Seneca College

OSI model:

Get to know that what OSI model and its layers are

Activity #2

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Table of Contents

Introduction....2

Advantages....3

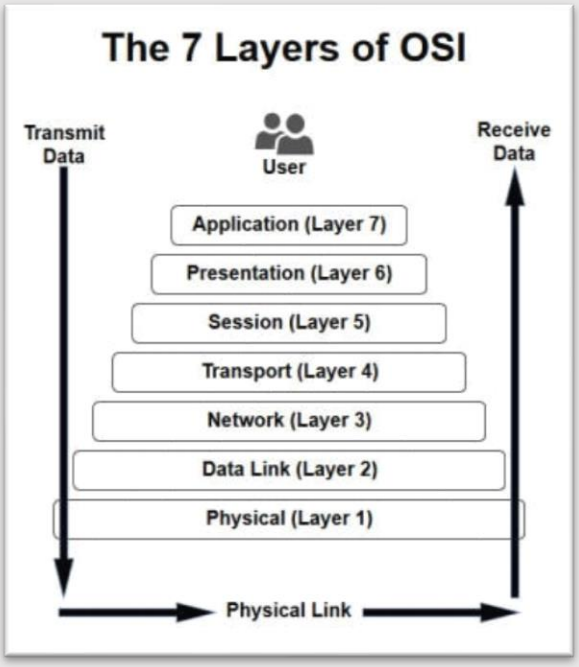
Layers....4

- Physical....4
- Data Link....4
- Network Layer....5
- Transport....5
- Session....6
- Presentation....6
- Application....7

References....8

Introduction

What is OSI model: It stands for Open Systems Interconnection and is a conceptual model that characterizes and standardizes the communication functions of a telecommunication or computing system. In the earliest days of network communication, every manufacturer of networking equipment had their own protocol. That meant if you purchased devices from two different vendors and you tried to make them talk, they wouldn't because they did not have a common protocol. So, in the 1970's, the International Standards Organization also known as the ISO came forward to standardize network communication. The OSI model introduced by ISO divided network communication into seven layers.



The 7 Layers of the OSI Model (Webopedia)

Advantages

1. the OSI model provides a conceptual overview of networking processes. In other words, it breaks down the complex world of networking into a single model so that we can more easily understand what's happening in a network or between networks.
2. OSI model helps network administrators in determining the required hardware and software to build their network
3. It encourages hardware manufactures to create the networking products that can communicate with each other over the network.
4. The best advantage of the OSI model is its simplicity. Each of the seven OSI layers is responsible for a distinct function, and each layer provides a service to the layer above it; this makes troubleshooting a network much easier.
5. It provides a common vocabulary to talk about networking concepts, especially for areas that the dominant TCP/IP model doesn't really cover, such as session and presentation (and to a certain extent, routing).
6. Since the protocols are hidden, any protocols can be implemented in this model. It has all flexibility to adopt features of other protocols.

Layers

Physical

The bottom most layer of the OSI model is the physical layer. The PDU for the physical layer is a bit; that means data at this layer is in the form of bits which means zeroes and ones. The physical layer performs many functions such as hardware specification, that means defining the electrical and the physical specification of the hardware used to communicate over the network; this includes cables, connectors, frequencies, or voltages and wireless signals. The primitive duty of the physical layer is to provide transparent transmission of bits from the data-link layer of the sender to the datalink layer of the receiver. Other responsibility that the physical layer has is sequencing, which means the physical layer must make sure that the transmitted bits arrive in the same sequence in which they were sent from the data-link layer. Devices at the physical layer include hubs, repeaters, modems, fibers, et cetera. Fast Ethernet, RS232, and ATM are protocols with physical layer components.

Data Link

The second layer of the OSI model is the data link layer. I mentioned that data at the physical layer is in the form of bits. The PDU of the data-link layer is a frame. When this zeroes and ones reach the data link layer, they get transformed into frames. These frames may range from few hundred bytes to few thousand bytes. The data link layer is mainly responsible for communication over the same network or over the local area network. The data link layer also performs a very important function known as physical addressing, it is also known as the MAC address and this one is the real address of the device which is burned onto the chip which is burned onto the network interface card. It also performs flow control which is synchronizing the sending and receiving rate of frames. Last but not least, another function that data link layer provides is error control. Some physical channels might be susceptible to

factors that prevent the data from being delivered in the right way; data link layer will detect and control these errors. The protocols that operate at data link layer include ethernet, frame relay, token ring, fiber distributed data interface, etc. The devices that operate at data link layer include modems, network cards, bridges and 2-layer switches.

Network Layer

Third layer of the OSI model is the network layer. The PDU for the network layer is a packet. The data which is in the form of frames at layer two will get transformed into what is known as packets when they reach layer three. The network layer is responsible for IP addressing, controlling the subnet, and routing, which is essentially moving the packets across different networks. Another task that data link layer takes on is fragmentation and reassembly which means if the packets are too large to be sent over the network it breaks it down into smaller parts known as fragments. The protocols that operate at this layer include IPv4, IPv6, ICMP, et cetera and the devices that operate at the network layer include 3-layer switches, routers, brouters, firewalls, etc.

Transport

The fourth layer is the transport layer. The PDU for the transport layer is a segment. At the network layer data is in the form of packets. When it moves one level up, when it reaches the transport layer, it gets transformed into segments. The transport layer is responsible for deciding the transport protocol which could be TCP or UDP. TCP provides connection-oriented services (connection needs to be established before the start of transmitting data from the sender to the receiver) which is basically reliable data connection. UDP provides connectionless services (there is no connection establishment before the transmission of data takes place) which is useful for real time data such as voice and video. Same as network layer, the transport layer also performs segmentation and reassembly which means if the

packet is too large to be sent over the network it breaks it down into smaller segments. Some common protocols used in transport layer are User Datagram Protocol (UDP), AppleTalk Transaction Protocol (ATP), Transaction Control Protocol (TCP) and Sequenced Packet Exchange (SPX). Devices used in transport layer are Gateways and Firewalls.

Session

The fifth layer of the OSI model is the session layer. The session layer does not have a PDU of its own. It handles the data in the shape they come in, without division or concatenation. It is responsible for session management which means establishing and controlling the session between sending and the receiving devices. It also performs synchronization; that means avoiding communication errors using sequence numbers. The protocols that operate at the session layer include NetBIOS, SOCKS, Network File System, et cetera. Added to Gateways and Firewalls as transport layer, PC is another device used in session layer,

Presentation

Layer 6, or the presentation layer, serves as the data translator between an application or process and the network. This layer is responsible for the formatting and subsequent delivery of data to the application layer either for processing or display. The presentation layer, like the session layer, does not have a PDU on its own. This layer performs compression to improve data transmission rates. It also performs encryption to improve data security. Protocols used at presentation layer include Apple Filing Protocol (AFP), Telnet, Network Data Representation (NDR) and Lightweight Presentation Protocol (NCP). Devices used in this layer is the same as session layer.

Application

Layer 7 refers to the seventh and topmost layer of the Open Systems Interconnect (OSI) Model known as the application layer. This is the highest layer which supports end-user processes and applications. The application layer does not represent the applications that we're running on the computer. The application layer provides the interface between the applications you run on your computer and the underlying network. Easy talking, this layer is responsible for displaying images and data to the user as a human-recognizable format in order to allow the user to interface with the layer below it, which is the presentation layer. The protocols at the application layer include DNS, HTTP, FTP, etc. Some of the devices used in Application layer are: PC’s, Phones, Servers, Gateways and Firewalls.

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