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The OSI reference Model: An Overview

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Abstract: *Open System Interconnection(OSI) model was developed by the International Standard Organization (ISO) in 1983. ISO is an international body of experts who defines a variety of different technical standards. This model is known as ISO OSI (Open System Interconnection) Reference model. The Open Systems Interconnection model (OSI Model) is a conceptual model that characterizes and standardizes the internal functions of a communication system by dividing it into abstraction layers. There are seven layers in OSI model. This paper explains the OSI Reference Model and depicts the function of different layers.*

Keywords: *Open System Interconnection (OSI), International Standard Organization (ISO), protocol, APDU*

I. INTRODUCTION

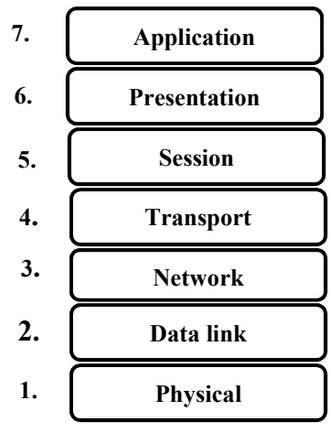
The OSI model is called ISO OSI (Open Systems Interconnection) Reference model because it deals with connecting open systems (systems that are open for communication with other systems). Open System Interconnection model was developed to demonstrate how the part of a network communication system should work together. It is also known as standard reference model which is used for communication between two end users through network [1]. The OSI reference model is the world's major used networking architecture model. The model reveals only what needs to be done. It does not reveal how those needs are to be implemented. Actual implementation is left up to individual developers and programmers. The OSI model was basically developed to simplify network complexity, facilitate network training and introduce easy network trouble shooting. The OSI model is not real network architecture, because it does not really specify the services and protocols each layer should use. It rather describes what the layers must do. The OSI model has seven layers which describes how data communication takes place between two end users. In other words, the model specifies communication functions into seven logical layers. Each layer specifies specific task. A layer serves the layer above it and is served by the layer below it. So, we can say that the model was created as a framework and reference model to explain how different networking technologies work together and interact. It is not a standard that networking protocols must follow.

The principles which were applied to reach at the seven layers [2] are as follows-

- Each layer should perform a well-defined function.
- A layer should be created where a different abstraction is needed.
- The function of each layer should define internationally standardized protocols.
- The layer boundaries should minimize the information flow across the interfaces.
- The number of layers should be large enough that distinct functions need not be thrown together in the same layer out of necessity and small enough that the architecture does not become complex.

II. THE LAYERS OF OSI MODEL

The OSI Reference Model is composed of seven layers and each layer specifying particular network functions. Each layer provides a service to the layer above it in the protocol specification and communicates with the same layer's software or hardware on other computers. The seven layers of the OSI model are shown in following figure-



A. THE UPPER LAYERS OF OSI MODEL

The top three layers of the OSI model are often known as the **upper layers**:

- Layer-7 - Application layer
- Layer-6 - Presentation layer
- Layer-5 - Session layer

Protocols that operate at these layers manage application-level functions and are generally implemented in software. The functions of these layers of the OSI model can be difficult to visualize. Upper layer protocols do not always fit perfectly within a layer, and often function across multiple layers. They are orientated more toward services to the applications.

B. THE LOWER LAYERS OSI MODEL

The bottom four layers of the OSI model are known as the **lower layers:**

• Layer-4 – Transport layer
• Layer-3 – Network layer
• Layer-2 – Data-Link layer
• Layer-1 – Physical layer

Protocols that operate at these layers control the end-to-end transport of data between devices and are implemented in both software and hardware. They are concerned with the flow of data from end to end through the network.

C. THE NETWORK ARCHITECTURE BASED ON OSI MODEL

The network architecture is shown in the appendix.

III. FUNCTION OF THE LAYERS

Functions of the layers are as follows-

1. Physical layer: The physical layer specifies the electrical, mechanical and functional specification for handling network data. This layer is mainly concerned with transmitting raw bits over a communication channel. The Physical layer provides specifications for different hardware [3].

- Cabling
- Connectors and transceivers
- Network interface cards (NICs)
- Wireless radios
- Hubs

The functions of this layer are to keep track of voltages, electrical pulses, connectors and switches so that data can be transmitted from one network device to another.

2. Data Link Layer: The data link layer is responsible for detecting and correcting low level data errors during transfer of data between the physical layer and the layer above the physical layer. The main function of this layer is to provide a method by which **information** from the network is broken down into frames and transmitted over the physical layer. This d layer is divided into two sub layers:

- **The Media Access Control (MAC) layer:** The MAC layer is responsible for how a computer on the network gains access to the data and permission to transmit it.
- **The Logical Link Control(LLC) layer:** The LLC layer keeps track of frame synchronization, flow control and error checking.

3. Network Layer: The network layer plays an important role in path determination and logical Addressing. This layer provides logical addresses to the packets received which in turn helps them to find their path [4]. This layer is responsible for controlling the operation of the **subnet**. It facilitates in determining how packets are routed from source to destination so we can say that it defines end-to-end delivery of packets. It requires logical addresses such as IP addresses so that any endpoint can be identified. It also Defines how routing works and how routes are learned so that the packets can be delivered. It specifies how to fragment a packet into smaller packets to accommodate different media. Routers operate at Layer 3 (Network layer).

4. Transport Layer: The transport layers accept data from the session layer, split it up into smaller units, pass to the network layer. This layer includes function for establishing appropriate connection, initiating data transmission and releasing the connections after the transmission is completed. The transport layer ensures data is successfully sent and received between two nodes. If data is sent incorrectly, this layer ask for retransmission of the data.

The transport layer takes data from higher levels of OSI Model and breaks it into segments that can be sent to lower-level layers for data transmission. It also reassembles data segments into data that higher-level protocols and applications can use and arrange segments in correct order (known as sequencing) so they can be reassembled in correct order at destination. Layer 4 protocols include TCP (Transmission Control Protocol) and UDP (User Datagram Protocol).

5. Session Layer: The session layer sets up and clear communication channels between two communicating component. This layer decides when to turn communication on and off between two computers. It provides the mechanisms that control the data exchange process and coordinates the interaction between them. It also manages record of transmission sent [5].

The session layer defines how to start, control and end conversations (called sessions) between applications.

6. Presentation Layer: The presentation layer is responsible for the syntax and semantics of the information transmitted. This layer formats the data to be presented to the application layer. It works as the translator for the network. This layer may translate data from a format used by the application layer into a common format at the sending station, and then translate the common format to a format known to the application layer at the receiving station. The presentation layer [6] performs following task-

- **Character code translation**: for example, ASCII to EBCDIC.
- **Data conversion:** bit order, CR-CR/LF, integer-floating point, and so on.
- **Data compression:** decreases the number of bits that need to be transmitted on the network.
- **Data encryption**: encrypt data for security purposes. For example, password encryption.

7. Application Layer: The application layer includes many protocols that are commonly needed. This layer facilitates in file transfer and provides an interface between the user and the presentation layer. This layer defines the languages that programs use to communicate with other programs. Common functions of this layer are opening, closing, reading and writing files, transferring files and e-mail message, executing remote jobs and obtaining directory information about network resources. The application layer is closest to the end user, which shows both the OSI application layer and the user interact directly with the software application.

The presentation layer transmits the data to the application layer. The data unit in this layer is called APDU (Application Protocol Data Unit). It directly links with the application such as web browser or email. E-Mail and Messaging can be exchanged and handled with help of application layer [7].

IV. THE ADVANTAGES OF THE OSI MODEL

- The OSI model has become a teaching tool that shows how different tasks within a network should be handled in order to promote error-free data transmission [8].
- It facilitates the users to understand the network picture.
- It gives the idea to the users that how hardware and software work together.
- It separates the complex network into the manageable modules.
- Developed new technologies can be easily learnt which simplifies teaching and learning.
- Reduces complexity. The process of breaking up the functions or tasks of networking into layers reduces complexity
- It facilitates modular engineering.
- It ensures interoperable technology.
- It Accelerates evolution.

CONCLUSION

In this paper an attempt has been made to explain the OSI model and the task performed by its seven layers. The OSI model is an architecture which gives an idea how packets transfer over the network during any communication**.** This model is a proven concept that is used in all other data communications protocols. It will continue to be used as a guideline for all other communications applications.

RFERENCES

[1]. Vansh Raheja, Supriya Mahajan, Open System Interconnection (OSI): A Seven Layered Model, The International Journal of Science & Technoledge, Vol 2, Issue 1, 2014, page 15-19.

[2]. P. Ravali, A Comparative Evaluation of OSI and TCP/IP Models, International Journal of Science and Research, Volume 4, Issue 7, July 2015, page 514-521.

[3]. Aaron Balchunas, OSI Reference Model v1.31, http://www.routeralley.com

[4]. Gaurav Bora, Saurabh Bora et al., OSI Reference Model: An Overview, International Journal of Computer Trends and Technology, Volume 7, Number 4, 2014, page 214-218.

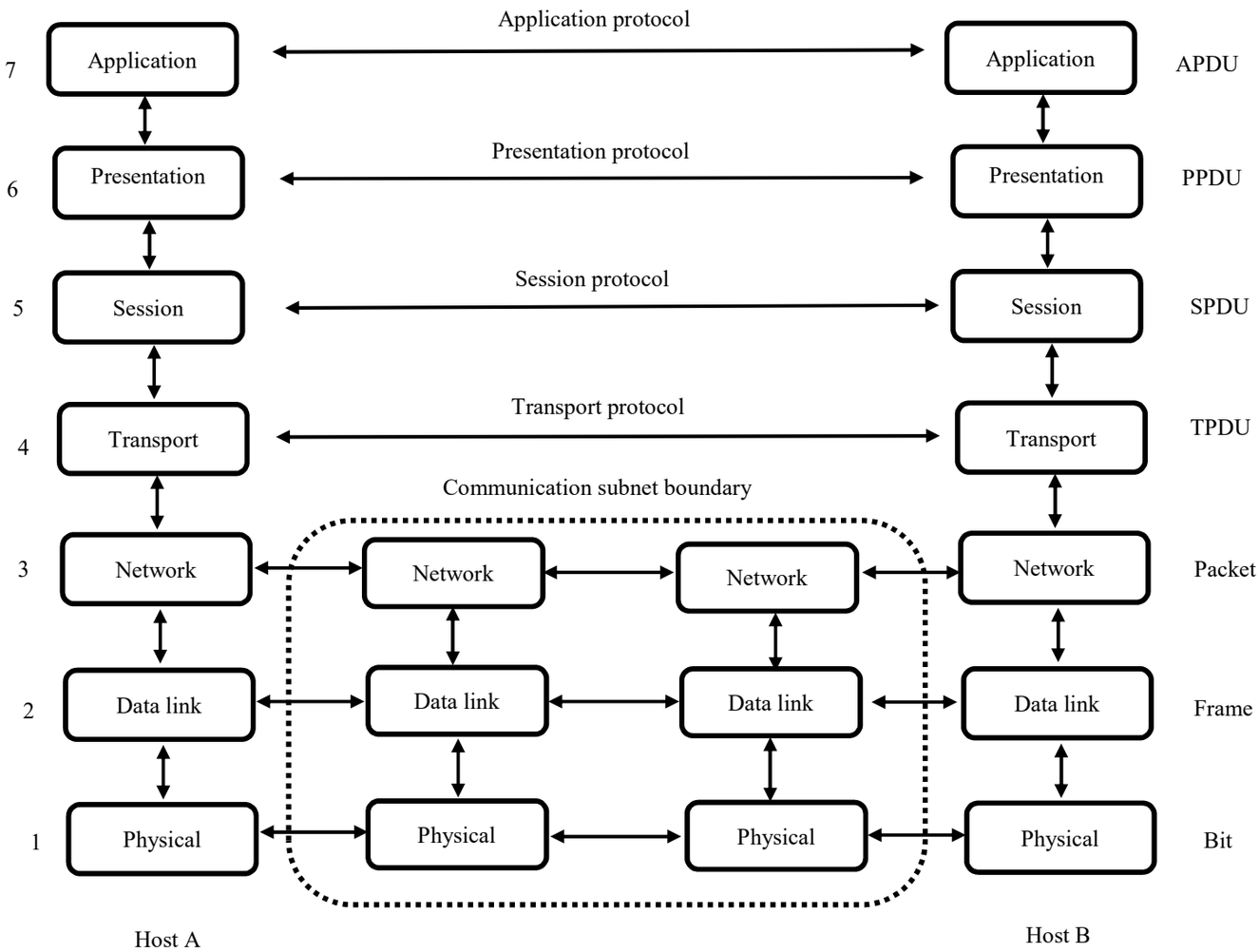
[5]. P. Suresh, Survey on Seven Layered Architecture of OSI Model, International Journal of Research in Computer Applications and Robotics, Vol.4 Issue 8, 2016, page 1-10.

[6]. Sumit Kumar, Sumit Dalal, Vivek Dixit, The OSI Model: Overview on The Seven Layers of Computer Networks, International Journal of Computer Science and Information Technology Research, Vol. 2, Issue 3, 2014, page 461-466.

[7]. Aarushi, Madan Aarusi, Tuteja Bharti, OSI Reference Model, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 9, 2014, page 55-59.

[8]. Vibhu Chinmay, Rishabh garg, A REVIEW PAPER ON OSI MODEL – A SEVEN LAYERED ARCHITECTURE OF OSI MODEL, INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY, Volume 1, Issue 12, 2015, page 394-400.

APPENDIX


Application protocol
Presentation protocol
Session protocol
Transport protocol
Communication subnet boundary
7
6
5
4
3
2
1
Application
Presentation
Session
Transport
Network
Data link
Physical
Application
Presentation
Session
Transport
Network
Data link
Physical
Network
Data link
Physical
Network
Data link
Physical
APDU
PPDU
SPDU
TPDU
Packet
Frame
Bit
Host A
Host B