted pair, Optical Fibre or coaxial cable.

Advantages:

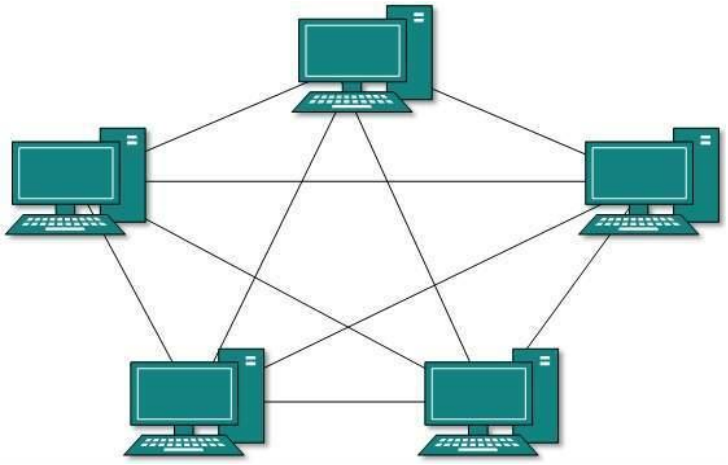
1. Fast performance with few nodes and low network traffic.
2. Hub can be upgraded easily.
3. Easy to troubleshoot.
4. Easy to setup and modify.
5. Only that node is affected which has failed, rest of the nodes can work smoothly.

Disadvantages:

1. Cost of installation is high.
2. Expensive to use.
3. If the hub fails then the whole network is stopped because all the nodes depend on the hub.
4. Performance is based on the hub that is it depends on its capacity.

Mesh Topology:

It is a point-to-point connection to other nodes or devices. All the network nodes are connected to each other. Mesh has $n(n-2)/2$ physical channels to link n devices.



Features:

1. Fully connected.
2. Robust.
3. Not flexible.

Advantages:

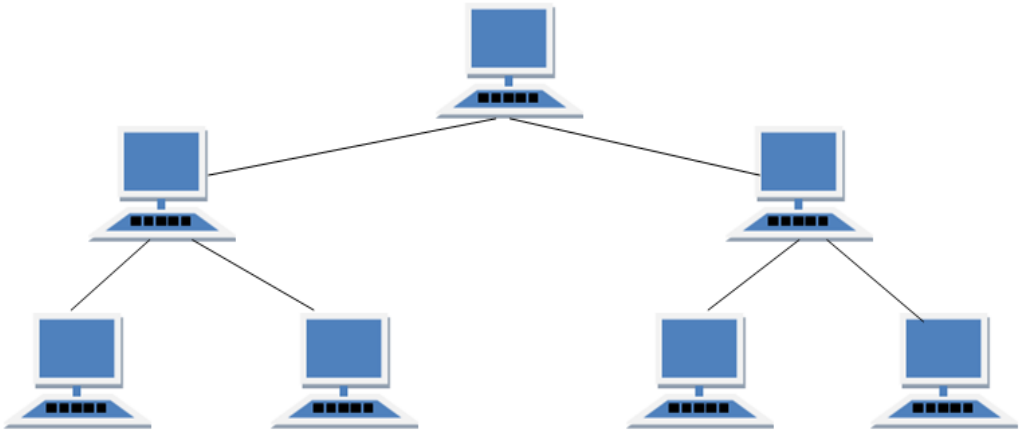
1. Each connection can carry its own data load.
2. It is robust.
3. Fault is diagnosed easily.

Disadvantages:

1. Installation and configuration is difficult.
2. Cabling cost is more.
3. Bulk wiring is required.

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 at least have three levels to the hierarchy.



Features:

1. Ideal if workstations are located in groups.
2. Used in Wide Area Network.

Advantages:

1. Extension of bus and star topologies.
2. Expansion of nodes is possible and easy.
3. Easily managed and maintained.
4. Error detection is easily done.

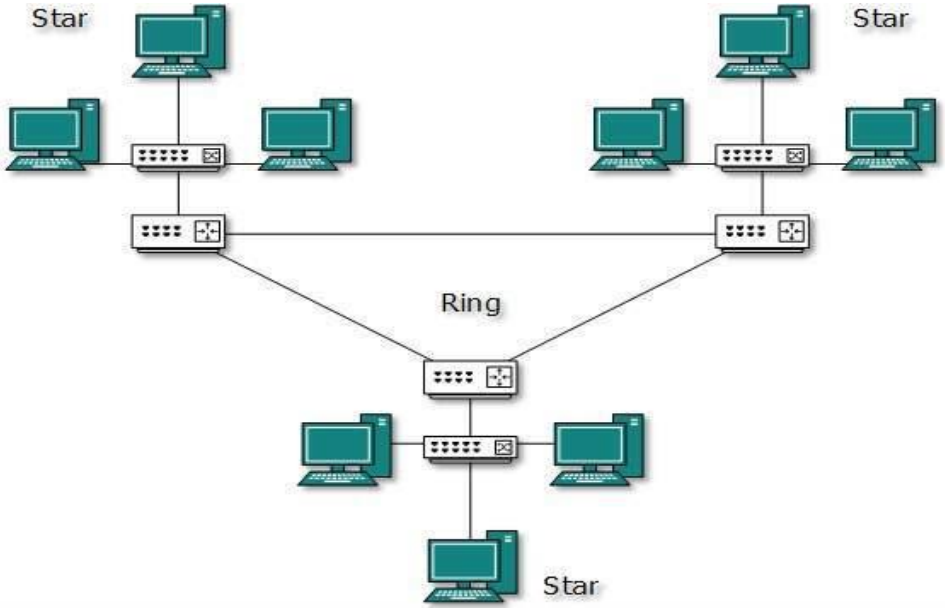
Disadvantages:

1. Heavily cabled.
2. Costly.
3. If more nodes are added maintenance is difficult.
4. Central hub fails, network fails.

Hybrid Topology:

A network structure whose design contains more than one topology is said to be hybrid topology. Hybrid topology inherits merits and demerits of all the incorporating topologies.

Ex: Star and Ring Topologies



Features:

1. It is a combination of two or topologies
2. Inherits the advantages and disadvantages of the topologies included.

Advantages:

1. Reliable as Error detecting and trouble shooting is easy.
2. Effective, Flexible.

Disadvantages:

1. Complex in design.
2. Costly.

8. Explain different data representations in data communication.

Answer

Data is collection of raw facts which is processed to deduce information. There may be different forms in which data may be represented. Some of the forms of data used in communications are as follows:

1. Text: Text includes combination of alphabets in small case as well as upper case .It is stored as a pattern of bits. Prevalent encoding system : ASCII, Unicode

2. Numbers: Numbers include combination of digits from 0 to 9.It is stored as a pattern of bits. Prevalent encoding system : ASCII, Unicode

3. Images:"An image is worth a thousand words" is a very famous saying. In computers, images are digitally stored. A Pixel is the smallest element of an image. To put it in simple terms, a picture or image is a matrix of pixel elements. The pixels are represented in the form of bits.

Example: if an image is purely black and white (two color) each pixel can be represented by a value either 0 or 1, so an image made up of 10 x 10 pixel elements would require only 100 bits in memory to be stored.

Commonly used Image formats : jpg, png , bmp, etc

4. Audio: Data can also be in the form of sound which can be recorded and broadcasted. Example: What we hear on the radio is a source of data or information .Audio data is continuous, not discrete.

5. Video: Video refers to broadcasting of data in form of picture or movie.

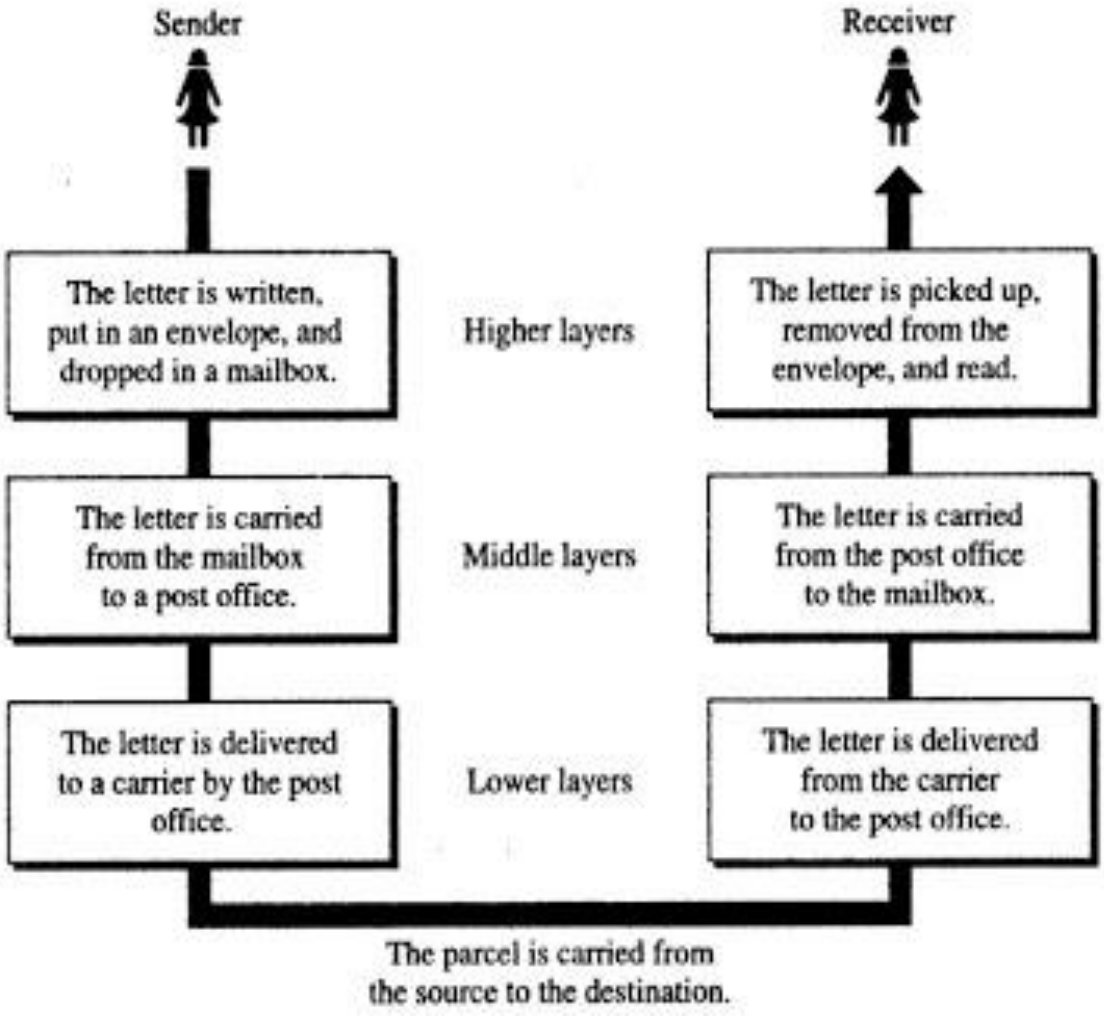
9. Draw and explain layered task in network models.

i. The main objective of a computer network is to be able to transfer the data from sender to receiver. This task can be done by breaking it into small sub tasks, each of which are well defined.

ii. Each subtask will have its own process or processes to do and will take specific inputs and give specific outputs to the subtask before or after it. In more technical terms we can call these sub tasks as layers.

iii. In general, every task or job can be done by dividing it into sub task or layers. Consider the example of sending a letter where the sender is in City A and receiver is in city B.

iv. The process of sending letter is shown below:



v. The above figure shows,

a. Sender, Receiver & Carrier

b. Hierarchy of layers

vi. At the **sender site**, the activities take place in the following:

a. Higher Layer: The sender writes the letter along with the sender and receivers address and put it in an envelope and drop it in the mailbox.

b. Middle Layer: The letter is picked up by the post man and delivered to the post office

c. Lower Layer: The letters at the post office are sorted and are ready to be transported through a carrier.

vii. During transition the letter may be carried by truck, plane or ship or a combination of transport modes before it reaches the destination post office.

viii. At the **Receiver site,** the activities take place in the following:

a. Lower Layer: The carrier delivers the letter to the destination post office

b. Middle Layer: After sorting, the letter is delivered to the receiver's mail box

c. Higher Layer: The receiver picks up the letter, opens the envelope and reads it.

ix. Hierarchy of layers: The activities in the entire task are organized into three layers. Each activity at the sender or receiver side occurs in a particular order at the hierarchy.
x. The important and complex activities are organized into the Higher Layer and the simpler ones into middle and lower layer.

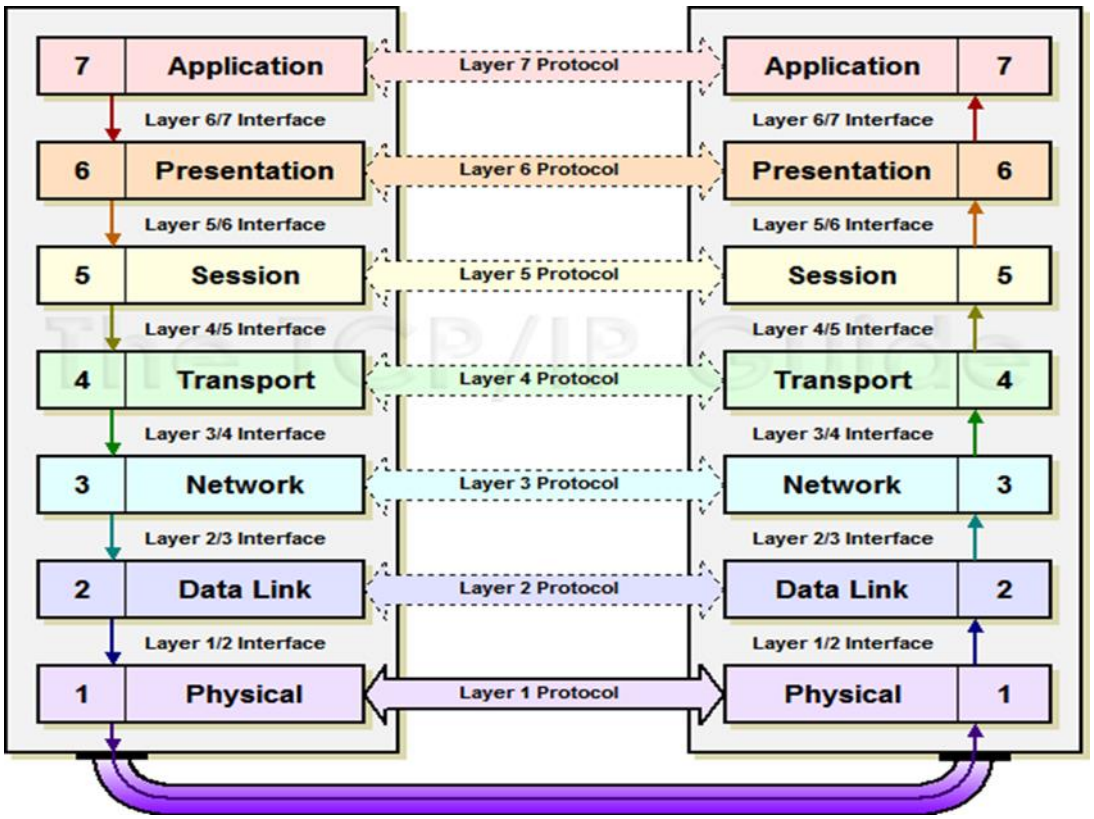
10. Draw and explain OSI layers and explain responsibilities of each layer.

OSI Model & its layers:

- The Open Systems Interconnection (OSI) Model was developed by International Organization for Standardization (ISO).
- It was developed to allow systems with different platformsto communicate with each other.

Platform could meanhardware, software or operating system.

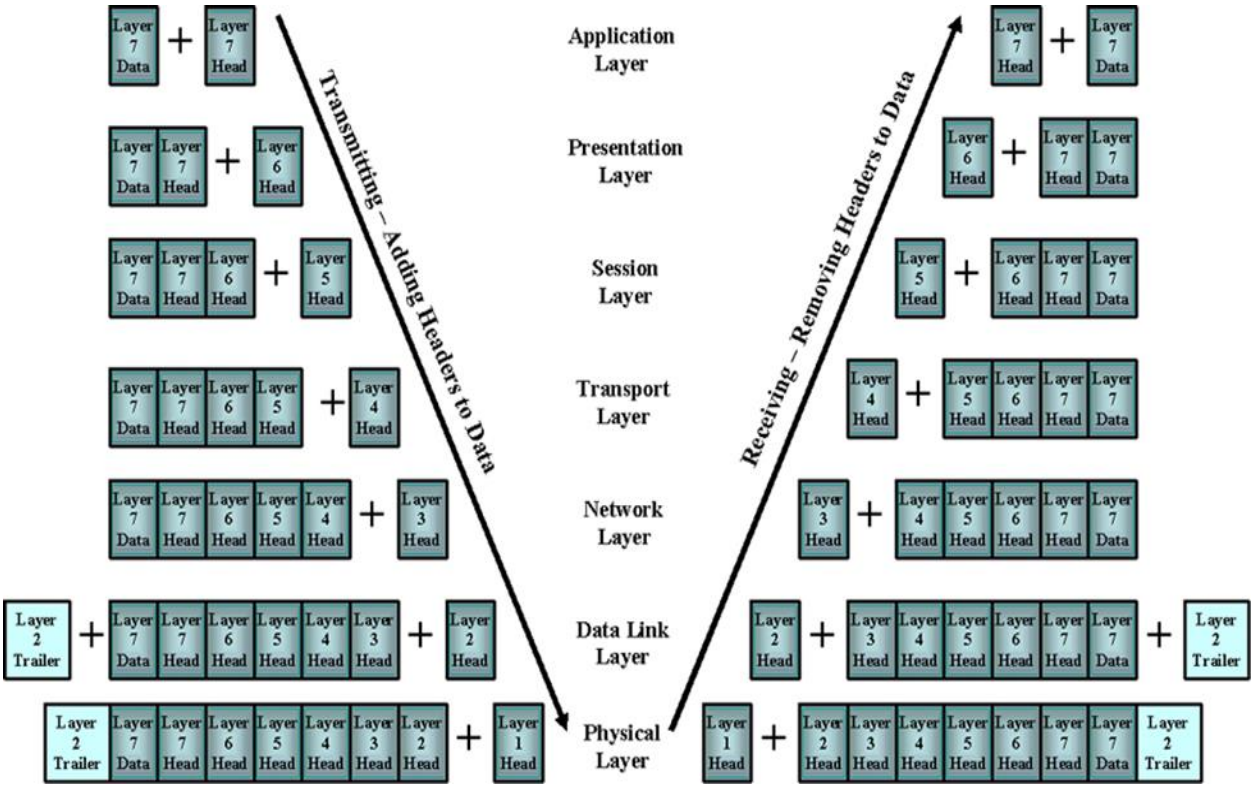
- It is a network model that defines the protocols fornetwork communications.
- It has 7 layers as follows: (Top to Bottom)



1. Application Layer
2. Presentation Layer
3. Session Layer
4. Transport Layer
5. Network Layer
6. Data Link Layer
7. Physical Layer

Each layer has specific duties to perform and has to cooperate with the layers above and below it.

Encapsulation:



- As shown in the figure above the data at layer 7 i.e the Application layer along with the header added at layer 7 is given to layer 6, the Presentation layer. This layer adds its header and passed the whole package to the layer below.
- The corresponding layers at the receiving side removes the corresponding header added at that layer and sends the remaining data to the above layer.
- The above process is called encapsulation.

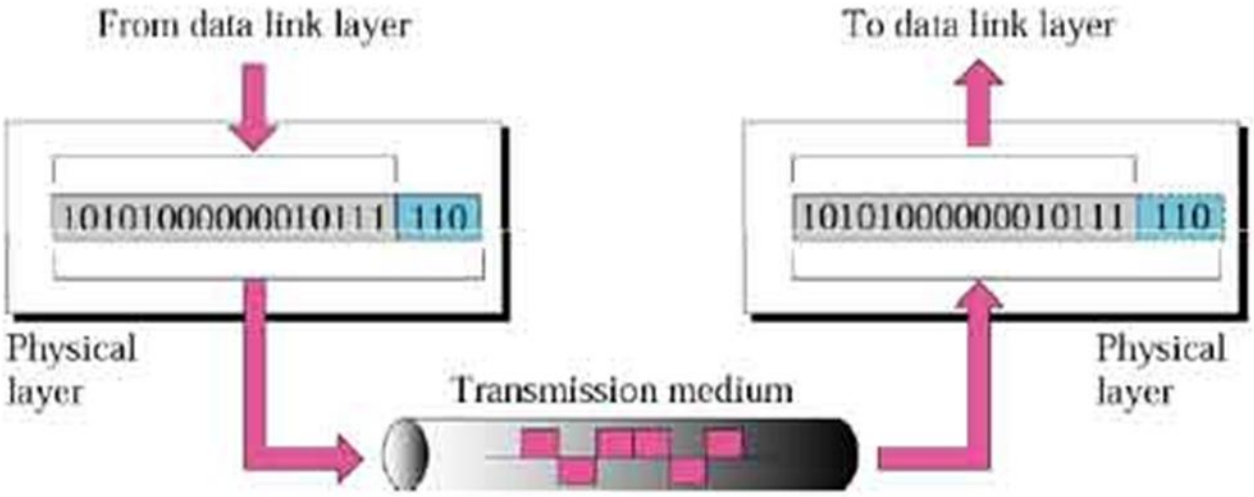
Description of Layers in the OSI Model:

1. Physical Layer:

The Physical Layer provides a standardized interface to physical transmission media.

- On the sender side, the physical layer receives the data from Data Link Layer and encodes it into signals to be transmitted onto the medium.

- On the receiver side, the physical layer receives the signals from the transmission medium decodes it back into data and sends it to the Data Link Layer.



- **Interface -**The Physical Layer defines the characteristics of interfaces between the devices & transmission medium.

- **Representation of bits-**The physical layer is concerned with transmission of signals from one device to another which involves converting data (1‘s & 0‘s) into signals and vice versa. It is not concerned with the meaning or interpretation of bits.

- **Data rate-**The physical layer defines the data transmission rate i.e number of bits sent per second. It is the responsibility of the physical layer to maintain the defined data rate.

- **Synchronization of bits-** To interpret correct and accurate data the sender and receiver have to maintain the same bit rate and also have synchronized clocks.

- **Line configuration-**The physical layer defines the nature of the connection .i.e. a point to point link, or a multi point link.

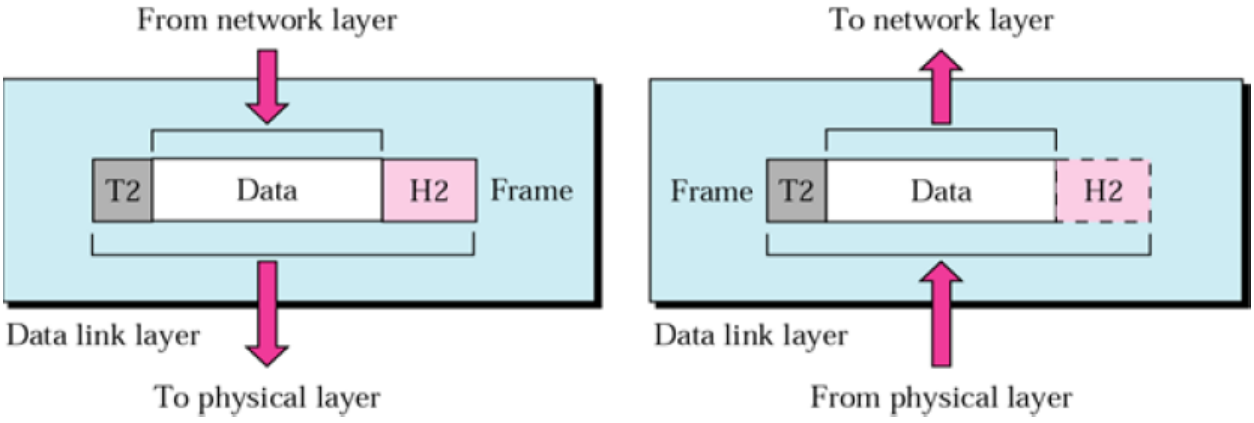
- **Physical Topology**- The physical layer defines the type of topology in which the device is connected to the network. In a mesh topology it uses a multipoint connection and other topologies it uses a point to point connection to send data.

- **Transmission mode-**The physical layer defines the direction of data transfer between the sender and receiver. Two devices can transfer the data in simplex, half duplex or full duplex mode.

2. Data Link Layer:

The Data Link layer adds reliability to the physical layer by providing error detection and correction mechanisms.

- On the sender side, the Data Link layer receives the data from Network Layer and divides the stream of bits into fixed size manageable units called as Frames and sends it to the physical layer.
- On the receiver side, the data link layer receives the stream of bits from the physical layer and regroups them into frames and sends them to the Network layer. This process is called Framing.



➢ **Physical Addressing-** . The Data link layer appends the physical address in the header of the frame before sending it to physical layer. The physical address contains the address of the sender and receiver. In case the receiver is not directly connected to the sender, the physical address is the address of the next node where the data is supposed to be delivered.

➢ **Flow control-** The data link layer makes sure that the sender sends the data at a speed at which the receiver can receive it else if there is an overflow at the receiver side the data will be lost. The data link layer imposes flow control mechanism over the sender and receiver to avoid overwhelming of the receiver.

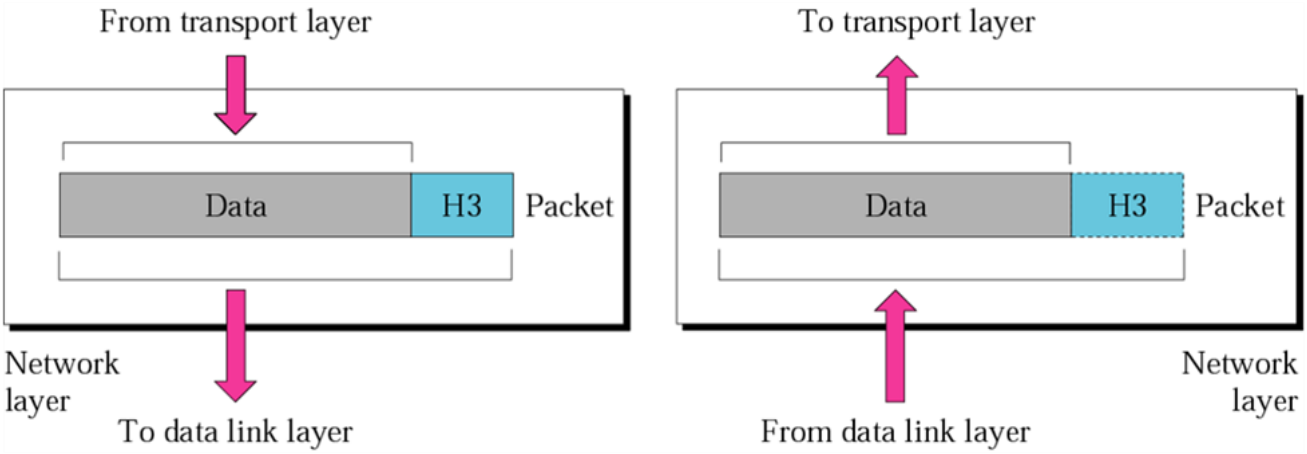
➢ **Error control-** The data link layer imposes error control mechanism to identify lost or damaged frames, duplicate frames and then retransmit them. Error control information is present in the trailer of a frame.

➢ **Access Control-** The data link layer imposes access control mechanism to determine which device has right to send data in an multipoint connection scenario.

3. Network Layer:

- The network layer makes sure that the data is delivered to the receiver despite multiple intermediate devices.

- The network layer at the sending side accepts data from thetransport layer, divides it into packets, adds addressinginformation in the header and passes it to the data link layer.
- At the receiving end the network layer receives the framessent by data link layer, converts them back into packets,verifies the physical address (verifies if the receiver addressmatches with its own address) and the send the packets tothe transport layer.



- The network layer is responsible for source to destination of delivery of data. Hence it may have to route the data through multiple networks via multiple intermediate devices. In order to achieve this the network layer relies on two things:

a. Logical Addressing

b. Routing

➢ **Logical Addressing-**The network layer uses logical address commonlyknown as IP address to recognize devices on the network.

- An IP address is a universally unique address which enables the network layer to identify devices outside the sender‘s network.
- The header appended by the network layer contains the actual sender and receiver IP address.
- At every hop the network layer of the intermediate node check the IP address in the header, if its own IP address does not match the IP address of the receiver found in the header, the intermediate node concludes that it is not the final node but an intermediate node and passes the packet to the data link layer where the data is forwarded to the next node.

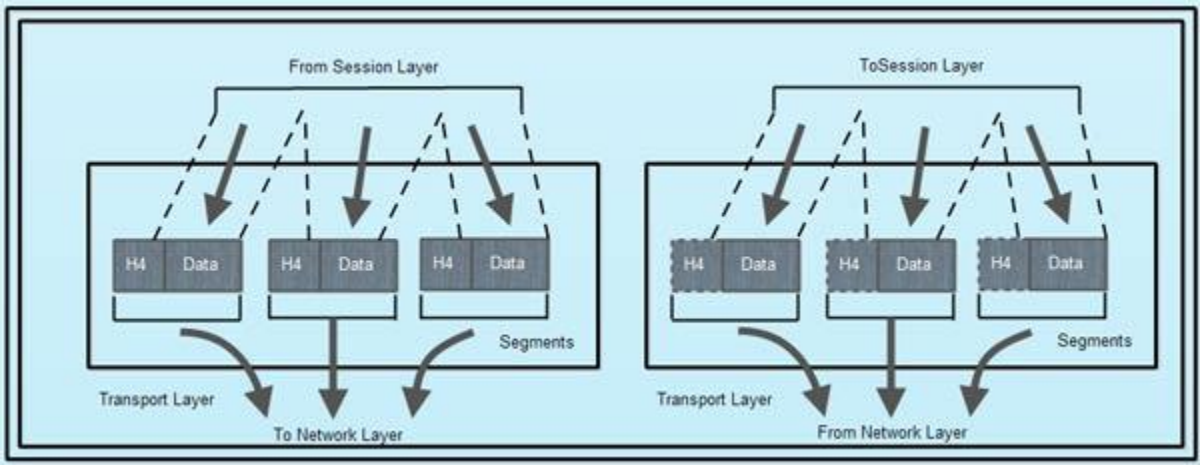
➢ **Routing-**The network layer divides data into units called packets of equal size and bears a sequence number for rearranging on the receiving end.

- Each packet is independent of the other and may travel using different routes to reach the receiver hence may arrive out of turn at the receiver.
- Hence every intermediate node which encounters a packet tries to compute the best possible path for the packet.
- The best possible path may depend on several factors such as congestion, number of hops, etc .

- This process of finding the best path is called as Routing. It is done using routing algorithms.

4. Transport Layer:

- The transport layer takes care of process to process delivery of data and makes sure that it is intact and in order.
- At the sending side, the transport layer receives data from the session layer, divides it into units called segments and sends it to the network layer.
- At the receiving side, the transport layer receives packets from the network layer, converts and arranges into proper sequence of segments and sends it to the session layer.



➢ To ensure process to process delivery the transport layer makes use of port address to identify the data from the sending and receiving process. A **Port Address** is the name or label given to a process. It is a 16 bit address. Ex. TELNET uses port address 23, HTTP uses port address 80. Port address is also called as **Service Point Address** .

➢ The data can be transported in a connection oriented or connectionless manner. If the connection is connection oriented then all segments are received in order else they are independent of each other and are received out of order and have to be rearranged.

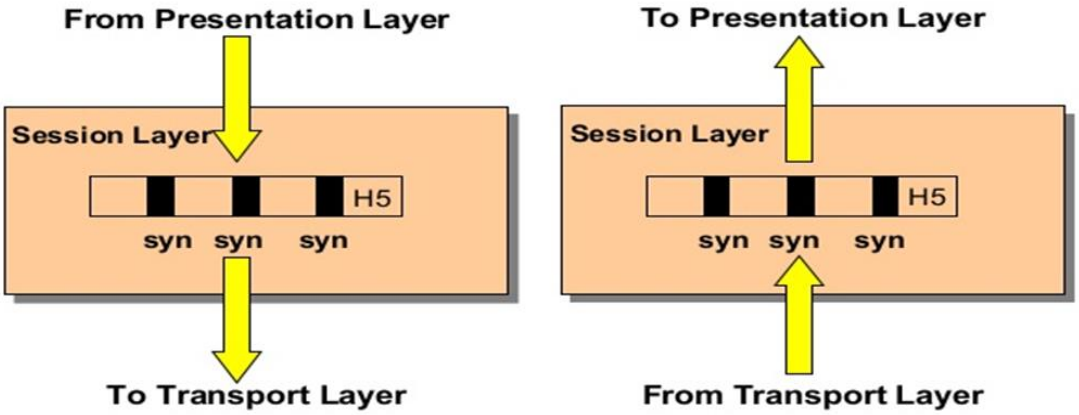
➢ The Transport layer is responsible for **segmentation and reassembly** of the message into segments which bear sequence numbers. This numbering enables the receiving transport layer to rearrange the segments in proper order.

➢ **Flow Control & Error control**-The transport layer also carries out flow control and error control functions; but unlike data link layer these are end to end rather than node to node.

5. Session Layer:

- The session layer at the sending side accepts data from the presentation layer adds checkpoints to it called syn bits and passes the data to the transport layer.

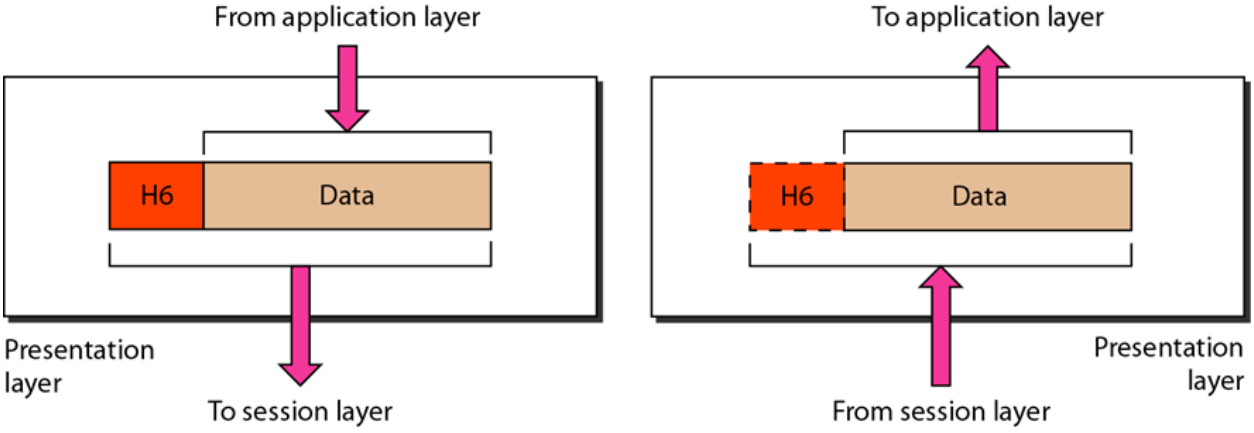
- At the receiving end the session layer receives data from the transport layer removes the checkpoints inserted previously and passes the data to the presentation layer.



- The session layer establishes a session between the communicating devices called dialog and synchronizes their interaction. It is the responsibility of the session layer to establish and synchronize the dialogs. It is also called the network **dialog controller**.
- The checkpoints or **synchronization** points is a way of informing the status of the data transfer. Ex. A checkpoint after first 500 bits of data will ensure that those 500 bits are not sent again in case of retransmission at 650th bit.

6. Presentation Layer:

- The communicating devices may be having different platforms. The presentation layer performs translation, encryption and compression of data.
- The presentation layer at sending side receives the data from the application layer adds header which contains information related to encryption and compression and sends it to the session layer.
- At the receiving side, the presentation layer receives data from the session layer decompresses and decrypts the data as required and translates it back as per the encoding scheme used at the receiver.



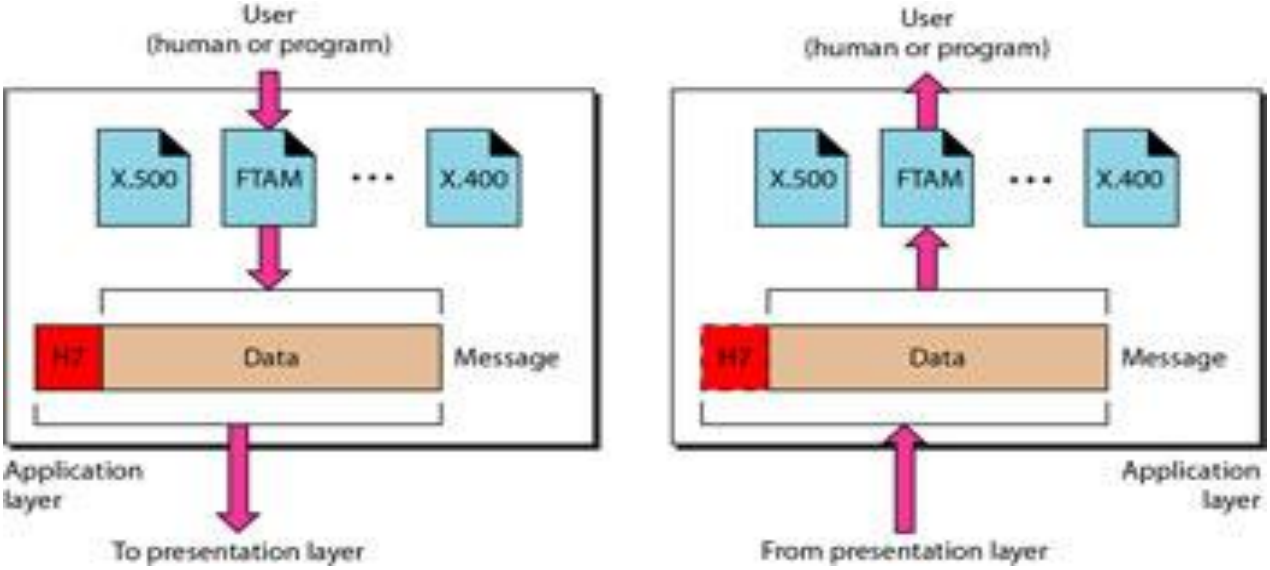
➢ **Translation-** The sending and receiving devices may run on different platforms (hardware, software and operating system). Hence it is important that they understand the messages that are used for communicating. Hence a translation service may be required which is provided by the Presentation layers

➢ **Compression-**Compression ensures faster data transfer. The data compressed at sender has to be decompressed at the receiving end, both performed by the Presentation layer.

➢ **Encryption-** It is the process of transforming the original message to change its meaning before sending it. The reverse process called decryption has to be performed at the receiving end to recover the original message from the encrypted message.

7. Application Layer:

- The application layer enables the user to communicate its data to the receiver by providing 43 certain services.
- For ex. Email is sent using X.400 service.



➢ **X500-**is a directory service used to provide information and access to distributed objects.

➢ **X400-** is services that provides basis for mail storage and forwarding.

➢ **FTAM-** (File transfer, access and management) provides access to files stored on remote computers and mechanism for transfer and manage them locally.

❖ **Main Responsibilities of these 7 layers:**

Main responsibility of the ,

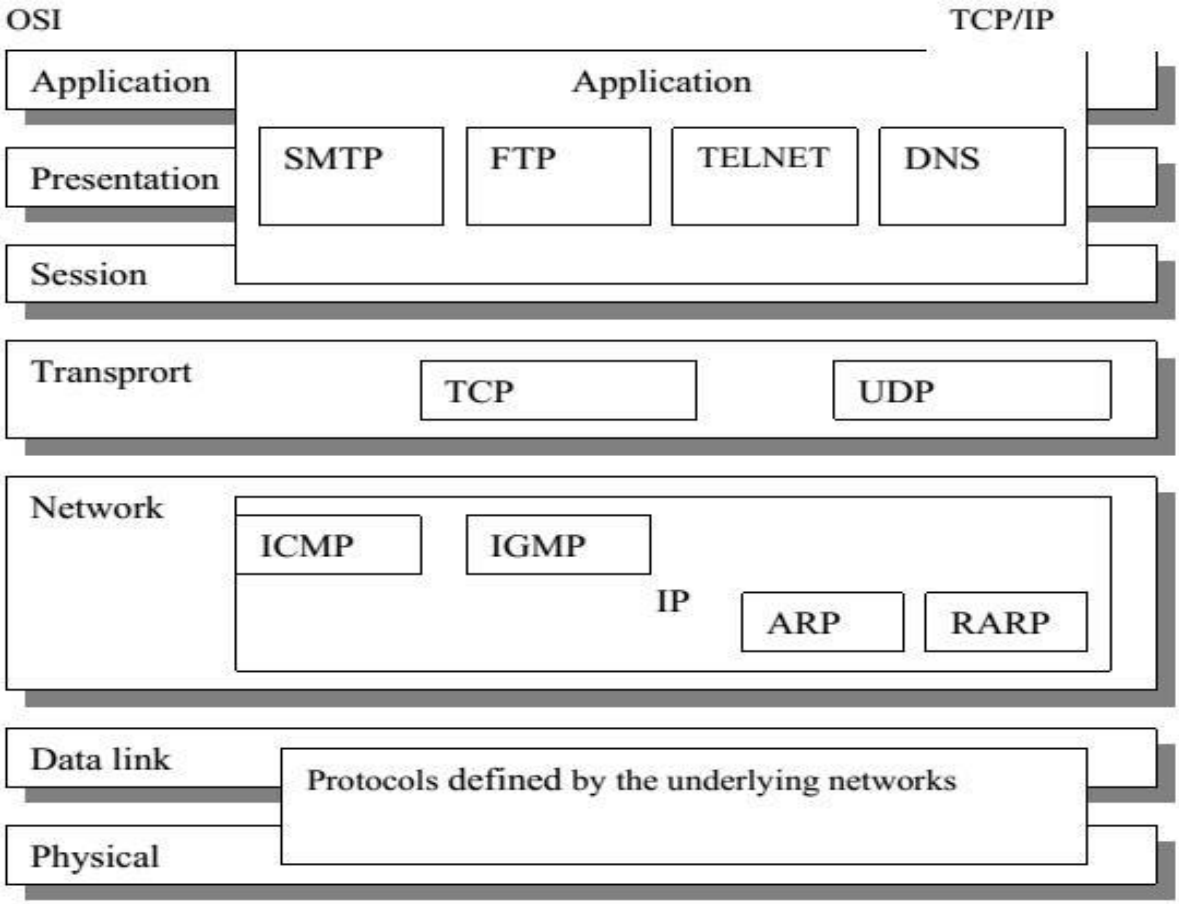
- Physical layer is transmission of bits from one hop to the next.
- Data link layer is hop to hop transmission of frames.
- Network Layer is transmission of packets from source to destination.
- Transport layer is process to process delivery of the entire message

- Session layer is dialog control and synchronization.
- Presentation layer is translation, compression and encryption.
- Application layer is to provide access to network resources.

11. Draw TCP/IP suite and explain different addresses available in networks.

TCP/IP Model: It is also called as the TCP/IP protocol suite. It is a collection of protocols.

- IT is a hierarchical model, i.e. There are multiple layers and higher layer protocols are supported by lower layer protocols.
- It existed even before the OSI model was developed.
- Originally had four layers (bottom to top):
- 1. Host to Network Layer 2. Internet Layer 3. Transport Layer 4. Application Layer
- The Application layer of TCP/IP model corresponds to the Application Layer of Session, Presentation & Application Layer of OSI model.
- The Transport layer of TCP/IP model corresponds to the Transport Layer of OSI model
- The Network layer of TCP/IP model corresponds to the Network Layer of OSI model
- The Host to network layer of TCP/IP model corresponds to the Physical and Datalink Layer of OSI model**.**



➢ **Application Layer -** The Application Layer is a combination of Session, Presentation & Application Layers of OSI models and define high level protocols like File Transfer (FTP), Electronic Mail (SMTP), Virtual Terminal (TELNET), Domain Name Service (DNS), etc.

➢ **Transport Layer-** Transport layer protocols are responsible for transmission of data running on a process of one machine to the correct process running on another machine. The transport layer contains three protocols:

1. TCP (Transmission Control Protocol)
2. UDP (User Datagram Protocol)
3. SCTP (Stream Control Transmission Protocol).

➢ **Network Layer or IP-** Also called as the Internetwork Layer (IP). It holds the IP protocol which is a network layer protocol and is responsible for source to destination transmission of data. IP is a combination of four protocols:

1. ARP (Address Resolution Protocol)
2. RARP (Reverse Address Resolution Protocol)
3. ICMP (Internet Control Message Protocol)
4. IGMP (Internet Group Message Protocol)

➢ **Host to Network Layer-**This layer is a combination of protocols at the physical and data link layers. It supports all standard protocols used at these layers.

ADDRESSING IN TCP/IP:

The TCP/IP protocol suited involves 4 different types of addressing:

1. Physical Address
2. Logical Address
3. Port Address
4. Specific Address

Physical Address - Physical Address is the lowest level of addressing, also known as link address.

- It is local to the network to which the device is connected and unique inside it.
- The physical address is usually included in the frame and is used at the data link layer.
- MAC is a type of physical address that is 6 byte (48 bit) in size and is imprinted on the Network Interface Card (NIC) of the device.

Logical Address - Logical Addresses are used for universal communication

- Logical Address is also called as IP Address (Internet Protocol address).
- At the network layer, device i.e. computers and routers are identified universally by their IP Address.

- IP addresses are universally unique.
- Currently there are two versions of IP addresses being used:

a. IPv4: 32 bit address, capable of supporting 2^32 node.
b. IPv6: 128 bit address, capable of supporting 2^128 nodes.

Port Address-There is a need of addressing that helps identify the source and destination processes.

- Ex. Users A & B are chatting with each other using Google Talk, Users B & C are exchanging emails using Hotmail. The IP address will enable transmitting data from A to B, but still the data needs to be delivered to the correct process. The data from A cannot be given to B on yahoo messenger since A & B are communicating using Google Talk.
- In other words, data needs to be delivered not only on the correct device but also on the correct process on the correct device. X.
- A Port Address is the name or label given to a process. It is a 16 bit address.
- Ex. TELNET uses port address 23, HTTP uses port address 80.

Specific Address-Port addresses address facilitates the transmission of data from process to process but still there may be a problem with data delivery.

- For Ex: Consider users A, B & C chatting with each other using Google Talk. Every user has two windows open, user A has two chat windows for B & C, user B has two chat windows for A & C and so on for user C Now a port address will enable delivery of data from user A to the correct process (in this case Google Talk) on user B but now there are two windows of Google Talk for user A & C available on B where the data can be delivered.
- Again the responsibility of the port address is over here and there is a need of addressing that helps identify the different instances of the same process.
- Such addresses are user friendly addresses and are called specific addresses.
- Other Examples: Multiple Tabs or windows of a web browser work under the same process that is HTTP but are identified using Uniform Resource Locators (URL), Email addresses.