

OSI Layer:-

Layer 2 Presentation Layer:-

Next to the application layer, there is presentation layer. Presentation layer receives data from the application layer. This data is in the form of characters and numbers. This layer converts these characters and numbers to machine understandable binary formats. For eg:- conversion of ASCII to EBCDIC code.

This conversion function of presentation layer is called translation. Before data is transmitted, presentation layer reduces the number of bits that are used to represent the original data. This bit reduction process is called data compression. It can be lossy or lossless. Data compression reduces the amount of space used to store the original file. As the size of the file is reduced, it can be received at the destination at the very less time. So, this way data transmission can be faster. Thus, data compression is very helpful in real-time video and audio streaming.

To maintain the integrity of data during transmission, data is encrypted. Encryption enhances the security of sensitive data. At sender side, data is encrypted and at the receiver's side data is decrypted. SSL (Secure Socket Layer) protocol is used in the presentation layer for encryption and decryption. So to sum up, we can say that presentation layer performs three basic functions:-

- Translation
- Compression
- Encryption/ Decryption

Layer 3 Session Layer:-

Suppose you have planned for a party, you have hired few helpers to ensure that each activity runs smoothly. Helpers will help you in setting up, cleaning and closing the party. Same is the case with session layer. Session layer helps in setting up and managing connections enabling sending and receiving of data followed by termination of connections or sessions. Like you hired some helpers for party, sessions layer too has its own helpers called APIs (Application Programmable Interface). NETBIOS for network basic input output system is an example of APIs which allows applications on different computers to communicate with each other. Just before a session or a connection is established to the server, server performs a function called authentication. Authentication is the process of verifying who you are. For this server uses a username and a password. Once, entered username and a password are matched, a session or a connection is established between your computer and a server. After authenticating the user, authorization is checked. It is the process used by the server to determine if you have permission to access a file. If not, you will get a message saying "you are not authorized to access this page". Both of these functions are performed by session layer.

This layer also keeps the track of the file that are being downloaded. For example, a web page contains text, images etc these texts and images are stored as separate files on the web server. When you request a website in your web browser, your web browser opens a separate session to the

web server to download the text and image files separately. These files are received in the form of data packets. Session layer keeps track of which data packets belong to which file. Either text file or the image file. And tracks where the received data packets go. In this case, it goes to the web browser.

Thus, session layer helps in session management, authentication and authorization. Your web browser performs all the functions of session, presentation and application layer.

Layer 4 Transport Layer:-

Layer below session Layer is the transport layer. It controls the reliability of communication through segmentation, flow control and error control.

In segmentation, data received from session layer is divided into small data units called segments. Each segment contains the source and destination port number and sequence number. Port number helps to direct each segment to the correct application. And sequence number helps to reassemble segments in the correct order to form correct message at the receiver.

In flow control, transport layer controls the amount of data being transmitted. Consider our mobile is connected to a server. Suppose server can transmit data maximum at 100 mbps and our mobile can process data max at 10 mbps. Now, you are downloading your file from the server, but the server starts sending at 70 mbps, which is greater than the rate our mobile can process. So, mobile phone with the help of transport layer can tell the server to slow down data transmission rate up to 10 mbps so that no data gets lost. Similarly, the mobile can also tell server to increase the rate of transmission incase needed to maintain system performance.

This layer helps in error control as well. If some data does not arrive the destination. This layer uses automatic repeat request schemes to retransmit the lost or corrupted data. A group of bits called checksum is added to each segment by the transport layer to find out received corrupted segment.

Transport layer passes the data segments to the network layer.

Layer 5 Network Layer

Network layer works for the transmission of received data segments from one computer to another located in different network. Data in the network layer are called packets. Router reside at this layer. The function of network layers are:- logical addressing, routing and path determination.

Every computer in the network have a unique IP address. Network layer assigns sender and receivers IP address to each segments to form an IP packet. IP addresses are assigned to ensure that each packets can reach the correct destination.

Routing is the method of moving data packets from source to destination. And it is based on the logical address formats of IPV4 or IPV6. Suppose 'computer A' is connected to network 1 and 'computer B' is connected to network 2. From 'computer B' we requested to access facebook.com. Now, there is a reply from the face book server to 'computer B' in the form of packet. This packet needs to be delivered to 'computer B' only. Network layer of the face book

server already added sender and receiver IP address in the packet. Based on the IP address, routing decisions are made in the computer network.

Network layer also performs the function of path determination. Path determination is the process of choosing the best path for data delivery out of various available alternative paths.

Layer 6 Data Link Layer

This layer receives data packets from network layer. Data packets contains IP address of senders and receivers. This layer is responsible to do logical addressing, where MAC address of sender and receivers are assigned to each data packets to form a frame. MAC address is a 12-digit alphanumeric number embedded in the Network Interface card (NIC) in the computer by the computer manufacturer. Data unit in this layer is called frame. Data link layer is embedded in the NIC and provides means for transferring data from one computer to another computer via a local media. Local media includes copper wire, optical fiber or air.

Consider different hosts laptop and a desktop communicating with each other. As laptop and desktop are connected to different network. They will be using network layer protocols IP to communicate with each other. Now desktop wants to send some data to laptop. Desktop is connected to 'Router 1' via Ethernet cable. Laptop is connected to 'Router 2' via a WIFI link. And Router 1 and Router 2 are connected to each other via a satellite link. Now based on the medium used to connect the desktop and 'Router 1', data link layer adds some data in the head and tail of the IP packet and converts to frame. Ethernet frame in this case. Router 1 receives the Ethernet frame decapsulates it to an IP packet and encapsulates It again to make a frame so that it can cross satellite link so that it reaches the 'Router 2'. 'Router 2' will again decapsulate the received frame and encapsulate it to form a wireless data link frame. Laptop receives the wireless data link frame, decapsulate it and then forward IP packet the network layer. Finally, the data arrives the application layer. Application makes the received data visible in the computer screen. Network layer and other higher level layers are able to transmit data across different media with the help of data link layer.

Layer 7 Physical Layer

Till now, data from application layer has been segmented by transport layer, placed into packets by n/w layer and framed by data link layer which is the sequence of binary 0s and 1s.

Physical layer converts these binary sequences into signals and transmits over the local media. It can be an electrical signal in case of the LAN cable or light signal in case of optical fiber radio signals in case of the air. So, signals generated by physical layer depends on the type of media used to connect two devices. At the receiver, physical layer receives signals, converts it to bits and pass it to the data link layer as frame. Frame is further decapsulated as it moves the higher layers. Finally, data is moved to the application layer. Application layer protocols makes the sender's message visible in the application in the receivers computer system.

In this way OSI model is helping to transfer data between different hosts. So, these seven layers of OSI model are lying behind the smooth function of the internet.

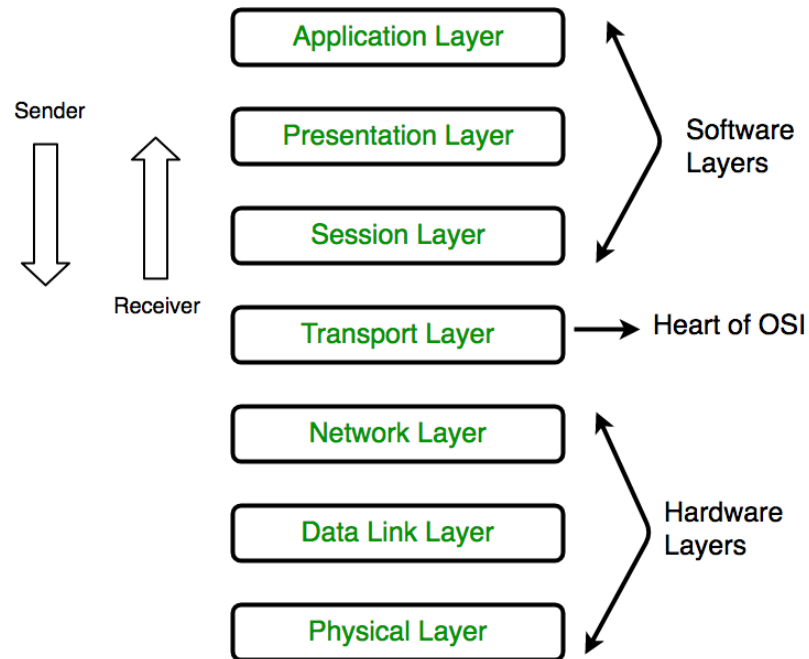


Fig: - OSI layer

Note: - There is also some explanation of OSI layer in the presentation slides of unit 5 from slide number 63-67.

dsj

