The OSI Model

Initial computer networks had their own set of standards and conventions that were hardware dependent. Each manufacture developed its own communication protocols for its networks. For example, some earlier communication protocols of this type were SNA (System Network Architecture) by IDB, DNA (Digital Network Architecture) by DEC (Digital Equipment Corporation), BNA(Burroughs Network Architecture) by Burroughs Incorporation, DSN (Distributed System Network) by Hewlett Packard, and PRIMENET(Prime Computers Network) by Prime Incorporation. The main problem with this approach with was that communication protocols of one network were not compatible with any other network. Moreover, standards of same network architecture also kept changing from time to time. For example, earlier versions of SNA were not compatible with is subsequent versions. Such incompatibilities started creating bottleneck in efficient and proper utilization of network resources.

International Organization for Standardization (ISO) recognized this problem and established a subcommittee to develop an international stand for network architectures. Result of this subcommittee's recommendation was the Open system interconnection (OSI) model. It is a framework for defining standards for linking heterogeneous computer is a packet switched network. Hence standardized OSI protocols made it possible for any two heterogeneous computer, location anywhere in the world, to communicate easily with each other.

In actual implementation of these seven layers, first three layers are likely to be in hardware, next two layers in operating system, presentation layer in library subroutines use's address space, and application layer in user's program

Physical Layer:

Physical layer transmits raw bit streams between two nodes by converting sequence of binary digits into electric signals, light signal, or electromagnetic signal, depending on whether the two nodes are on a cable circuit, fiber optic circuit, or microwave/radio circuit, respectively. Physicals layer protocols decide electrical details, such as how many volts to use for 0 and 1, how many bits can be send per second, and whether transmission can take place in one direction only or in both directions simultaneously. They also deal with mechanical details such a size and shape of connecting plugs, number of pins in plugs, and function of each pin. RS232-C is a popular physical layer standard for serial communication lines.

Data-Link Layer:

Physical layer transmit data between two nodes as raw bits. Data-link layer detects and corrects any error in transmitted data. For this, it partitions a raw bit stream of physical layer into frames and performs error detection and correction for each frame independently. It also performs flow control of frames between two nodes to ensure that a sender does not flood a receiver with data by sending frames at a rate faster than the receiver can process.

Network Layer:

Network layer sets up a logical communication path between two nodes. It encapsulates frames into packets and decides their transmission path from one node to another by using a high-level addressing and routing scheme. That is, routing id the primary job of network layer, and routing algorithm forms the main part of network layer protocol. Two popular network layer protocols are X.25 protocol and the internet protocol(called IP)

Notice that the network layer functions are primarily required in WANs. In a single LAN< the network layer is largely redundant because a LAN transmits packets directly from any node on the network to any other node.

Transport Layer:

Transport layer accepts messages of arbitrary length from session layer, segments them into packets, submits them to network layer for transmission, and finally reassembles the packets at destination. Some packets may be lose on the way from sender to receiver, and depending on routing algorithm used in network layer, packets may arrive at destination in a sequence that is different from the order in which they were send. Transport layer protocols include mechanisms for handling lost and out-of-sequence packets. For this, the transport layer assigns a sequence number to each packet, and uses sequence number for detecting lost packets and for reconstructing the packets of a message in correct sequence. Two most popular transport layer protocols are Transport Control Protocol (TCP) and User Datagram Protocol (UDP).

Session Layer:

Session layer provide means of establishing, maintaining, and terminating a dialogue or a session between two end users. It allows communicating parties to authenticate each other before establishing a dialog session between them. It specifies dialog type-one-way, two-way alternate, or two-way simultaneous and initiates a dialog sessio9n, if message is a connection request message. IT also provides priority management service that is useful for giving priority to important and time-bound messages over normal, less-important messages.

Presentation Layer:

Presentation layer provides facilities to covert message data info a from that is meaningful to communicating application layer entities. For this, it may perform on message data such transformation as encoding and decoding, code conversion and decompression, encryption and decryption, depending on an application’s requirements.

Application Layer:

Application layer provides services that directly support end users of network. It is a collection of miscellaneous protocols for various commonly used applications such as electronic mail, file transfer, remote logic, remote job entry, and schemas for distributed databases. Some population application layer protocol are X.400 (Electronic Mail Protocol), X.500 (Director Server Protocol), FTP (File Transfer Protocol), and rlogin (Remote Login Protocol).