Open System Interconnection (OSI) model

This layered model is a conceptualized view of how one system should communicate with the other, using various protocols defined in each layer. Further, each layer is designated to a well-defined part of communication system.

OSI Layers model has seven layers; **Application, Presentation, Session, Transport, Network, data link and physical.**

Application Layer

Application layer provides platform to send and receive data over the network. All applications and utilities that communicate with network fall in this layer. For examples

Browsers :- Mozilla Firefox, Internet Explorer, Google Chrome etc

Email clients: - Outlook Express, Mozilla Thunderbird etc.

FTP clients :- Filezilla, sFTP, vsFTP

Application layer protocols

SNMP (*Simple Network Management Protocol*) — Used to control the connected networking devices.

TFTP (*Trivial File Transfer Protocol*) — Used to transfer the files rapidly.

DNS (*Domain Naming System*) — Used to translate the name with IP address and vice versa.

DHCP (*Dynamic Host Configuration Protocol*) — Used to assign IP address and DNS information automatically to hosts.

Telnet— used to connect remote devices.

HTTP (*Hypertext Transfer Protocol*) — Used to browse web pages.

FTP (*File Transfer Protocol*) — Used to reliably sends/retrieves files.

SMTP (*Simple Mail Transfer Protocol*) — Used to sends email.

POP3 (*Post Office Protocol v.3*) — Used to retrieves email.

NTP (*Network Time Protocol*) — Used to synchronizes clocks.

Presentation layer

Presentation layer prepares the data. It takes data from application layer and marks it with formatting code such as .doc, .jpg, .txt, .avi etc. These file extensions make it easy to realize that particular file is formatted with particular type of application. With formatting presentation layer also deals with compression and encapsulation. It compresses (on sending computer) and decompresses (on receiving computer) the data file. This layer can also encapsulate the data, but it's uncommon as this can be done by lower layers more effectively.

Session Layer

Session layer deals with connections. It establishes, manages, and terminates sessions between two communicating nodes. This layer provides its services to the presentation layer. Session layer also synchronizes dialogue between the presentation layers of the two hosts and manages their data exchange. For example, web servers may have many users communicating with server at a given time. Therefore, keeping track of which user communicates on which path is important and session layer handle this responsibility accurately.

Transport Layer

It sets up and maintains the connection between two devices.
According to requirement data transmission method can be connection oriented or connection less.
For unreliable data delivery connection less method is used.
Connection less method uses UDP protocol.
For reliable data delivery connection oriented method is used.
Connection oriented method uses TCP protocol.

Connection management

Transport layer setup, maintain and tear down connections for session layer. Actual mechanic of connection is controlled by transport layer. Transport layer use two protocols for connection management UDP and TCP.

UDP(User datagram protocol)

UDP is a connection less protocol. Connection-less transmission is said to be unreliable. Now, don't get worried about the term "unreliable" this doesn't mean that the data isn't going to get its destination; its only means that it isn't guaranteed to get its destination. Think of your options when you are sending a postcard, put it in the mailbox, and chances are good that it will get where it's supposed to go but there is no guarantee. There is always a chance of missing in the way. On the other hand, it's cheap.

TCP(Transmission control protocol)

TCP is a connection oriented protocol. Connection-oriented transmission is said to be reliable. Think TCP as registry AD facility available in Indian post office. For this level of service, you have to buy extra ticket and put a bunch of extra labels on it to track where it is going and where it has been. You get a receipt when it is delivered. In this method you have a guaranteed delivery. All of this costs you more—but it is reliable!

Connection Multiplexing/Application Mapping

Connection multiplexing feature allows multiple applications to connect at a time. For example a server performs a number of functions like email, FTP, DNS, Web service, file service, data service etc. Suppose server has a single IP address, how will it perform all these different functions for all the hosts that want to connect with it? To make this possible transport layer assigns a unique set of numbers for each connection. These numbers are called **port or socket numbers**. These port numbers allow multiple applications to send and receive data simultaneously.

Port number	Descriptions
0–1023	Well-Known—For common TCP/IP functions and applications
1024–49151	Registered—For applications built by companies
49152–65535	Dynamic/Private—For dynamic connections or unregistered applications

Common TCP and UDP Port Numbers

TCP		UDP	
FTP	20, 21	DNS	53
Telnet	23	DHCP	67,68
SMTP	25	TFTP	69

DNS	53	NTP	123
HTTP	80	SNMP	161
POP	110		
NNTP	119		
HTTPS	443		

Network Layer

Network layer is responsible for providing logical address known as IP address. Router works on this layer. Main functions of this layer are following:-

Define IP address

Find routes based on IP address to reach its destination

IP address

IP address a 32 bit long software address which made from two components:

Network component: - Defines network segment of device.

Host component :- Defines the specific device on a particular network segment

Subnet mask is used to distinguish between network component and host component.

IP addresses are divided in five classes.

- Class **A** addresses range from **1-126**.
- Class **B** addresses range from **128-191**.
- Class **C** addresses range from **192-223**.
- Class **D** addresses range from **224-239**.
- Class **E** addresses range from **240-254**.

Following addresses have special purpose: -

0 [*Zero*] is reserved and represents all IP addresses;

127 is a reserved address and it is used for testing, like a loop back on an interface:

255 is a reserved address and it is used for broadcasting purposes.

Data link layer

Main functions of data link layer are

- Defining the Media Access Control (MAC) or hardware addresses
- Defining the physical or hardware topology for connections
- Defines hardware (MAC) addresses as well as the communication process that occurs within a media.

MAC Address

MAC address is a **48 bit long layer two address**. It is also known as hardware address. This address is burnt with device by manufacturing company.

The first six hexadecimal digits of a MAC address represent its manufacture company.

Physical Layer

Physical layer deals with communication media.

Short code to remember OSI layers

A Penguin Said That Nobody Drinks Pepsi

A – Application

P – Presentation

S – Session

T – Transport

N – Network

D – Data link

P - Physical