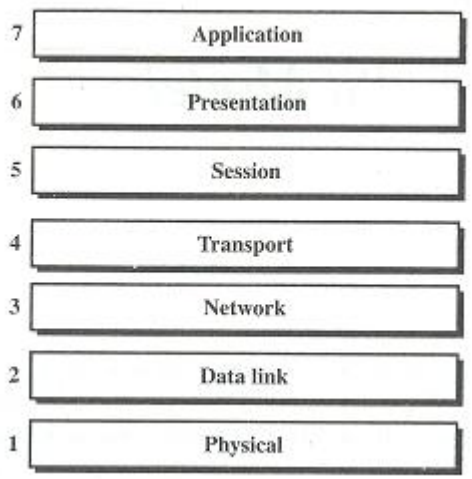
OPEN SYSTEM INERCONNECTION (OSI) MODEL

Established in 1947, the International Standards Organization (ISO) is a multinational body dedicated to worldwide agreement on international standards. The purpose of the OSI model is to open communication between different systems without requiring changes to the logic of the underlying hardware and software. The OSI model is not a protocol: it is a model for understanding and designing a network architecture that is flexible, robust and interoperable.

THE MODEL

The Open Systems Interconnection model is a layered framework for the design of network systems that allows for communication across all types of computer systems. It consists of seven separate but related layers, each of which defines a segment of the process of moving information across a network. Understanding the fundamentals of the OSI model provides a solid basis for exploration of data communication.

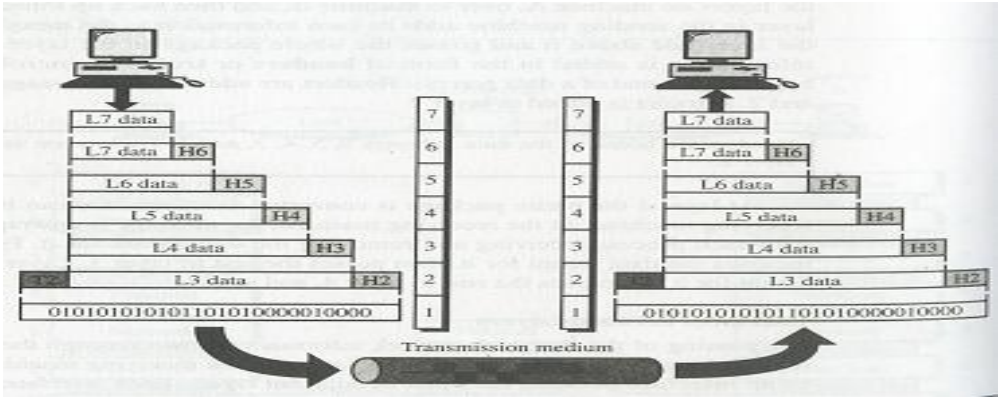
Layered Architecture



Organization of the Layer

The seven layers can be thought of as belonging to three subgroups. Layers 1, 2, and 3 – physical, data link, and network – are the network support layers; they deal with the physical aspects of moving data from one device to another (such as electrical specifications, physical connections, physical addressing, and transport timing and reliability). Layers 5, 6, and 7 – session, presentation, and application – can be thought of as the user support layers; they allow interoperability among unrelated software systems. Layer 4, the transport layer, ensures end-to-end reliable data transmission while layer 2 ensures reliable transmission on a single link. The upper OSI layers are almost always implemented in software: lower layers are a combination of hardware and software; except for the physical layer, which is mostly hardware.

At each layer (except layer 7 and 1), a header is added to the data unit. At layer 2, a trailer is added as well. When the formatted data unit passes through the physical layer (layer 1), it is changed into an electromagnetic signal and transported along a physical link.



Upon reaching its destination, the signal passes into layer 1 and is transformed back into bits. The data units then move back up through the OSI layers. As each block of data reaches the next higher layer, the headers and trailers attached to it at the corresponding sending layer are removed, and actions appropriate to that layer are taken. By the time it reaches layer 7, the message is again in a form appropriate to the application and is made available to the recipient.

FUNCTIONS OF THE LAYERS

In this section we briefly describe the functions of each layer in the OSI model.

Physical Layer

The **physical layer** coordinates the functions required to transmit a bit stream over a physical medium. It deals with mechanical and electrical specifications of the interface and transmission medium.

Data Link Layer

The data link layer transforms the physical layer, a raw transmission facility, to a reliable link and is responsible for node-to-node delivery. It makes the physical layer appear error free to the upper layer (network layer).

Network Layer

The network layer is responsible for the source-to destination delivery of a packet possible across multiple network (link). Whereas the data link layer oversees the delivery of the packet between two systems on the same network (link), the network layer ensures that each packet gets from its point of origin to its final destination.

Transport Layer

The transport layer is responsible for source-to-destination (end-to-end) delivery of the entire message. Whereas the network layer oversees end-to-end delivery of individual packets, it does not recognize any relationship between those packets.

Session Layer

The services provided by the first three layers (physical, data link, and network) are not sufficient for some processes. It establishes, maintains, and synchronizes the interaction between communicating systems.

Presentation Layer

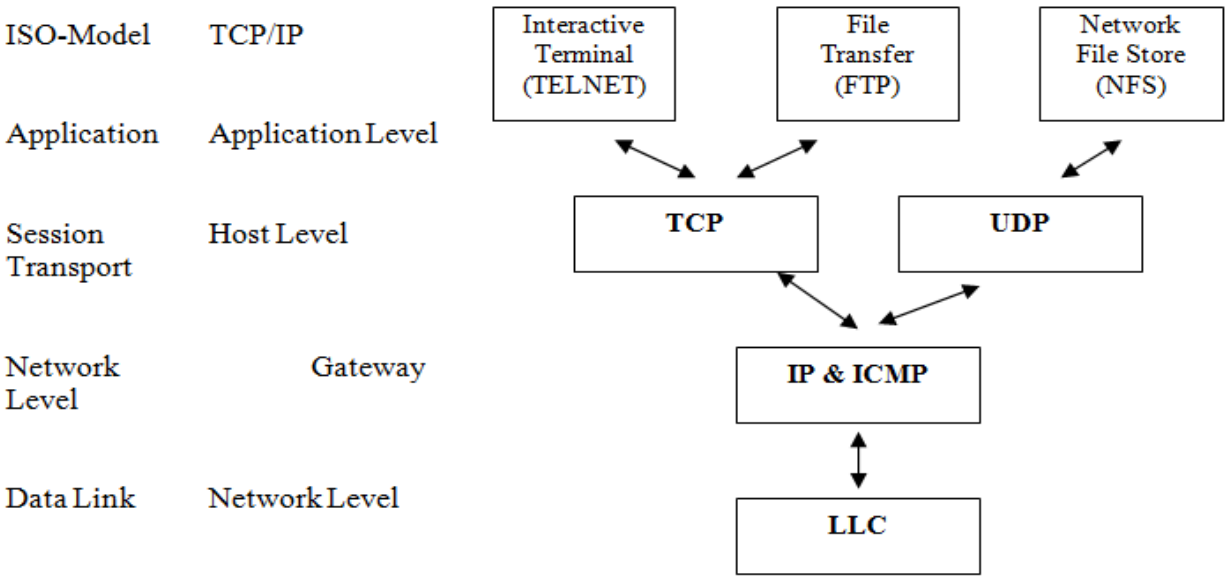
The presentation layer is concerned with the syntax and semantics of the information exchanged between two systems.

Application layer

The application layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as electronic mail, remote file access and transfer, shared database management, and other types of distributed information services.

TCP/IP PROTOCOL SET STRUCTURE

The TCP/IP suite is not a single protocol. Rather, it is four-layer communication architecture that provides some reasonable network features, such as end-to-end communications, unreliable communications line fault handling, packet sequencing, internet work routing.



It can be seen that this is essentially a four layer model, although the layers are not as clear cut as in the ISO model, and the model has been drawn from analysis of what is used, rather than being defined first and then the protocols specified. The TCP/IP philosophy is the antithesis of the ISO philosophy. In ISO protocols, everything appears to be put into the protocol, but parts are made optional. In TCP/IP, the protocols are kept very simple. If more functionality is required, then another protocol is added to deal with the situation.

User Datagram Protocol

1-Provides unreliable connectionless service
2- Transfers data without establishing a session
3- Used for services that has an inbuilt reliability
4- Does not use end to end error checking and correction
5- Does not order the packets; may loose or duplicate a packet
6- Runs faster than TCP due to less overheads

Internet Protocol

1-Provides best-effort or connectionless delivery service.
2- No error checking or tracking
3-If reliability is important; IP must be paired with a reliable protocol like TCP
4- Transmits blocks of data called datagram each of which is transported separately
5- Responsible for IP addressing
6- Datagrams may travel along different routes and may arrive out of sequence or Duplicated.

Internet Control Message Protocol

1- Internet Control Message Protocol is a mechanism used by hosts and routers to send notification of datagram problems back to the sender.
2-Sends error messages only to the source and not to intermediate routers.
3- Sole function is to report problems, not to correct them.
4- An important use of ICMP is echo/reply to test whether a destination is reachable and responding.

Address Resolution Protocol

1-Address Resolution Protocol is used to translate 32 bits IP addresses to 48 bits Ethernet addresses.
2- A host's physical address is determined by broadcasting its IP address to all machines.
3- The machine with matching IP address, in broadcast message, sends its hardware address to the machine originating broadcast.