



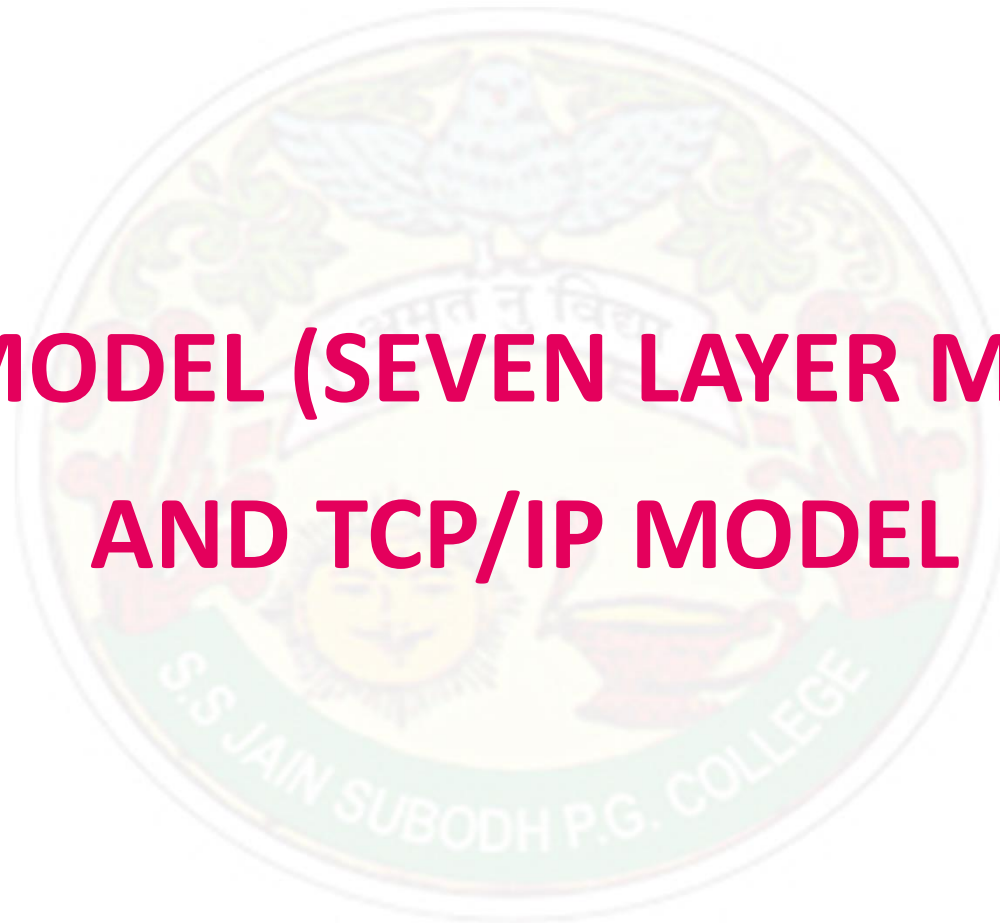
**S. S Jain Subodh P.G. (Autonomous) College**

**SUBJECT - DATA COMMUNICATION NETWORKING**

**TITLE – OSI MODEL AND TCP/IP MODEL**

**BY: RAVI SHANKAR SHARMA**

# **OSI MODEL (SEVEN LAYER MODEL) AND TCP/IP MODEL**





# Communication Architecture

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- ❑ 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

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- ❑ 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

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- ❑ 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

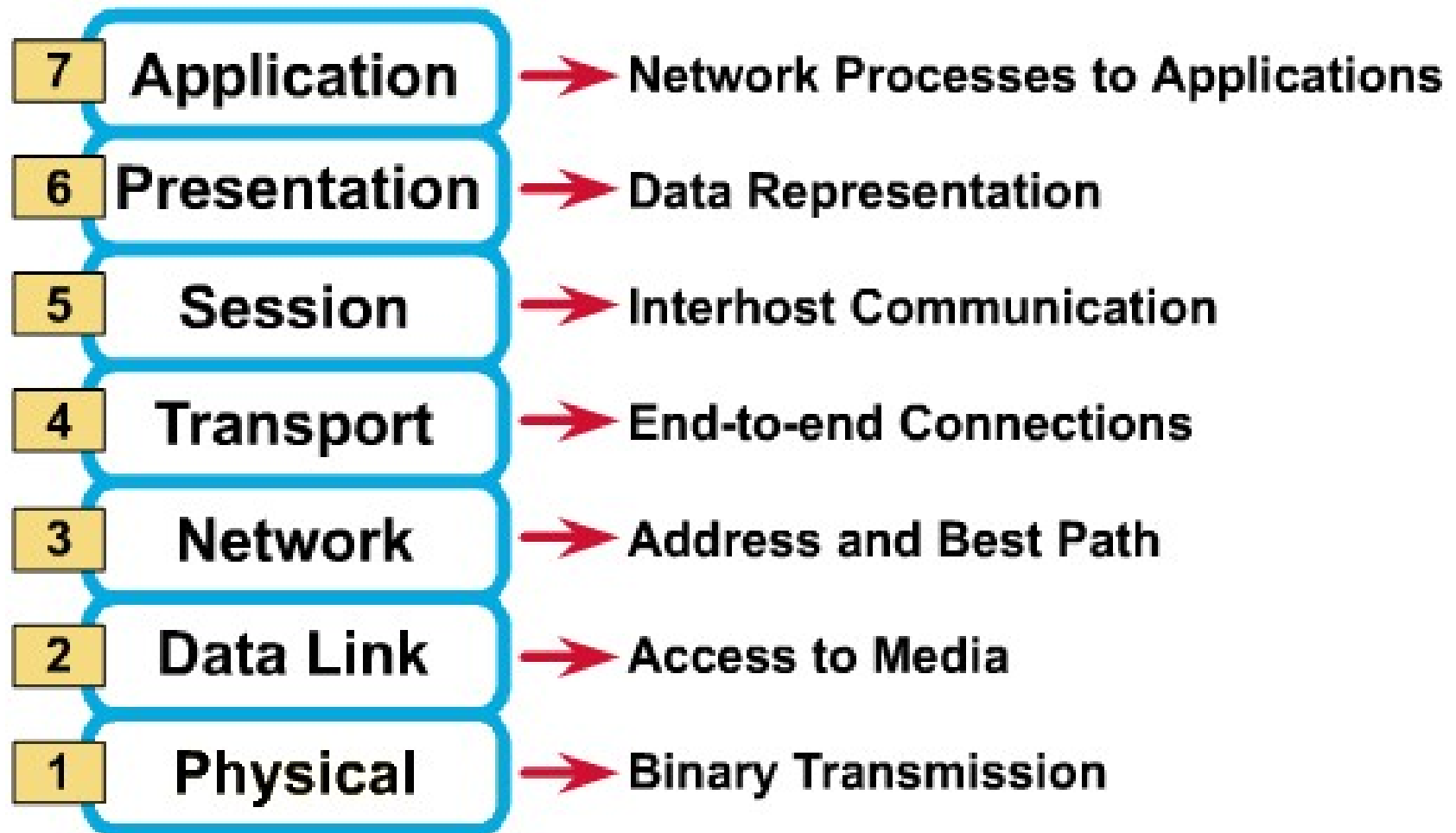
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- ❑ The OSI model is now considered the primary Architectural model for inter-computer communications.
- ❑ The OSI model describes how information or data makes its way from application programmes (such as spreadsheets) through a network medium (such 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

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## 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 four 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

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- ❑ 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

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- ❑ 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

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- ❑ 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

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- ❑ 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

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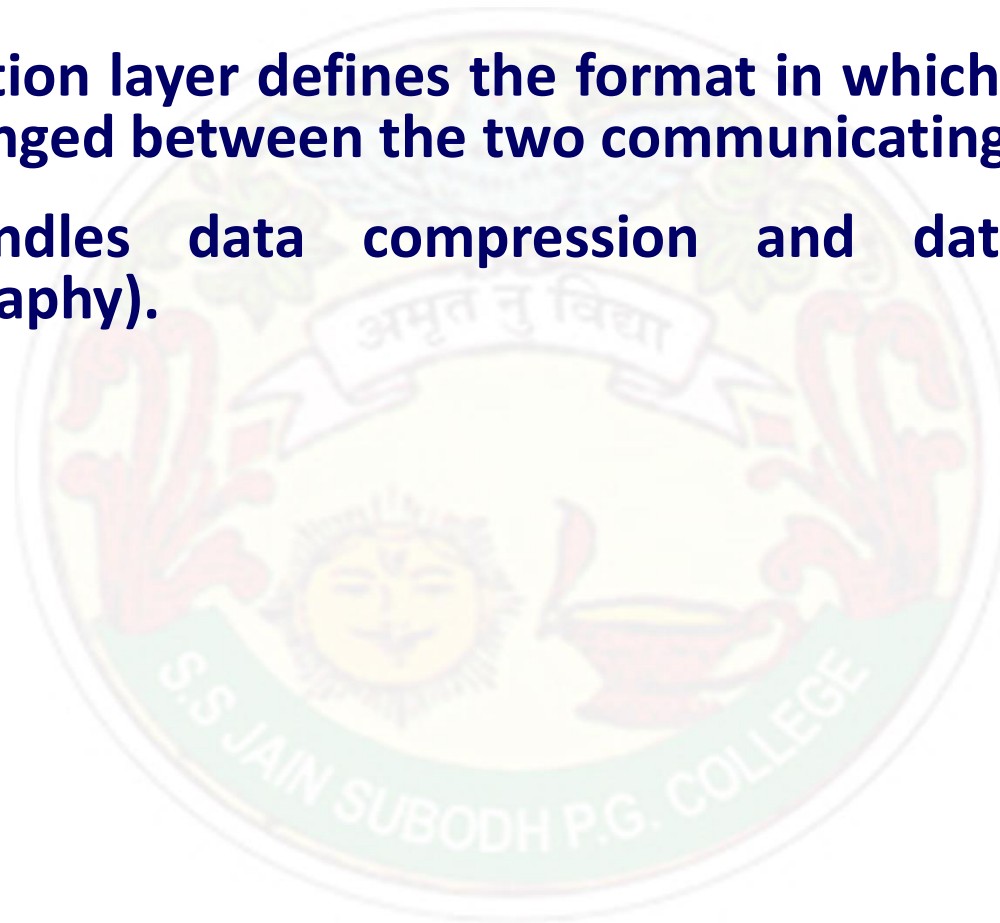
- ❑ Session layer provides mechanism for controlling the dialogue between the two end systems. It defines how to start, control and end conversations (called sessions) between applications.
- ❑ This layer requests for a logical connection to be established on an end-user's request.
- ❑ Any necessary 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

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- ❑ 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

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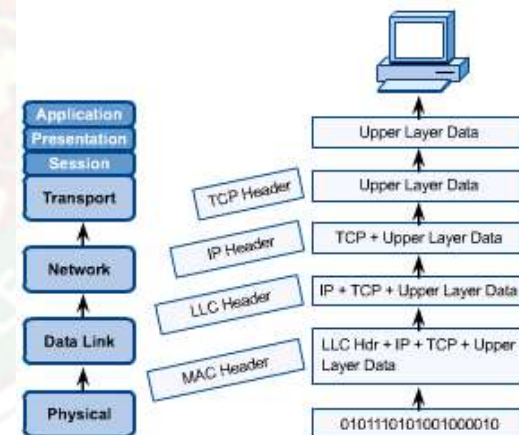
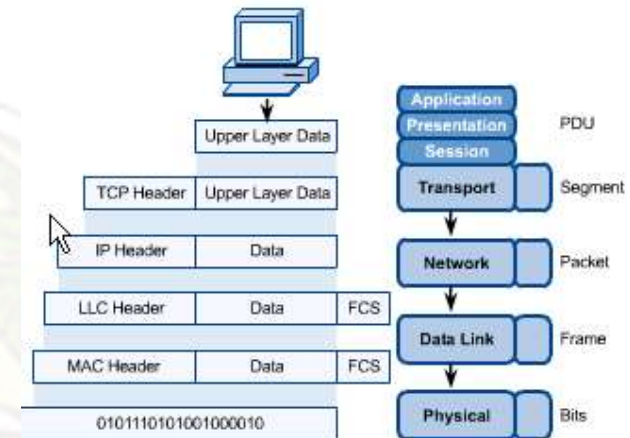
- ❑ Application layer interacts with application programs and is the highest level of OSI model.
- ❑ Application layer contains management functions to support distributed applications.
- ❑ Examples of application layer are applications such as file transfer, electronic mail, remote login etc.





## 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 striped from the message as it travels up the corresponding layers.





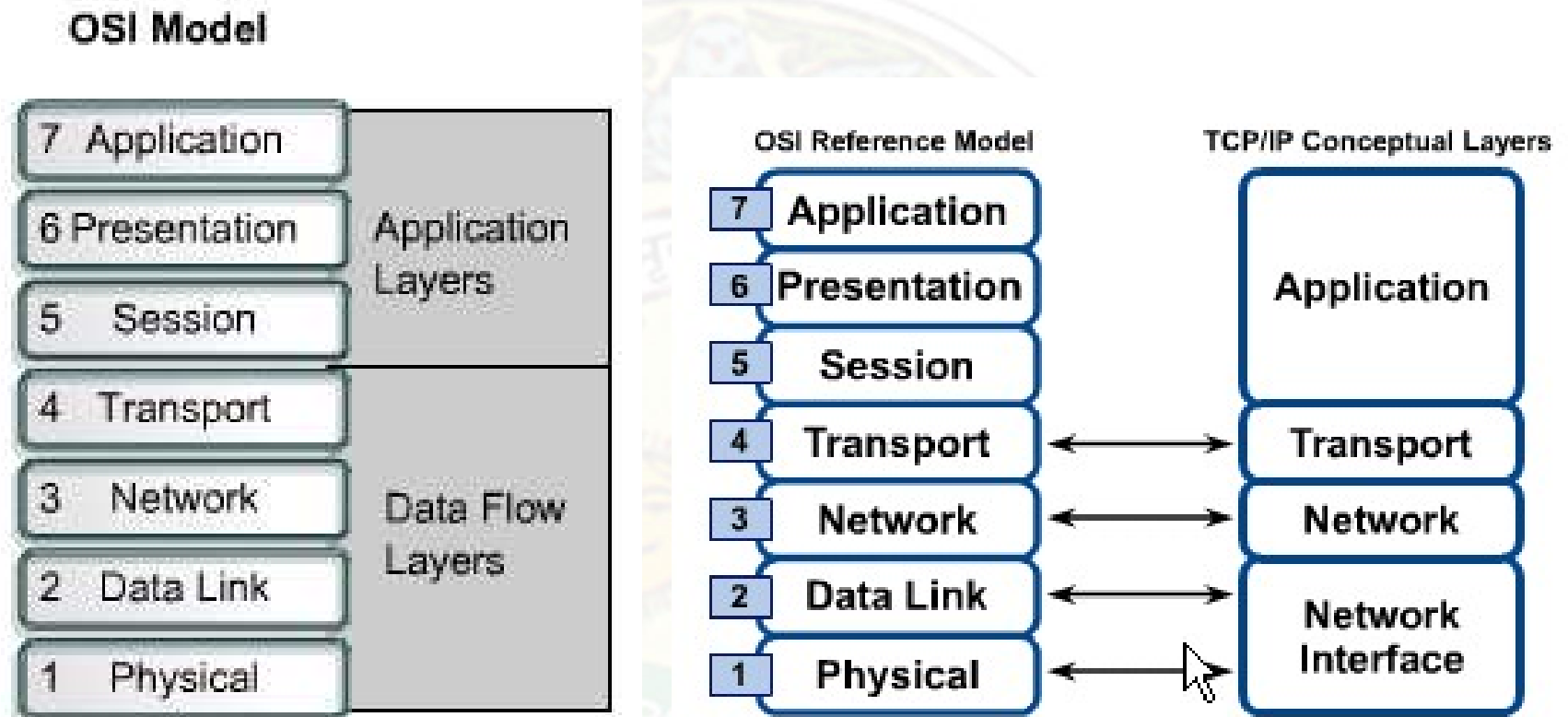
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# TCP/IP MODEL



# OSI & TCP/IP Models





# 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