Computer Networking

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All about OSI Modal
Abstract: The following paper consists of all the information concerning the Open System Interconnection (OSI) Model. It has the various data for the OSI model, its discovery, and its layers as well as it is working.

Index Terms:

INTRODUCTION

The OSI Model stands for Open System Interconnection Model. (ISO) which is International Standard Organization that gave rise to this modal. The production of the OSI Model was completed in 1980 and was available in working condition. It took approximately ten years for an OSI Model to form. The OSI Model is used to guide technology traders, as well as for the development of any technical conversation! The model was split into seven parts for a simple understanding of the process. In this model, the data of the sender and receiver are passed from one layer to another. In this way, the process the entire process is held. The model is divided into two parts; The 1st three layers are the hardware layers, and the bottom three layers are the software layers.

APPLICATION LAYER

The application layer is the 7th (Topmost layer) of OSI. It is responsible for user interaction. It also enables the user to access the network. The application programs used for the user interaction process are decided by this layer only. It is applied on skype, the world wide web, File Transfer Protocol (FTP), Electronic mail, Remote database access, etc. The user and the application programs interact physically at this layer. It has provided an abstract view of the layers underneath and allows the user an application to concentrate on their tasks rather than worrying about lower-level network protocols. The responsibilities taken by the application layer include - network abstraction, file access, and transfer, mail services, remote logging, world wide web.

PRESENTATION LAYER

The Presentation Layer is the sixth-most layer of the OSI Model. It is responsible for the data formatting and display, allowing for compatibility. If two hosts are communicating with each other, They might be going for some other coding languages or sets for representing the data. For understanding, if the two hosts go for two different character sets for the presentation of data, ASCII and EBCDIC. For this such situations, the presentation layer is used, and these differences are taken care of properly and systematically. This layer also takes care of the Data Encryption and Decryption for security. The Presentation layer also takes care of Data Compression and Decompression.

The presentation layer is responsible for-
a). TRANSLATION:
The translation is handled by the transportation layer before the data is transmitted without any translating issues.

b). Encryption and Decryption:
The presentation layer for security handles the process of encryption and decryption.

c). Compression and Decompression:
For smoother transmission of data, the Presentation Layer looks after the Compression of data and decrypts the data while carrying further transmission.

SESSION LAYER

The Session Layer is the fifth layer of the OSI Model. The session layer is responsible for managing a session between two applications. The session layer handles the establishing, maintaining, and synchronizing of the interaction between two communicating hosts. It ensures that the session forms will be closed gradually and abruptly. For understanding, suppose a user wants to send a large document at the same time must be consisting of more than 1000 pages, if a problem occurs concerning power failures, etc:- in such cases after fixing the issue with the documented page will be transmitted from the first page or the most recent page? This question is solved with the help of the Session Layer. In this layer, each task is a session, a session is divided into certain sub-sessions. Here in the context of the above example, the 1000-page document is divided into sub-sessions must be each consisting of 10-20 pages. After the transmission of each sub-session, they would take a checkpoint of the shared content. As a result, the record is stored for the transmission of data. For this kind of error, the Session Layer is used.

The Session layer is responsible for :
a). Session and Sub-session:
The sessions are divided into sub-sessions for preventing any type of re-transmitting problems.

b). Synchronization:
It decides the order of transmission of data to the Transport Layer.

c). Session Closure:
The session should be closed gradually after the transmission of data.

d). Dialogue Control:
Session Layer decides which user/ application sends the data and at what point in time, whether the communication is simple, half, or full duplex.

TRANSPORT LAYER

The Transport Layer is the fourth layer of the OSI Model. The transport layer is responsible for transferring the information from the end-to-end points on the network and deals with errors such as lost or duplicate packages. It is considered to be the only end-to-end layer and is known to be the heart of the OSI Model. All the lower layers were the protocols between the adjacent layers. Hence, the header at the layer contains information that helps to send the message to the corresponding layer at the destination nodes. This layer looks for error detection and correction, flow control, etc: - Its transmission takes place in a packed format. It ensures smoother and more effective transmission of data. The transport layer breaks the Session Layer data into packets, also a sequence number is subjected to each of these packets. It is also responsible for breaking the packets into smaller packets. It may also form a logical connection between the source and destination.

The Transport layer is responsible for:
a). Host to Host message delivery:
It ensures that all the packets have reached the intended node.

b). Application to application communication:
Enables communication between two applications running on different computers.

c). Segmentation and Reassembly:
This layer breaks the message into segments for better transmission of the packets and accordingly reassembles the message for further transmission.

NETWORK LAYER

The network Layer is the third layer of the OSI model. The network layer is responsible for routing a packet within the subnet i.e., from the source to the destination node across multiple nodes in the same network or across multiple networks. This layer ensures the successful delivery of a packet to the destination node. When there is only one small network based on broadcast philosophy this layer is either absent or has very minimal functionality. Many private or public subnet operators provide the hardware links and the software consisting of the physical data link and network layers. They guarantee error-free delivery of a packet to the destination at a charge. This layer has to carry out the accounting function to facilitate the billing based on how many packets are routed. When packets are sent across National boundaries the rates may change thus making

this accounting function complex. A router can connect two networks with different protocols packet lengths and formats. At this layer, a header is added to a packet that includes the source and destination address. Responsibilities of the network layer are as follows: a) Routing: routing is a method to route a data packet from source to destination b) Congestion control: congestion is the situation in a communication network in which too many packets are present in a part of a subnet performance degrades. c) Address transformation: interpreting logical addresses to get the physical equivalent using ARP d) Logical addressing: logical addressing is a function of the network layer of the OSI model unlike hardware [MAC address] is it twice hierarchy and structure to separate networks e) Accounting and billing d) Source to destination error-free delivery.

DATA LINK LAYER

The data link layer is the second layer of the OSI model. The data link layer is responsible for transmitting a group of bits between the adjacent nodes. The group of bits is generally called a frame or packet. The network layer passes a data unit to the data link layer. The data link layer adds the header and trailer information to this. The header contains the address and other control information. The addresses at this level refer to the physical addresses of the adjacent nodes of the network between which the frame is being sent. Thus this address changes as the frame travel from different nodes on the route from the source node to the destination node. The addresses of the end node i.e., those of the source and destination nodes are already a part of the data unit transfer from the network layer to the data link layer. Hence they remain unchanged as the packet moves through different nodes from the source to the destination. They are not a part of the header and trailer added at the data link layer. The data link layer also performs the flow control function. Responsibilities of the data link layer are as follows:

a) Addressing: Headers and trailers are added containing the physical addresses of the adjacent nodes and removed upon successful delivery.

b) Flow control: This avoids overwriting on the receiver's buffer by regulating the amount of data that can be sent.

c) Media access control: In LAN it decides who can send data, when, and how much.

d) Synchronization: Headers have bits that tell the receiver when a frame is arriving. It also contains bits to synchronize its timing to know the bit interval to recognize the bit correctly. Trailers mark the end of a frame apart from containing the error control bits.

e) Error control: It checks the CRC to ensure the correctness of the frame. If it is incorrect it asks for re-transmission.

f) Node-to-Node Delivery: Finally it is responsible for error-free delivery of the entire frame to the next adjacent node.

PHYSICAL LAYER

The first layer of the OSI model is the physical layer. The physical layer is concerned with sending raw bits between the source and destination nodes which in this case are adjacent nodes. The source and the destination nodes have to agree on several factors such as what voltage constitutes a bit value 0, what voltage constitutes with value 1, and whether the communication is in only one or both the direction simultaneously (i.e., simplex, half duplex, or full duplex). It also deals with the electrical and mechanical specifications of the cable conductors and interface. The physical layer converts frames to electrical pulses which represent binary data. The binary data is then sent over the wired or wireless media. Responsibilities of the network layer are: a) Signals: When data is sent over a physical medium it needs to be first converted into an electromagnetic signal. Data itself can be analog such as human voice or digital signals such as files on the disk. b) Digital signal: Digital signals are discrete and represent a sequence of voltage pulses digital signals are used within the circuitry of a computer system. c) Analog signal: Analog signals are in the continuous waveform in nature and represent by continuous electromagnetic waves.

CONCLUSION

OSI model is still a very useful and productive model in day to day technological life.

REFERNECE

[1] https://www.wikipedia.org/

[2] https://www.geeksforgeeks.org/