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OSI REFERENCE MODEL

The open systems interconnection reference model is a layered, abstract representation created as a guidline for network protocol design. The OSI model divides the networking process ito seven logical layers, each of which has a unique functionality and to which are assigned specific services and protocols.

In this model, information is passed from one layer to the next, starting at the Application layer on the transmitting host, and proceeding down the hierarchy tot the Physical layer, then passing over the communications channel to the destination host, where the information proceeds back up the hierarchy, ending at the Application layer. The figure depicts the steps in this process.

The Application layer, Layer seven is the top layer of both the OSI and TCP/IP models. It is the layer that provides the interface between the applicatinos we use to communicate and the undelying network which our messages are transmitted. Application layer protocols are used to exchange data between programs running on the source and destination hosts. There are many application layer protocols and new protocols are always being developed.

Initially the OSI model was designed by the International Organization for Standardization (ISO) to provide a framework on which to build a suite of open systems protocols. The vision was that this set of protocols would be used to develop and international network that would not be dependent on proprietary systems.

As a reference model, the OSI model provides and extensive lists of functions and services that can occur at each layer. It also describes the interaction of each layer with the layers directly above and below it.

1. PHYSICAL LAYER

The OSI Physical layer provides the means to transport across the network media that bits that make up a Data Link layer frame. This layer accepts a complete fram from the Data Link layer and encodes it as a series of signals that are transmitted onto the local media. The encoded bits that comprise a frame are received by either an end device or an intermediate device.

The delivery of frames across the local media requires the following Physical layer elements:

* The physical media and associated connectors
* A representation of bits on the media
* Encoding of data and control information
* Transmitter and receiver circuitry on the network devices

At this stage the communication process, the user data has been segmented by the Transport layer, placed into packets by the Network layer, and further encapsulated as frames by the Data Link layer. The purpose of the Physical layer is to create the electrical, optical, or microwave signal that represents the bits in each frame. These signals are then sent on the media one at a time.

It is also the job of the Physical layer to retrieve these individual signals from the media, restore them to their bit representations, and pass the bits up the Data Link layer as a complete frame.

PROTOCOLS OF THE PHYSICAL LAYER

Commonly used protocol here is the Ehternet such as 10BaseT or 100BaseTX which specifies the type of cables that can be used, the optimal topology (star vs. bus. Etc.) the maximum length of cables, etc.

1. THE DATA LINK LAYER

Transmits data frames of from source to destination within same network segment. Ensures the reliability of the physical link established at layer 1. Standards define how data frames are recognized and provide the necessary flow control and error handling at the frame set.

The data link layer is divided into two sublayers. The Media Access Control (MAC) layer and Logical Link Control (LLC) layer. The MAC sublayer controls how a computer on the network gains access to the data and permission to transmit it. The LLC layer controls the frame synchronization, flow control and error checking.

PROTOCOLS IN LAYER 2

Actual layer 2 protocol used depends on the logical topology of the network and implementation of the Physical Layer. Given the wide range of topologies in networking, there are correspondingly high number of layer 2 protocols in use and they include:-

* Ethernet
* Point-to-Point Protocol (PPP)
* High-Level Data link control (HDLC)
* Frame Relay
* Asynchronous Transfer Mode (ATM)

Each protocol performs media access control for specified layer 2 logical topologies. This means that a number of different network devices can acts as nodes that operate at the Data Link layer when implementing these protocols. These devices include the network adapter and network interface cards (NICs) on computers as well as the interfaces on routs and Layer 2 switches.

The Layer 2 protocol used for a particular network topology is determined by the technology used to implement that topology. The technology is, in turn, determined by the size of the network – in terms of the number of hosts and the geographic scope – and the services to be provided over the network.

1. THE NETWORK LAYER

The Network layer, or the OSI Layer 3, provides services to exchange the individual pieces of data over the network between identified end devices. To accomplish this end-to-end transport, Layer 3 uses four basic processes.

1. Addressing

First the network layer must provide a mechanism for addressing these end devices. If individual peces of data are to be directed to an end device, that device must have a unique address. In an IPV4 network, when this address is added to a device, the device is then referred to as a host.

1. Encapsulation ( Wrapping of data in a particular protocol header)

Second, the Network layer must provide encapsulation, Not only must the devices be identified with an address, the individual pieces – the Network Layer PDUs (Protocol Data Unit) – must also contain these addresses. During the encapsulation process, Layer 3 receives the Layer 4 PDU and adds a Layer 3 header, or label, to create the Layer 3 PDU. When referring to the Network layer, we call this PDU a packet. When a packet is created, the header must contain the address of the host to which it is being sent. This address is referred to as the destination address. The Layer 3 header also contains the address of the originating host. This address is also called the source address.

After the Network layer completes its encapsulation process, the packet is sent down to the Data Link layer to be prepared for transportation over the media.

1. ROUTING

Next the Network layer must provide services to direct these packets to their destination host. The source and destination hosts are not always connected to the same network. In fact, the packet might have to travel through many different networks. Along the way, each packet must have guided through the network to reach its final destination and these networks are connected by routers. The role of the router is to select paths for and direct packet toward their destination. This process is known as routing.

During the routing throughout and internetwork, the packet may traverse many intermediary devices. Each route that a packet takes to reach the next device is called a hop. As a packet is forwarded, its contents (the Transport layer PDU), remain intact until the destination host is reached.

1. DECAPSULATION