

Network Models

- Network is combination of hardware and software .
- Hardware consists of the physical equipment .
- Software consists of instruction sets .
- Higher levels & low levels
- Sending an e-mail.

LAYERED TASKS

Sender



The letter is written,
put in an envelope, and
dropped in a mailbox.

The letter is carried
from the mailbox
to a post office.

The letter is delivered
to a carrier by the post
office.

Higher layers

Middle layers

Lower layers

Receiver



The letter is picked up,
removed from the
envelope, and read.

The letter is carried
from the post office
to the mailbox.

The letter is delivered
from the carrier
to the post office.

The parcel is carried from
the source to the destination.

Open Systems Interconnection OSI

- Introduced in the late 1970s by ISO
- How to facilitate communication
- OSI is model for understanding and designing a network
 - ✓ Flexible network
 - ✓ Robust network
 - ✓ Interoperable network

- OSI is layered framework for the design of network systems
- Consists of seven layers
 - Application layer
 - Presentation layer
 - Session layer
 - Transport layer
 - Network layer
 - Data link layer
 - Physical layer

OSI Model

data unit

layers

Host Layers

data

application

Network Process to Application

data

presentation

Data Representation & Encryption

data

session

Interhost Communication

segments

transport

End-to-End Connections
and Reliability

Media Layers

packets

network

Path Determination &
Logical Addressing (IP)

frames

data link

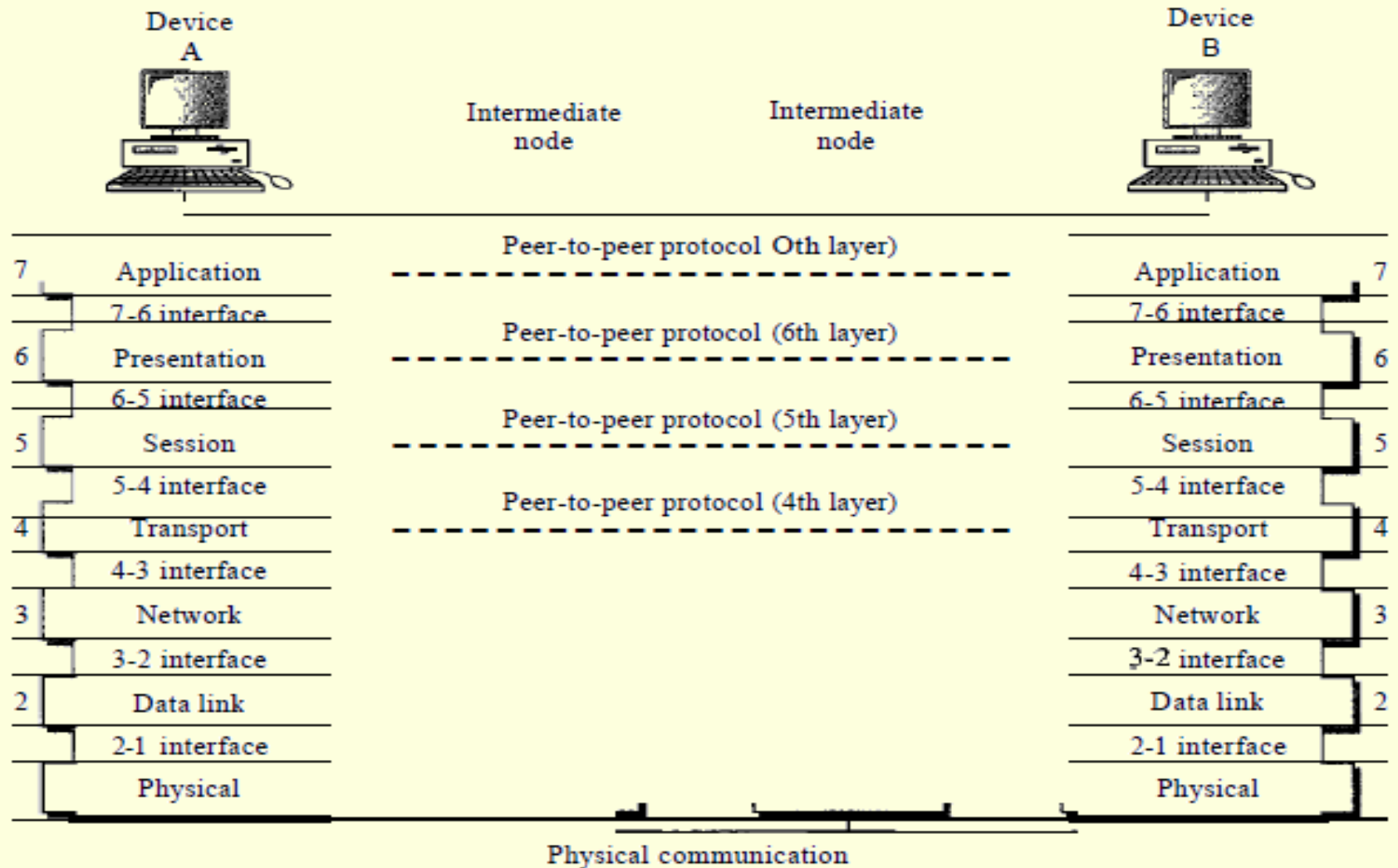
Physical Addressing (MAC & LLC)

bits

physical

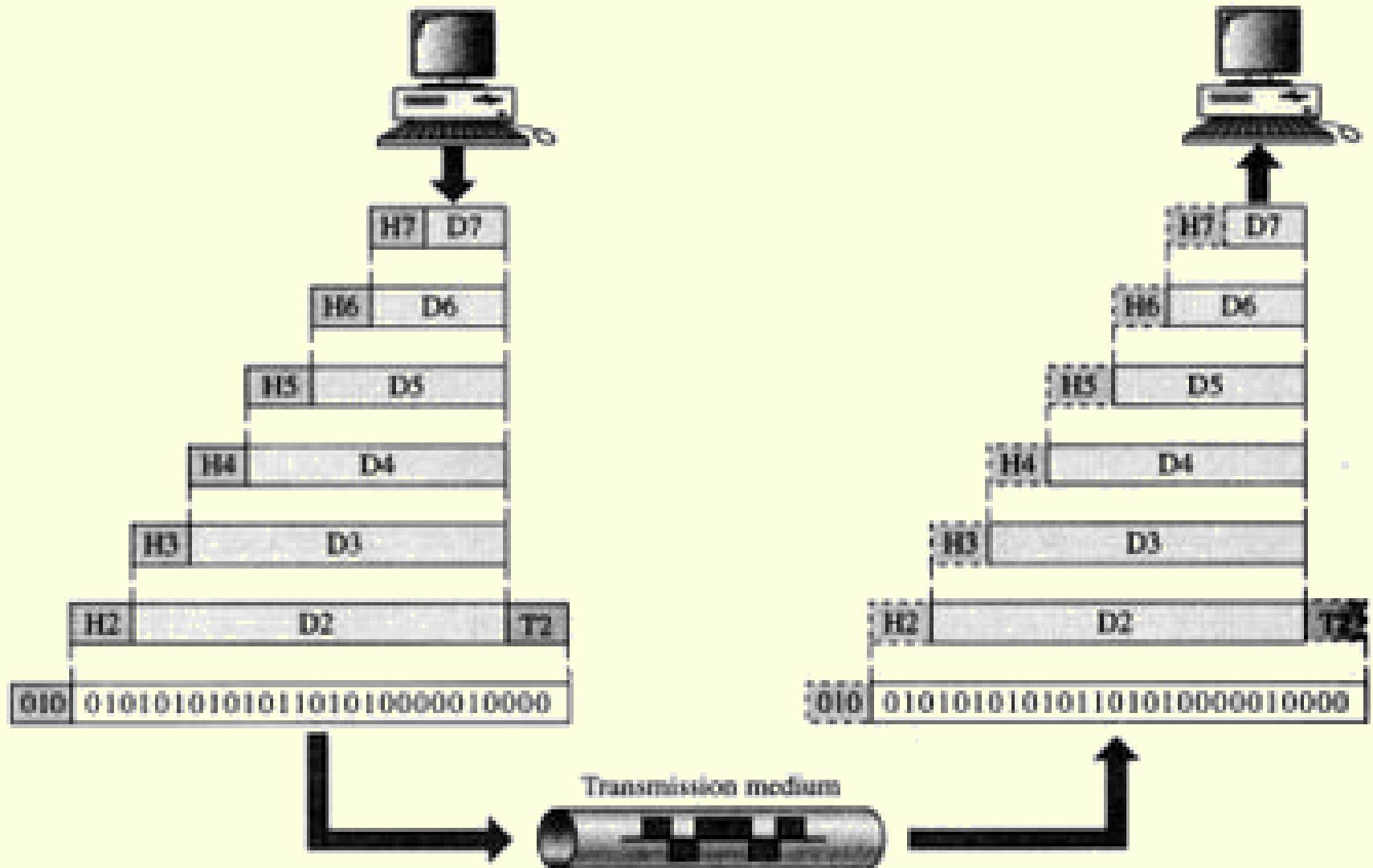
Media, Signal
and Binary Transmission

Peer – to - Peer



- layer defines a family of functions
- Each layer in the sending device adds its own information
- Interfaces Between Layers ?
- Encapsulation ?

An exchange using the OSI model



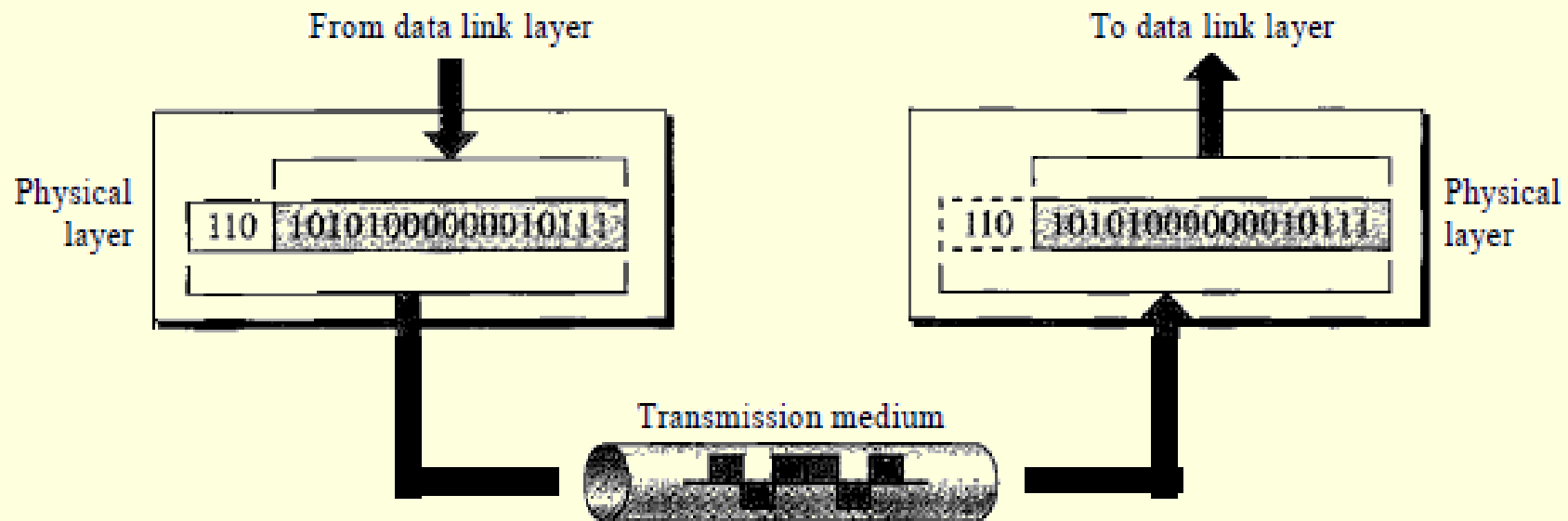
LAYERS IN THE OSI MODEL

☐ Physical Layer

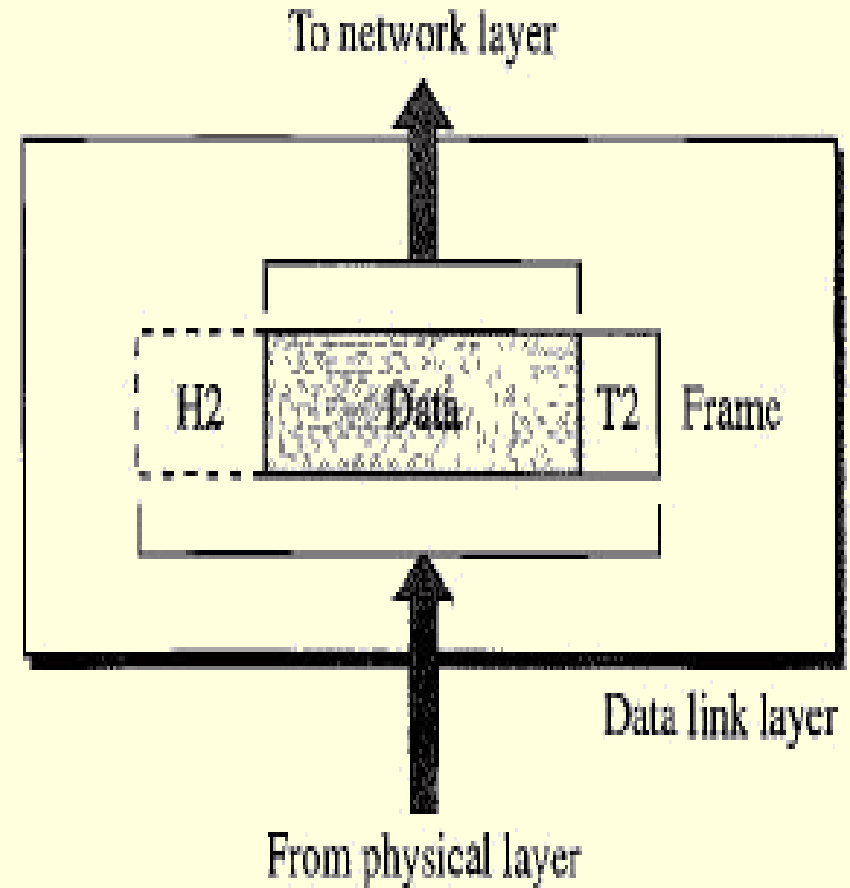
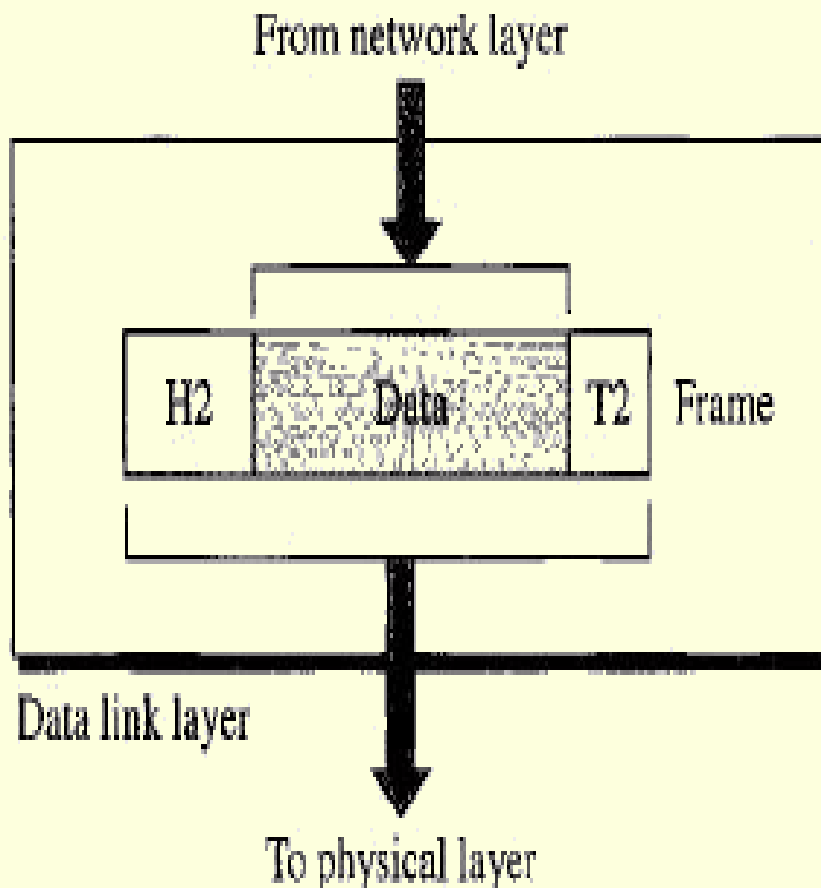
- Coordinates function to carry bit stream over link
- Deals with the mechanical and electrical
- Defines the procedures and functions

- Physical characteristics of interfaces and medium : define
 - characteristics of the interface between device and links
 - Type of transmission medium
- Representation of bits : encode bits to signals
- Data rate : how long bit lasts

- Synchronization of bits ?
- Line configuration : type of connection?
- Physical topology ?
- Transmission mode: data flow ?

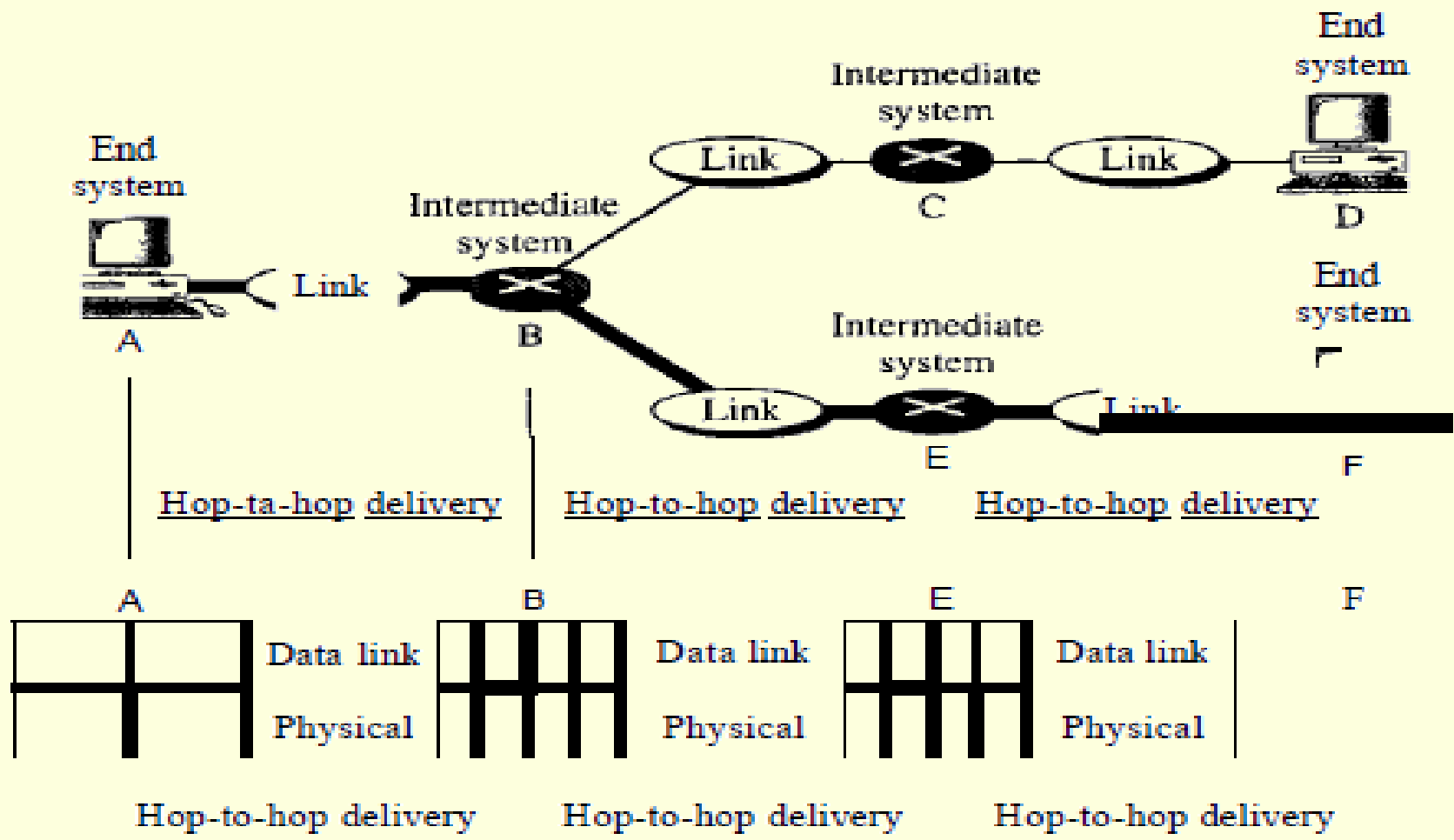


Data Link Layer



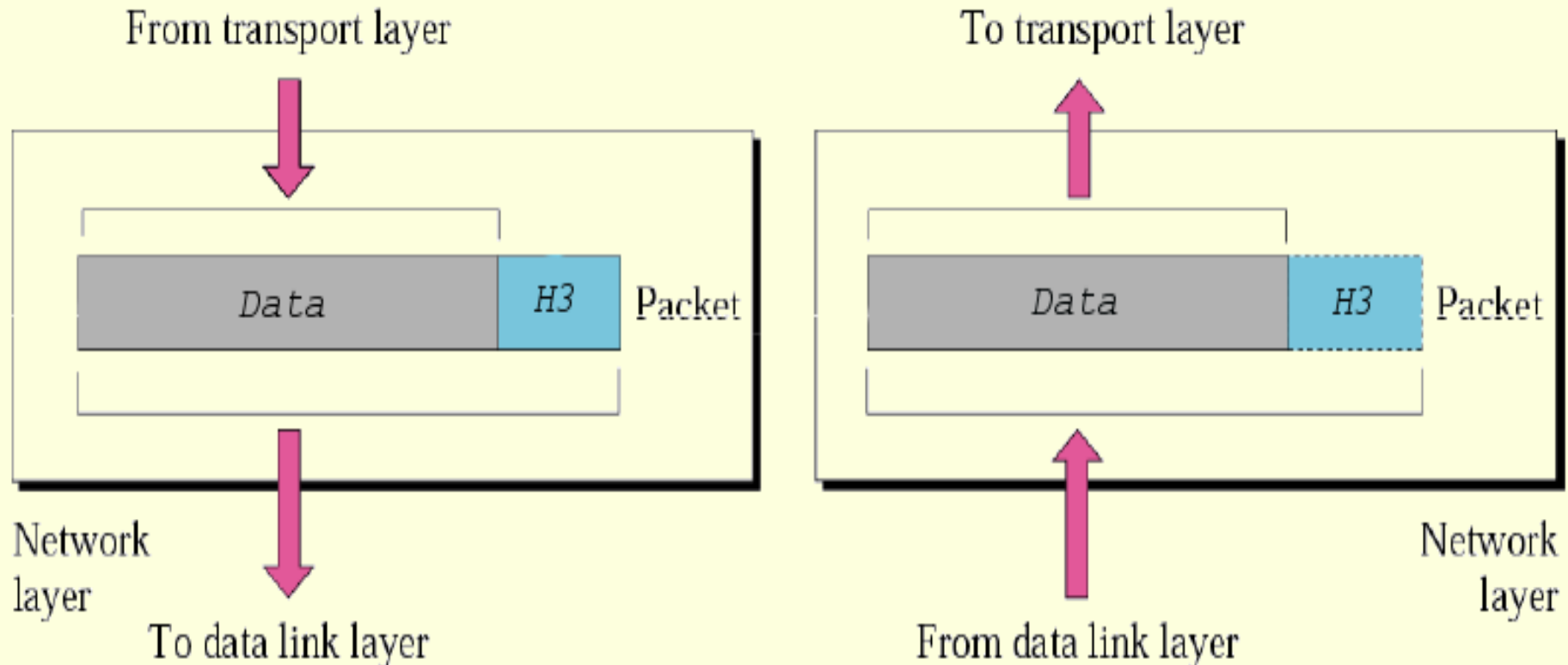
- Framing : divides the stream of bits received into manageable data units
- Flow control : when data at receiver less than data that sent
- Error control :
 - When loss or duplicated frames
 - Achieved through a trailer

- Access control : when two devices connected to the same link ?

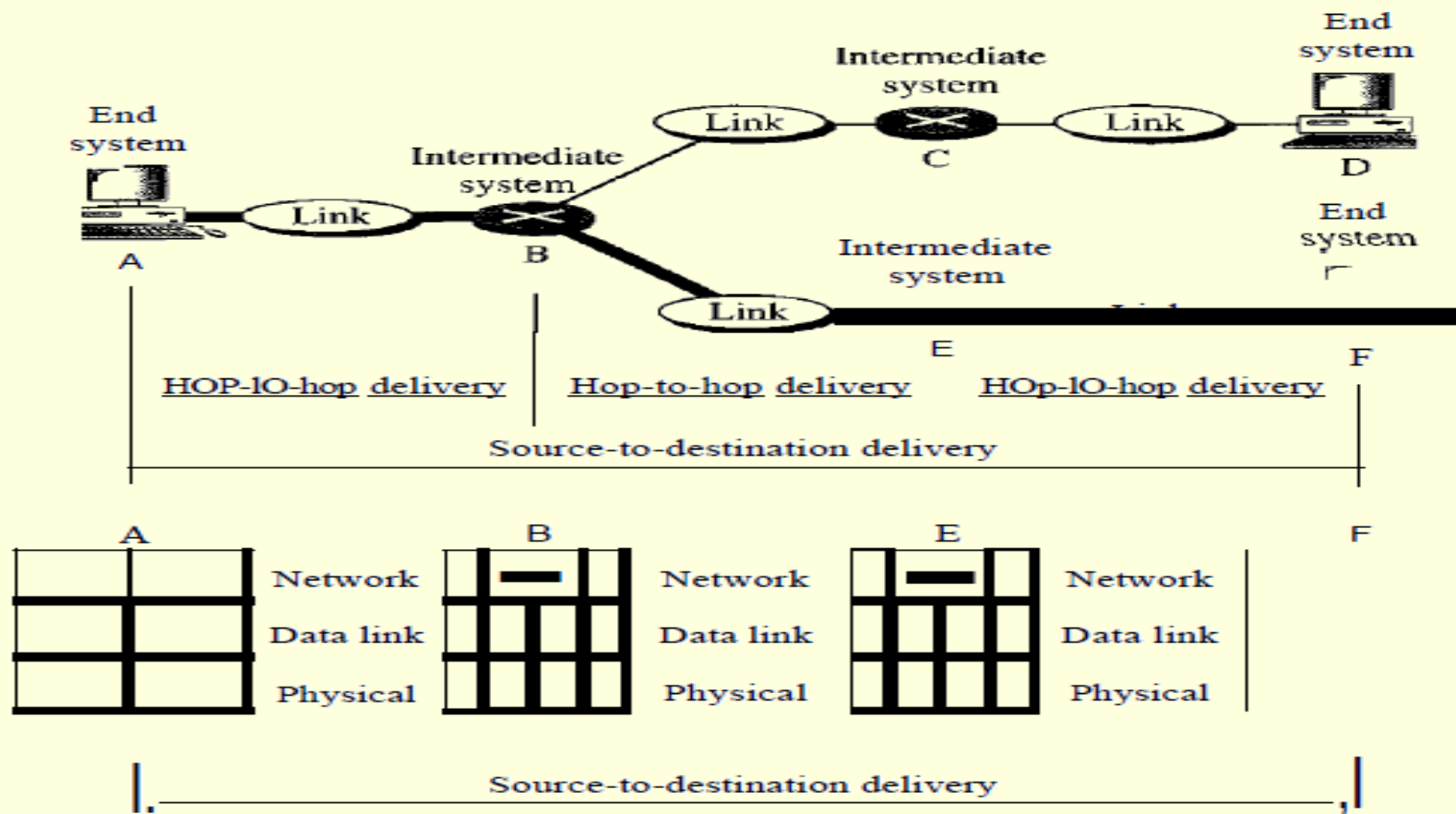


Network Layer

- Responsible for the source-to-destination delivery of a packet

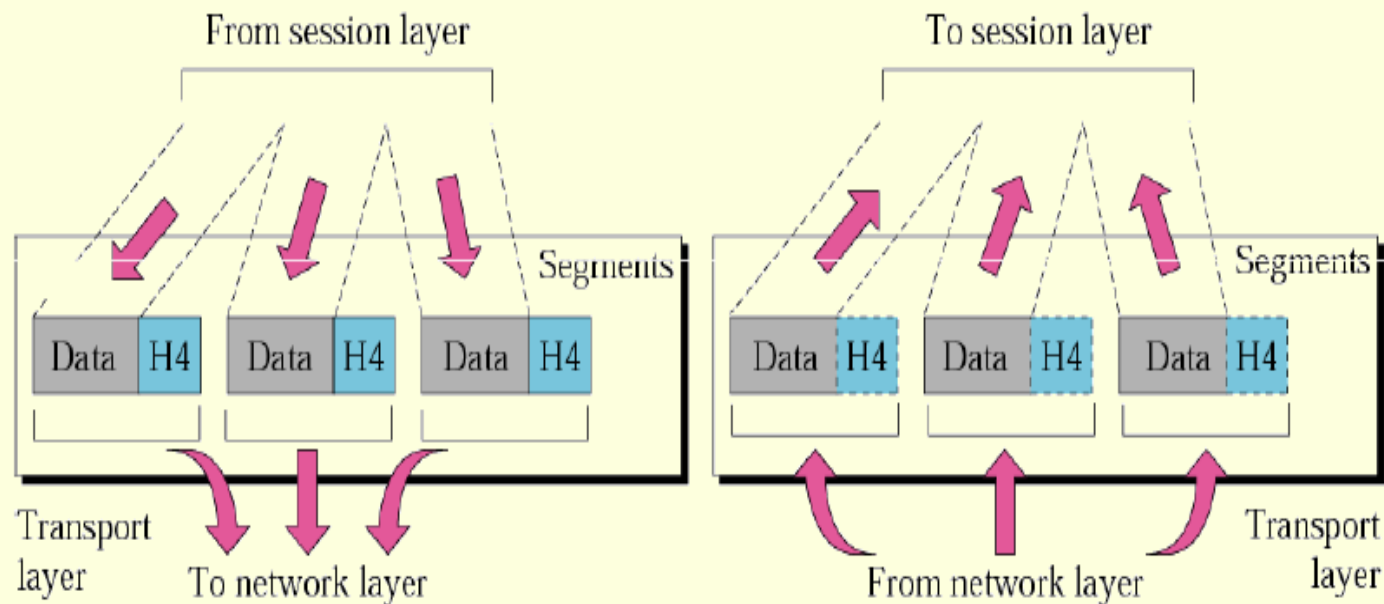


- Logical addressing
 - ✓ logical addresses of the sender and receiver
- Routing



Transport Layer

- responsible for process-to-process delivery of the entire message
- A process is an application program running on a host

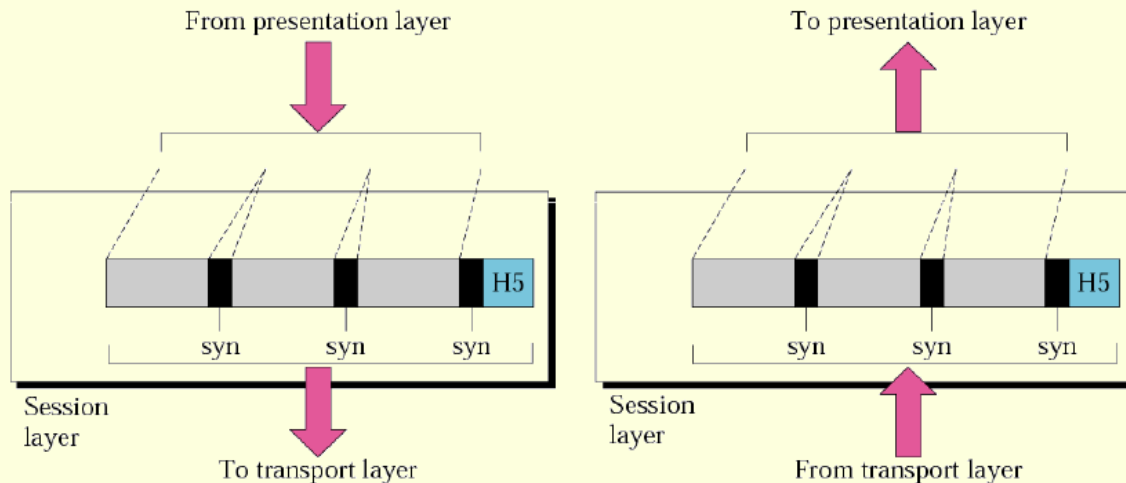


- Service-point addressing
 - ✓ port address
- Segmentation and reassembly
 - ✓ segment containing a sequence number
- Connection control :
 - ✓ connectionless or connection oriented ?
- Flow control
- Error control
 - ✓ process-to –process
 - ✓ Error correction is usually achieved through retransmission.

□ Session Layer

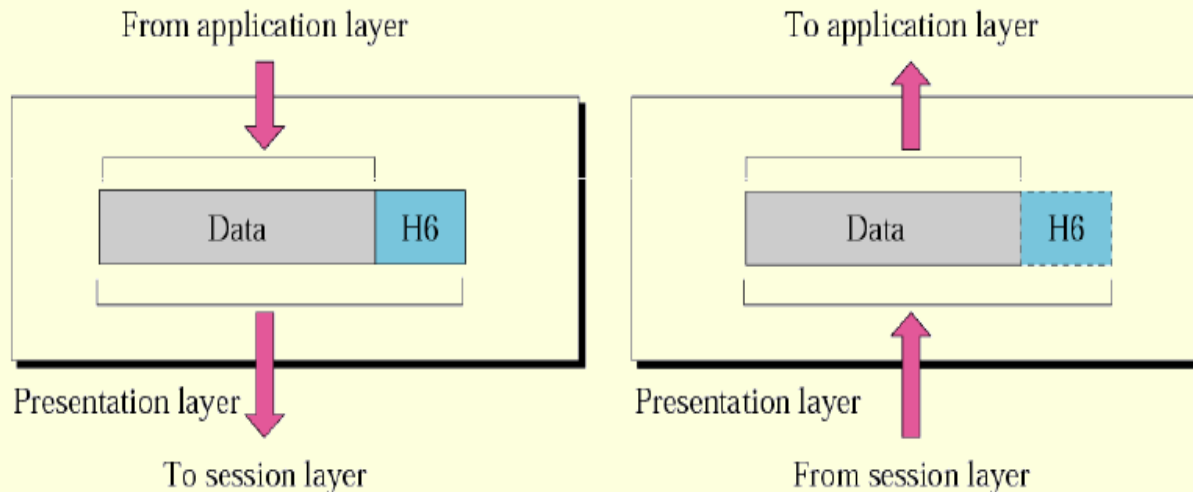
Establishes, maintains, and synchronizes the interaction among communicating systems

- Dialog control
- Synchronization



❑ Presentation Layer

- Translation
- Encryption : (Encryption & Decryption)
- Compression : (reduces the number of bits)



□ Application Layer

- Network virtual terminal
- File transfer, access & management
- Mail services
- Directory services

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data unit

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Media, Signal
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Transmission Control Protocol / Internet protocol

TCP / IP

OSI Model Layers

Application
Layer

Presentation
Layer

Session
Layer

Transport
Layer

Network
Layer

Data-Link
Layer

Physical
Layer

TCP/IP Protocol Architecture Layers

Application
Layer

Host-to-Host
Transport
Layer

Internet
Layer

Network
Interface
Layer

❑ Physical and Data Link Layers

Network Layer

IP ,ARP, RARP , ICMP , IGMP

❖ Internetworking Protocol (IP)

- Transmission mechanism
- Datagrams
- An unreliable
- Connectionless protocol
- Best-effort delivery service

❖ Address Resolution Protocol
ARP

❖ Reverse Address Resolution Protocol
RARP

❖ Internet Control Message Protocol
ICMP

❖ Internet Group Message Protocol
IGMP

□ Transport Layer

UDP , TCP , SCTP

❖ User Datagram Protocol UDP

- Process-to-process protocol that adds only port addresses
- Checksum
- Error control
- Length information

❖ Transmission Control Protocol

TCP

- Reliable stream transport protocol
 - ✓ connection-oriented
- Segments
- Sequence number in every segment

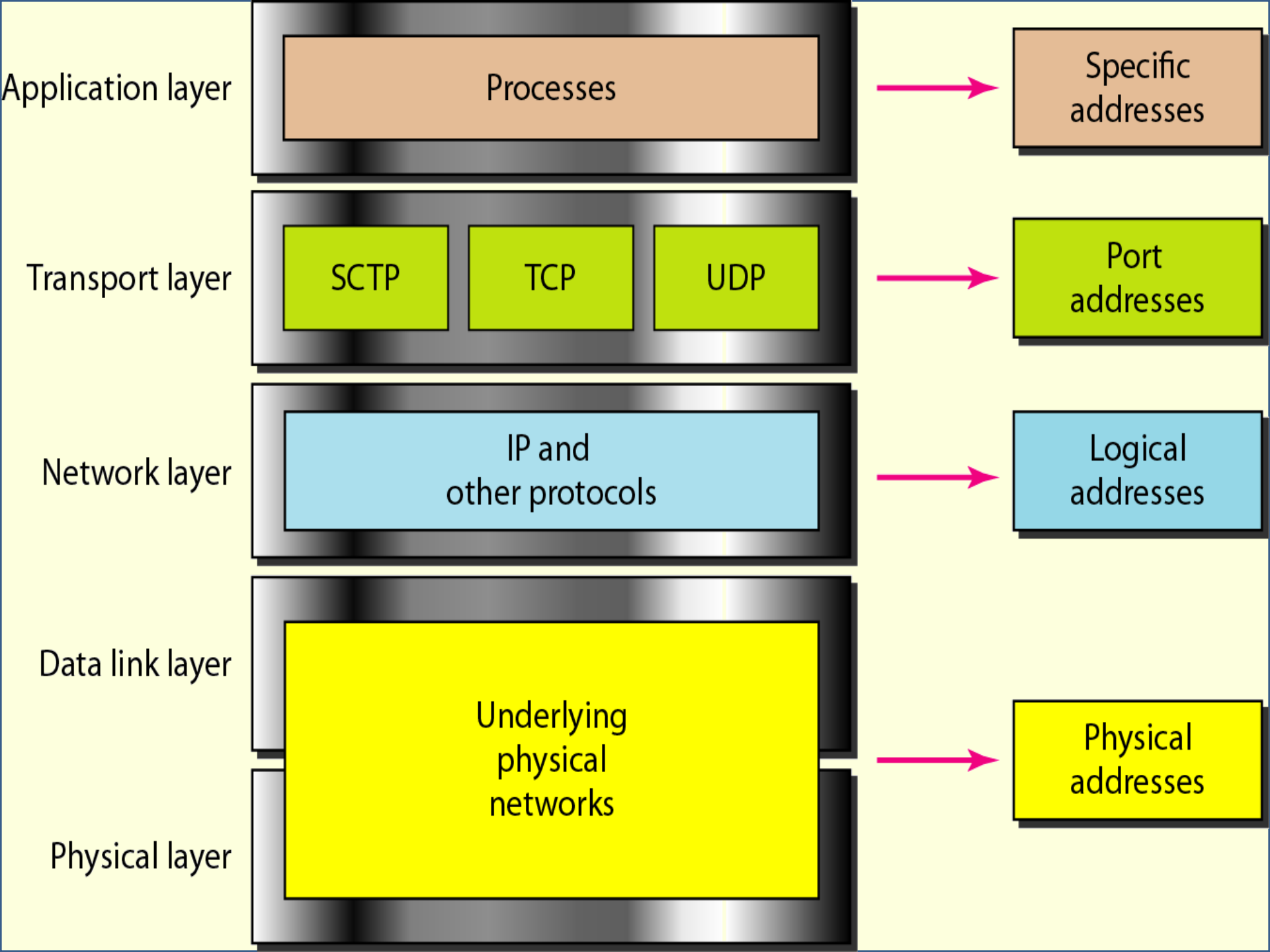
❖ **Stream Control Transmission Protocol SCTP**

□ Application Layer

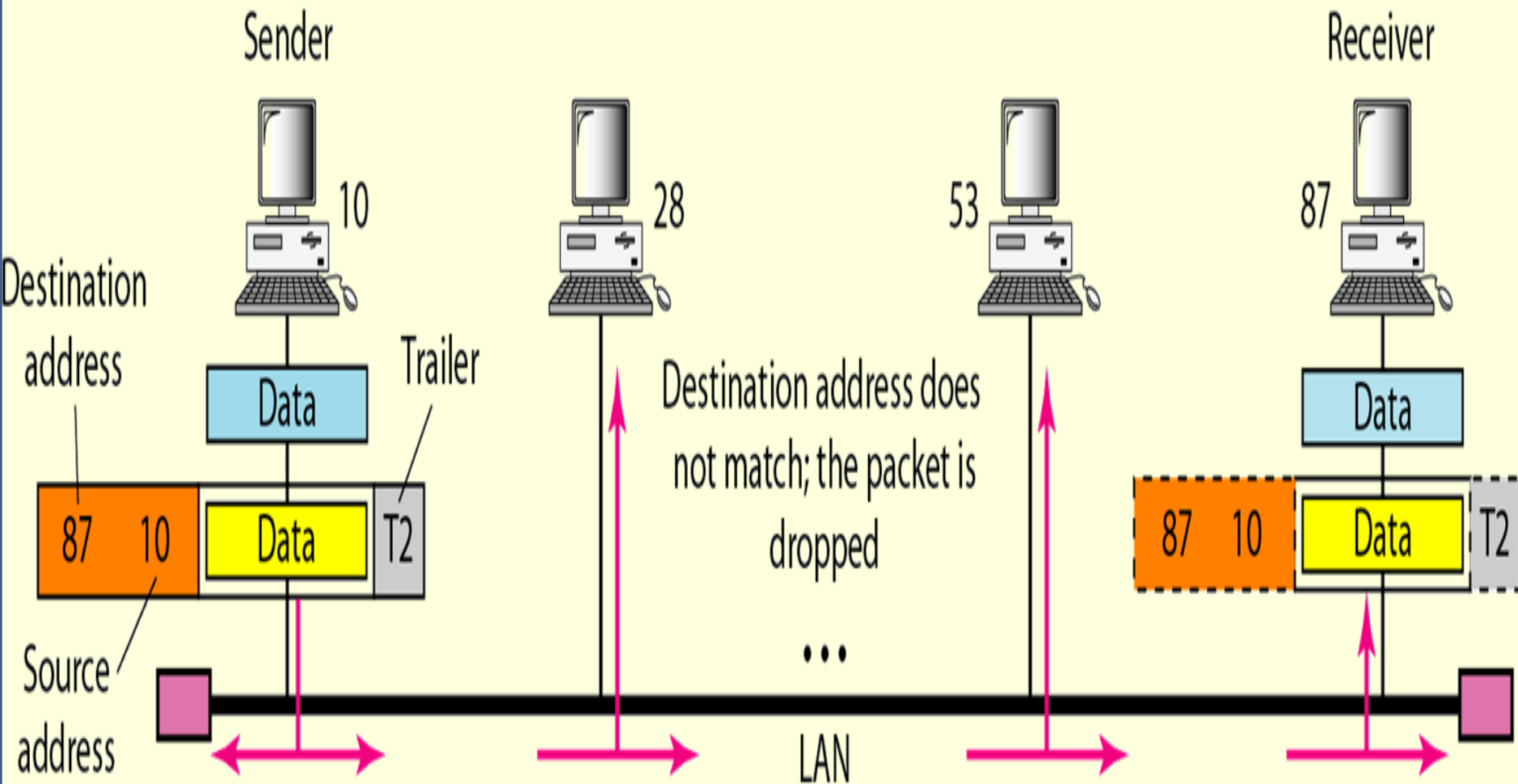
Session, Presentation, and Application

ADDRESSING

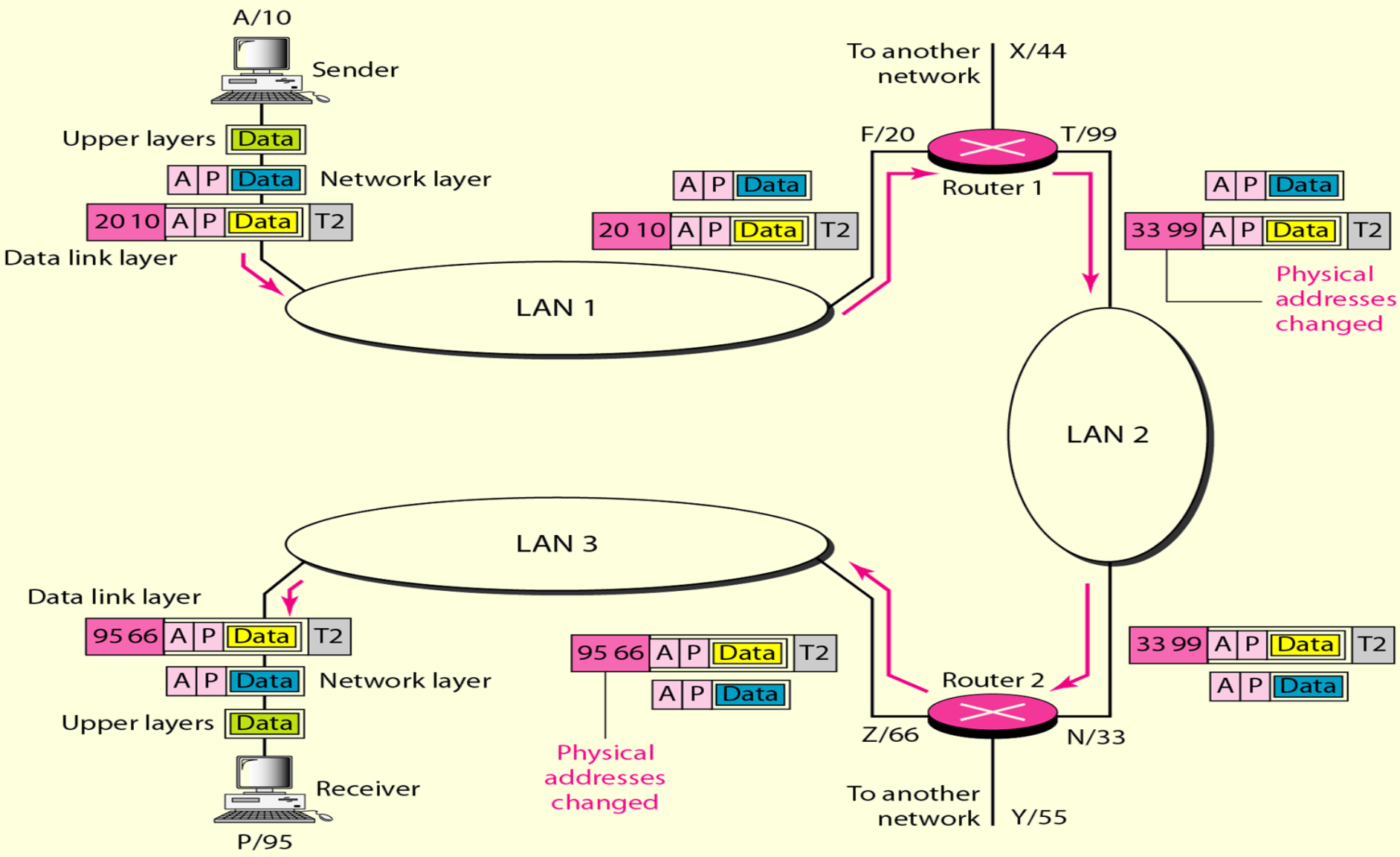
- Physical (link) addresses
- Logical (IP) addresses
- Port addresses
- Specific addresses



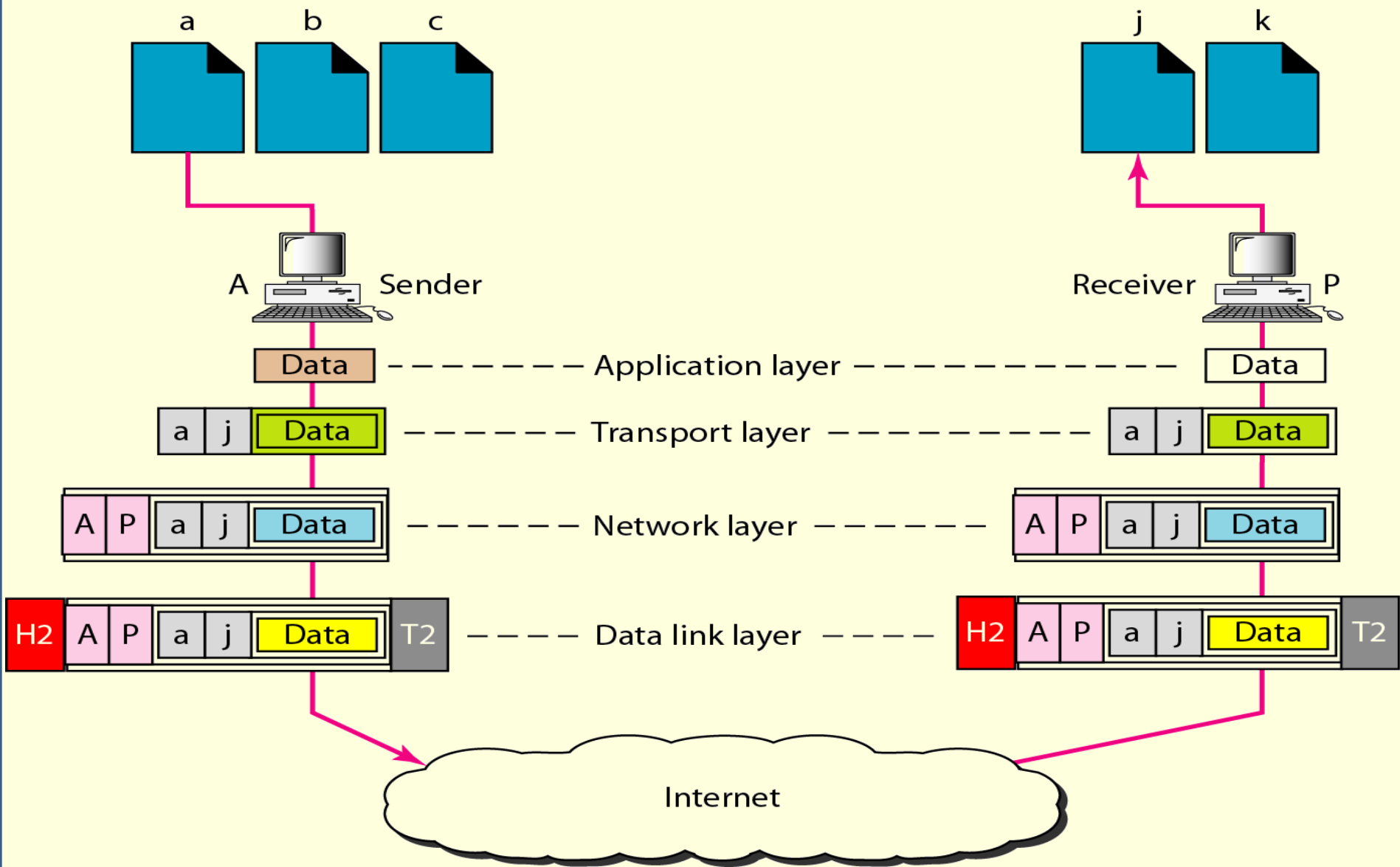
Physical addresses



IP addresses



Port addresses



Specific Addresses

Thank you