

# Lecture

# Computer Networks

## OSI Model

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# Open Systems Interconnect Model

- International Standards Organization (ISO) developed a model in 1983
- This model is to define an architecture that describes the communication between heterogeneous computers
- Communication is respectively the exchange of data between computers
- Various elements are involved :
  - electrical characteristics
    - » coding cable types
    - » network adapters
    - » data segmentation / packetizing
    - » error control
    - » software compatibility ...
- Strategic solution
  - Handling of the different aspects in seven distinct layers :
  - Seven layer OSI model**

# Seven Layer OSI Model

The main characteristics of the seven layer OSI model are :

- Each layer performs a defined subset of functions for the overall communication process
- The functions rely on those of the previous lower layer :
  - To perform more primitive functions
  - To hide the details of the lower layer functions
- Each layer provides services to the next higher layer
- Modifications within a layer do not require modifications of the other layers
- Dividing the communication functions into separate layers facilitates the management of the communication process

# Main OSI Layer Terms

The main terms used in OSI Layer can be summarized as follows :

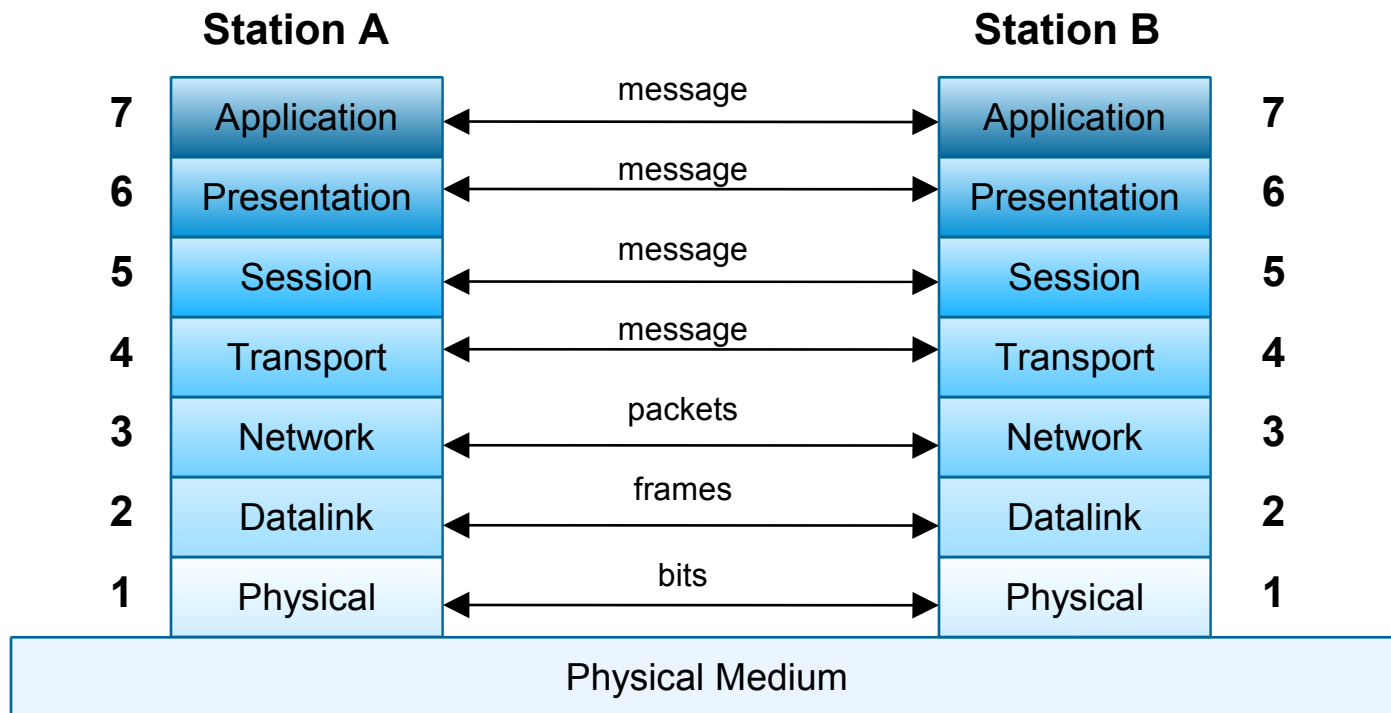
- Service : Each layer serves additional services for the higher layer. Type of service is dependent on the definition of the layer model.
- Interface : Services are usable via an interface through layers. Usage of services is also specified between layers.
- Protocol : It defines the internal operation procedure of a layer. The protocol is private to the layer. It can be changed or replaced without affecting other layers.

# Peer to Peer communication

## How do two networked systems communicate?

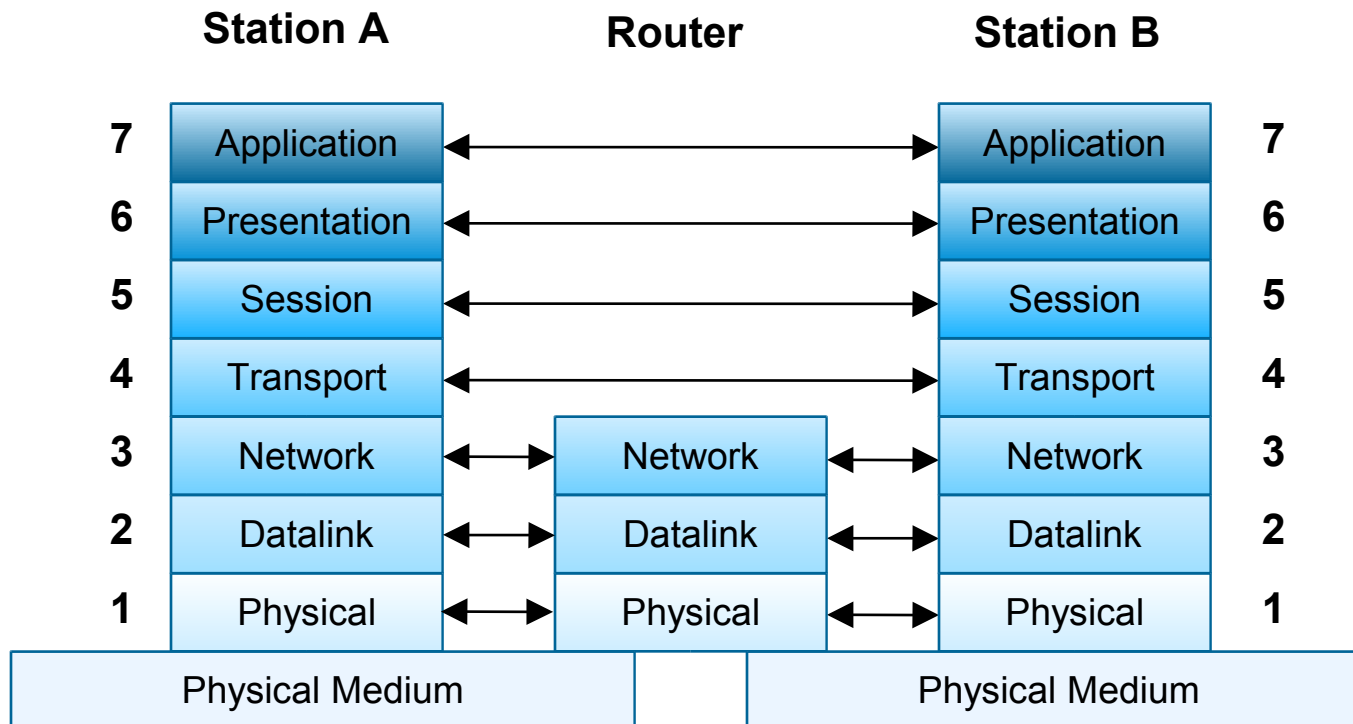
- Through their network protocol stacks
- Each layer communicates with its peer

e.g. as bit streams are received by a receiving node's physical layer, they are passed up to the data link layer where they are again formed into frames and then to the network layer where they again become packets as shown below.



# OSI Reference model for “Open Systems”

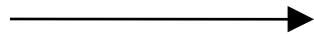
- The 1. Layer Data is transmitted by bits. The 2. Layer transmits data by frames and the 3. Layer Data is transmitted by packets.
- The network layer creates a Protocol Data Unit (PDU) by the packets it forms and passes those PDUs to 4. Layer.
- As the received transmission travels up the stack, each layer receives a PDU from the layer below. The information (placed in the PDU by the peer layer) becomes available.
- In this way, each layer in a transmitting node communicates with its peer layer of the receiving node.



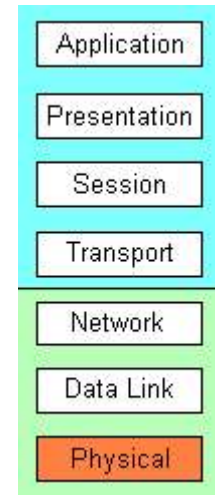
# Layers 1 and 2

## 1. Physical Layer

- Mechanical
- Electrical
- and procedural characteristics

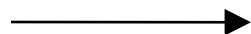


Establishment,  
maintenance and  
deactivation of the  
physical link

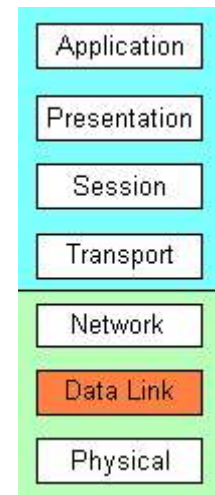


## 2. Link Layer

- Transparent / Error - Free Transmission
- Facility Sequential Transmissions
- Flow Control
- Access protocols



Reliable transfer  
of data across the  
physical link

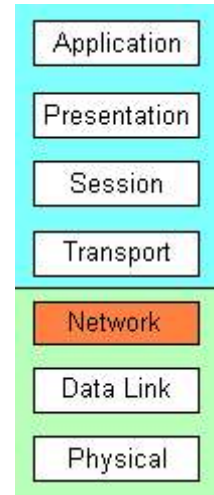


## 3. Network Layer

- Unreliable datagram service
- Static & Dynamic Routing Control
- Transport Accounting
- Packet Segmentation
- Heterogeneous Network Control



Upper Layers are independent from the data transmission and switching of technologies

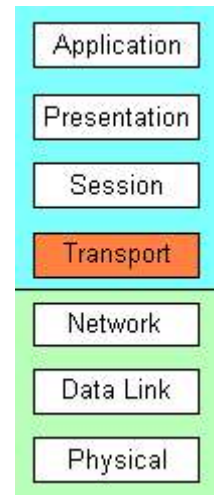


## 4. Transport Layer

- Segment Messages
- Establish & Manage Connections
- End-To-End Control
- Multiple Connection Control



Reliable, transparent transfer of data between source and destination

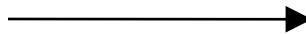




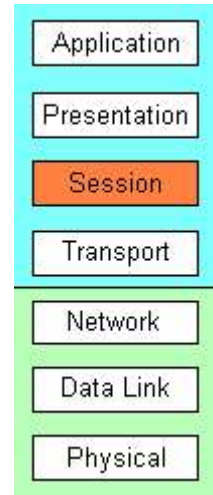
# Layers 5 and 6

## 5. Session Layer

- Session Establishment
- Session Control
- Dialog Control
- Token Management
- Synchronization
- Checkpoint Insertion



Control structure  
for communication  
between  
applications



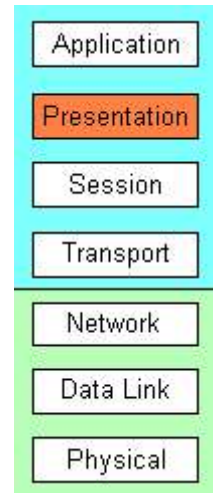
## 6. Presentation Layer

- Encryption & Decryption
- Reformatting
  - Syntax & Semantics
  - Information Representation
  - Data Compression & Decompression



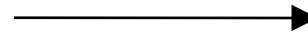
Standardized  
application interface

Common  
communications  
services

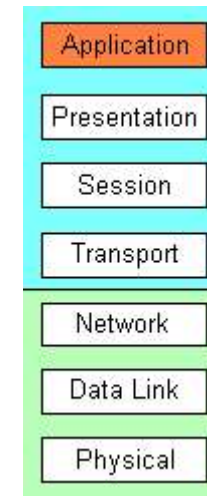


## 7. Application Layer

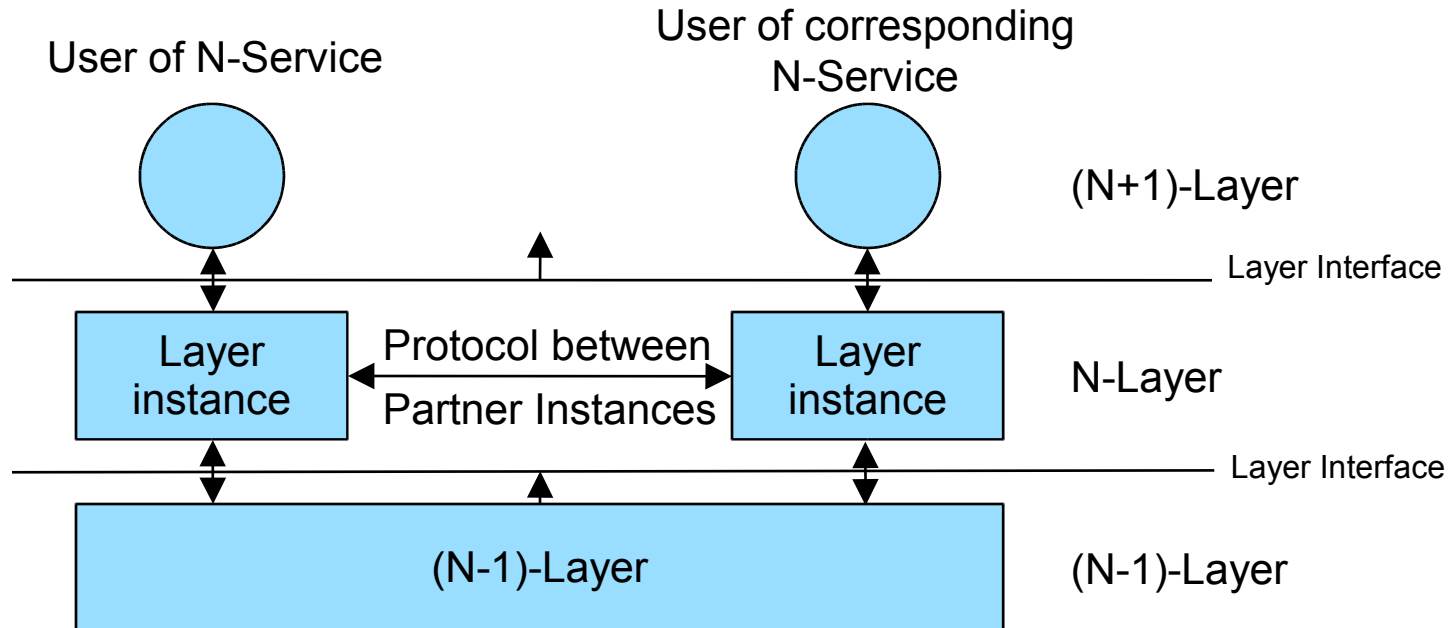
- Network applications facilitate network connectivity
  - Virtual Terminal
  - File Transfer
  - E-Mail
- Service announcement
- Service availability
- Mapping of virtual world into real world



Services to the users of the OSI environment



# Layer concept



# Access Methods

