






OSI MODEL

Communication Architecture

-  Strategy for connecting host computers and other communicating equipment.
-  Defines necessary elements for data communication between devices.
-  A communication architecture, therefore, defines a standard for the communicating hosts.
-  A programmer formats data in a manner defined by the communication architecture and passes it on to the communication software.
-  Separating communication functions adds flexibility, for example, we do not need to modify the entire host software to include more communication devices.





Layer Architecture

- ❏ Layer architecture simplifies the network design.
- ❏ It is easy to debug network applications in a layered architecture network.
- ❏ The network management is easier due to the layered architecture.
- ❏ Network layers follow a set of rules, called protocol.
- ❏ The protocol defines the format of the data being exchanged, and the control and timing for the handshake between layers.

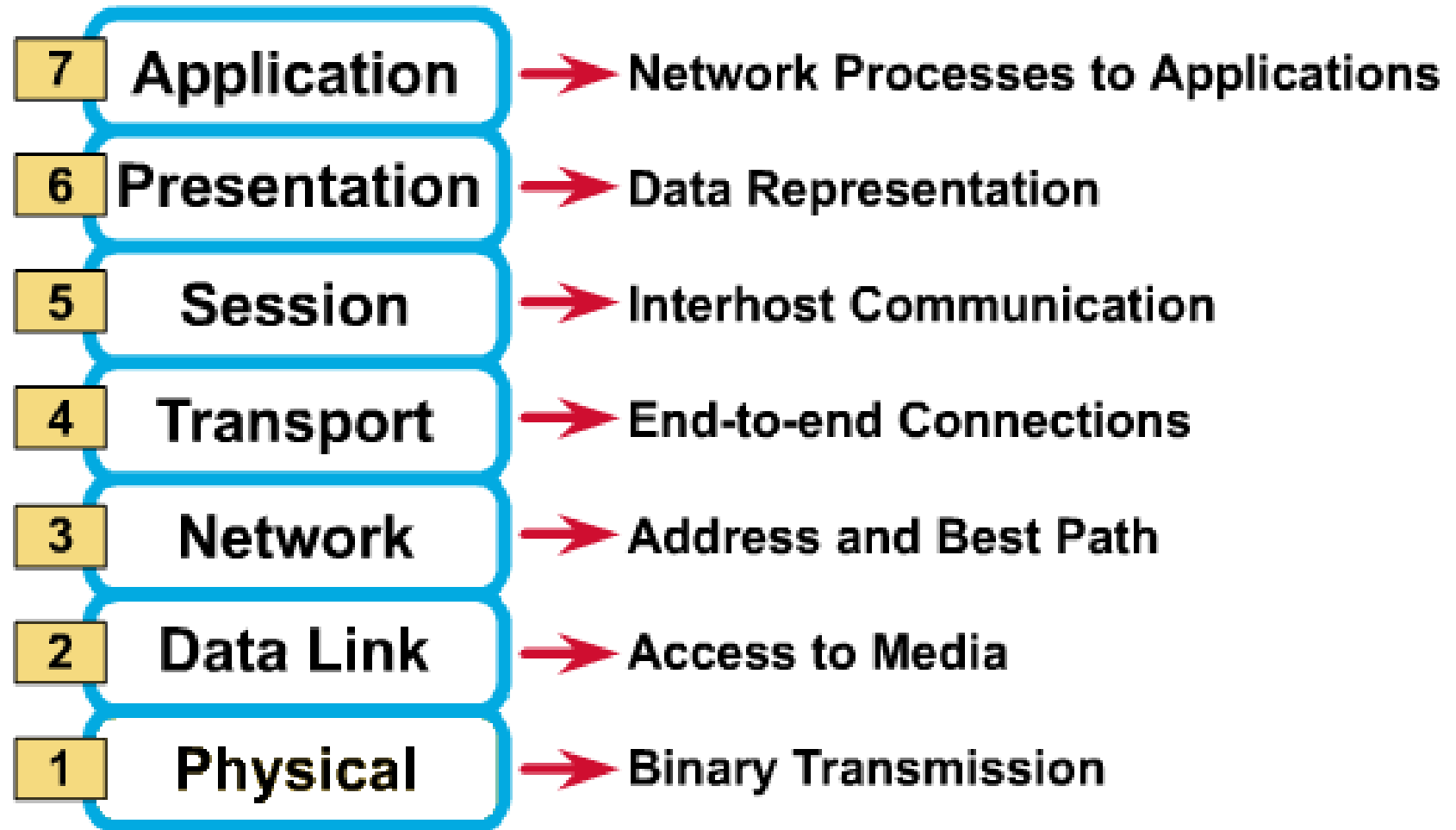
Open Systems Interconnection (OSI) Model

- International standard organization (ISO) established a committee in 1977 to develop an architecture for computer communication.
- Open Systems Interconnection (OSI) reference model is the result of this effort.
- In 1984, the Open Systems Interconnection (OSI) reference model was approved as an international standard for communications architecture.
- Term “open” denotes the ability to connect any two systems which conform to the reference model and associated standards.







OSI Reference Model

-  The OSI model is now considered the primary Architectural model for inter-computer communications.
-  The OSI model describes how information or data makes its way from application programmes (such as spreadsheets) through a network medium (such as wire) to another application programme located on another network.
-  The OSI reference model divides the problem of moving information between computers over a network medium into SEVEN smaller and more manageable problems .
-  This separation into smaller more manageable functions is known as layering.





OSI Reference Model: 7 Layers



OSI: A Layered Network Model

-  The process of breaking up the functions or tasks of networking into layers reduces complexity.
-  Each layer provides a service to the layer above it in the protocol specification.
-  Each layer communicates with the same layer's software or hardware on other computers.
-  The lower 4 layers (transport, network, data link and physical —Layers 4, 3, 2, and 1) are concerned with the flow of data from end to end through the network.
-  The upper 3 layers of the OSI model (application, presentation and session—Layers 7, 6 and 5) are orientated more toward services to the applications.
-  Data is Encapsulated with the necessary protocol information as it moves down the layers before network transit.

Physical Layer

-  Provides physical interface for transmission of information.
-  Defines rules by which bits are passed from one system to another on a physical communication medium.
-  Covers all - mechanical, electrical, functional and procedural - aspects for physical communication.
-  Such characteristics as voltage levels, timing of voltage changes, physical data rates, maximum transmission distances, physical connectors, and other similar attributes are defined by physical layer specifications.








Data Link Layer

- ❏ Data link layer attempts to provide reliable communication over the physical layer interface.
- ❏ Breaks the outgoing data into frames and reassemble the received frames.
- ❏ Create and detect frame boundaries.
- ❏ Handle errors by implementing an acknowledgement and retransmission scheme.
- ❏ Implement flow control.
- ❏ Supports points-to-point as well as broadcast communication.
- ❏ Supports simplex, half-duplex or full-duplex communication.

Network Layer

- ❏ Implements routing of frames (packets) through the network.
- ❏ Defines the most optimum path the packet should take from the source to the destination
- ❏ Defines logical addressing so that any endpoint can be identified.
- ❏ Handles congestion in the network.
- ❏ Facilitates interconnection between heterogeneous networks (Internetworking).
- ❏ The network layer also defines how to fragment a packet into smaller packets to accommodate different media.



Transport Layer

-  Purpose of this layer is to provide a reliable mechanism for the exchange of data between two processes in different computers.
-  Ensures that the data units are delivered error free.
-  Ensures that data units are delivered in sequence.
-  Ensures that there is no loss or duplication of data units.
-  Provides connectionless or connection oriented service.
-  Provides for the connection management.
-  Multiplex multiple connection over a single channel.




Session Layer

- ❏ Session layer provides mechanism for controlling the dialogue between the two end systems. It defines how to start, control and end conversations (called sessions) between applications.
- ❏ This layer requests for a logical connection to be established on an end-user's request.
- ❏ Any necessary log-on or password validation is also handled by this layer.
- ❏ Session layer is also responsible for terminating the connection.
- ❏ This layer provides services like dialogue discipline which can be full duplex or half duplex.
- ❏ Session layer can also provide check-pointing mechanism such that if a failure of some sort occurs between checkpoints, all data can be retransmitted from the last checkpoint.

Presentation Layer

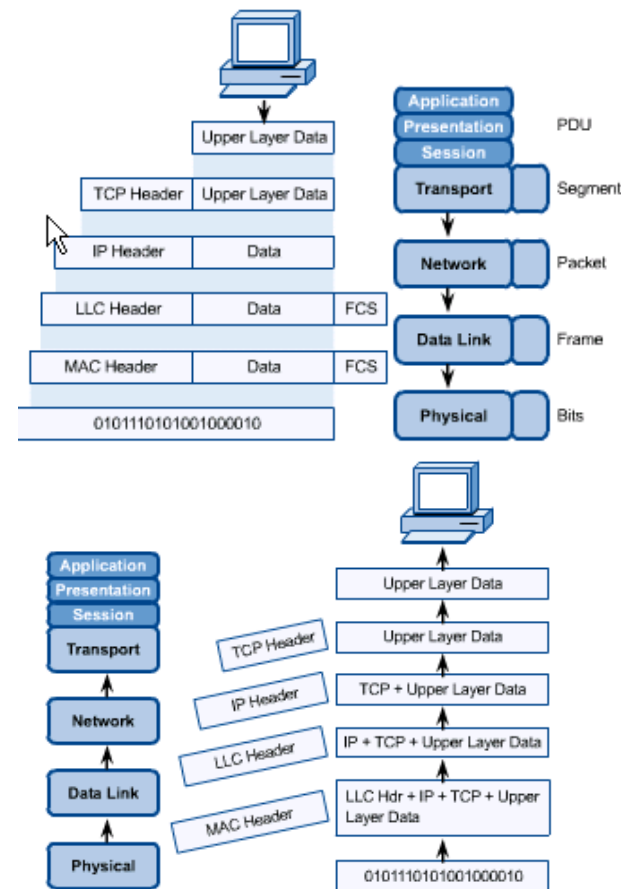
-  Presentation layer defines the format in which the data is to be exchanged between the two communicating entities.
-  Also handles data compression and data encryption (cryptography).

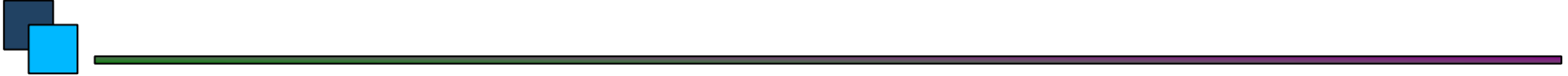
Application Layer

-  Application layer interacts with application programs and is the highest level of OSI model.
-  Application layer contains management functions to support distributed applications.
-  Examples of application layer are applications such as file transfer, electronic mail, remote login etc.

OSI in Action

- A message begins at the top application layer and moves down the OSI layers to the bottom physical layer.
- As the message descends, each successive OSI model layer adds a header to it.
- A header is layer-specific information that basically explains what functions the layer carried out.
- Conversely, at the receiving end, headers are stripped from the message as it travels up the corresponding layers.

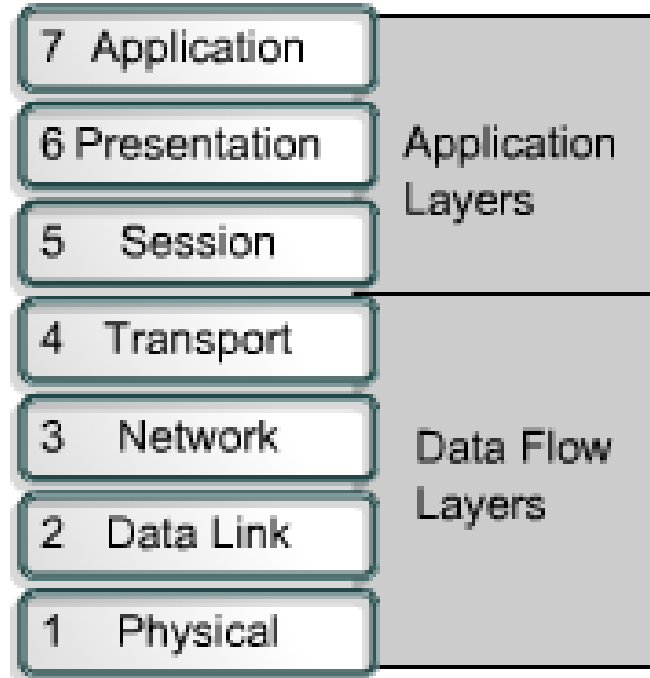




TCP/IP MODEL

OSI & TCP/IP Models

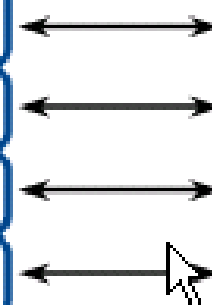
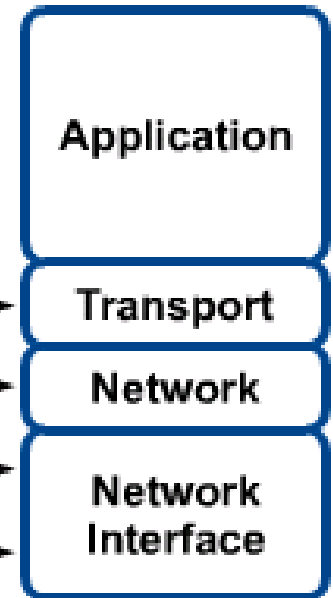
OSI Model



OSI Reference Model



TCP/IP Conceptual Layers



TCP/IP Model

Application Layer

Application programs using the network

Transport Layer (TCP/UDP)

Management of end-to-end message transmission,
error detection and error correction

Network Layer (IP)

Handling of datagrams : routing and congestion

Data Link Layer

Management of cost effective and reliable data delivery,
access to physical networks

Physical Layer

Physical Media