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ISYS 412 Section 1

The OSI Model: Definition of the networking framework for a protocol

The Open Systems Interconnection Model (OSI) was designed "as a means by which computer networks around the world could be designed around a common set of guidelines."(talkbroadband.com) This would give the ability for different types of networks to interact with each other with out redesigning the whole network. There are seven layers to the OSI model: (1) Physical layer, (2) Data link layer, (3) Network layer, (4) Transport layer, (5) Session layer, (6) Presentation layer, (7) Application layer. All of these individual layers make up the whole OSI model. Each layer has a specific part in the communication process. I will summarize what each layer does.

Physical Layer:

This layer "establishes the physical characteristics of the network (e.g., the type of cable, connectors, length of cable, etc.) It also defines the electrical characteristics of the signals used to transmit the data (e.g. signal voltage swing, duration of voltages, etc.). The Physical Layer transmits the binary data (bits) as electrical or optical signals depending on the medium." (http://www.frick-cpa.com/netess/Net_OSI.asp) As was stated on Professor Lindstrom's slide "Ultimately Layer 1 determines maximum bandwidth." There are several types of layer 1 topologies: Star, Bus, Ring, Mesh, and Hybrid. Any number of these topologies can be used to structure your network. Along with topologies there are types of media such as Cat 5, coaxial or wireless. Layer 1 sets all the specifications for these cables also.

Data Link Layer:

The data link layer is responsible for packaging data into smaller frame and then to bits so that it can be sent over the network media. At this level error detection and correction happens. "If an acknowledgement is expected and not received, the frame will be resent. Corrupt data is also identified at the data link layer." (http://www.frick-cpa.com/netess/Net_OSI.asp) This layer is broken down into the LLC and Mac. The LLC keeps the connection while the MAC allows you to talk directly to the other adapter. An example of hardware that operates at this level would be a bridge that allows for separate collision domains. Other protocols that operate at layer 2 include; PPP,SLIP, Ethernet, and many more.

Network Layer:

The network layer is responsible for translating logical addresses, or names, into physical addresses. The network layer also routes packets or datagrams to the correct network. A perfect example of this is a router. It takes whatever message that is being sent and relays it to another network based on its routing table. Network layer doesn't care about the message or if it has errors it just passes it on. The protocol that is most popular that operates at this level is the Internet Protocol or IP part of TCP/IP. IP is connectionless meaning that it doesn't care if the message is every received it just sends the message anyway.

Transport Layer:

This layer is made so to couple to the top layers with the bottom layers. What I mean is that the transport layer makes sure that a message is sent and received by the other computer. This is the case in TCP where a three-way handshake takes place. If a UDP transmission takes place then the information is sent out not caring if it makes to another host. Basically the transport layer is the middle man. TCP is the better protocol because it allows for sure knowledge of deliver because ACK's are sent back by the receiving host that he got the message.

Session Layer:

The session layer "is responsible for establishing, maintaining, and terminating a connection called a 'session'. A session is an exchange of messages between computers (a dialog). Managing the session involves synchronization of user tasks and dialog control (e.g., who transmits and for how long). Synchronization involves the use of checkpoints in the data stream. In the event of a failure, only the data from the last checkpoint has to be resent." (http://www.frick-cpa.com/netess/Net_OSI.asp) The session decides whether or not to have the communication. It controls the overall connection to the other host. This also helps security across connections by being able to control when a connection is live. Some examples of this are the ports that are used for different types of sessions such as port 25 for pop3 service and port 20/21 for ftp.

Presentation Layer:

This layer is used to translate what the user has entered at the application layer and makes it into the correct syntax. “All different formats from all sources are made into a common uniform format that the rest of the OSI model can understand.”(http://www.geocities.com/SiliconValley/Monitor/3131/ne/osimodel.html) The reason that it is called the presentation layer is that it presents all the other layers with what it has formatted from the application layer. This layer is a key because if the data is not formatted correctly then the rest of the stack will just send bad data on to the other host.

Application Layer:

This layer is exactly what its name implies; it interacts directly with the application that is requesting its service. The best way to describe this layer is with some common examples. Some of the common ones are File Transfer, Web Applications, Email and Newsgroups. Outlook for instance would, when checking email, go directly to its underlying component the application layer to make this request. The message of checking the email would continue down the stack and then back up with any messages. The application layer just passes the buck down the stack making the rest of the stack abstract to the program that is using it.

Just like any model it is a model and not strictly adhered to in the real world. Everyone has their own take on networking but, this model is just a good base to start from.