Practical 1 : To compare OSI & TCP/IP protocol model.

Questions:

Question 1: What is the function of routing table ?

Each host or router contains a routing table to route IP packets. In next hop routing the packet makes only the address of the next hop which is listed in the routing table. All hosts on a network share one entry in the routing table in network specific routing in host specific in the routing table full IP address of a host is given routing. A router is assigned to receive packets with no match in the routing table in default routing.

Question 2: What is Fragmentation ?

It is the division of a datagram into smaller units to accommodate of a data link protocol's MTU (Maximum Transmission Unit). The fields in the IP header which is related to fragmentation are the identification number, the flags fragmentation , and the offset fragmentation. The IP datagram header is consists of a fixed, 20- byte section and also a variable options section with a maximum of 40 bytes.

Question 3: What is the difference between flow control and error control ?

As the name suggests, flow control controls the rate of information transmitted to ensure the efficient delivery of data to the receiver. While error control checks and corrects errors in the data bits and packets.

Question 4: What are the differences between MAC sublayer and LLC sublayer ?

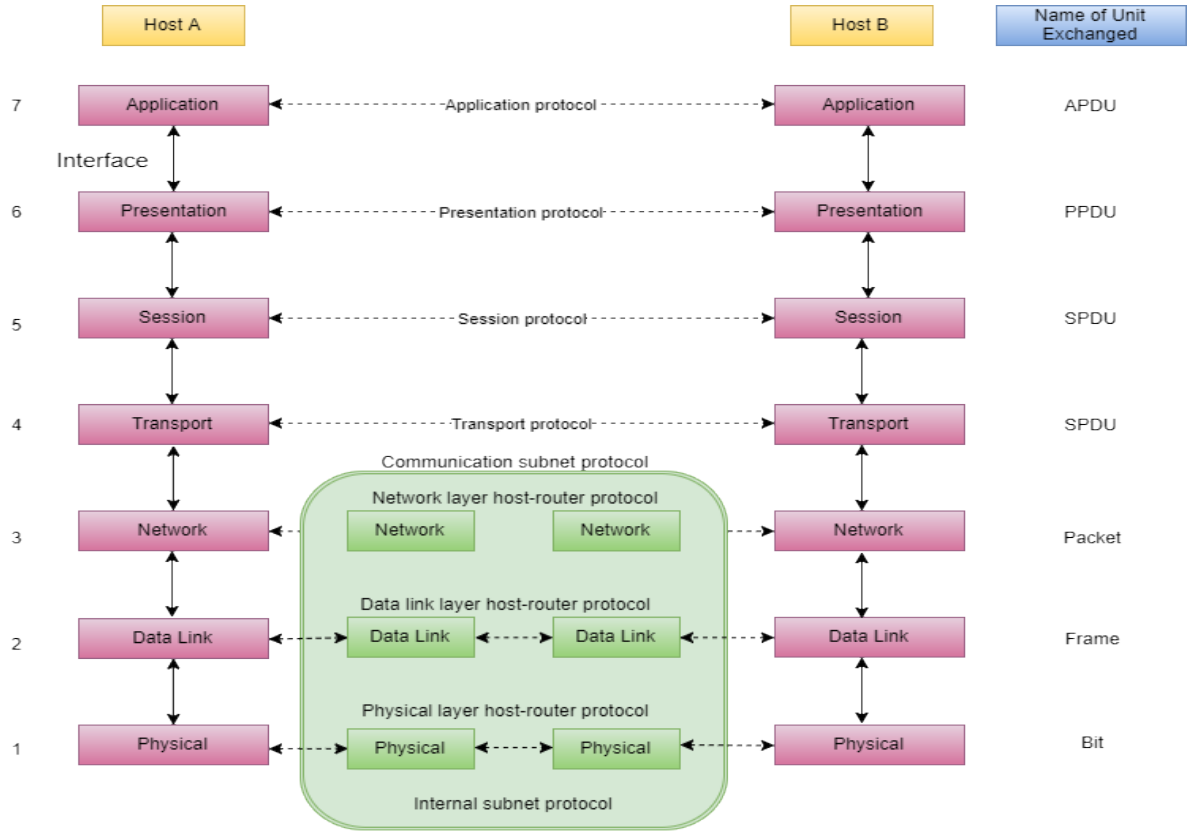
MAC sublayer stands for Media Access Control layer. MAC address works on Layer-2 Data Link Layer. This layer controls the permission of data to transmit it.
LLC sublayer stands for Logical Link Control layer. This layer controls frame synchronization, flow control and error checking.

Question 5: What is Buffering ?

TCP creates sending and also receiving buffers for each and every connection. TCP always uses a buffer to store the stream of data coming from the sending application program. The receiving TCP also buffers data when it arrives and also delivers the data to the application program.

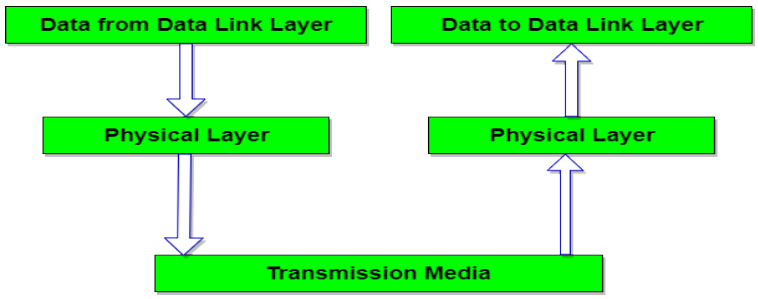
OSI MODEL

- OSI stands for **Open System Interconnection** is a reference model that describes how information from a software application in one computer moves through a physical medium to the software application in another computer.
- OSI consists of seven layers, and each layer performs a particular network function.
- OSI model was developed by the International Organization for Standardization (ISO) in 1984, and it is now considered as an architectural model for the inter-computer communications.
- OSI model divides the whole task into seven smaller and manageable tasks. Each layer is assigned a particular task.
- Each layer is self-contained, so that task assigned to each layer can be performed independently.



Functions of Physical Layer :

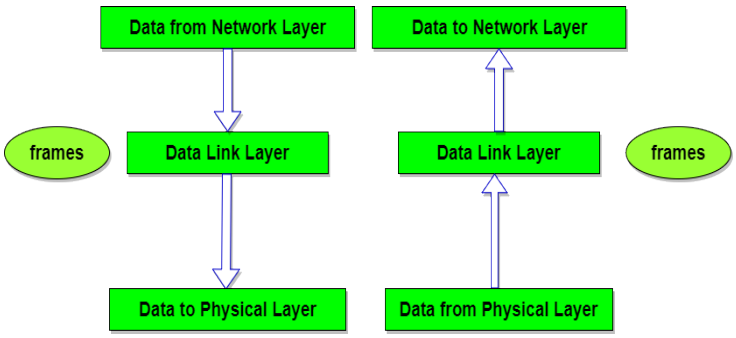
1. **Representation of Bits:** Data in this layer consists of stream of bits. The bits must be encoded into signals for transmission. It defines the type of encoding i.e. how 0's and 1's are changed to signal.
2. **Data Rate:** This layer defines the rate of transmission which is the number of bits per second.
3. **Synchronization:** It deals with the synchronization of the transmitter and receiver. The sender and receiver are synchronized at bit level.
4. **Interface:** The physical layer defines the transmission interface between devices and transmission medium.
5. **Line Configuration:** This layer connects devices with the medium: Point to Point configuration and Multipoint configuration.
6. **Topologies:** Devices must be connected using the following topologies: Mesh, Star, Ring and Bus.
7. **Transmission Modes:** Physical Layer defines the direction of transmission between two devices: Simplex, Half Duplex, Full Duplex.
8. Deals with baseband and broadband transmission.



Functions of Data Link Layer

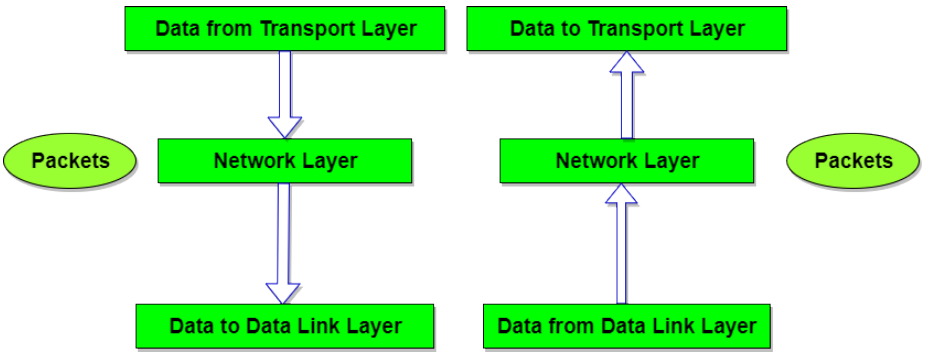
1. **Framing:** Frames are the streams of bits received from the network layer into manageable data units. This division of stream of bits is done by Data Link Layer.
2. **Physical Addressing:** The Data Link layer adds a header to the frame in order to define physical address of the sender or receiver of the frame, if the frames are to be distributed to different systems on the network.

3. **Flow Control:** A flow control mechanism to avoid a fast transmitter from running a slow receiver by buffering the extra bit is provided by flow control. This prevents traffic jam at the receiver side.
4. **Error Control:** Error control is achieved by adding a trailer at the end of the frame. Duplication of frames are also prevented by using this mechanism. Data Link Layers adds mechanism to prevent duplication of frames.
5. **Access Control:** Protocols of this layer determine which of the devices has control over the link at any given time, when two or more devices are connected to the same link.



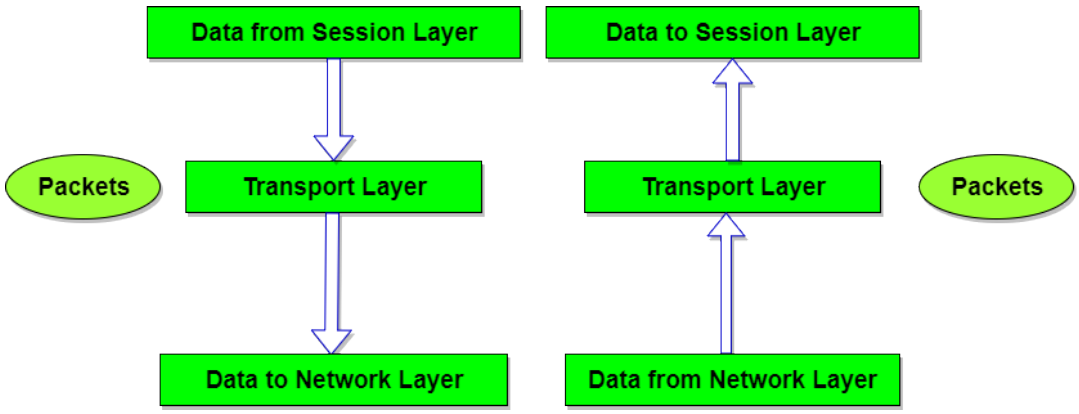
Functions of Network Layer

1. It translates logical network address into physical address. Concerned with circuit, message or packet switching.
2. Routers and gateways operate in the network layer. Mechanism is provided by Network Layer for routing the packets to final destination.
3. Connection services are provided including network layer flow control, network layer error control and packet sequence control.
4. Breaks larger packets into small packets.



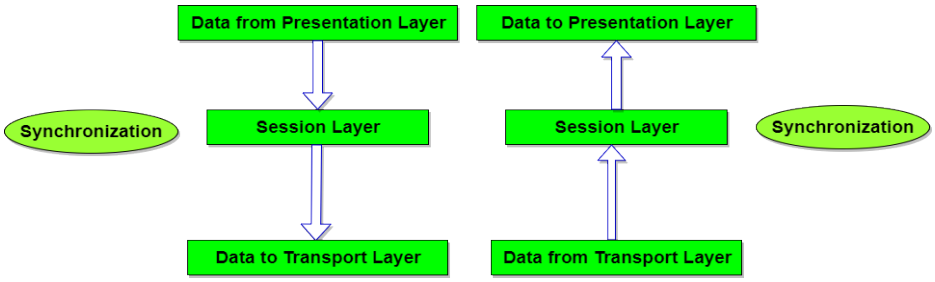
Functions of Transport Layer

1. **Service Point Addressing:** Transport Layer header includes service point address which is port address. This layer gets the message to the correct process on the computer unlike Network Layer, which gets each packet to the correct computer.
2. **Segmentation and Reassembling:** A message is divided into segments; each segment contains sequence number, which enables this layer in reassembling the message. Message is reassembled correctly upon arrival at the destination and replaces packets which were lost in transmission.
3. **Connection Control:** It includes 2 types:
   - Connectionless Transport Layer : Each segment is considered as an independent packet and delivered to the transport layer at the destination machine.
   - Connection Oriented Transport Layer : Before delivering packets, connection is made with transport layer at the destination machine.
4. **Flow Control:** In this layer, flow control is performed end to end.
5. **Error Control:** Error Control is performed end to end in this layer to ensure that the complete message arrives at the receiving transport layer without any error. Error Correction is done through retransmission.



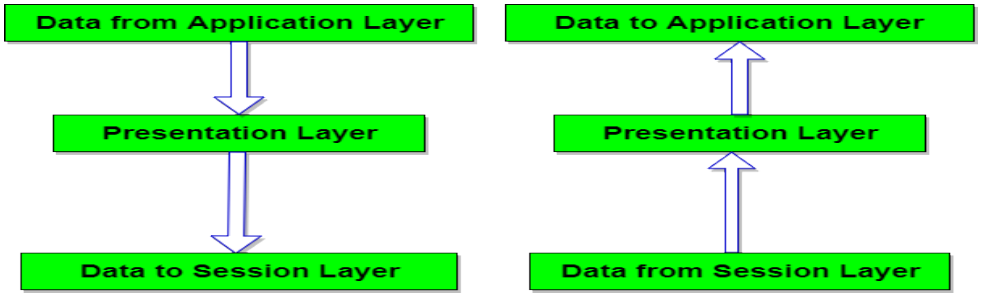
Functions of Session Layer

1. **Dialog Control :** This layer allows two systems to start communication with each other in half-duplex or full-duplex.
2. **Token Management:** This layer prevents two parties from attempting the same critical operation at the same time.
3. **Synchronization :** This layer allows a process to add checkpoints which are considered as synchronization points into stream of data. Example: If a system is sending a file of 800 pages, adding checkpoints after every 50 pages is recommended. This ensures that 50 page unit is successfully received and acknowledged. This is beneficial at the time of crash as if a crash happens at page number 110; there is no need to retransmit 1 to100 pages.



Functions of Presentation Layer

1. **Translation:** Before being transmitted, information in the form of characters and numbers should be changed to bit streams. The presentation layer is responsible for interoperability between encoding methods as different computers use different encoding methods. It translates data between the formats the network requires and the format the computer.
2. **Encryption:** It carries out encryption at the transmitter and decryption at the receiver.
3. **Compression:** It carries out data compression to reduce the bandwidth of the data to be transmitted. The primary role of Data compression is to reduce the number of bits to be transmitted. It is important in transmitting multimedia such as audio, video, text etc.



Functions of Application Layer

1. **Mail Services:** This layer provides the basis for E-mail forwarding and storage.
2. **Network Virtual Terminal:** It allows a user to log on to a remote host. The application creates software emulation of a terminal at the remote host. User's computer talks to the software terminal which in turn talks to the host and vice versa. Then the remote host believes it is communicating with one of its own terminals and allows user to log on.
3. **Directory Services:** This layer provides access for global information about various services.
4. **File Transfer, Access and Management (FTAM):** It is a standard mechanism to access files and manages it. Users can access files in a remote computer and manage it. They can also retrieve files from a remote computer.

The TCP/IP Reference Model

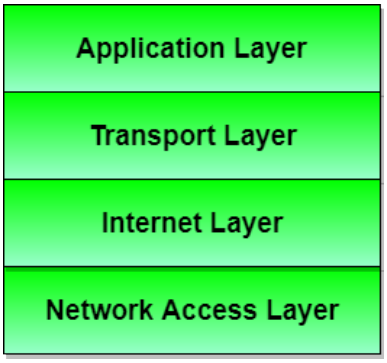
TCP/IP means Transmission Control Protocol and Internet Protocol. It is the network model used in the current Internet architecture as well. **Protocols** are set of rules which govern every possible communication over a network. These protocols describe the movement of data between the source and destination or the internet. They also offer simple naming and addressing schemes.

TCP/IP that is Transmission Control Protocol and Internet Protocol was developed by Department of **Defence's Project Research Agency** (ARPA, later DARPA) as a part of a research project of network interconnection to connect remote machines.

The features that stood out during the research, which led to making the TCP/IP reference model were:

- Support for a flexible architecture. Adding more machines to a network was easy.
- The network was robust, and connections remained intact untill the source and destination machines were functioning.

The overall idea was to allow one application on one computer to talk to(send data packets) another application running on different computer.



Difference between OSI and TCP/IP Reference Model

OSI(Open System Interconnection)	TCP/IP(Transmission Control Protocol / Internet Protocol)
1. In OSI model the transport layer guarantees the delivery of packets.	1. In TCP/IP model the transport layer does not guarantees delivery of packets. Still the TCP/IP model is more reliable.
2. Follows vertical approach.	2. Follows horizontal approach.
3. OSI model has a separate Presentation layer and Session layer.	3. TCP/IP does not have a separate Presentation layer or Session layer.

4. Transport Layer is Connection Oriented.	4. Transport Layer is both Connection Oriented and Connection less.
5. Network Layer is both Connection Oriented and Connection less.	5. Network Layer is Connection less.
6. OSI is a reference model around which the networks are built. Generally it is used as a guidance tool.	6. TCP/IP model is, in a way implementation of the OSI model.
7. Network layer of OSI model provides both connection oriented and connectionless service.	7. The Network layer in TCP/IP model provides connectionless service.
8. OSI model has a problem of fitting the protocols into the model.	8. TCP/IP model does not fit any protocol
9. Protocols are hidden in OSI model and are easily replaced as the technology changes.	9. In TCP/IP replacing protocol is not easy.
10. It has 7 layers	10. It has 4 layers