

# Osi Model: The Basics Structure of Network Communication

Nitin Kumar Agrawal, Shaamshad Alam, Harshit Raghav



**ABSTRACT:** In the present time, if we see around the world we can realize that information transfer through one place to another is very easy. A person lives in America easy do business with the person live far away from it. All this can be achieved by the phenomenon known as Networking. And the device through which the information are transferred are called interconnected device. As we know, in present time our need is not only transfer or sharing of information but in a secure way. So with the help of this we are not just transferring the information but in a secure manner To understand the whole phenomenon of this networking, the basic requirement is OSI LAYER Model. This is not just a model but a complete frame which gives us whole information of its working as well as link between them. So through this paper we give some basics concept building of OSI LAYER which help in understanding the Networking.

**Keywords:-** Networking, OSI MODEL, Interconnected devices, Information.

## I. INTRODUCTION

Andrew L. Russell [1] proposed about the Open Systems Interconnection (OSI) that In 1984 International Organization for Standardization (ISO) gives a standard called "The Basic Reference Model for Open Systems Interconnection". It is a collection of international approved, open standard for the system which is used the networking. It is a logical model and used to make and enforce to various application for developer of networking .so if someone say it is the blue print which describe the way of communication is not wrong. There are two major components of this model - (a) seven layer model (b) set of specific protocol. Since these set of protocols are used in these layers. By the use of OSI model, there are many advantage some of them given below:

- It can help in understanding the properties and functions which occurs in different OSI layer for users.
- It can allow them to communicate different type of hardware and software to each other.
- It can allow to breakdown the communication process into smaller elements, as a result element are easily design and errors are easily detect.

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- It gives an open platform for developer of different programming language to communicate with each other to give a better solution in upgradation in the field of networking.
- It also helpful in provide a link between hardware and software during the process of networking.
- Since work of all layers are specified, so similar function protocols or term work together and it become secure.
- Since this OSI model not only make the network sympathetic but also provide a better way to understanding about networking. The systematic block of seven layers is shown below:

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

Fig 1:Seven layer of OSI Layer  
Fig source: goggle scholar

## II. TYPES

These seven have specific name but they are generally known from layer 1, layer 2 etc. but due to this a problem arises, some says Application layer is the first layer some says Physical layer is first layer. So don't may confuse if work are accomplished from the sender side which are generally user which work on them. So according to this Physical layer is the First layer. And if work accomplished from the receiver side then the Application layer is the first layer. To remember the layer name from layer 7 to layer 1 serial-wise a simple trick we introduce.

All Public Sitting To Nine Mtr Distance Please

Since these seven layers classified into two categories: (a) Upper Layers (b) Lower Layers

## III. UPPER LAYER

These layers manage the application based problem and apply only on the software. It means if we trace the packet on wire then these layers can't seen .these are also knows Host layers because these layers exist between in source and destination devices [2]. These layers are responsible for connection of various applications to the user. The different types of upper layers are:



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## IV. APPLICATION LAYER

When a user want to access any application so that data will generates by this layer.

So this is the layer where user actually interfaces with computer by the help of the some application software like internet explorer. Since they don't shack the applications, they only cooperate with the protocol shack. It follows the identifying communication mechanisms in which they identified the partner and then check the availability of resources which are required. They support the synchronizing process and manages the all interface required by application. This layer is also known as Abstraction layer because they shared communication protocols and cooperate methods used by user. It converts the data into websites, messages, chats, programs and many others as per requirements. The main protocols used in this layer are File Transfer Protocol, Telnet, HTP, Domain Name Server etc. The working of this layer includes email & messaging handling, error handling and recovery. It also have a potential of print on a network. The major element used in this layer is gateway. This layer provides data integrity, privacy and evolves the network based application. The application architecture is used to define the structure of various systems. There are two types of application architecture :

(i)

**Client -Server architecture** : The programs serves on a computer send a request to other program for work are known as client and to which this request send are called server. And this whole architecture is known as Client - Server architecture. Since, There are some limitations of this model. It is not capable of holding all request come on them.

(ii) **Peer to Peer architecture**: This architecture is somehow different from Client - Server architecture. There are some computers which are not interface with the service providers, which are generally known as peer. They interface with each other and transfer the information without connected to the server; such type is known as Peer to Peer architecture.

## V. PRESENTATION LAYER

As from its name presentation, this layer is used to represent the data for application layer by converting into the user favorable form. It is also responsible for the conversion of data coding and their services. Translation services are used to help communication by using bit order, floating point etc. For example, American Standard Code for Information Interchange (ASCII) is used for the purpose of translation service. It setup the circumstance between application layer entities, in which they use the different syntax. So this layer is known as Syntax layer. With the help of this layer anyone can read the application layer by another application layer. It's control the formatting and syntax of data of user and also multimedia include in them. Since the audio includes MP3, WAV; format includes Text, RTF; Movies include MPEG, MOV etc. This layer has facility of data compression which help in reducing the number of bits and thus data easily transmitted. It can encrypt the data for the security during transmission. With the help of encapsulation this layer combines the multiple files into the single file. The protocols execute in this layer are XDR, TLS, SSL, MIME.

## VI. SESSION LAYER

This layer setup the virtual connection between user and application. And also manage and finish the connection. It means they create a environment between sender and receiver to setup the connection. So we can say that it is connection based layer. data

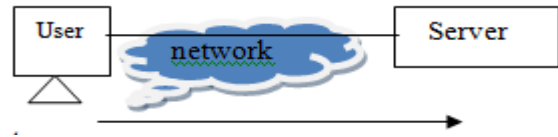


Fig2: Basic Structure of Session layer

Since there is a dialog control between devices, it means the communication process occurs between sender and receiver may be one-way or two-way as per requirement. The communication process defines by this layer into three forms: Simple, Half duplex, Full duplex.

- **Simple**: In this type of communication process only sender can send the message and receiver can receive the message but they do not respond on it. Examples of this are keyboard and monitor relation.
- **Half Duplex**: As from its name it is a half way communication in which either sender or receiver can respond on the message at a one time. Example is Walkie-Talkies in which at a time only one can speak.
- **Full Duplex**: It is the best way of communication in which at a single period of time both sender and receiver can send and respond to the message. Example are mobile phone in which speak and hear the voice at same time.

Since there are many facilities provide by this layer. They have facility of Retransmission, it means if due to some error the message not sent then they resend the message to them. It can manage the session and help to keep data separate. The protocols used in this layer are PPTP, SAP and NETBIOS etc. Since these protocols are not original protocol of this layer as a result there is a chance of failover. During the transfer of data it create checkpoint, when there is broken of network for some time after that when the reconnect then data not transfer from the initial path instead of this data will sent from the last checkpoint. This whole process is known as Synchronization and recovery. So it means they provide the facility of reconnection.

## VII. TRANSPORT LAYER

This Layer is known as The Heart of the OSI. They rebuild the data into single stream and responsible for the transfer of data from sender to receiver in the form of sequence. They convert long messages into small messages with the help of segmentation. Before the transmission of data , An approach Three way handshake is proceed for checking the connection. To understand this approach the basic structure is shown below:



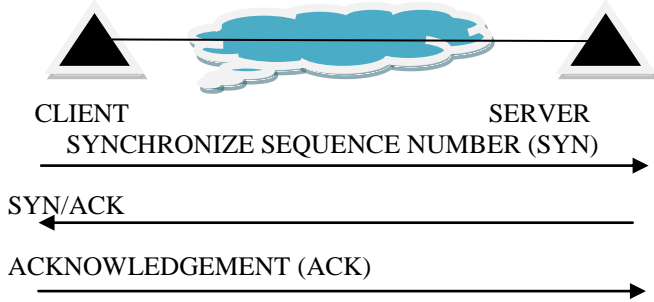


Fig 3: Three ways Handshake  
Fig source: goggle scholar

In the Three Way handshake, First SYN number is sent to server which tells the server that client want to make communication. Then server sends his own SYN number and the acknowledgement of the client. Then at last client sends the acknowledgement of server. And in this way it can achieved.

Since this layer has facility of indicator, if due to some reason they don't able send the packet then they not shown any error instead of this they show the indicator of "not ready". This layer is connection oriented and maintains the Quality of Service. They convert the data into segments and realign them in correct order on the receiver.

Multiplexing is used in them through which multiple sessions are seen on physical link. With the help of Data integrity they can control the flow control which prevents the losing of data. The main protocols of this layer are TCP and UDP. It is user oriented and interacts directly with them and they also identify the port number. They also regulate the size sequencing and stuff out the error checking.

### VIII. LOWER LAYERS

These layers deals with the problem related to transport of data. It gives information in local or wide area network between source and destination. So it is also known as media access layer. It can transmit and receive the bit flow on a physical medium. They can manage the addressing, routing and the traffic control. We can trace these layers over the wire. The various lower layers are:

### IX. NETWORK LAYER

This layer manages the address of device, track the location, select the best path for transfer of data by the help of logical addressing and check the connectivity. The Protocol data unit of this layer is Packet. This layer work on the basis of Routing Table in which packet is first check in this table, if find then they send otherwise they drop them. There are generally two type of a packet in this layer: Data packet and Route packet. Data packet is used to transport the data of user with the help of route protocols like Ipv6. Route update is used to check the connectivity of neighbor router by the help of protocols like RIP, EIGRP.

It can transfer the packet in different network with the help of IP addressing because they can easier setup and connect the devices. IP addressing consists of Source IP address and destination IP address through which they can communicate. It uses Routing Information Protocol which is open version to find shortest path for network.

The devices used in this layer are L-3 switches and Router. It can receive the frame from data link layer and convert them into packet and then send them to the destination. They

can organize the data before the transfer and after that they reassemble them through which user can get the logical information. They also diagnostics if there is any logical variation in network operation and they can report them. They used switching process to send the packet to desired host and capable to send packet to different network. The best feature is that it is good for the real time processing and transfer of data.

### X. DATA LINK LAYER

This layer responsible for managing the transfer of data which come in or out from the physical layer and handle the error notification, network topology. The Protocol data unit of this layer is Frames. The basic topology which describes the data link layer is shown below

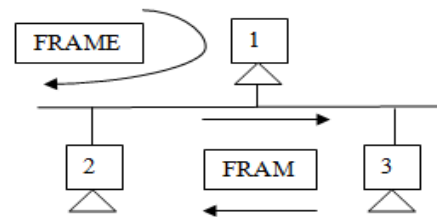


Fig 4: Basics Topology of Data Network Layer  
Fig source: goggle scholar

It can convert the packet comes from network layer into frame for the transmission into the physical layer. It also detects the error and corrects them as possible as. There are two sub-layer of this layer:

- (i) **MAC(Media Access Control):** This layer responsible for the give allowance to access them and give permission for transmission of data. They also responsible for the determining the last and start point of each frame which are transmitted and its flow control.
- (ii) **LLC(Logical Link Control):** They identify the protocols which are active on them and responsible for encapsulate of data and control the error checking process.

They format the messages and data frames and use the hardware addressing. They follow the "First come and First Served" rule in which the packet which come first are send first, it means they send the packet continuously without waiting the other packet. The MAC address helps the network to filter them.

They use Cyclic Redundancy Check (CRC) algorithm to check and detect the error in data. They simply add the additional bit and send to the receiver. At receiver side they decode the message and check the error. If there is present any error then they asks for re-transmission of message.

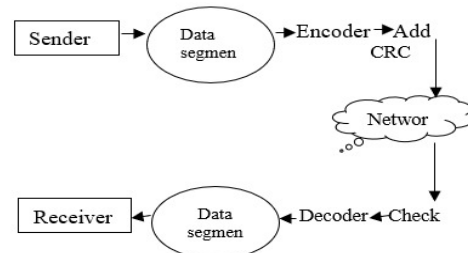


Fig 5: Working of CRC Algorithm



### Fig source: goggle scholar

The protocols used in this layer are ARP, HDLC, and PPP etc. There are different types of devices work in this layer like Layer-2 Switches, Bridges etc. Instead of Hubs, bridges are used in this layer because they have own collision domain so we can easily detect the place of error.

## XI. PHYSICAL LAYER

This layer transmits and receives the amorphous data between the device and the physical medium. Due to this layer is sometimes known as Hardware layer. The Protocol data unit of this layer is Bits. They specify the various characteristics like voltage level, modulation type etc. It is the lowest layer of OSI layer, so data comes in them only in the form of 0 and 1 with encoded form which is generally known as Morse code.

There are different types of technique used to represent these bit in different ways, Manchester encoding is one of them. For activate and maintaining the timing of physical connection between systems they highlight all components like electrical, mechanical and functional requirements. The various devices used in this layer are Network Hubs, Cabling, Repeaters and network adapters. Since Hub is like a repeater which transmits the signal to other port connected to it without check them.

The major protocols used in this layer are DSL, IEEE.802.11 and TIA 449 . This layer work as a converter, if message is come in this layer then they convert this electronic signal into bits and if message is going outside from this layer then they convert the bits into electronic form. It defines the protocols for the flow control. It tells the driver software for media attachment unit about the requirement which are sent with them across medium.

## XII. CONCLUSION

From this paper we are just explain the basic structure of the Seven Layer Model, which contribute the main role in the field of networking. This model tells how the different layers interconnected each other. And how the message convert into different form in the different layers through which they travel and how the security managed due to which they unaffected from the loss of message.

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