**OSI MODEL**

* OSI (Open System Interconnection) model was introduced by International Organization for standardization in 1984.
* OSI model is a framework that defines and is used to understand how data is transferred from one computer to another in a computer network.
* It splits this process into 7 distinct layers, each one playing a specific role within the overall operation.
* Each layer in OSI model is a package of protocols.
* The OSI model divides networking up into a “vertical stack” consisting 7 layers. Networking starts on the application layer at the top (Layer 7) and proceeds to the bottom layer (Layer 1). It is then passed back up the same hierarchy.

**APPLICATION LAYER (Layer 7):**

* It is used by network applications. Network applications are computer applications that use internet. Example: Google chrome, Firefox, outlook, skype etc.
* Application layer provides services for network applications with the help of protocols to perform user activities.
* Its protocols enable Layer 7 to work with whatever data the client is using.
* Application Layer Protocols: HTTP, HTTPs, FTP, NFS, FMTP, TELNET, SNMP, IRC, NNTP. All these protocols collectively form the application layer.
* File transfer is done by FTP protocol, web surfing is done by HTTP or HTTPs protocols, emails is done by SMTP protocol and for virtual terminals TELNET is used .
* Web server like chrome and Firefox use application layer protocols like HTTP and HTTPs for web surfing.
* These protocols form the basis for various network services like file transfer, web surfing, emails, virtual terminals etc.
* The application layer sends data to, and receives data from, the presentation layer.

**PRESENTATION LAYER (Layer 6):**

* Presentation layer receives data from application layer.
* This data is in the form of characters and numbers.
* This layer converts this data into machine understandable binary format. Example: ASCII to EBCDIC. This is known as Translation.
* Before data is transmitted it 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.
* It reduces the size of file to be transferred. Before transmission data is encrypted. SSL protocol (Secure Sockets Layer) is usen in presentation layer for encryption and decryption.
* It decrypts data at receiver side.

**SESSION LAYER (Layer 5):**

* Session layer helps in setting up and managing connections, enabling sending and receiving data followed by termination of connections or sessions.
* The session layer handles connections between different devices in the network. It creates communication channels, called sessions, between devices.
* Session layer has helpers called APIs (Application programming interface)
* Before establishing a connection/session/communication channel with server. Server performs two functions:
  1. Authentication: is the process of verifying who you are for this it uses username and password. And when the username and password is matched a session is established.
  2. Authorization: After authentication, authorization is checked. It is the process used by server to determine if you have permission to access a file.
* Both authentication and authorization is done by session layer.
* Session layer also helps in session management.
* It helps in:

1) Session Management.

2) Authentication.

3) Authorization.

**TRANSPORT LAYER (Layer 4):**

* Ensure reliable transfer of packets of data between users through segmentation, flow control, and error control.
* **SEGEMENTATION:** Data received from session layer is divided into small data units called segments. Each segment contains source and destination port number and a sequence number.
* Port number helps to direct the segment to the correct application and sequence number helps to reassemble the segments in the correct order
* **FLOW CONTROL:** Transport layer controls the amount of data being transmitted.
* It sends data at a rate that matches the connection speed of the receiving device.
* **ERROR CONTROL:** If some data does not arrive at the destination then the transport layer uses automatic repeat request schemes to re-transmit the lost/corrupted data. A group of bits called checksum is added to each segment by the transport layer to find out received corrupted segment.
* Protocols of transport layer: Transmission Control Protocol (TCP), User Datagram Protocol (UDP).
* It provides two services:

1) Connection-oriented transmission by TCP

2) Connectionless transmission using UDP.

* It passes the segments to the network layer.

**NETWORK LAYER (Layer 3):**

* Network layer determines the transmission path of data using routing protocols.
* Network layer works for the transmission of received data segments from one computer to another located in different networks.
* Data units in network layer are called packets.
* Function of network layer are:
  1. Logical Addressing: IP addressing done in network layer is called logical addressing. Every computer in a network has a unique IP address, network layer assigns senders and receivers IP address to each segment to form an IP packet.
  2. ROUTING: is a method of moving a data packet from source to destination. Based on IP address and mask routing decisions are made in a computer network.
  3. PATH DETERMINATION: Choosing the best possible path for data delivery from source to destination. Protocols used: OSPF(Open Shortest Path First), BGP(Border Gateway Protocol), IS-IS(Intermediate system to intermediate system).

**DATA LINK LAYER (Layer 2):**

* Receives data packets from network layer.
* Physical Addressing is done at data link layer, where sender and receiver MAC address are added to each data packet to form a frame.
* MAC address is a 12-digit alphanumeric number embedded in NIC (Network Interface Card) of your computer.
* Data link layer is embedded as a software in NIC and provides means to transfer data from one computer to another computer via a local media (such as copper wire, optical fiber, radio signal or air).
* Data Link Layer provides two functions:

1) Access to media to upper layers of the OSI model.

2) Controls how data is placed and received from the media: The technique used to get the frame on and off the media is called Media Access Control, there may be a number of devices connected to a common media if two or more devices connected the same media sends data at the same time then there may be a possibility of collision of two messages resulting in a useless message.

* Data link layer keeps an eye on when the shared media is free so that device can transmit data to the receiver. (ERROR DETECTION)
* Tail of each frame contains bits which are used to detect errors in the received frame.

**PHYSICAL LAYER (Layer 1):**

* The binary sequence of frame is converted into signals and transmit over local media.
* Signal can be electrical signal in case of copper cable or LAN cable, light signal in case of optical fiber, and radio signal in case of air.