ISO - OSI MODEL & TCP/IP MODEL

THE ISO - OSI MODEL

Established in 1947, the International Standards Organization (ISO) is a multinational body dedicated to worldwide agreement on international standards. An ISO standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model. It was first introduced in the late 1970s.

LAYERED ARCHITECTURE

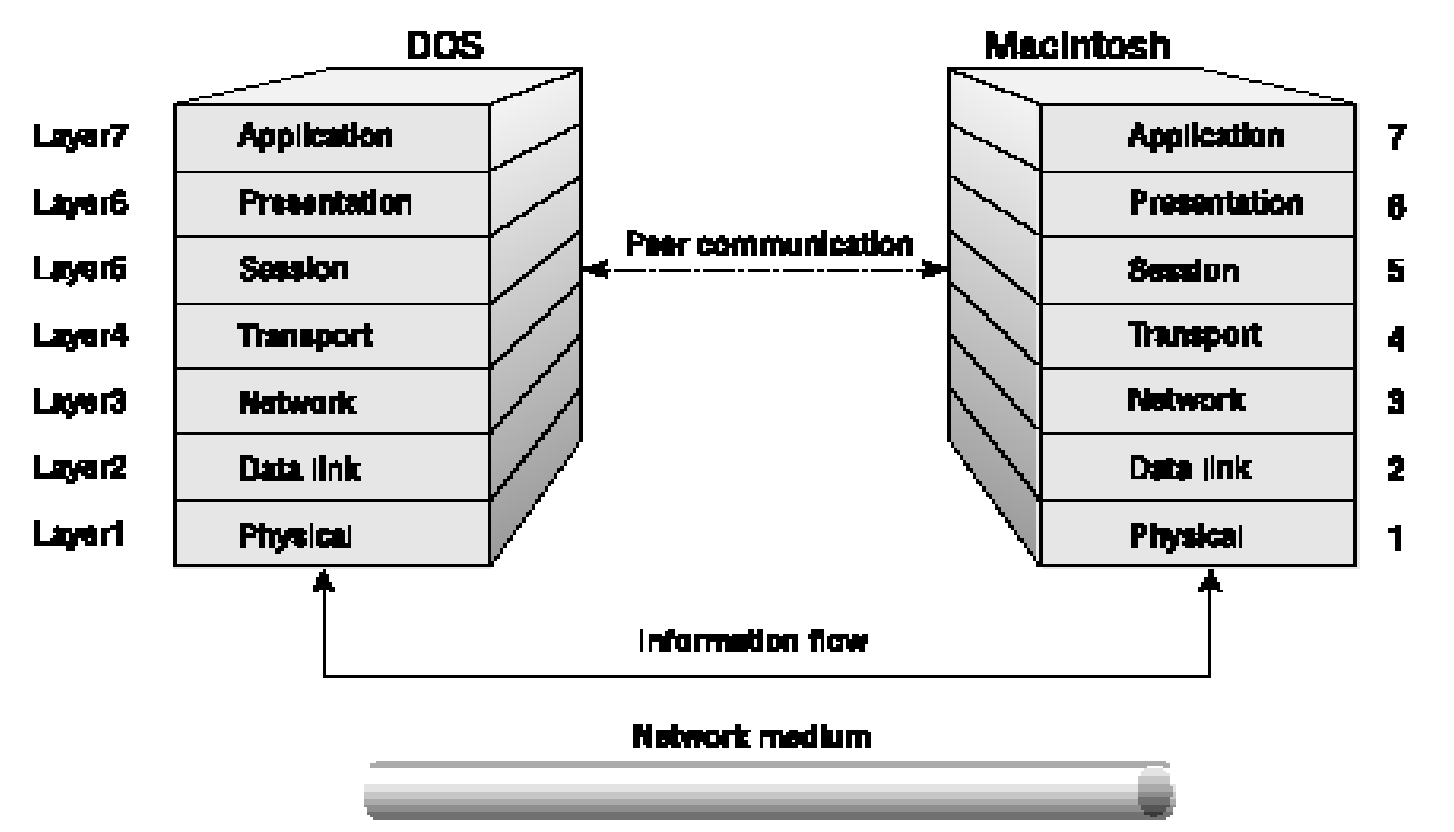
- Networks are organized as *layers* or *levels*.
- Reduces design complexity.
- Each network architecture has different:
  - number of layers
  - names of layers
  - functions of each layer
- Between adjacent layers there is an interface.
- Reference models exist to architect a network.

PROTOCOLS

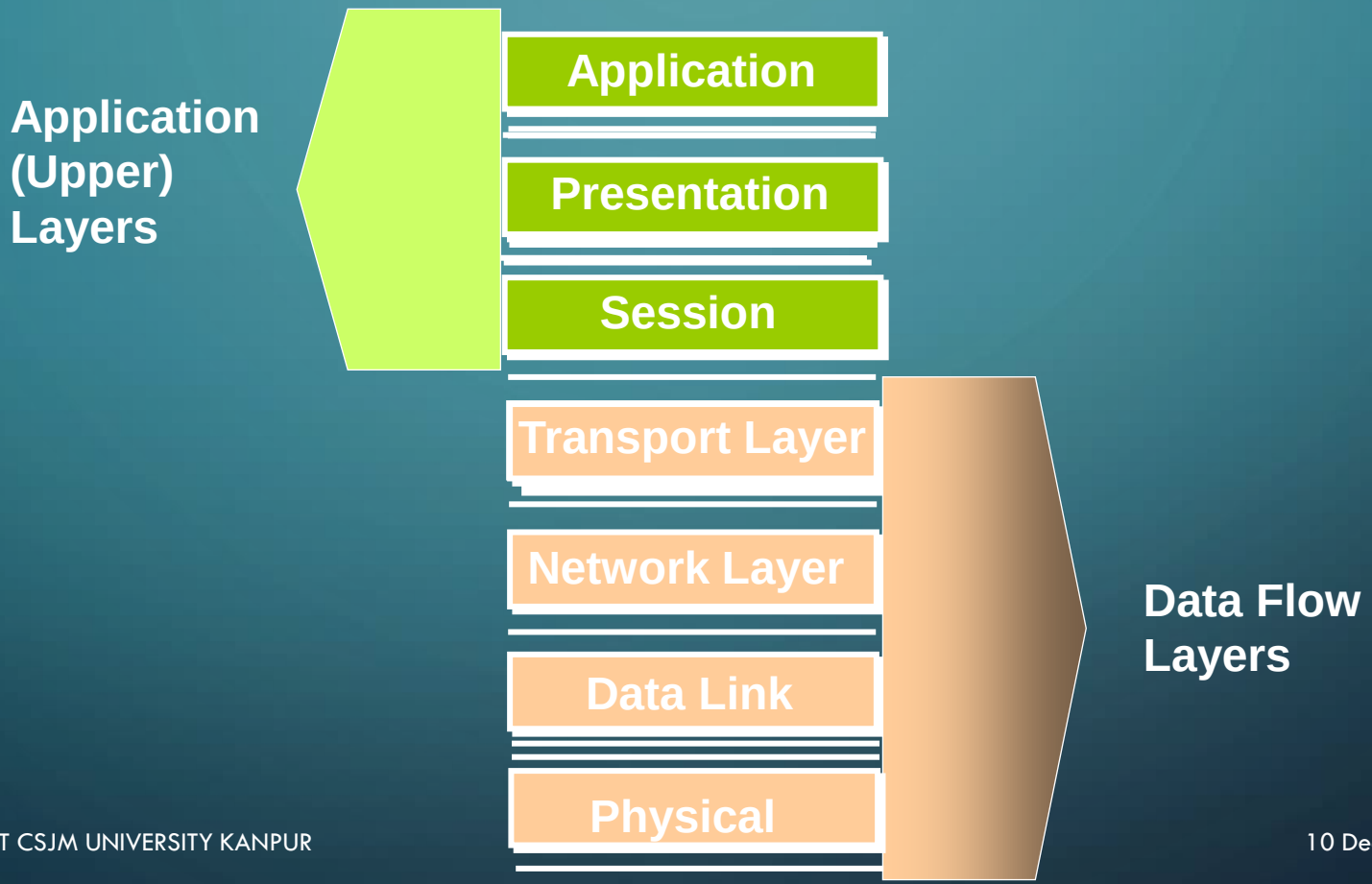
- Rules and conventions used by two communicating entities are collectively known as protocol.
- Each layer of network architecture has its own protocol.
- Two communicating entities at the same layer are called peers.
- A list of protocols used by a system is called protocol stack.
- A set of layers and protocols is referred to as network architecture.

THE THEORETICAL NETWORK - OSI MODEL

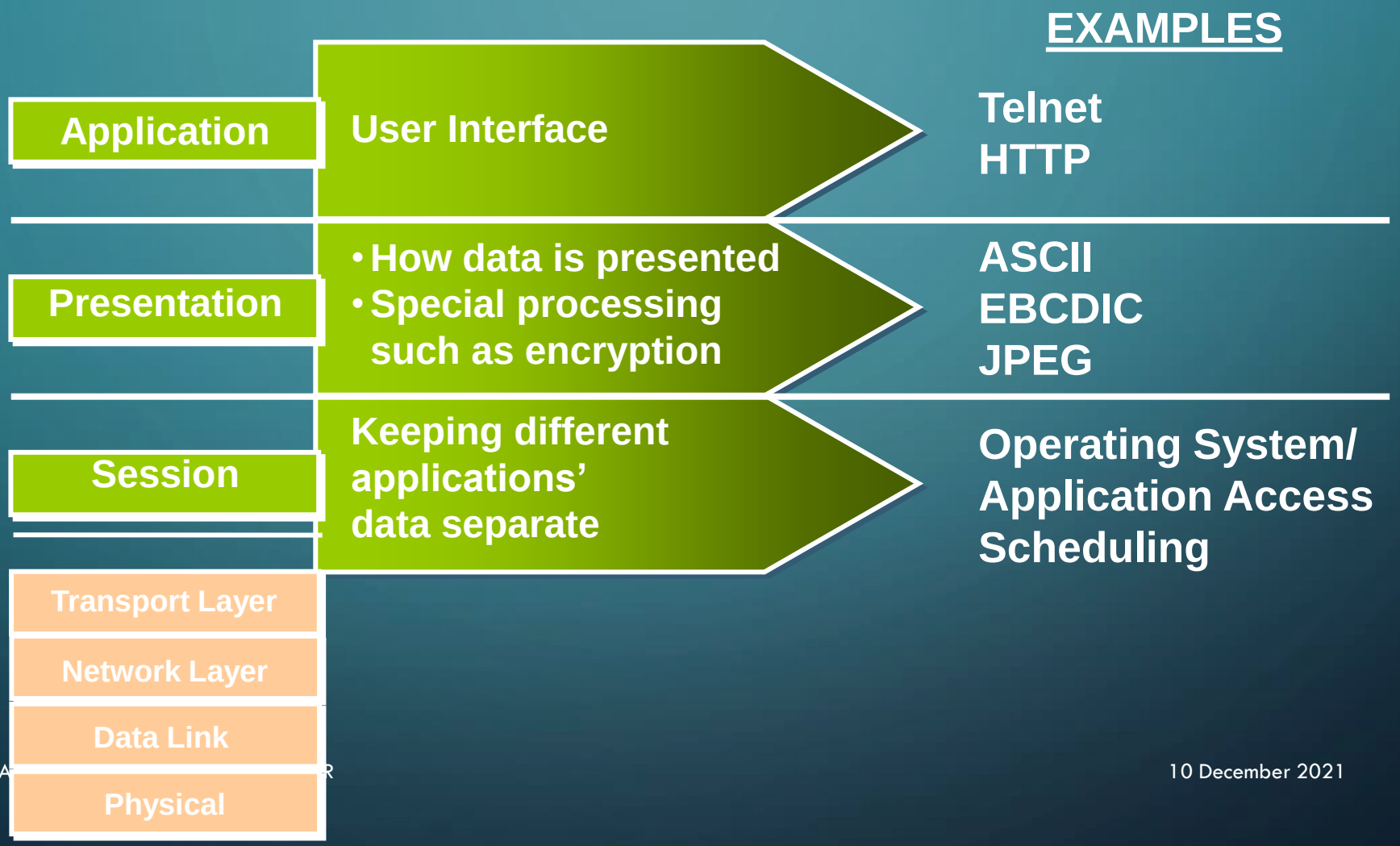
Peer communication between two computers



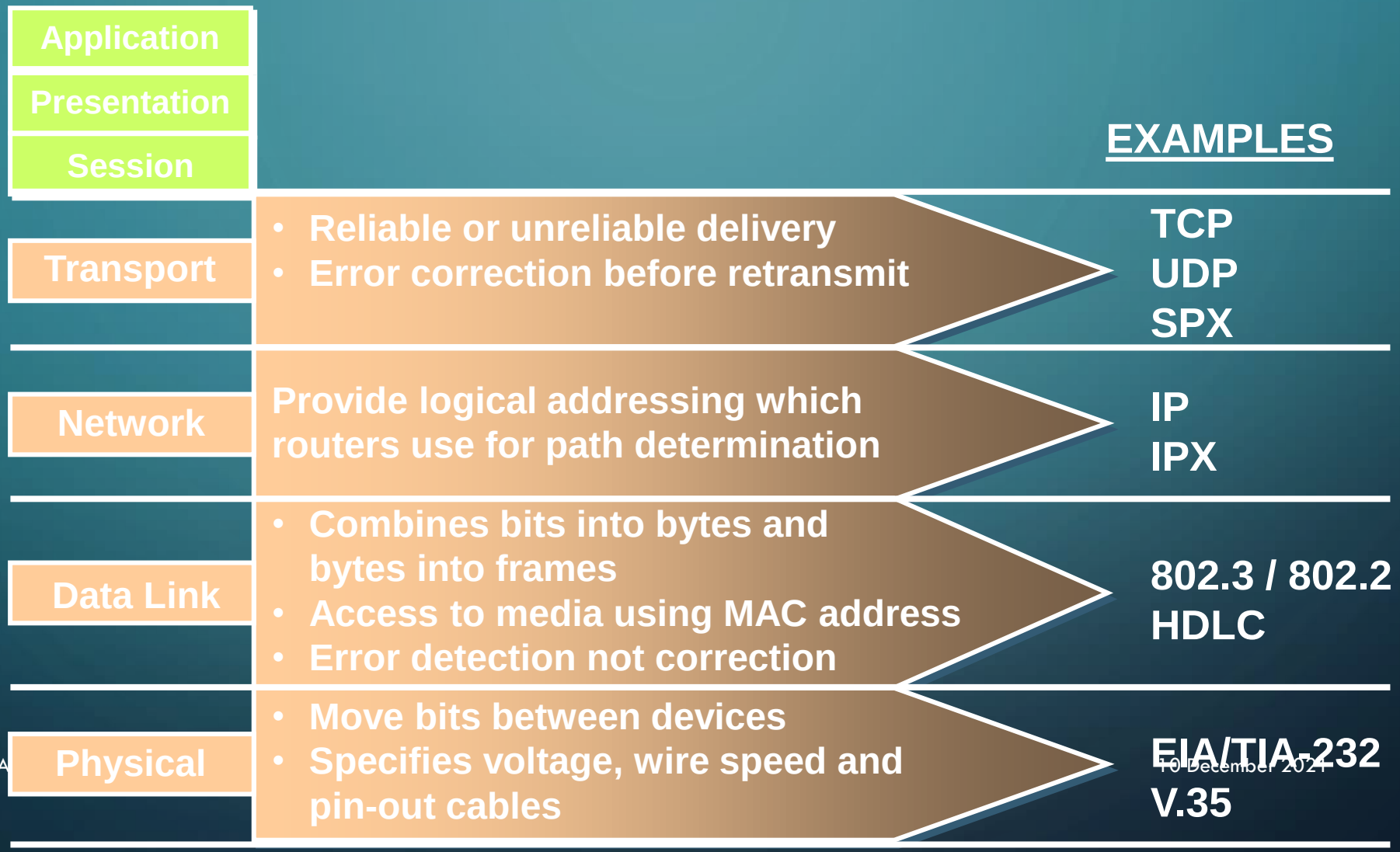
OSI MODEL OVERVIEW



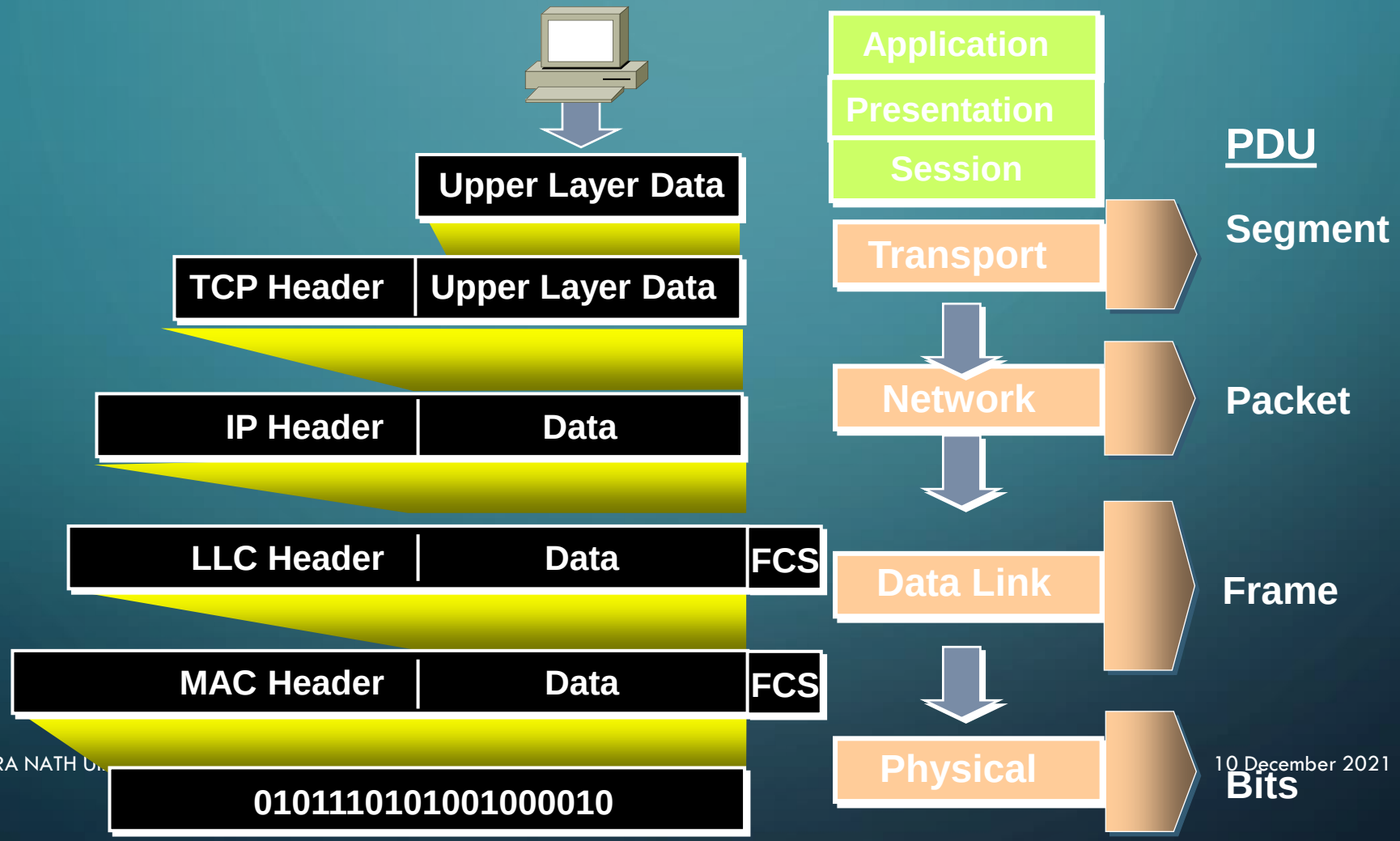
ROLE OF APPLICATION LAYERS



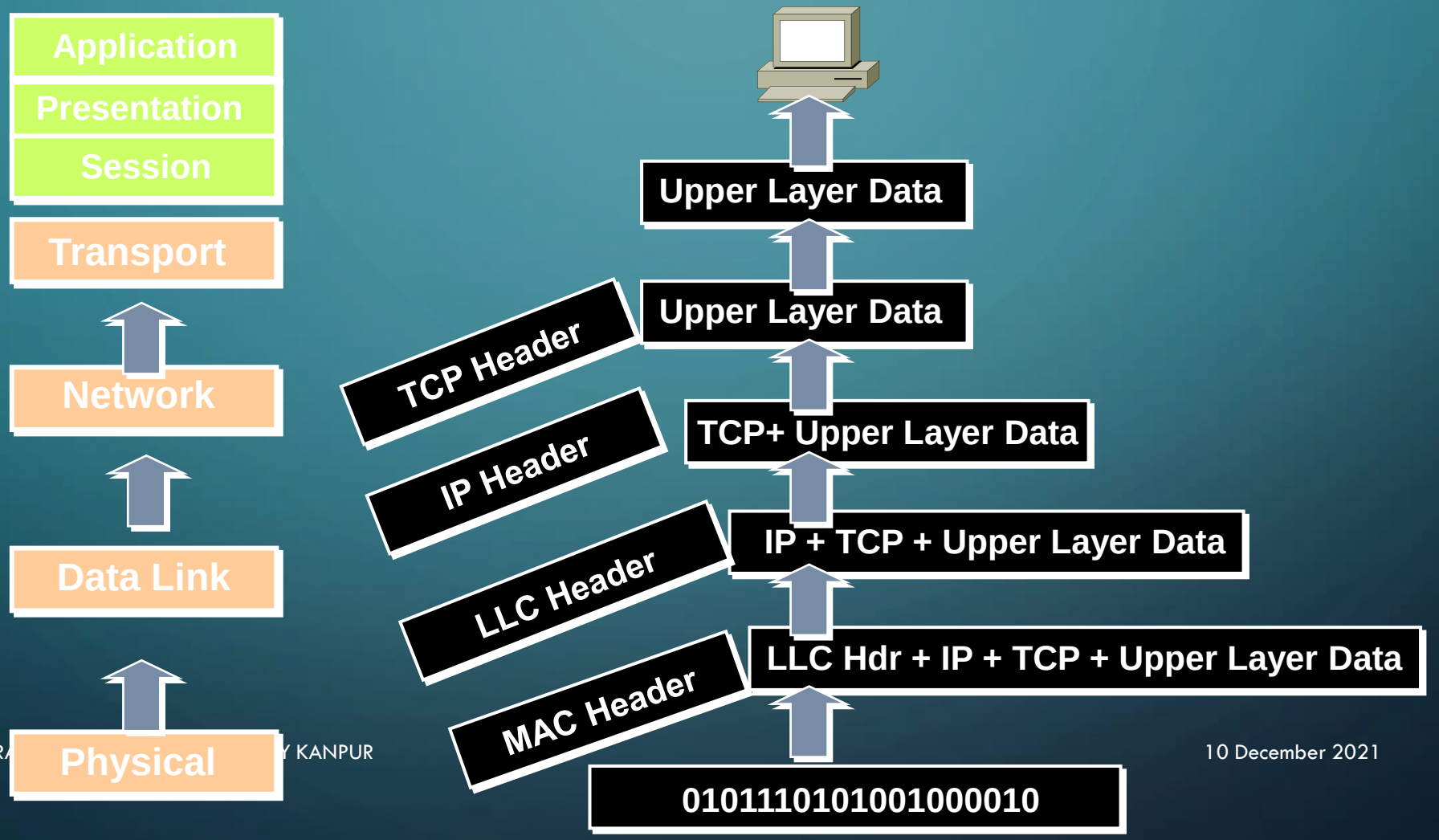
ROLE OF DATA FLOW LAYERS



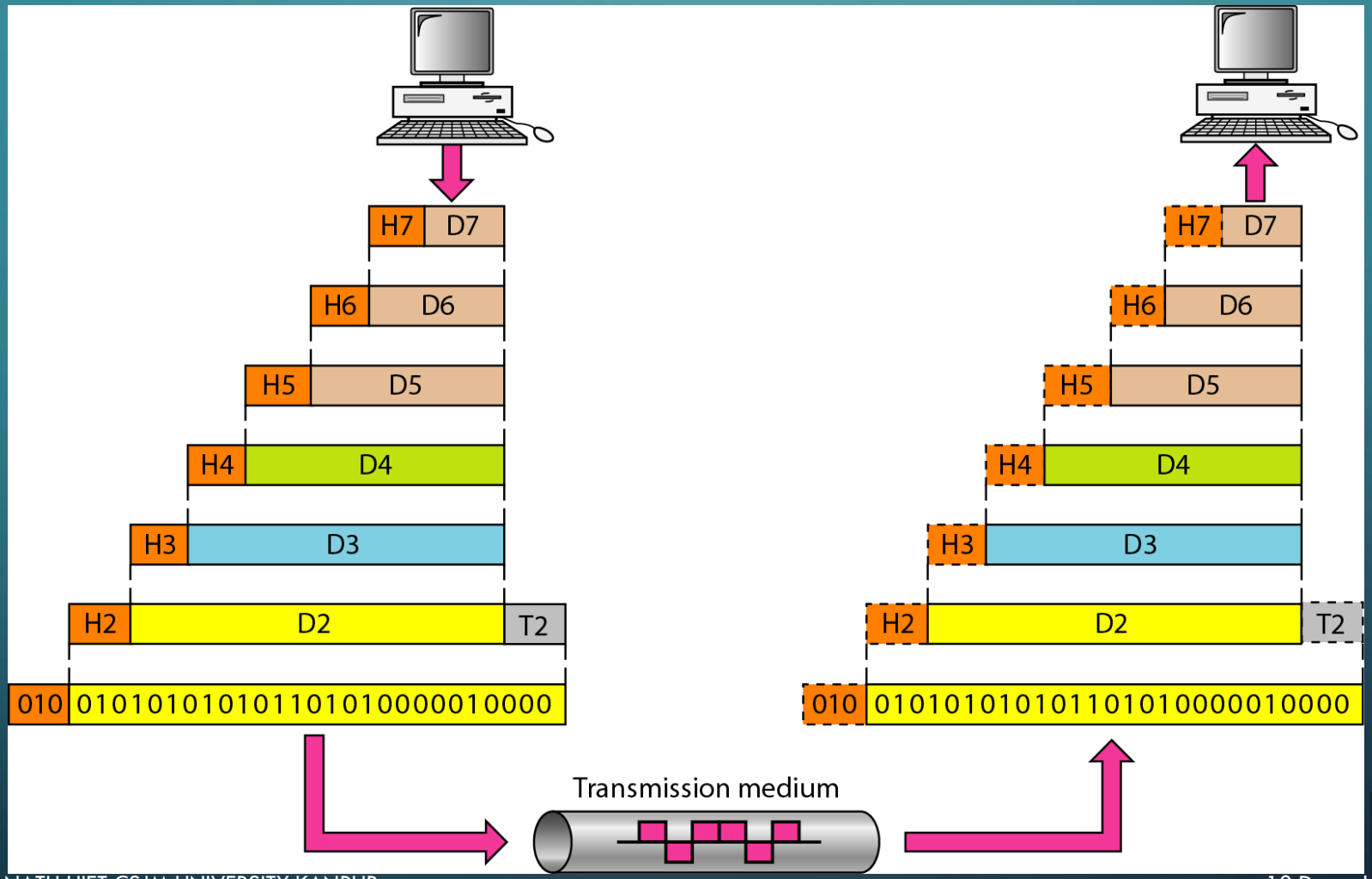
Encapsulating Data



De-encapsulating Data

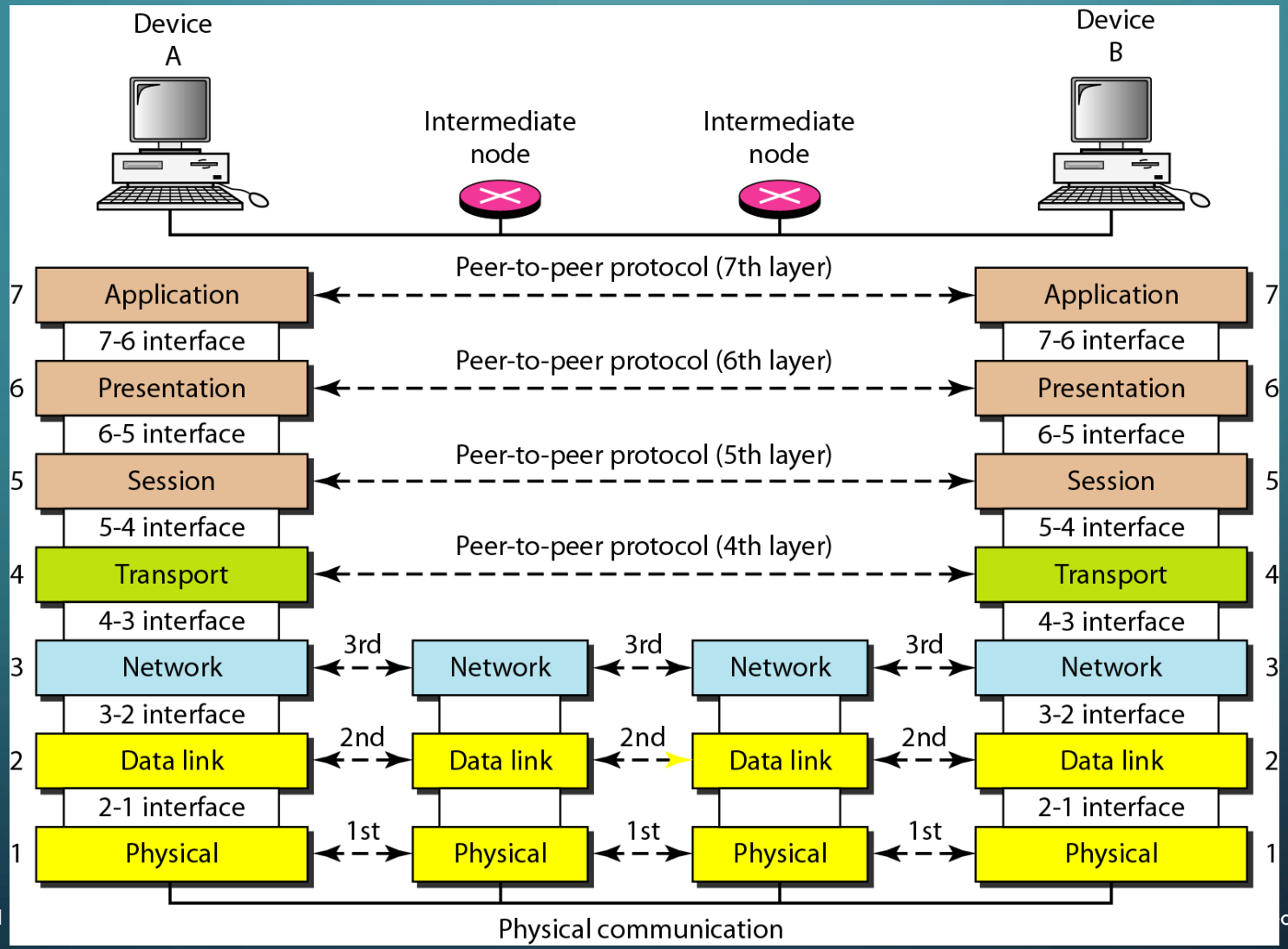


An exchange using the OSI model



Osi.swf

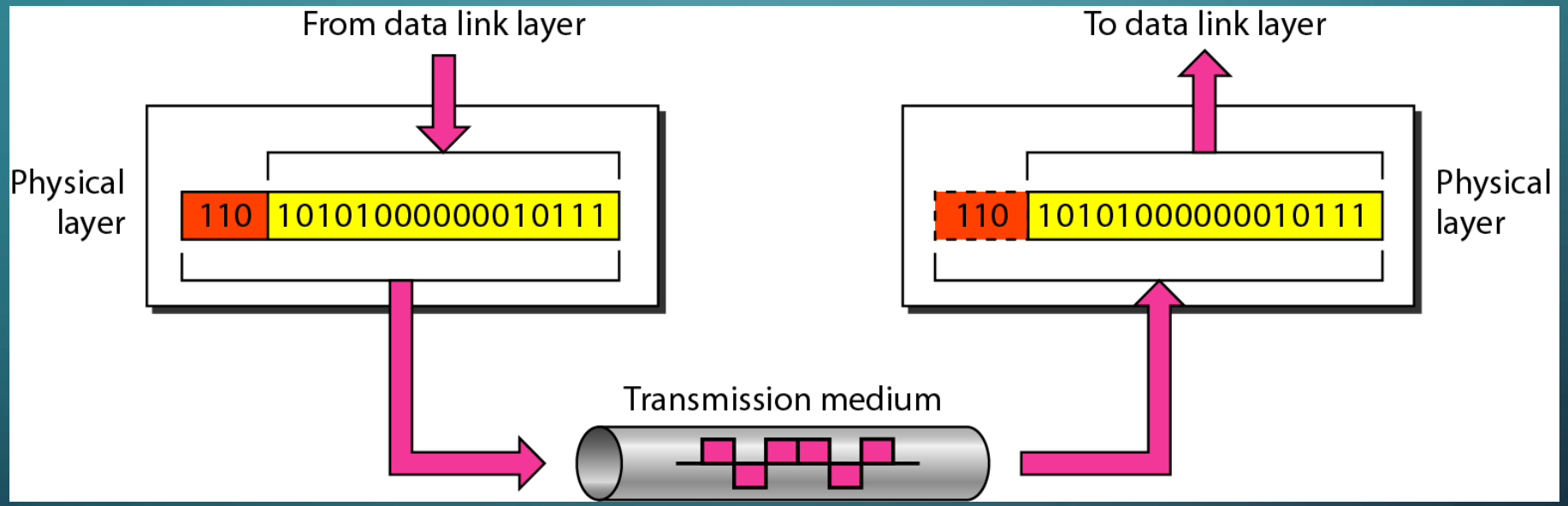
The interaction between layers in the OSI model



Note

The physical layer is responsible for movements of individual bits from one hop (node) to the next.

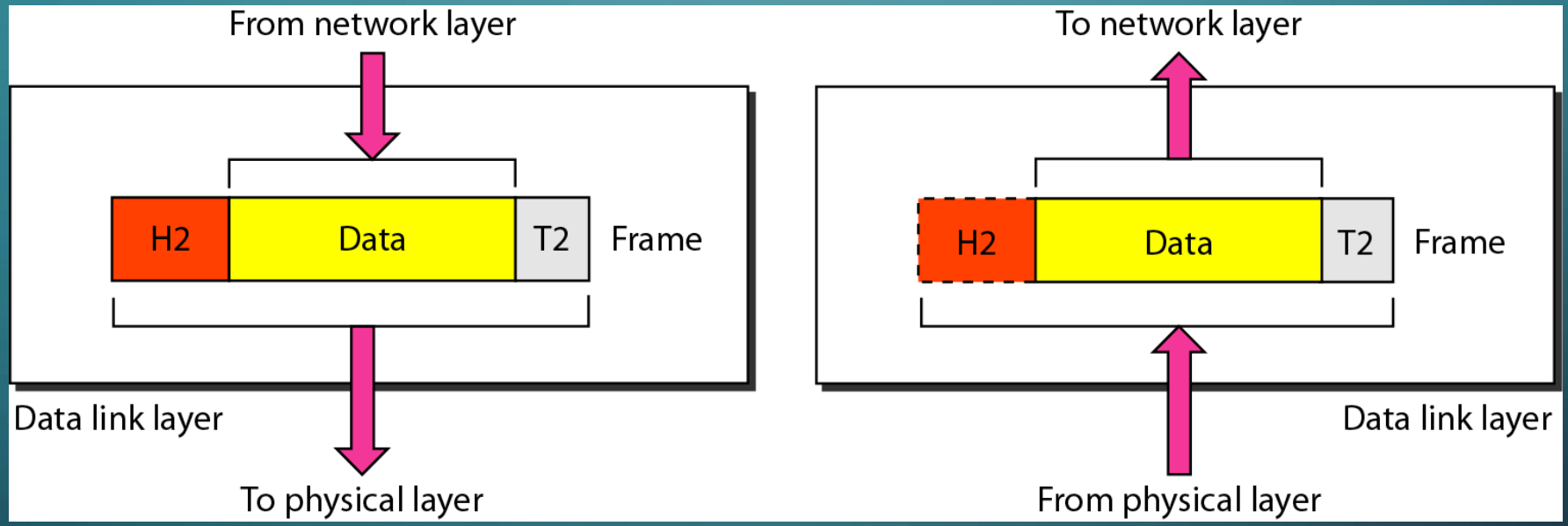
Physical layer



Note

The data link layer is responsible for moving frames from one hop (node) to the next.

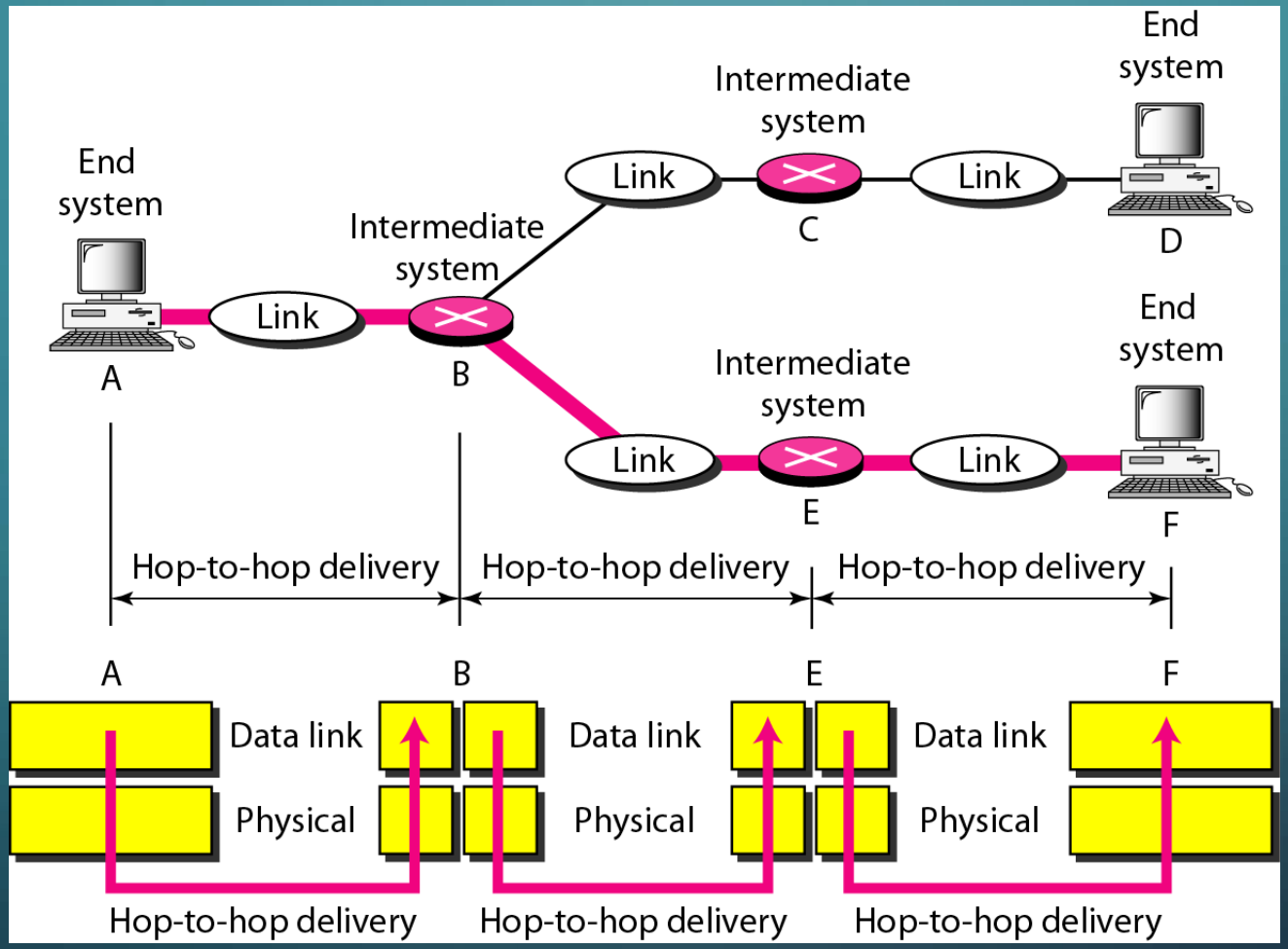
Data link layer



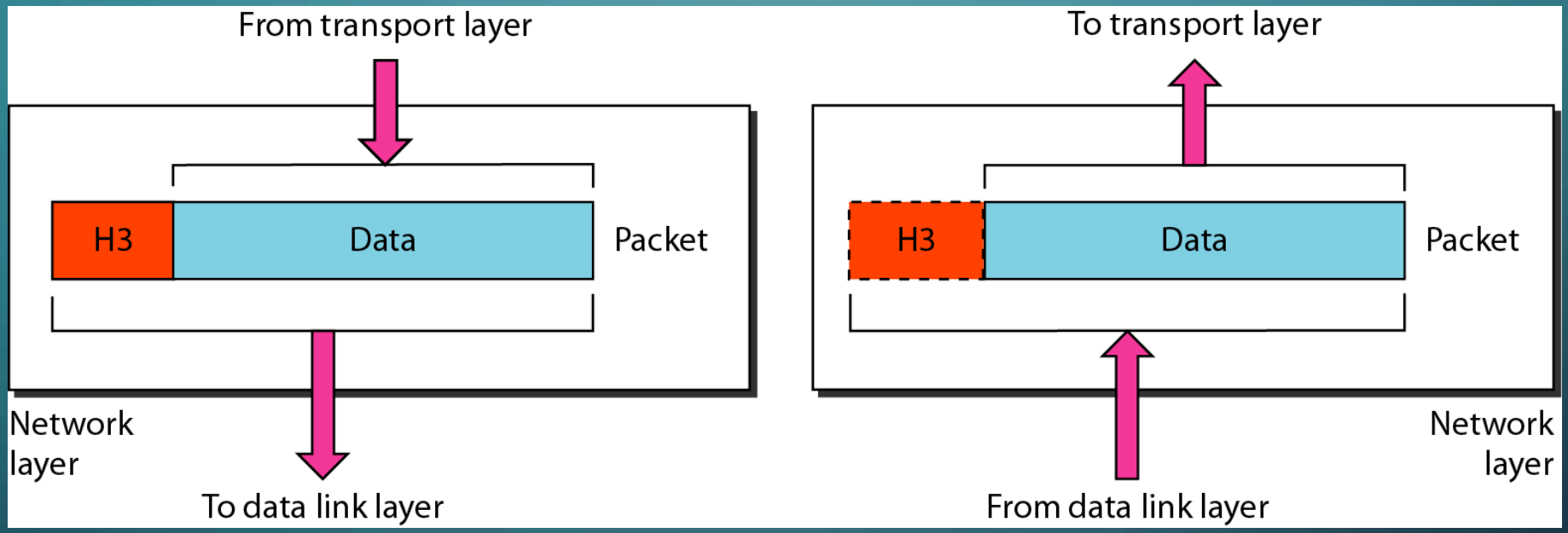
Note

The network layer is responsible for the delivery of individual packets from the source host to the destination host.

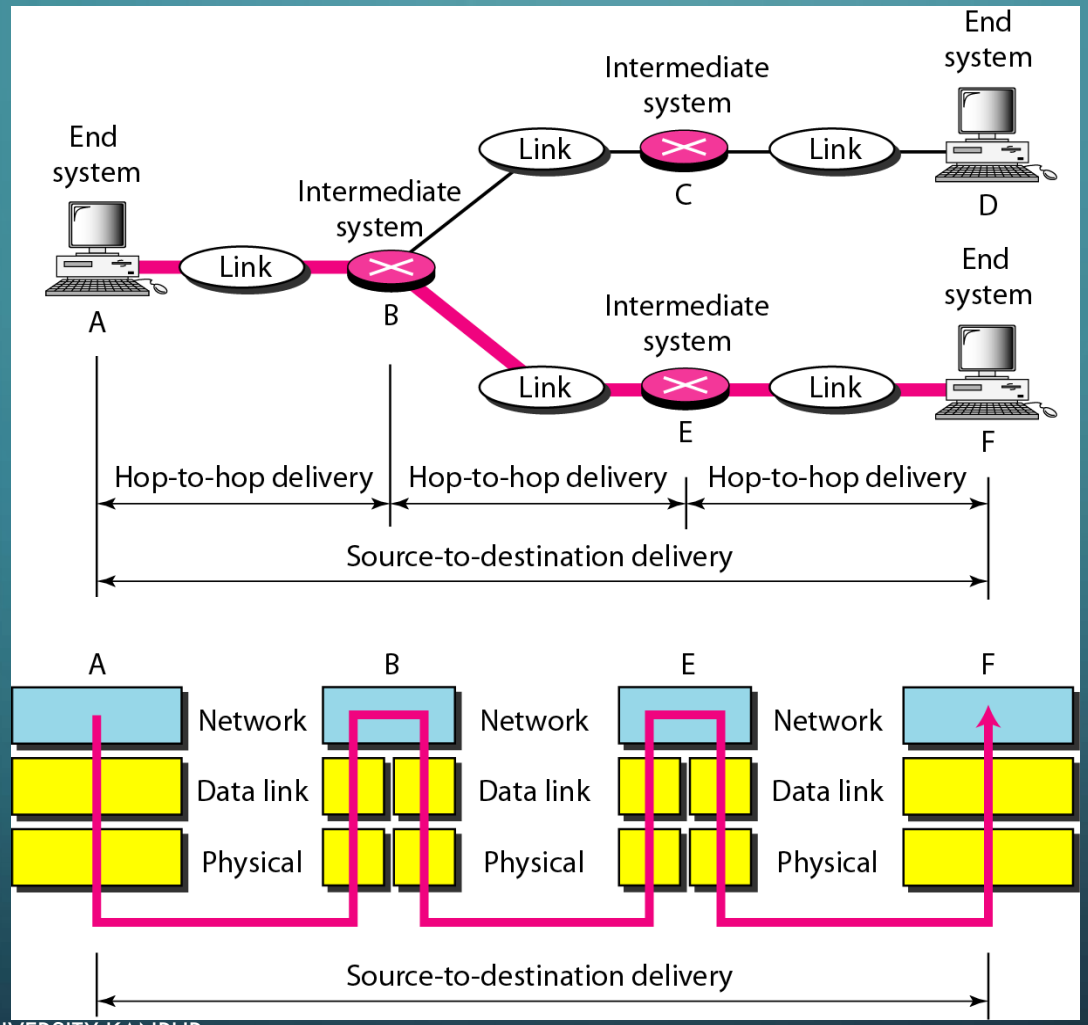
Hop-to-hop delivery



Network layer



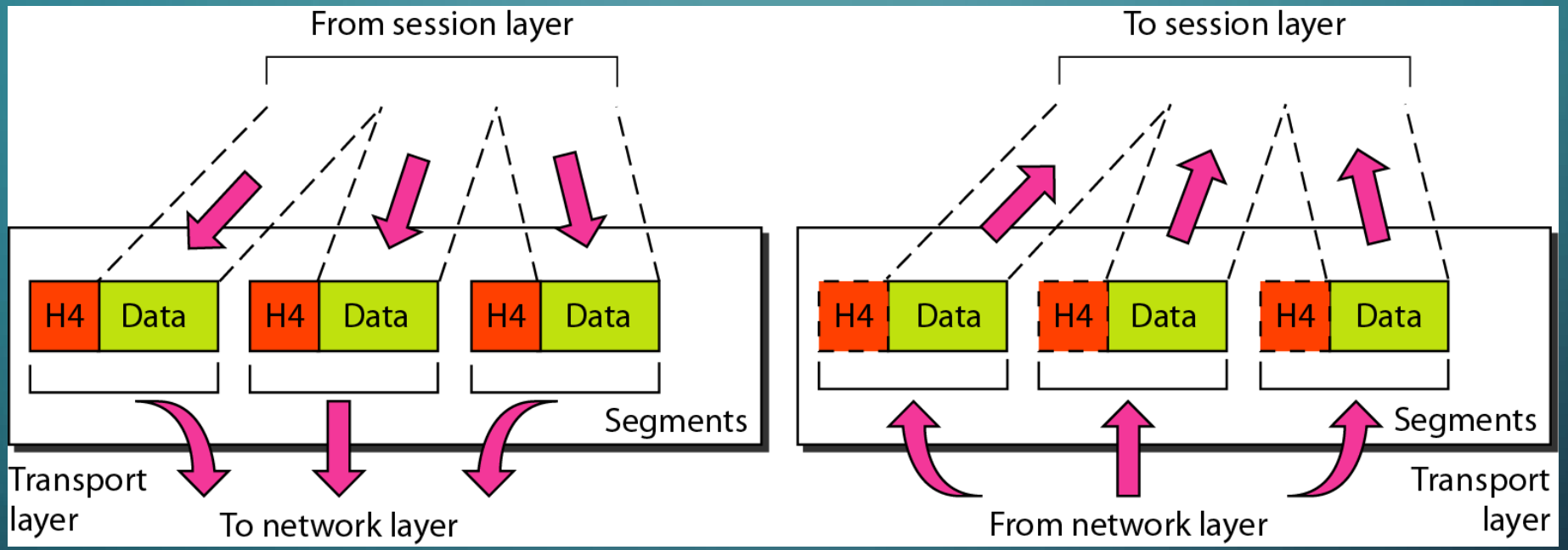
Source-to-destination delivery



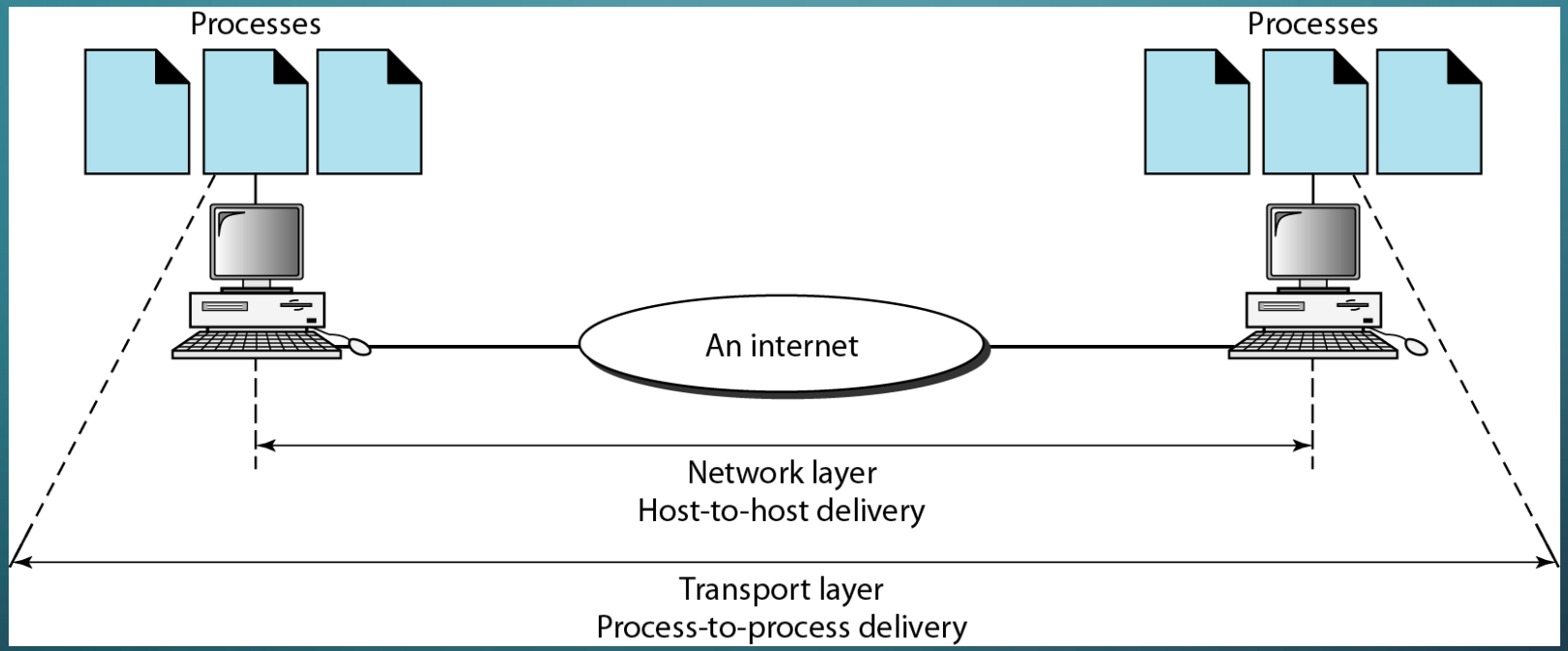
Note

The transport layer is responsible for the delivery of a message from one process to another.

Transport layer



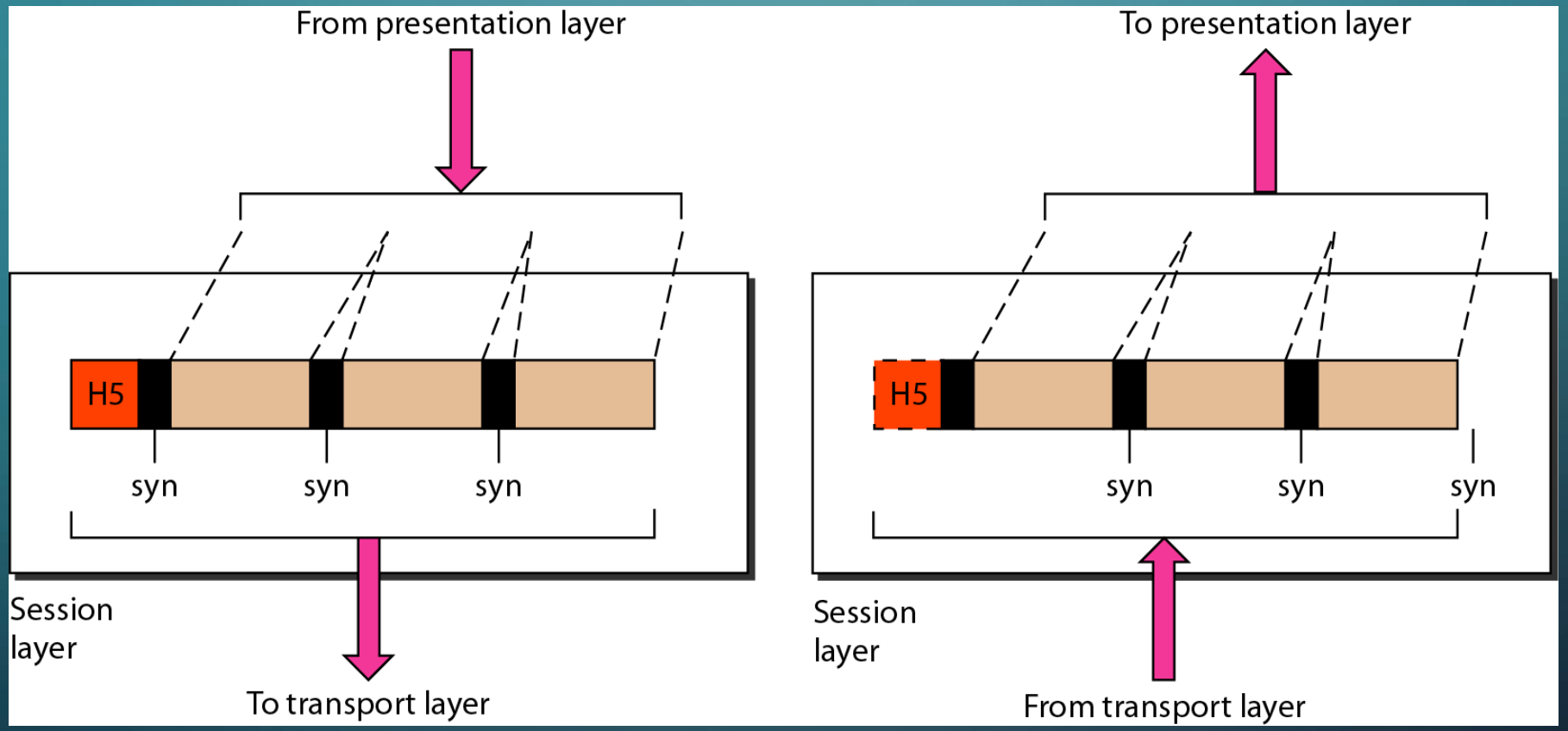
Reliable process-to-process delivery of a message



Note

The session layer is responsible for dialog control and synchronization.

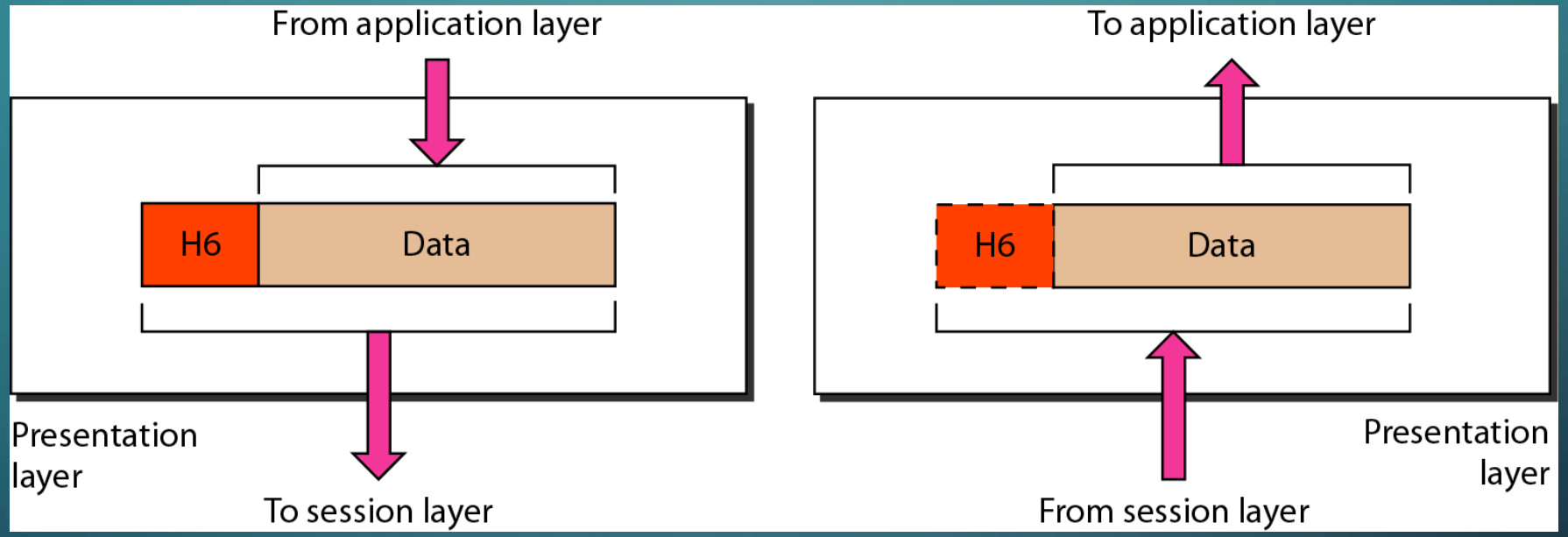
Session layer



Note

The presentation layer is responsible for translation, compression, and encryption.

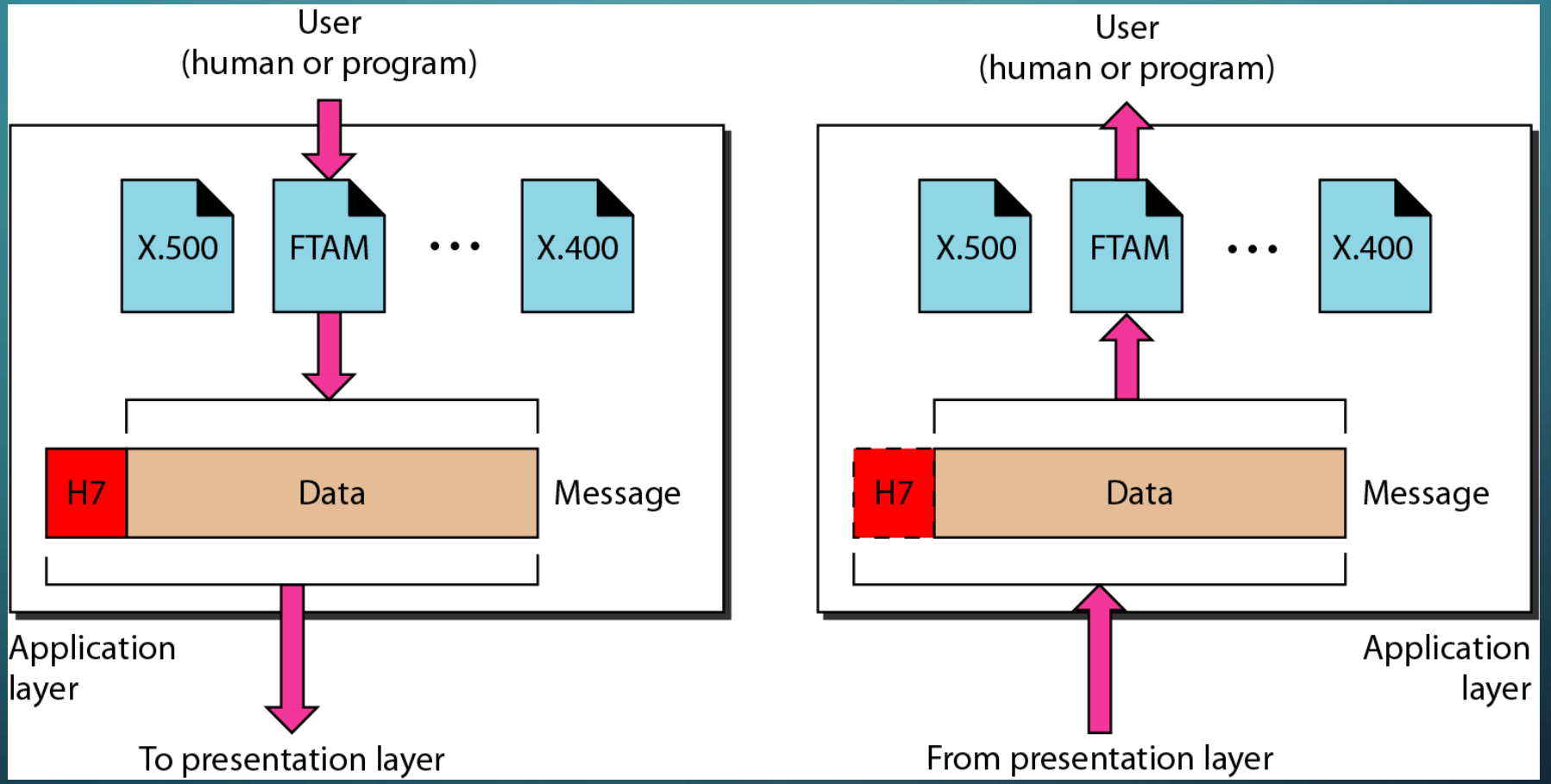
Presentation layer



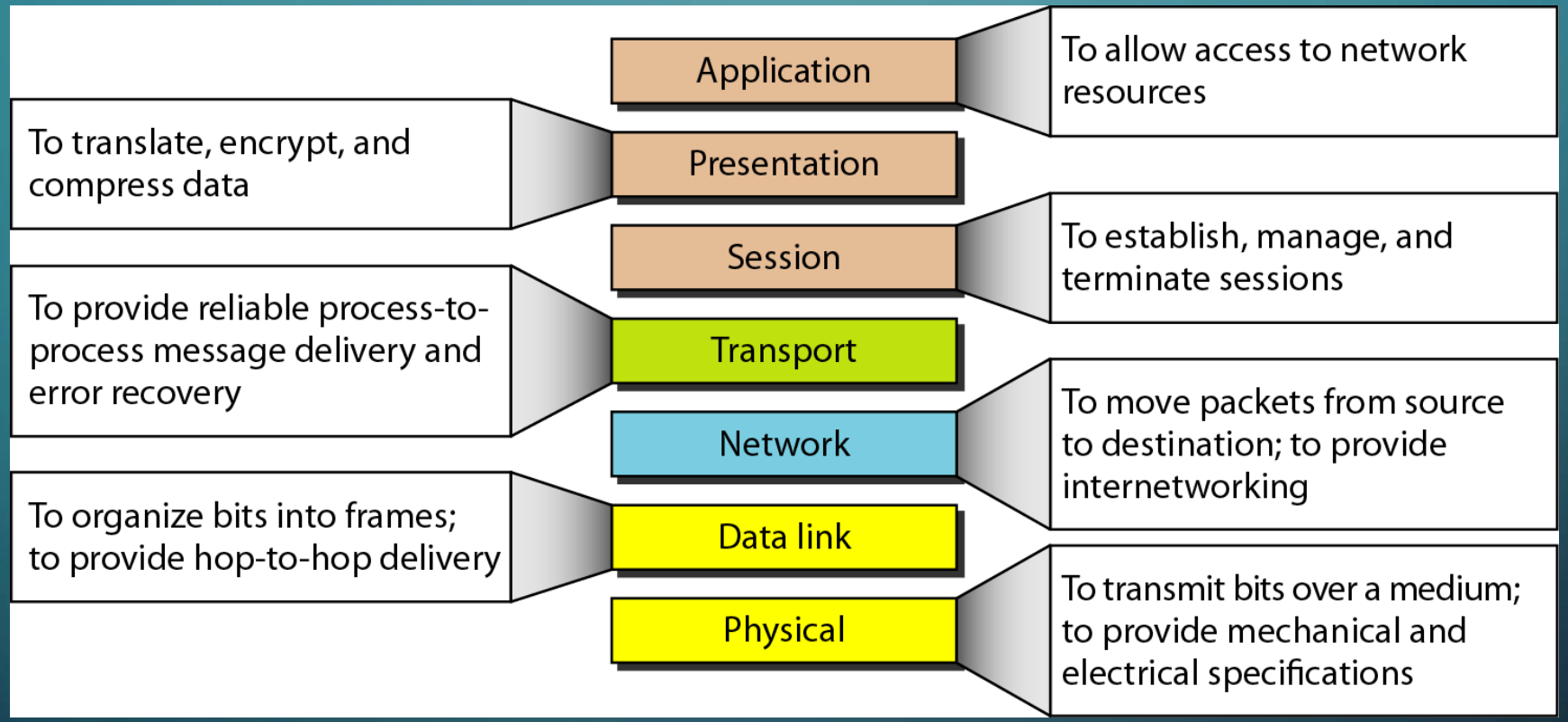
Note

The application layer is responsible for providing services to the user.

Application layer



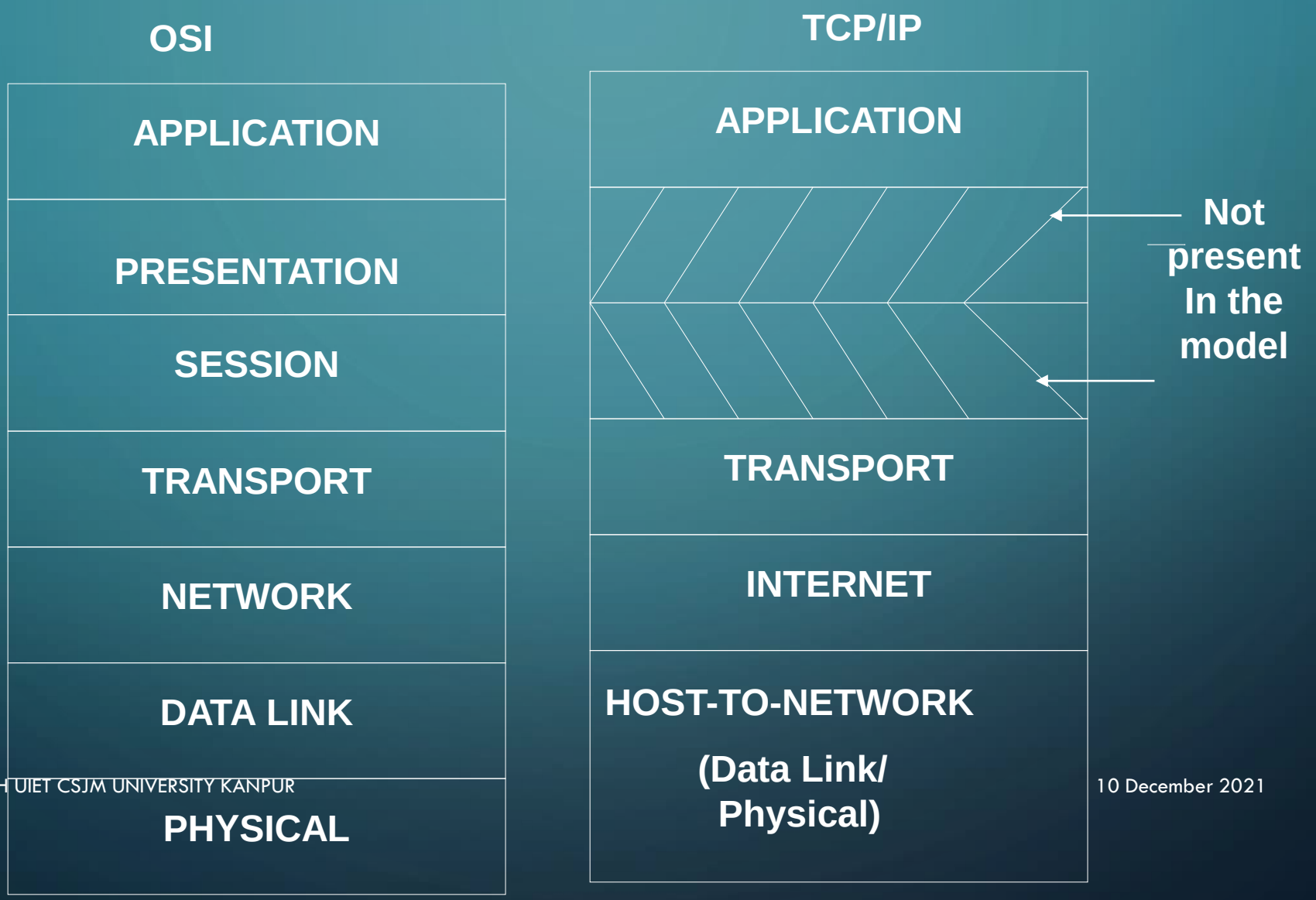
Summary of layers



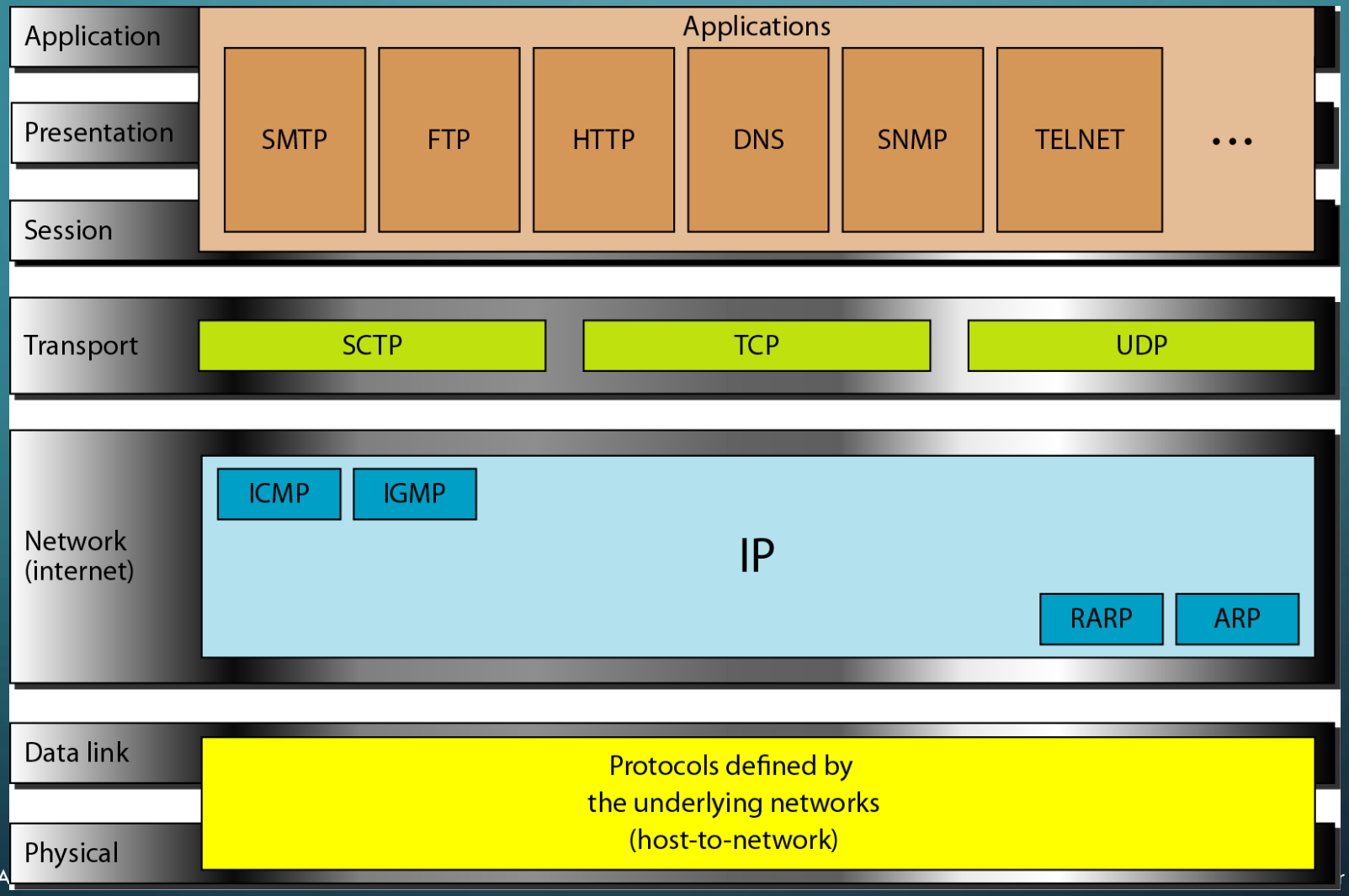
TCP/IP PROTOCOL SUITE

The layers in the TCP/IP protocol suite do not exactly match those in the OSI model. The original TCP/IP protocol suite was defined as having four layers: host-to-network, internet, transport, and application. However, when TCP/IP is compared to OSI, we can say that the TCP/IP protocol suite is made of five layers: physical, data link, network, transport, and application.

TCP/IP REFERENCE MODEL



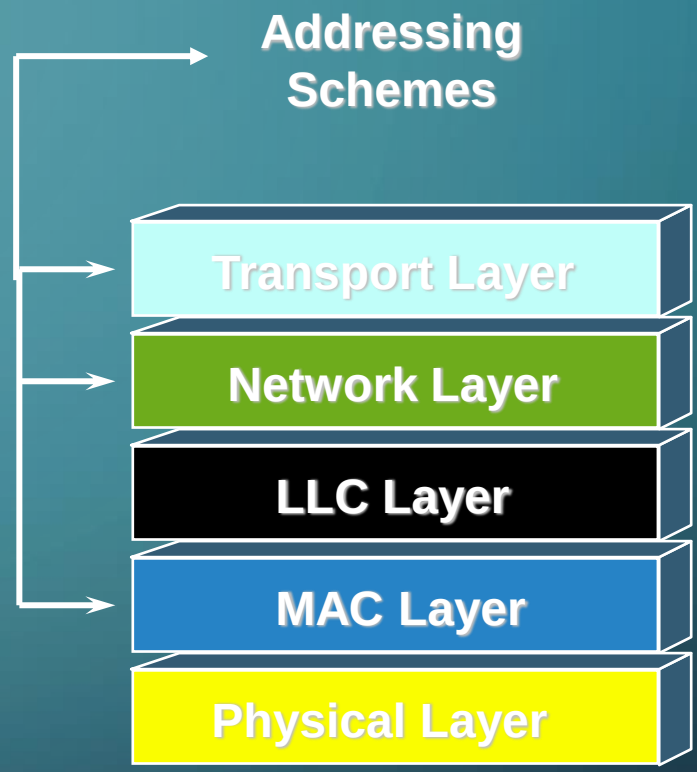
TCP/IP and OSI model

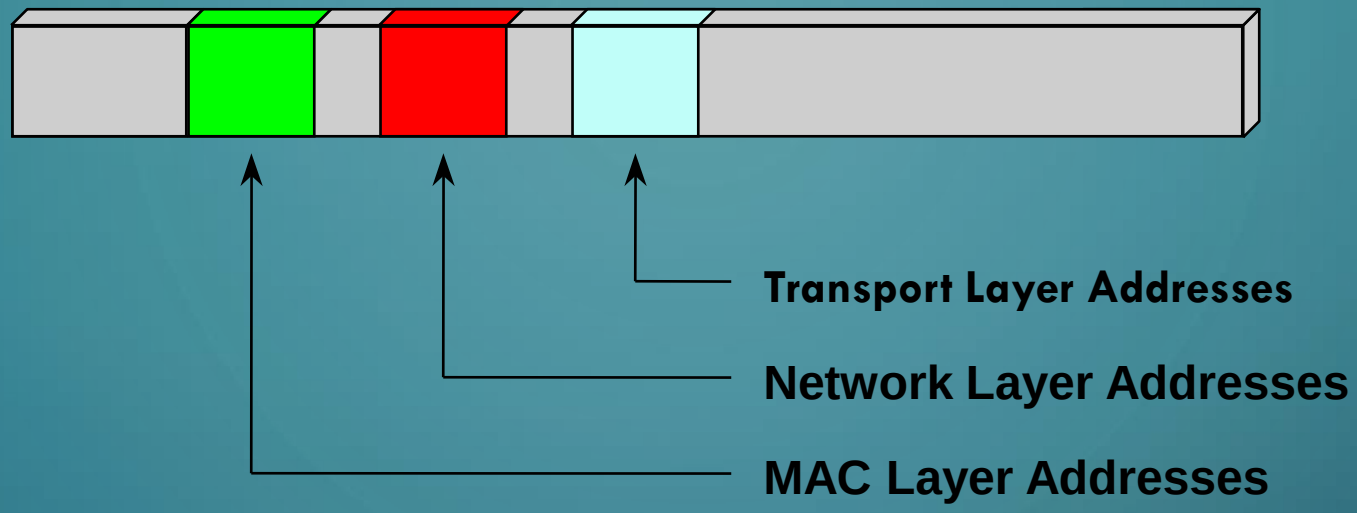


Network Addressing

Addressing is used to ensure that messages between any two of the machines are not received by other users.

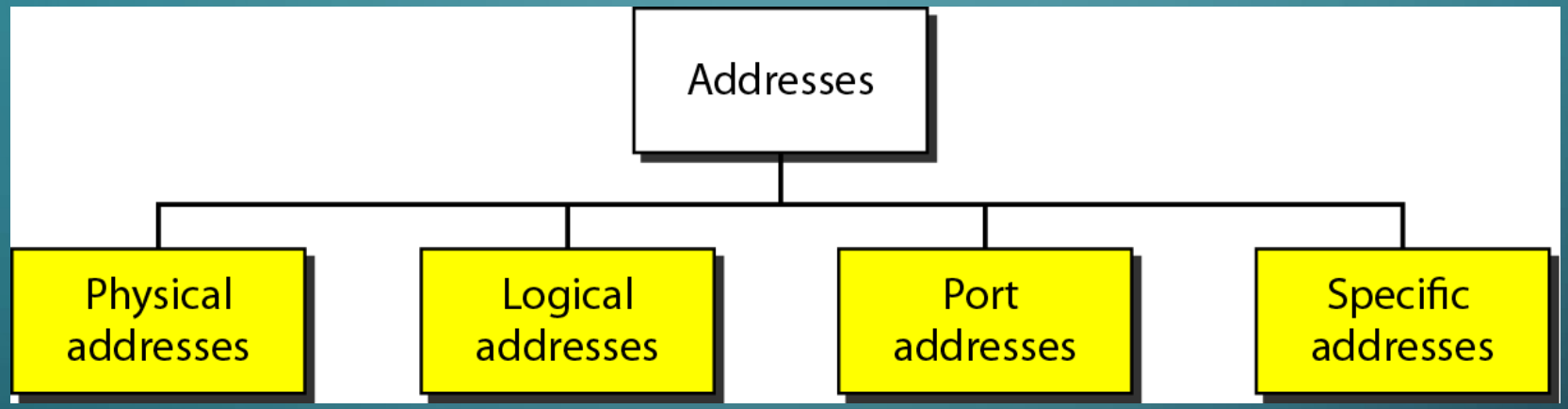
Addressing schemes exist at multiple layers of the OSI Model. A typical TCP/IP packet will contain addresses that are designed to be used at the MAC Layer, the Network Layer and the Transport Layer.



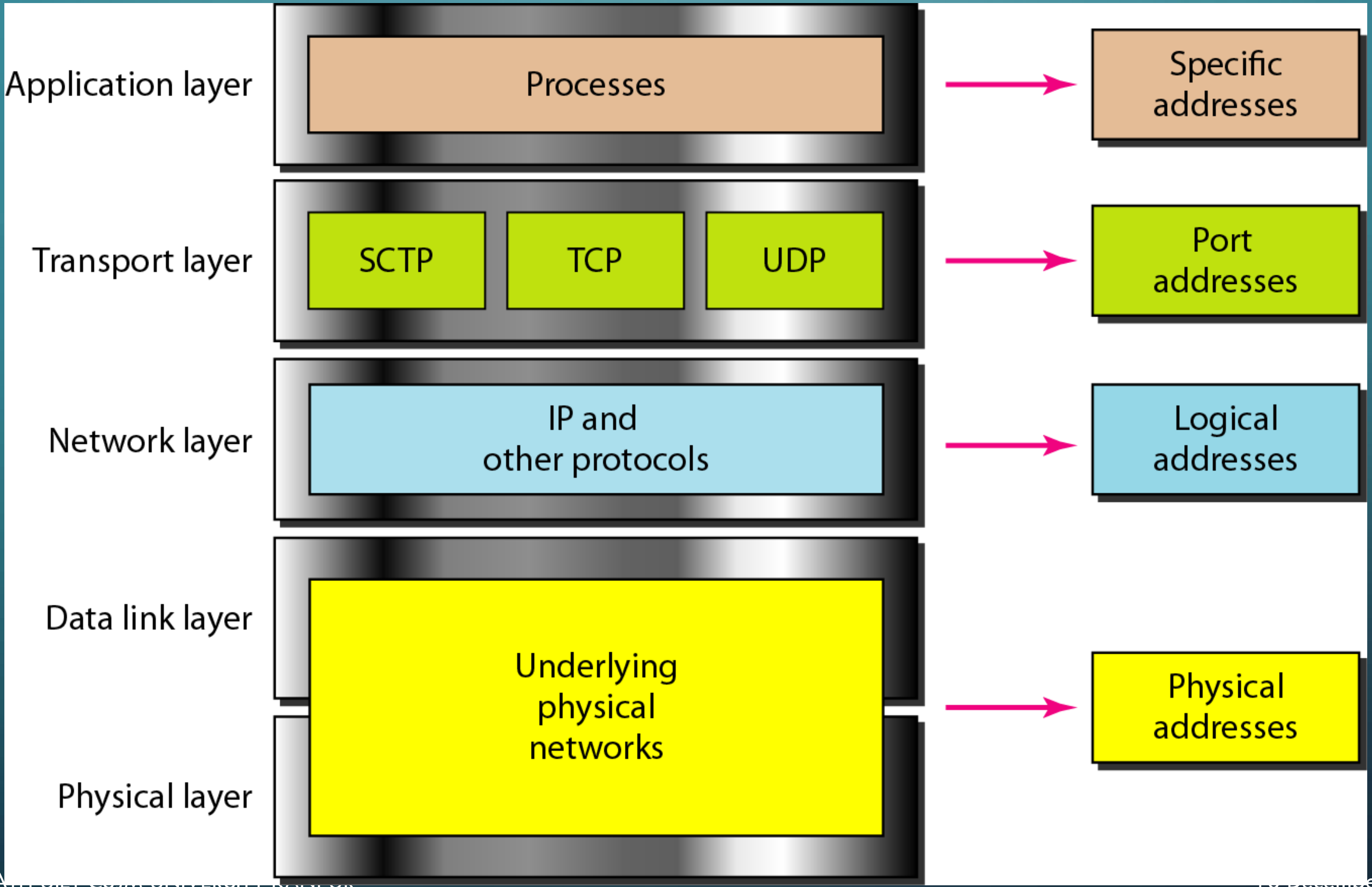


- The addresses are stored in specifically defined parts of the IP packet and the LAN frame.
- The consistent position of addresses is a key factor that allows software to interpret addressing information correctly. In other words, if we put addresses in the wrong format, or in the wrong place, our communication software will not work correctly.

Addresses in TCP/IP

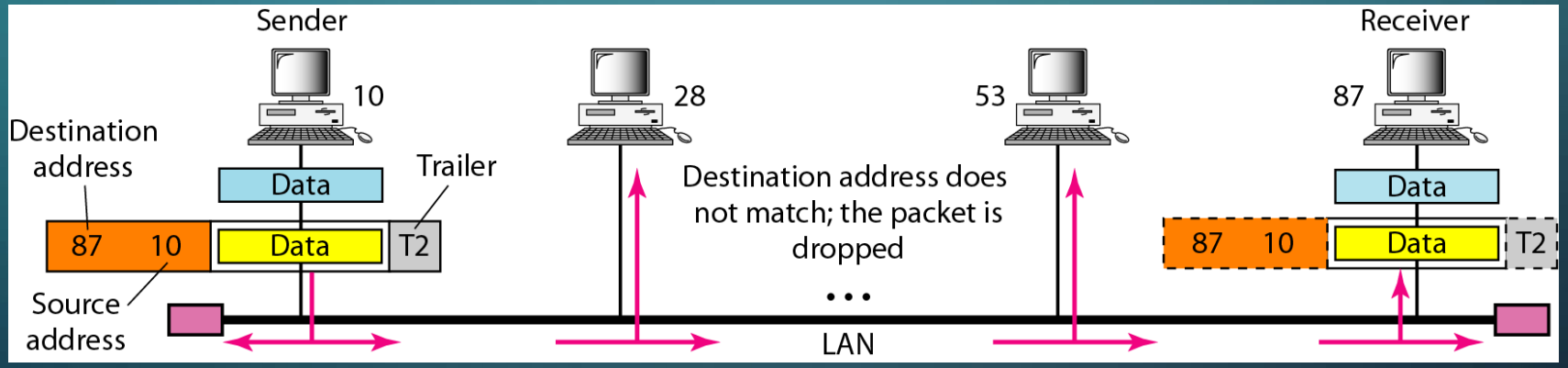


Relationship of layers and addresses in TCP/IP



Example

A node with physical address 10 sends a frame to a node with physical address 87. The two nodes are connected by a link (bus topology LAN). As the figure shows, the computer with physical address 10 is the sender, and the computer with physical address 87 is the receiver.



Most local-area networks use a 48-bit (6-byte) physical address written as 12 hexadecimal digits; every byte (2 hexadecimal digits) is separated by a colon, as shown below:

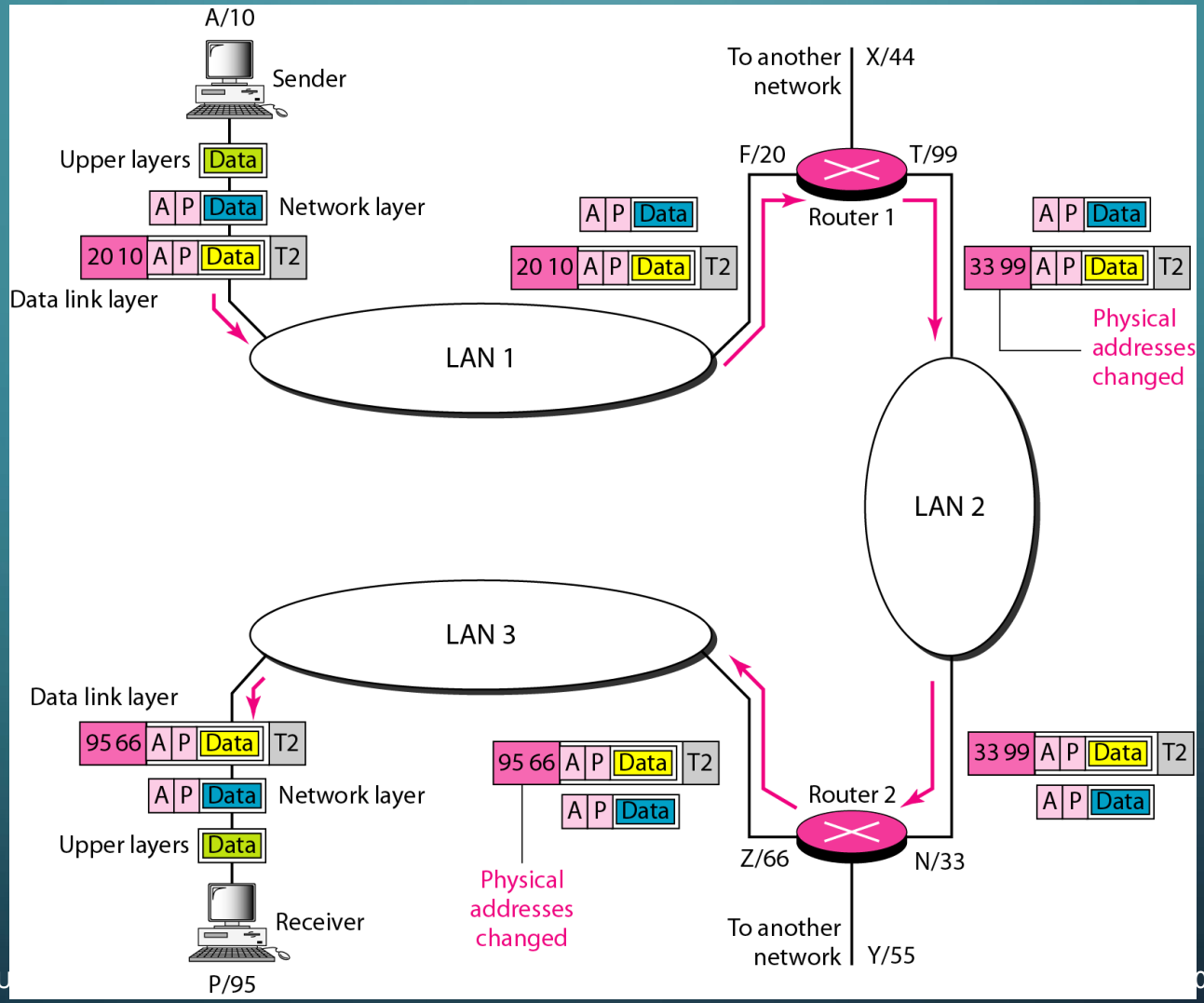
07:01:02:01:2C:4B

A 6-byte (12 hexadecimal digits) physical address.

Example

Figure next shows a part of an internet with two routers connecting three LANs. Each device (computer or router) has a pair of addresses (logical and physical) for each connection. In this case, each computer is connected to only one link and therefore has only one pair of addresses. Each router, however, is connected to three networks (only two are shown in the figure). So each router has three pairs of addresses, one for each connection.

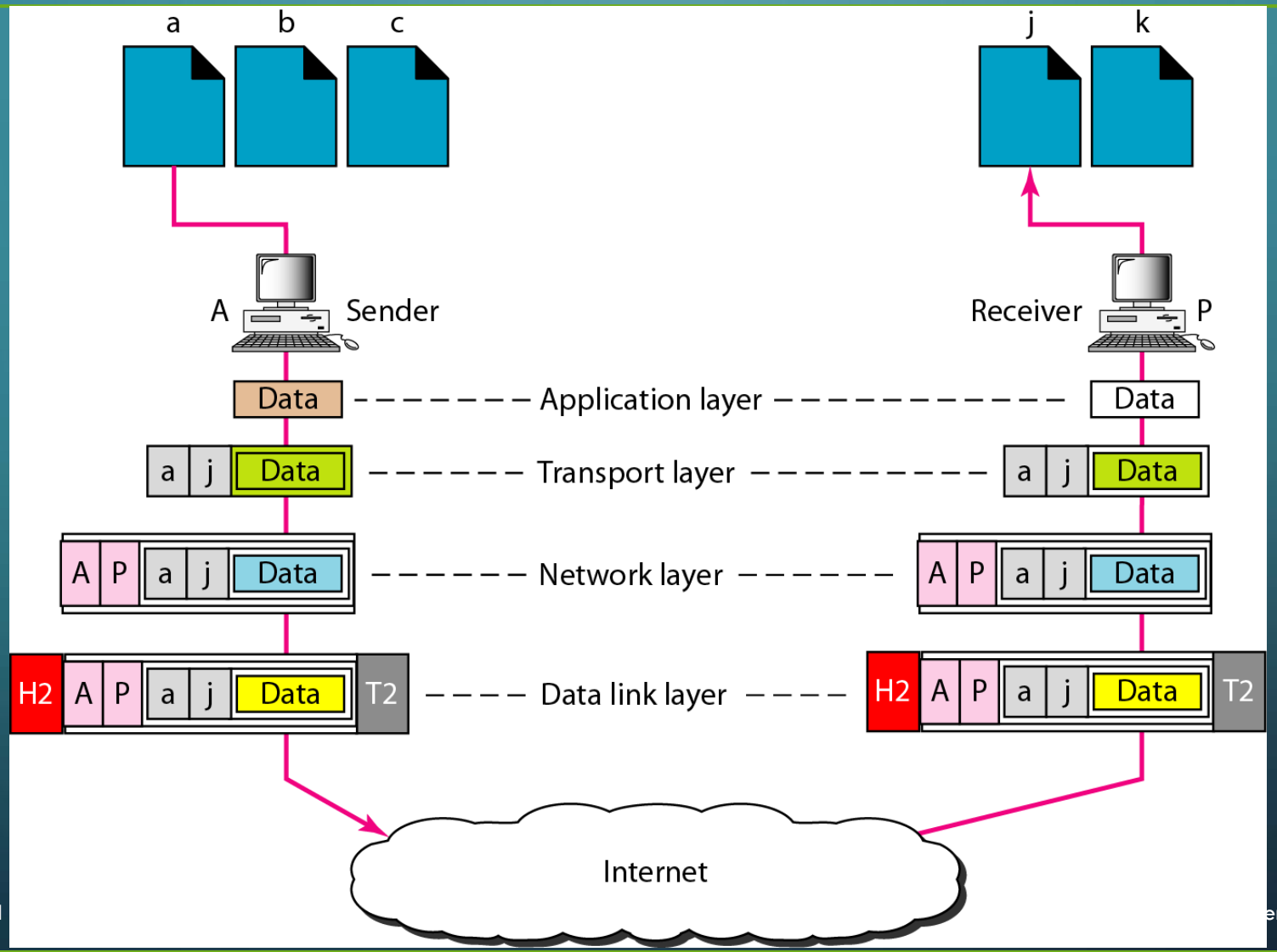
IP addresses



Example

Figure shows two computers communicating via the Internet. The sending computer is running three processes at this time with port addresses a, b, and c. The receiving computer is running two processes at this time with port addresses j and k. Process a in the sending computer needs to communicate with process j in the receiving computer. Note that although physical addresses change from hop to hop, logical and port addresses remain the same from the source to destination.

Port addresses



Note

The physical addresses will change from hop to hop, but the logical addresses usually remain the same.

A port address is a 16-bit address represented by one decimal number as shown.

753

A 16-bit port address represented as one single number.

Note

**The physical addresses change from hop to hop,
but the logical and port addresses usually remain the same.**

THANK YOU !!