Computer Networks

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In last two classes

- Generic Idea
- Data communication
- Network
- Physical structure of a network

What you will be able to understand

- **Classification of Network**
- **Network Service**
- **Network Layer**
- **Why different Layers**
- **Reference Model**

Local Area Network

- Privately-owned networks within a single building or campus of up to a few Kilometers in size.

- Characteristics :Size, Transmission technology, Topology
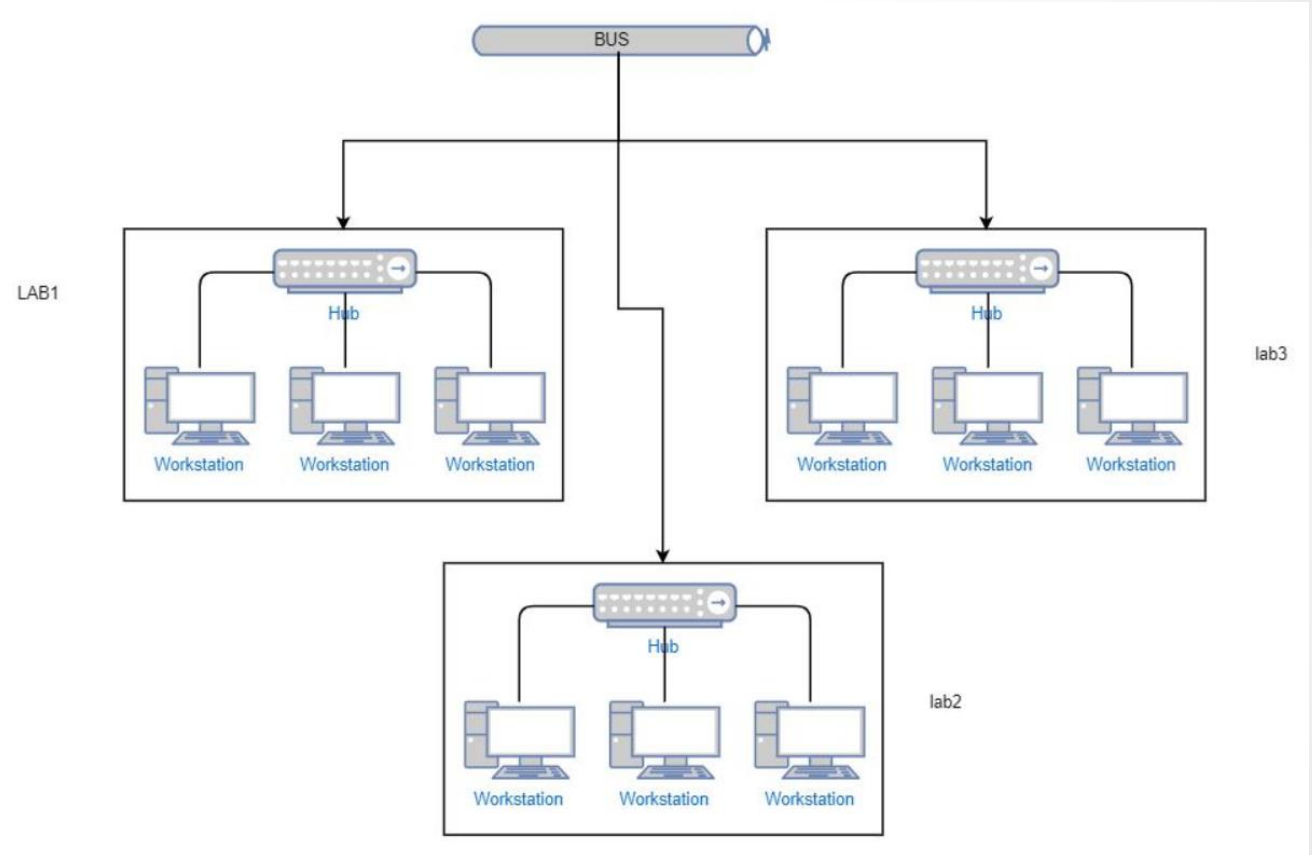
Metropolitan Area Network

- A metropolitan area network, or MAN, covers a city. The best-known example of a MAN is the cable television network available in many cities.

- Characteristics :Size, Transmission technology, Topology
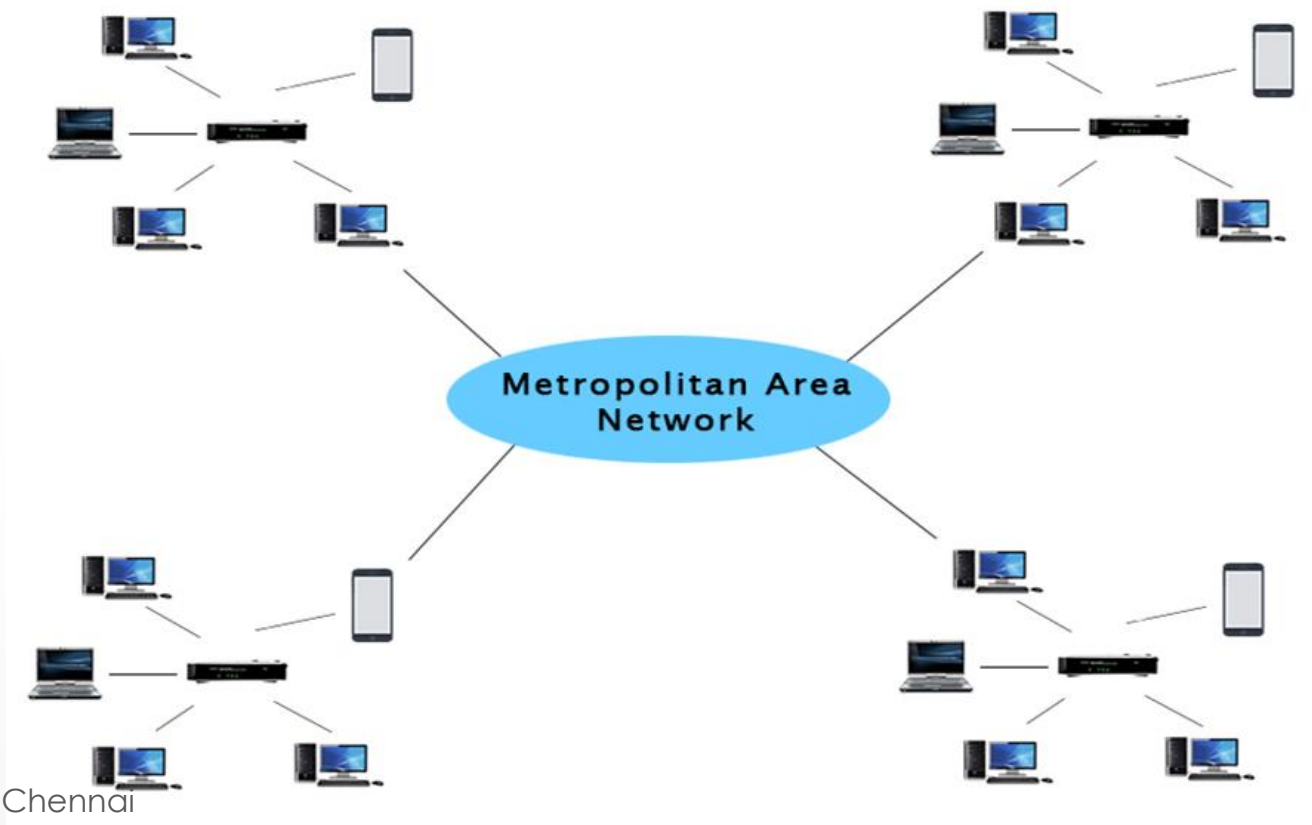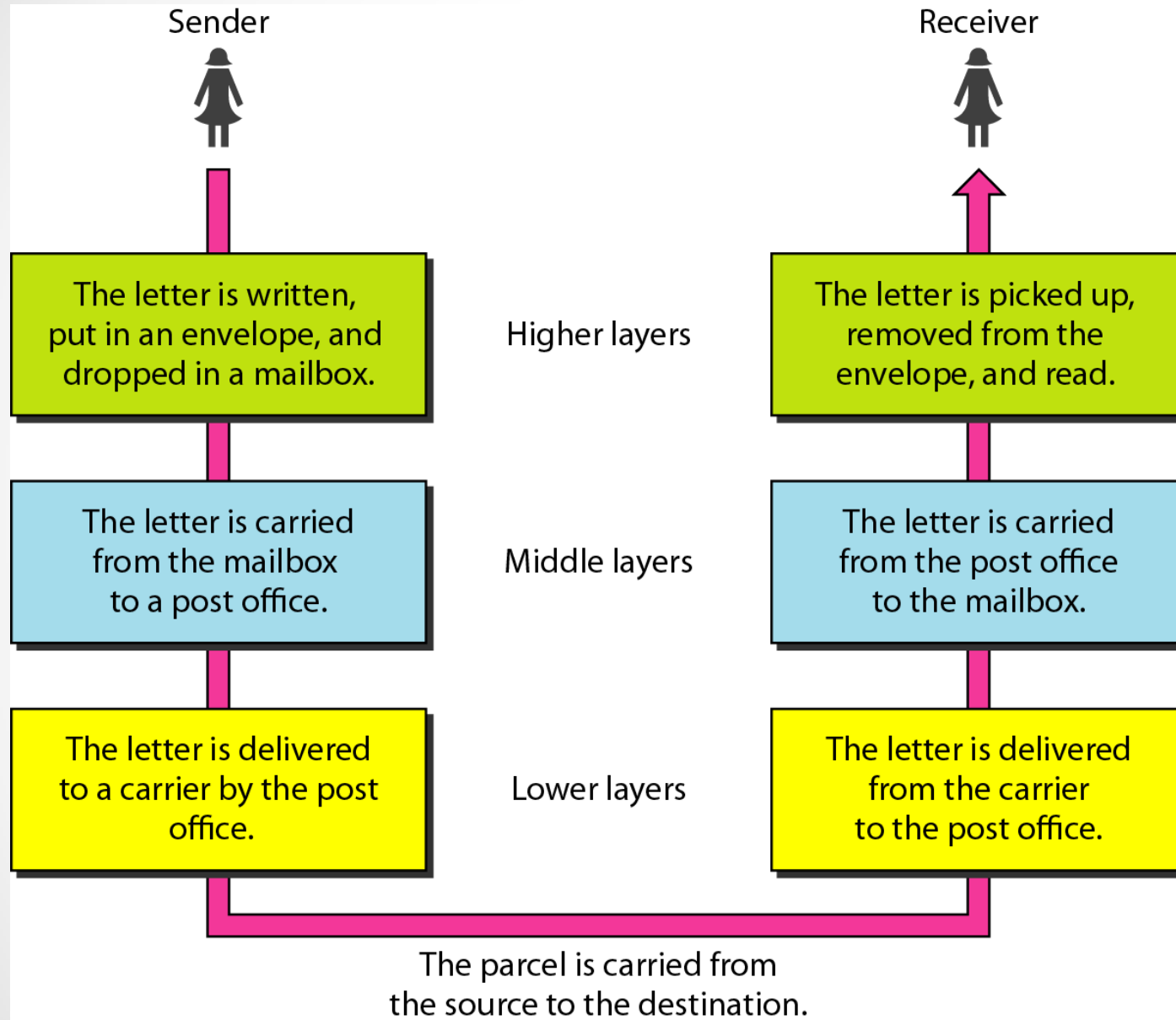
Wide Area Network

- A wide area network, or WAN, spans a large geographical area, often a country or continent. It contains a collection of machines intended for running user (i.e., application) programs

- Characteristics :Size, Transmission technology, Topology

Personal Area Network

Inkjet Printer

Desktop PC
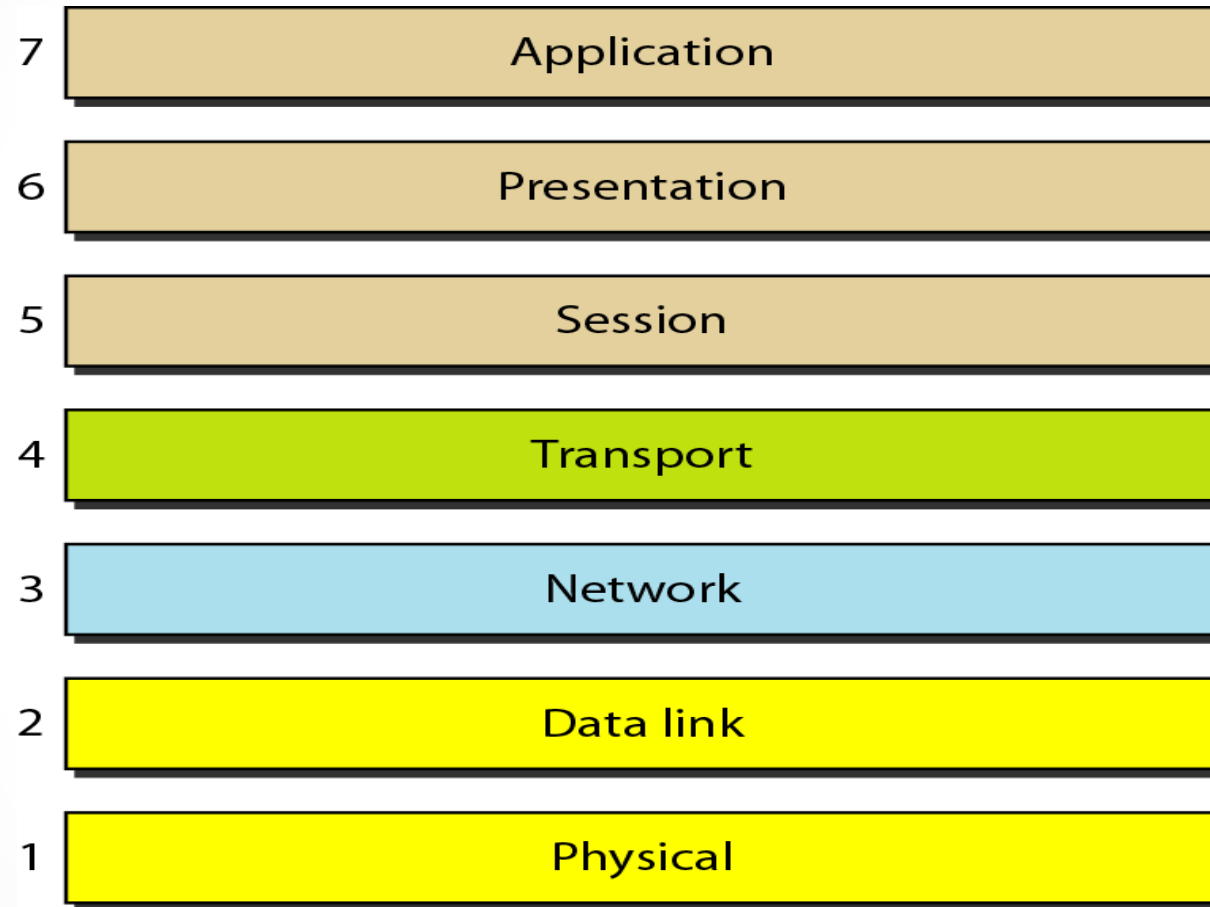
Laptop Computer

PDA

Mobile Phone

- A personal area **network**, or **PAN**, is a computer **network** that enables communication between computer devices near a person.

- **Examples** of wireless **PAN**, or WPAN, devices include cell phone headsets, wireless keyboards, wireless mice, printers, bar code scanners and game consoles

Sender | Higher layers | Receiver

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

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

Higher layers

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

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

Middle layers

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

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

Lower layers

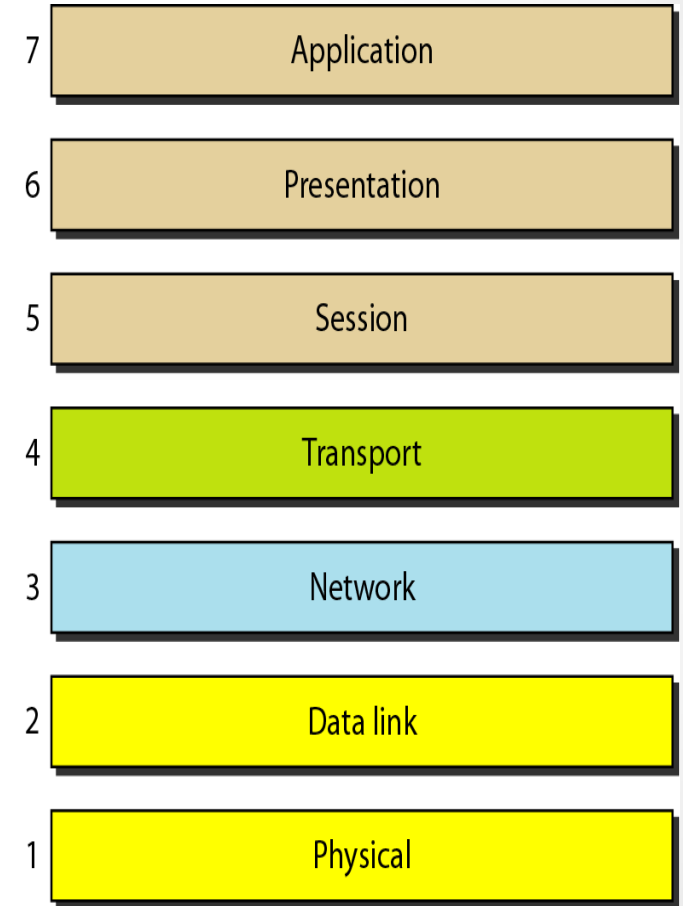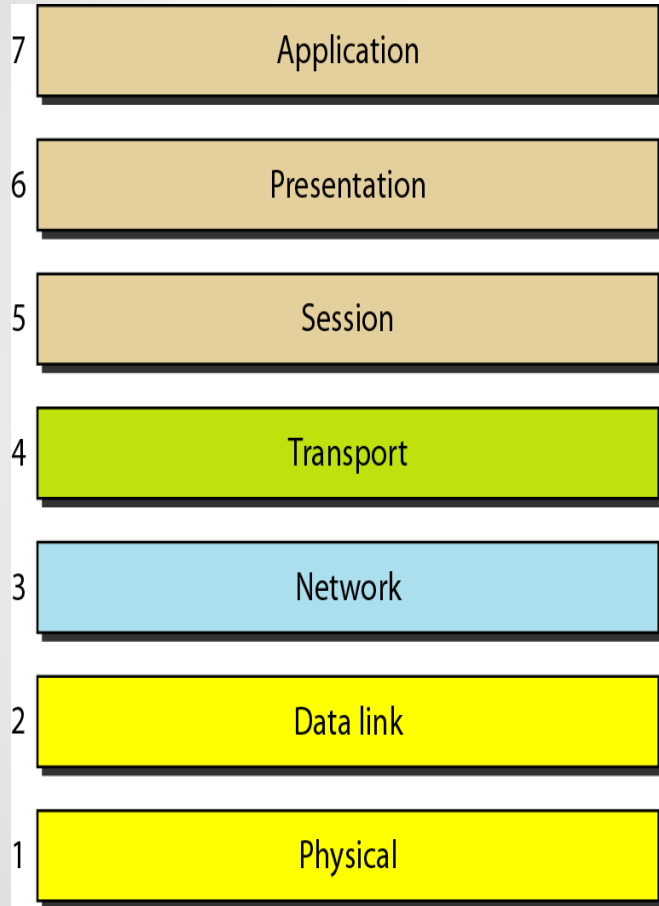The parcel is carried from the source to the destination.

An ISO standard that covers all aspects of network communications is **the Open Systems Interconnection (OSI)** model - introduced in the late 1970s.

Seven layers of the OSI model

Source: Data Communications and Networking – Behrouz A. Forouzan

Seven layers of the OSI model

7	Application		7	Application
6	Presentation		6	Presentation
5	Session		5	Session
4	Transport		4	Transport
3	Network		3	Network
2	Data link		2	Data link
1	Physical		1	Physical

The interaction between layers in the OSI model

Source: Data Communications and Networking – Behrouz A. Forouzan
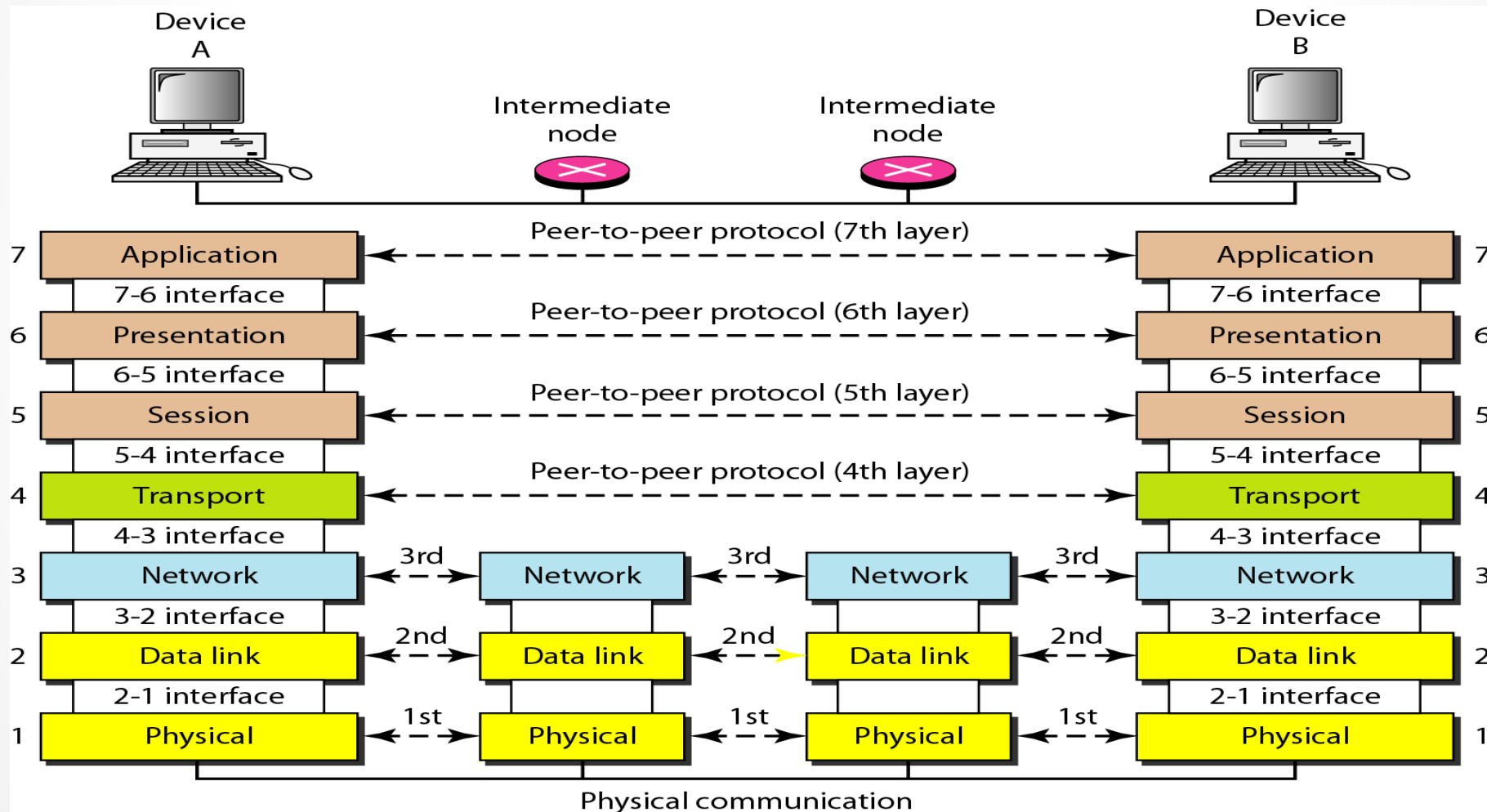
Peer to Peer

Stands for "Peer to Peer." In a P2P network, the "peers" are computer systems which are connected to each other via the Internet. Files can be shared directly between systems on the network without the need of a central server. In other words, each computer on a P2P network becomes a file server as well as a client.

Within a single machine, each layer calls upon the services of the layer just below it.

*Layer 3, for example, **uses the services provided by layer 2** and **provides services for layer 4**.*

Peer to Peer

Between machines, **layer x on one machine communicates with layer x on another machine**. This communication is governed by an agreed-upon series of rules and conventions called protocols.

The processes on each machine that communicate at a given layer are called **peer-to-peer processes**.

Communication between machines is therefore a peer-to-peer process using the protocols appropriate to a given layer.

Interfaces Between Layers

The passing of the data and network information down through the layers of the sending device and back up through the layers of the receiving device is made possible by an interface between each pair of adjacent layers.

Each interface defines the information and services a layer must provide for the layer above it. Well-defined interfaces and layer functions provide modularity to a network.

As long as a layer provides the expected services to the layer above it, the specific implementation of its functions can be modified or replaced without requiring changes to the surrounding layers.

An exchange using the OSI model

Source: Data Communications and Networking – Behrouz A. Forouzan
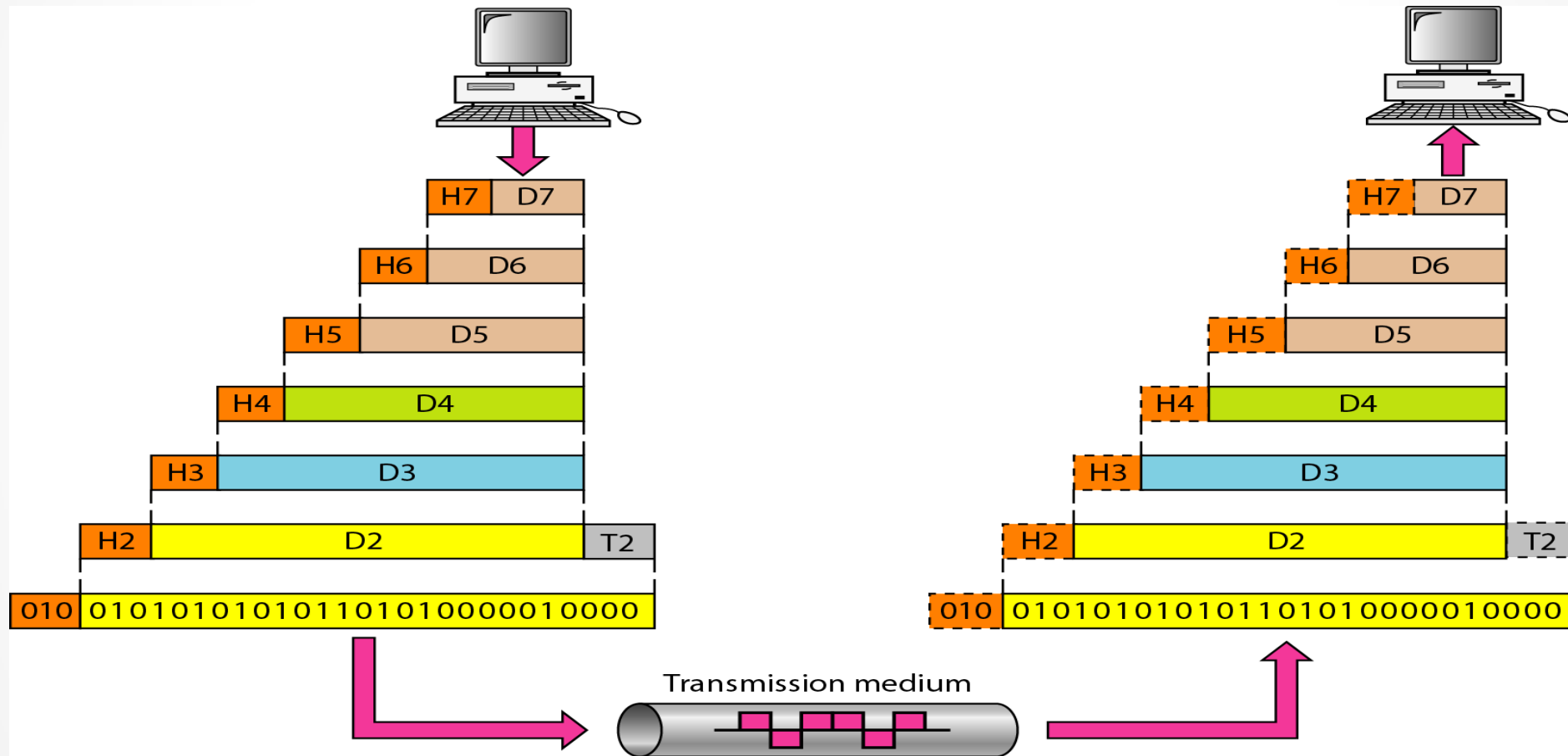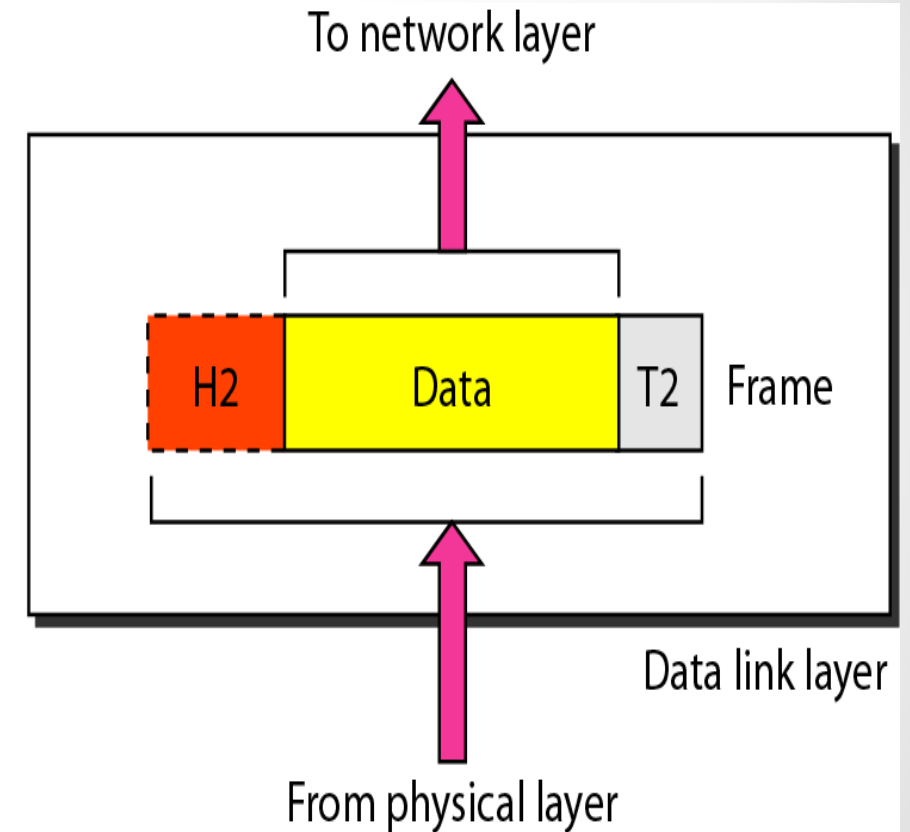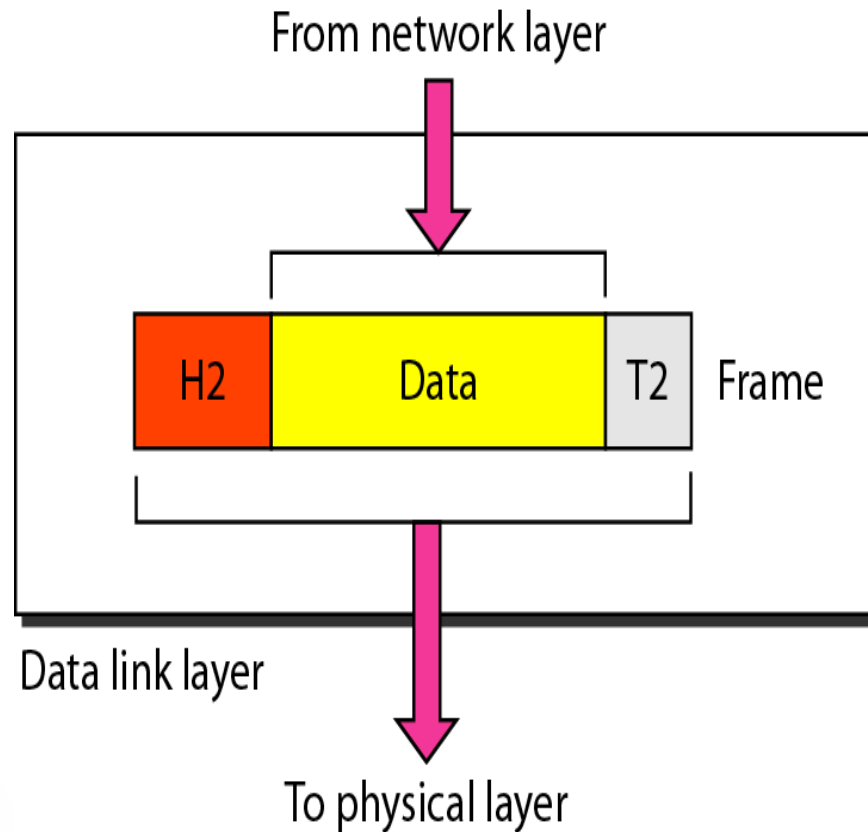
Physical layer

The physical layer is responsible for movements of individual bits from one hop (node) to the next
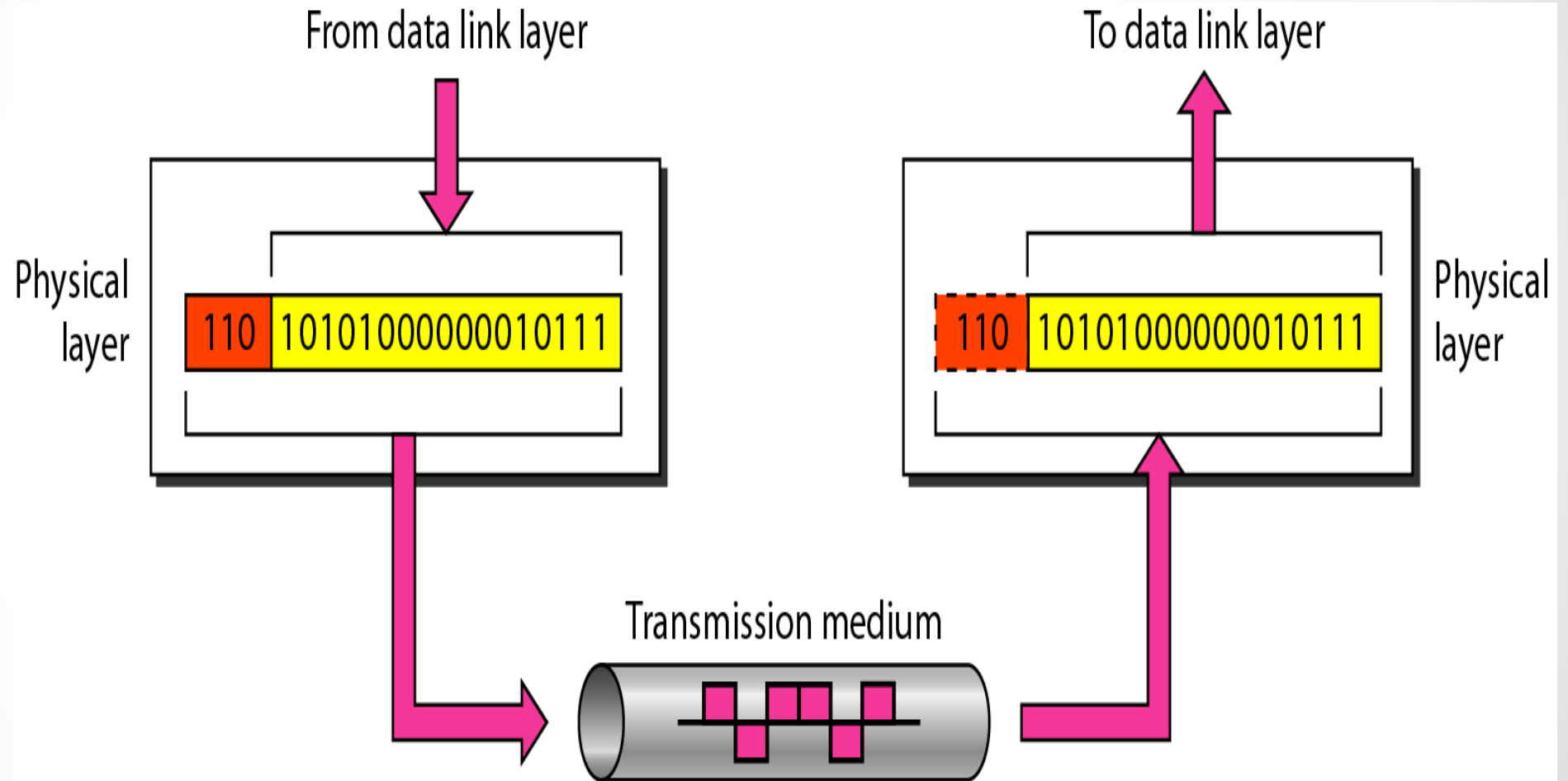
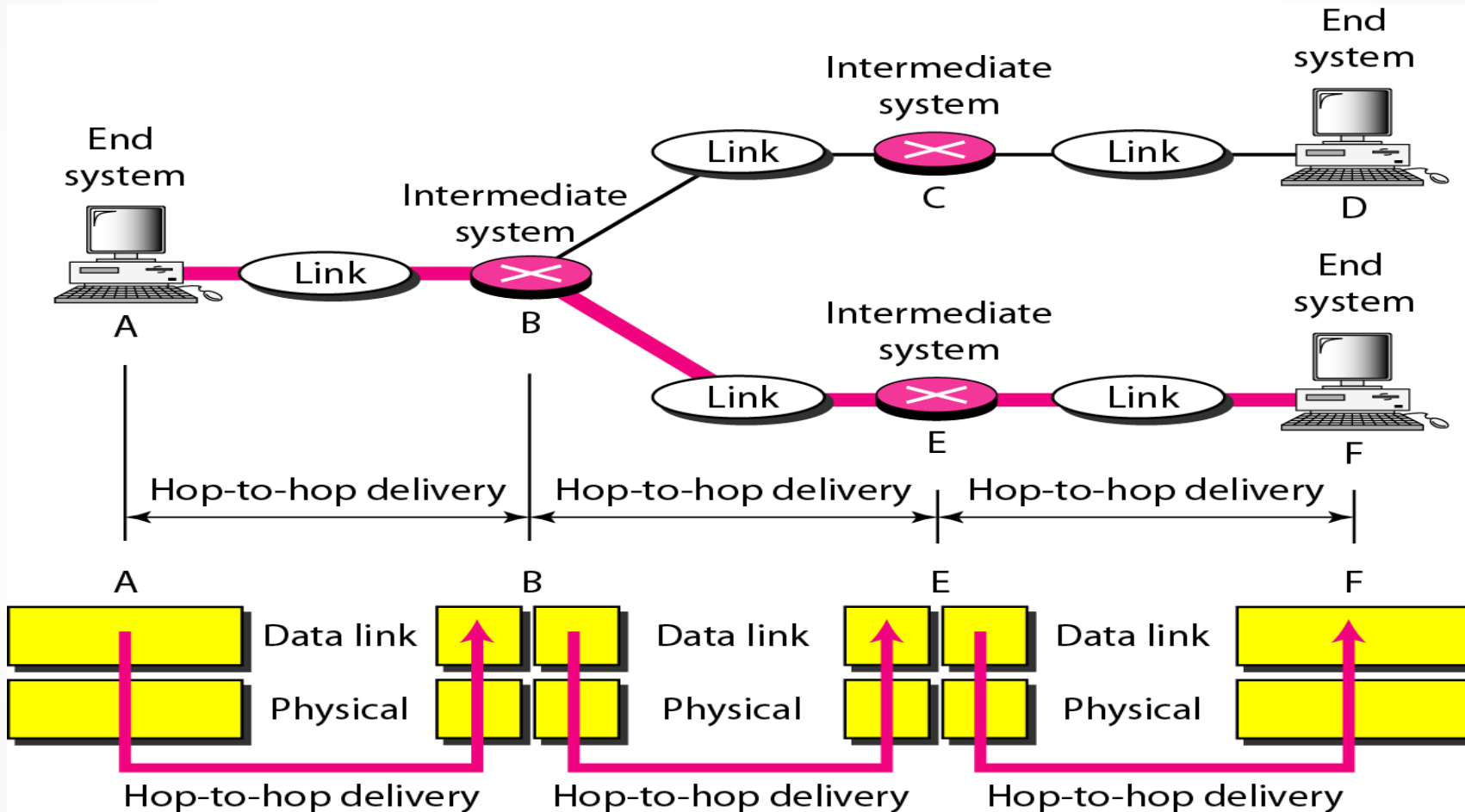Source: Data Communications and Networking – Behrouz A. Forouzan

Data link layer (Cont....)

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

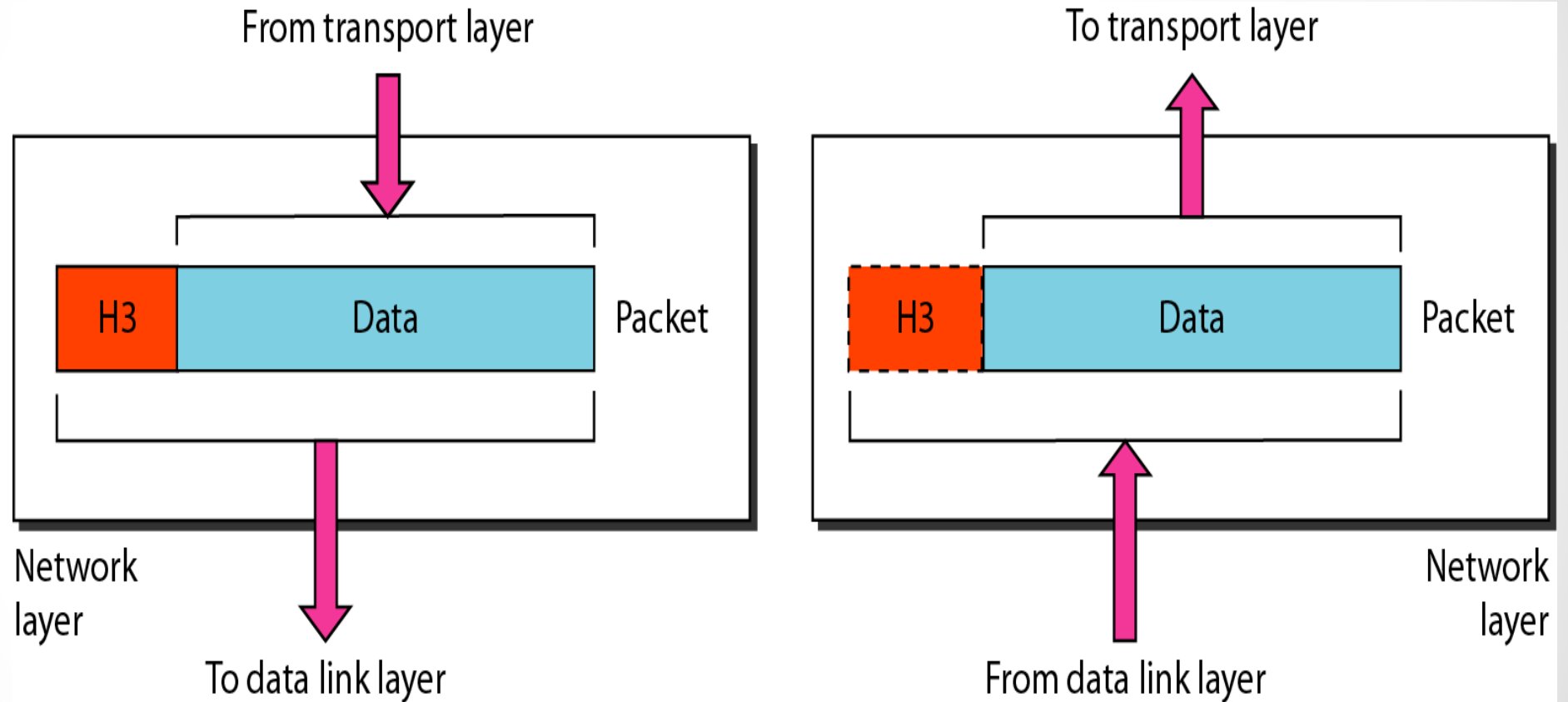Source: Data Communications and Networking – Behrouz A. Forouzan

Hop-to-hop delivery

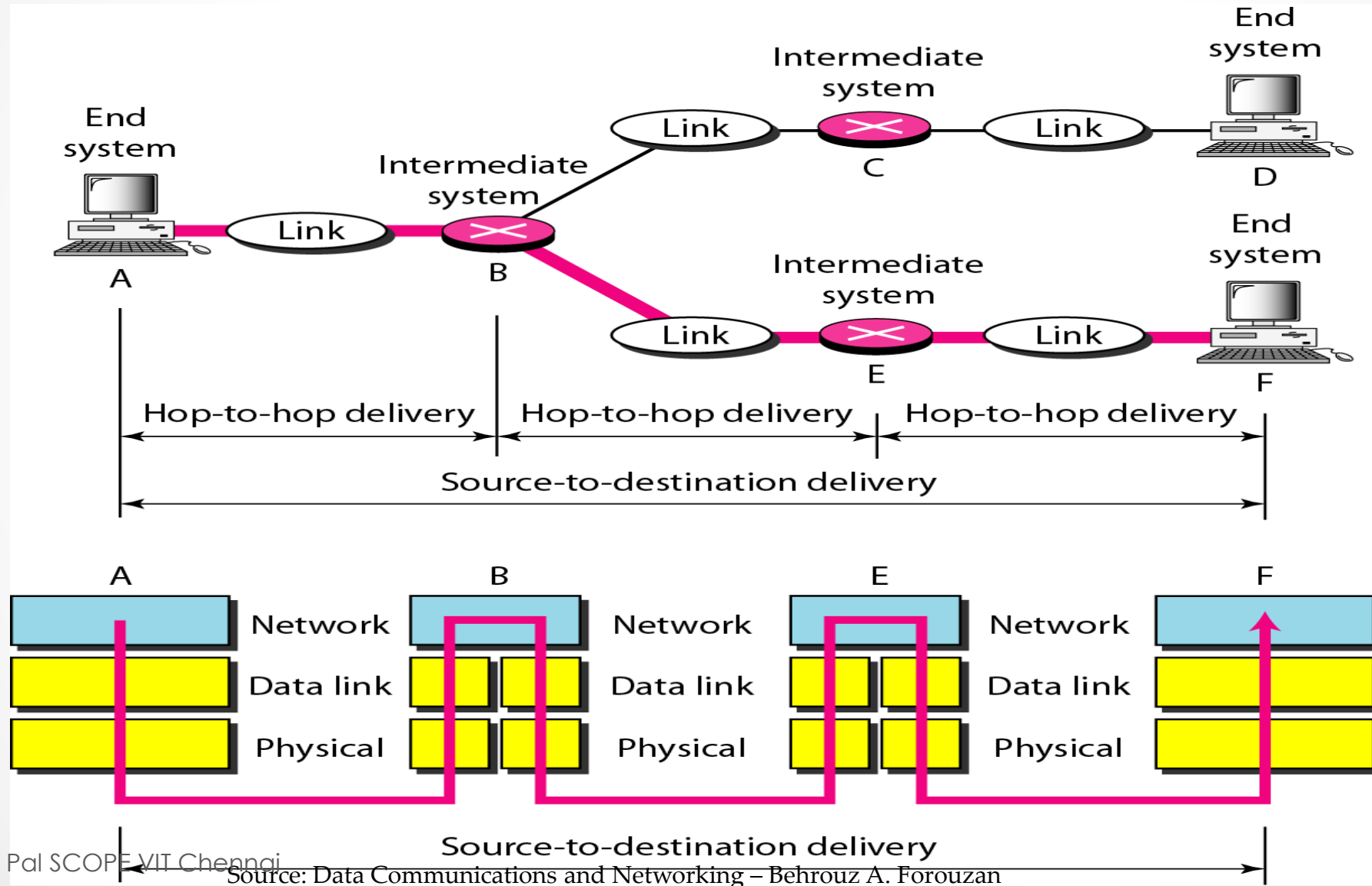Source: Data Communications and Networking – Behrouz A. Forouzan

Network layer

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

From transport layer

H3 | Data | Packet

Network layer

To data link layer

To transport layer

H3 | Data | Packet

Network layer

From data link layer

Source: Data Communications and Networking – Behrouz A. Forouzan

Source to destination delivery

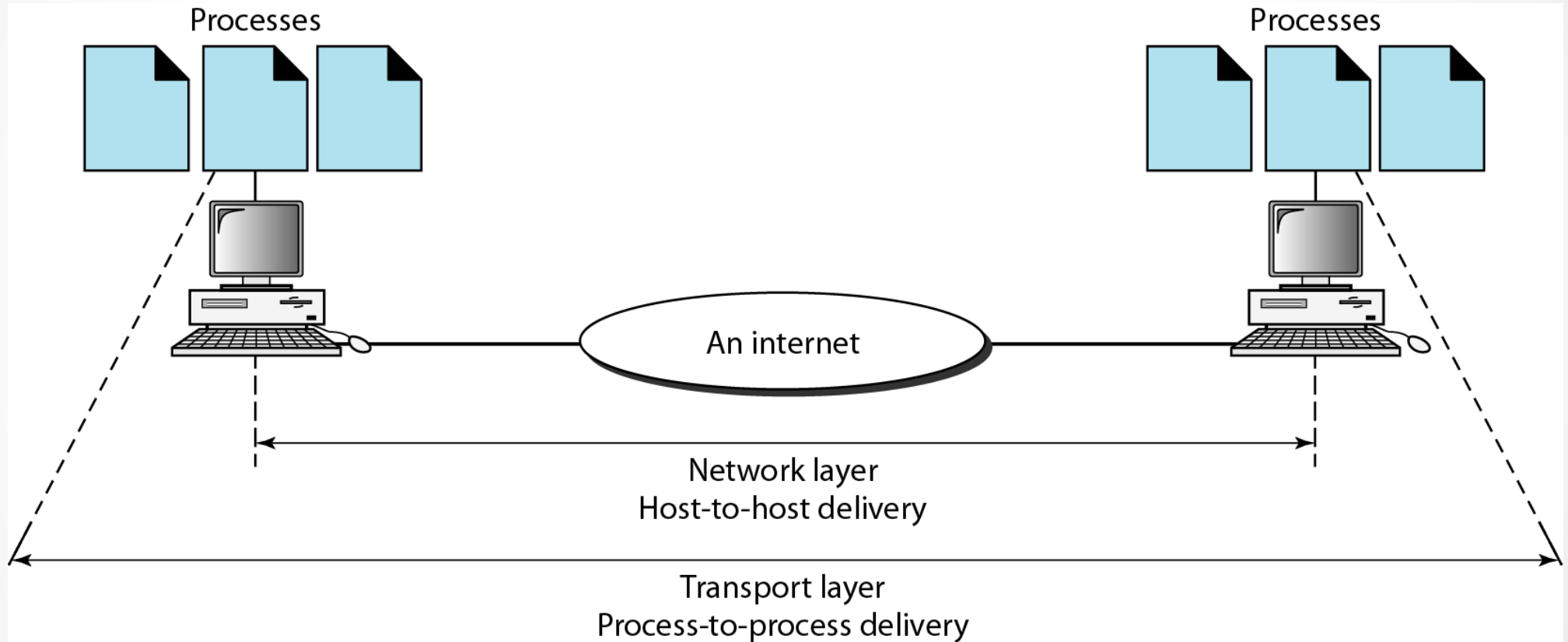Source: Data Communications and Networking – Behrouz A. Forouzan

Transport layer

The transport layer is responsible for the delivery of a message from one process to another.
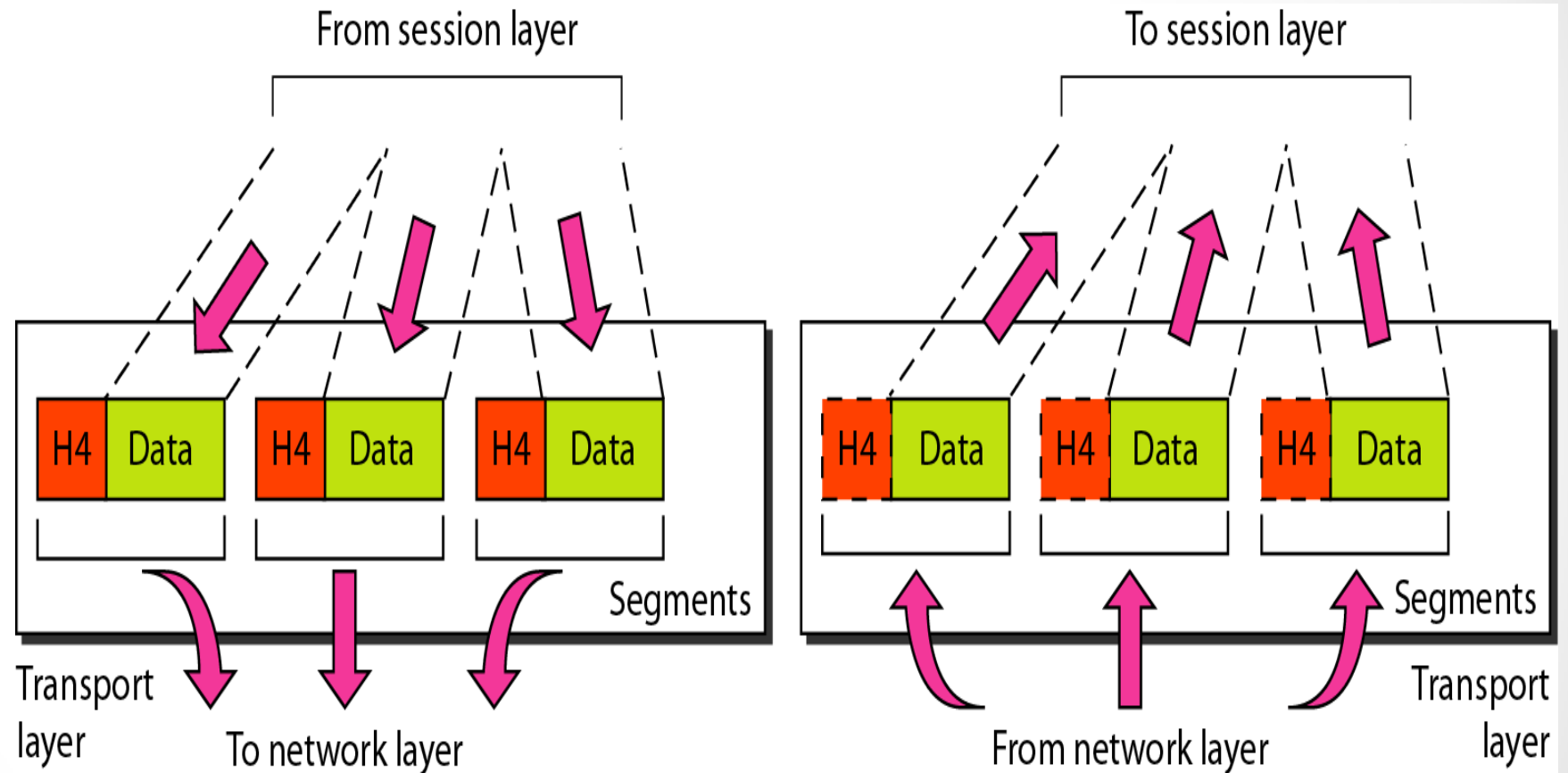
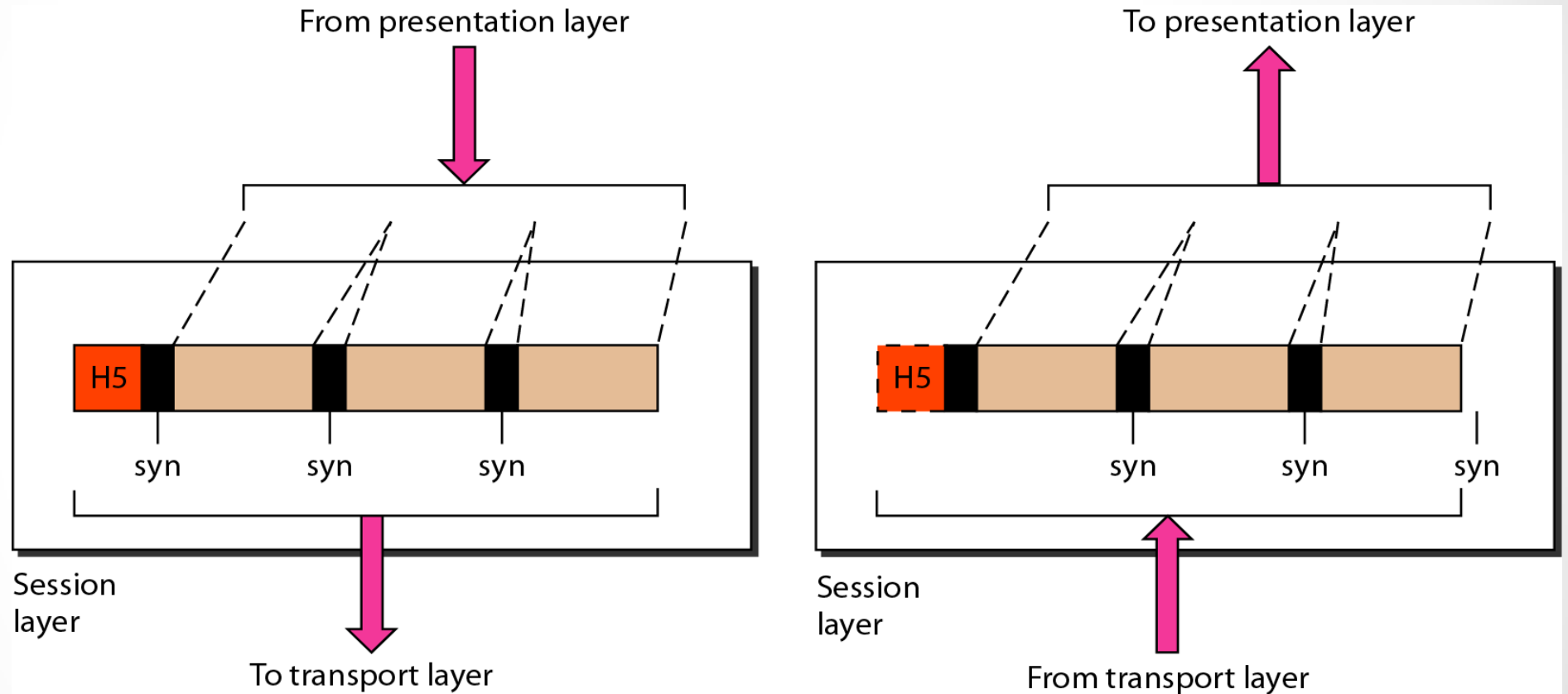Source: Data Communications and Networking – Behrouz A. Forouzan

Reliable process-to-process delivery of a message

Source: Data Communications and Networking – Behrouz A. Forouzan
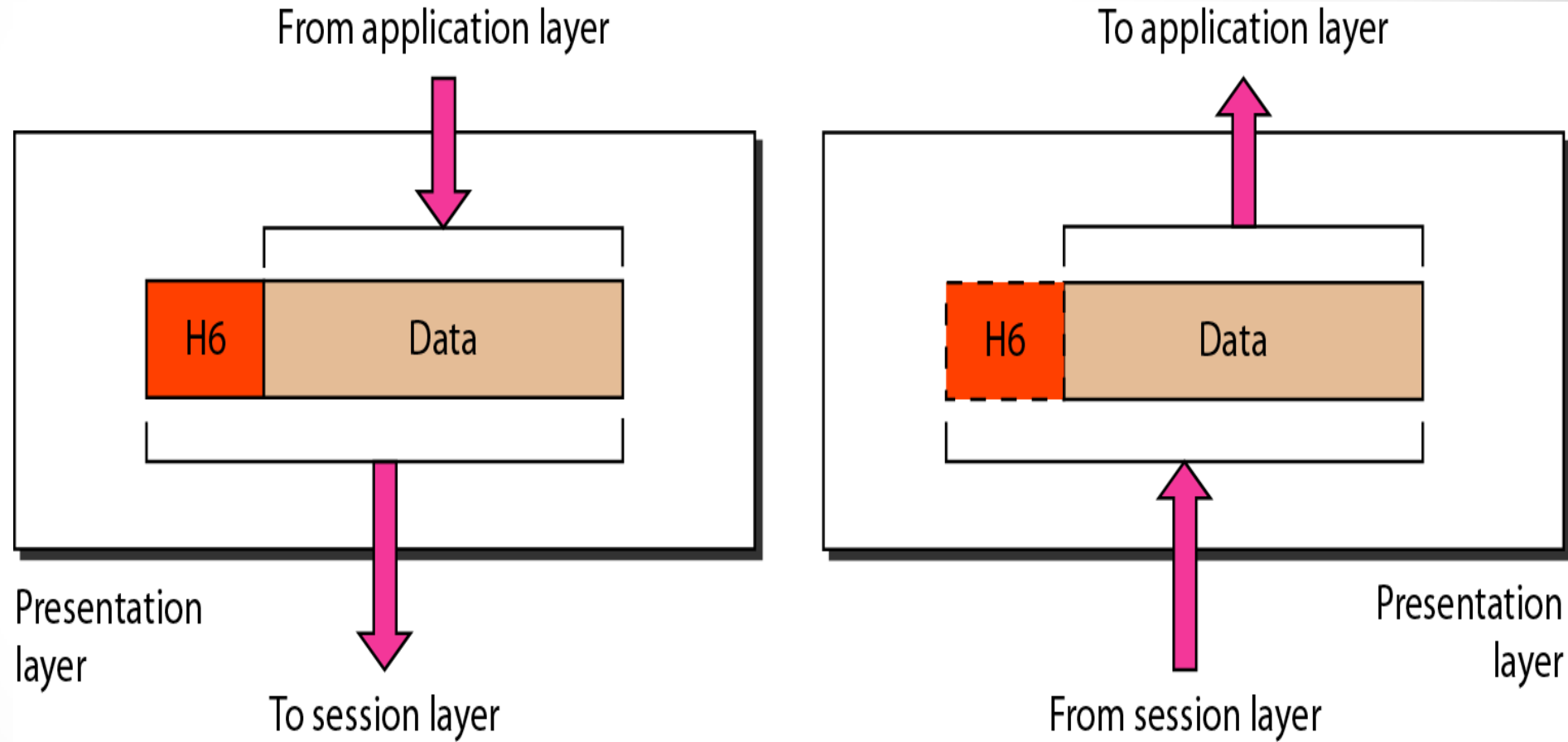
Session layer

The session layer is responsible for dialog control and synchronization.

Source: Data Communications and Networking – Behrouz A. Forouzan
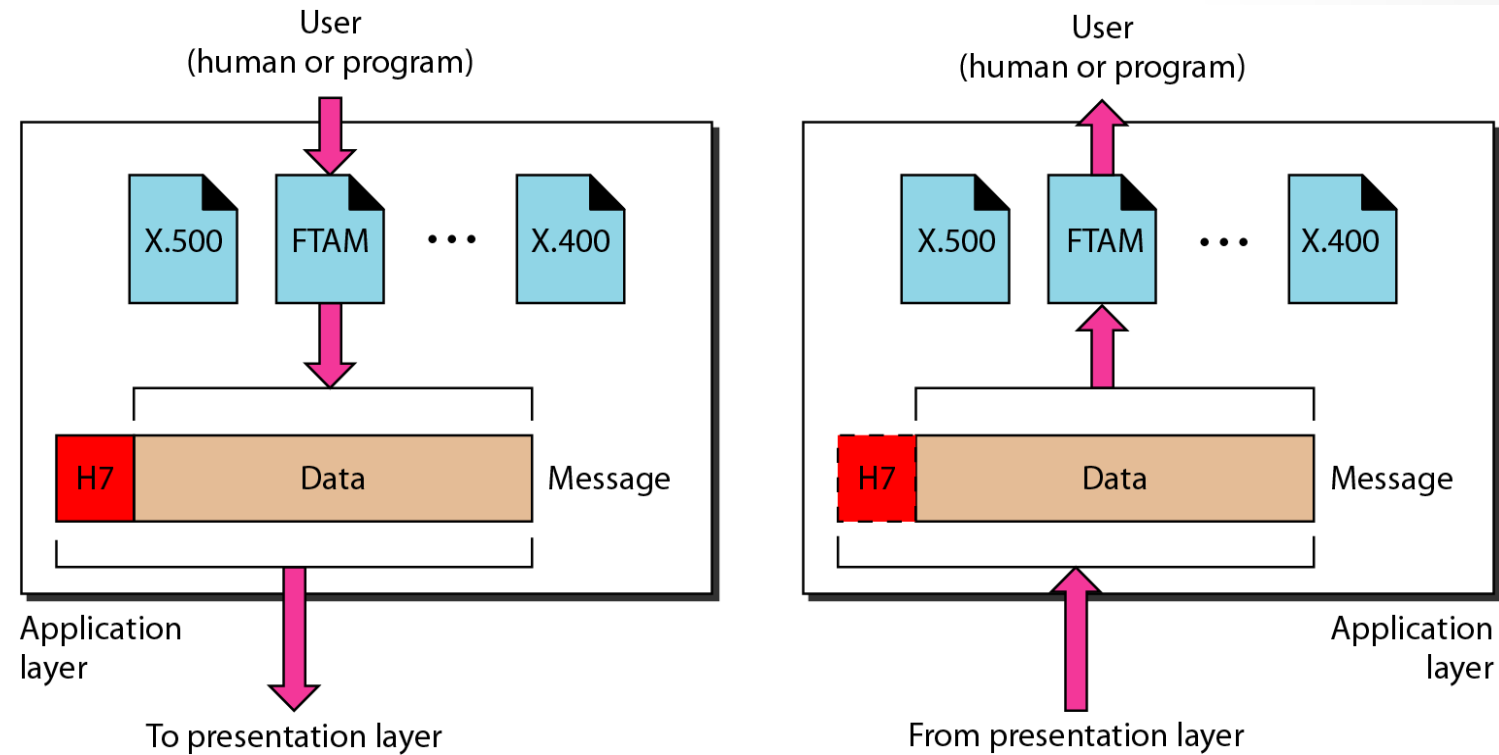
Presentation layer

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

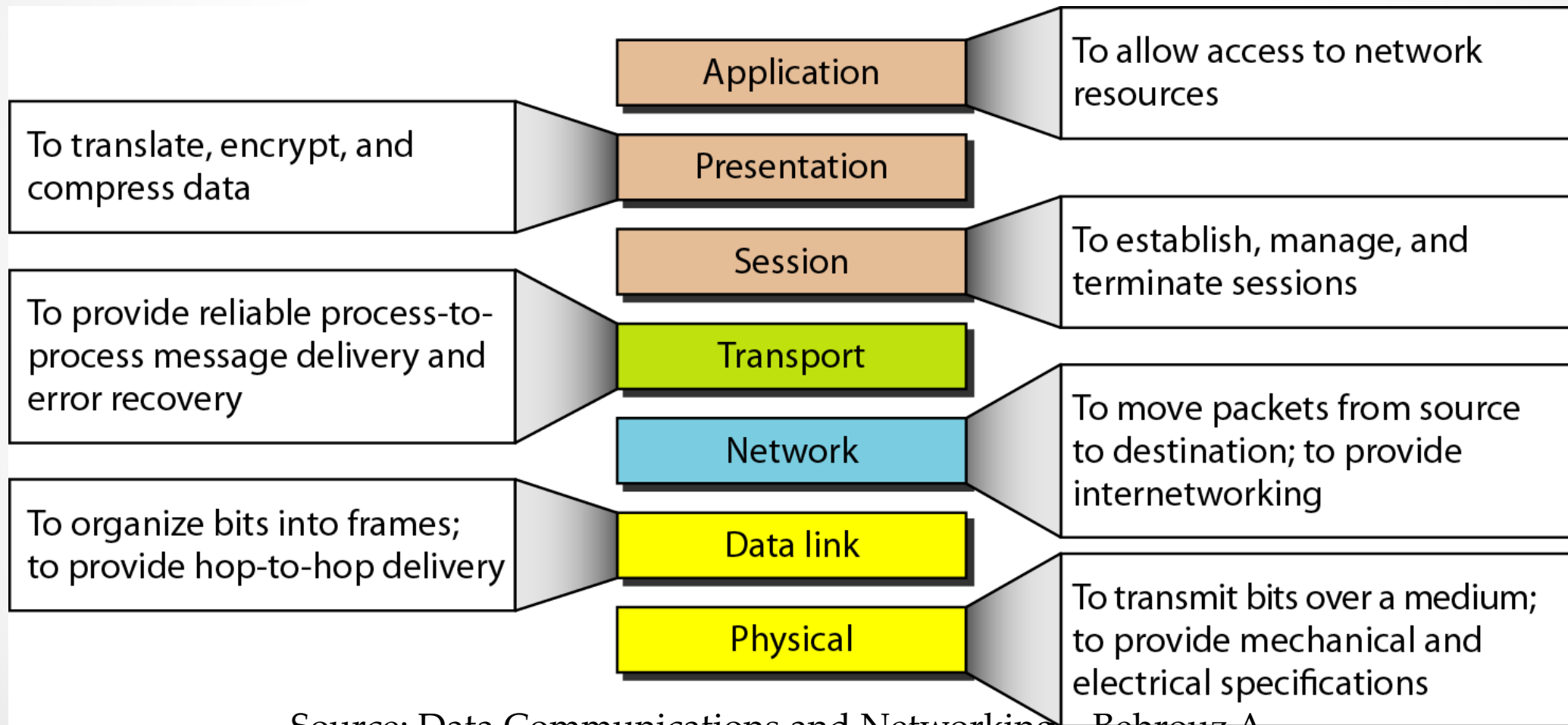Source: Data Communications and Networking – Behrouz A. Forouzan

Application layer

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

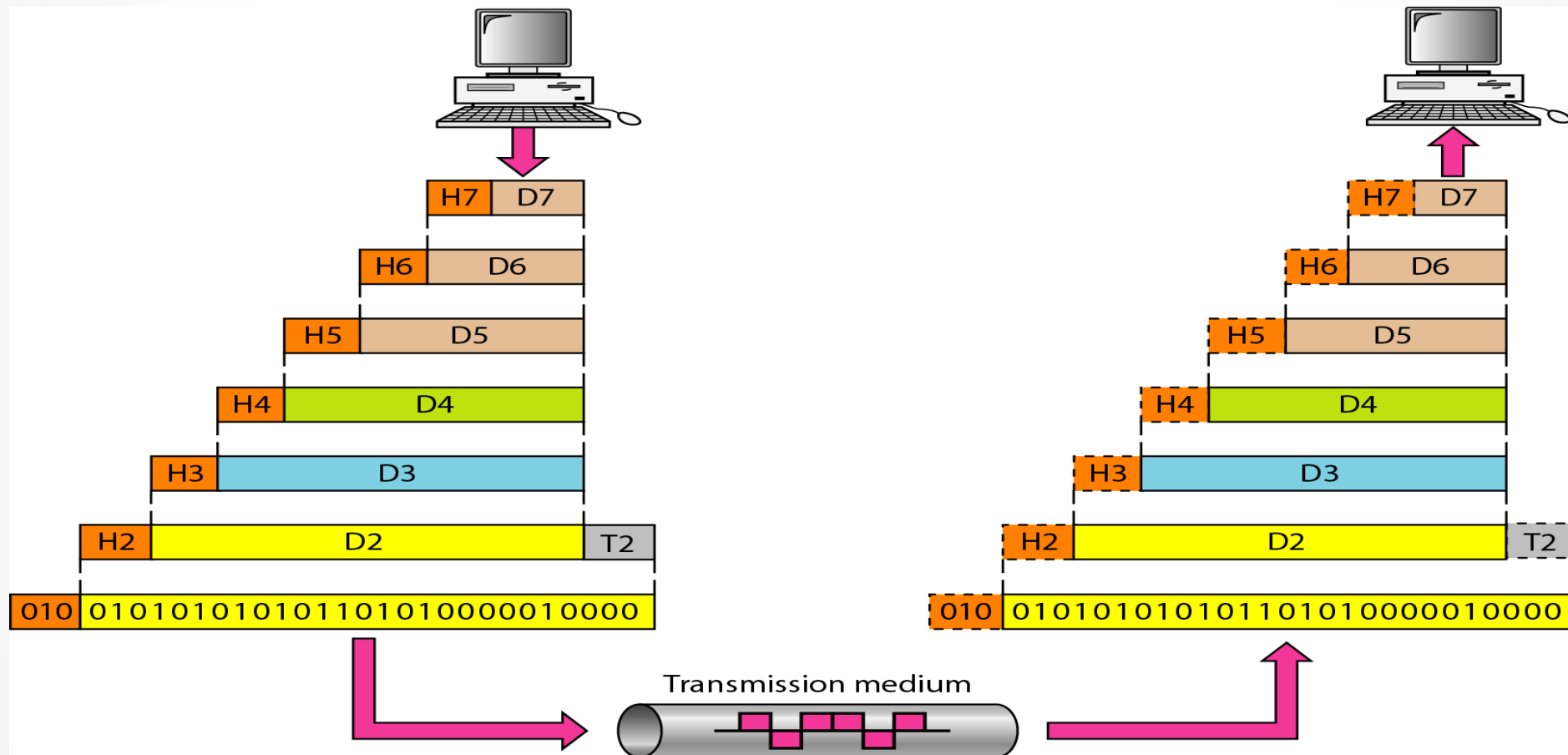Source: Data Communications and Networking – Behrouz A. Forouzan

Summary of layers

To translate, encrypt, and compress data

| | Application | To allow access to network resources |

| Presentation |

To provide reliable process-to-process message delivery and error recovery

| Session | To establish, manage, and terminate sessions |

| Transport |

| Network | To move packets from source to destination; to provide internetworking |

To organize bits into frames; to provide hop-to-hop delivery

| Data link |

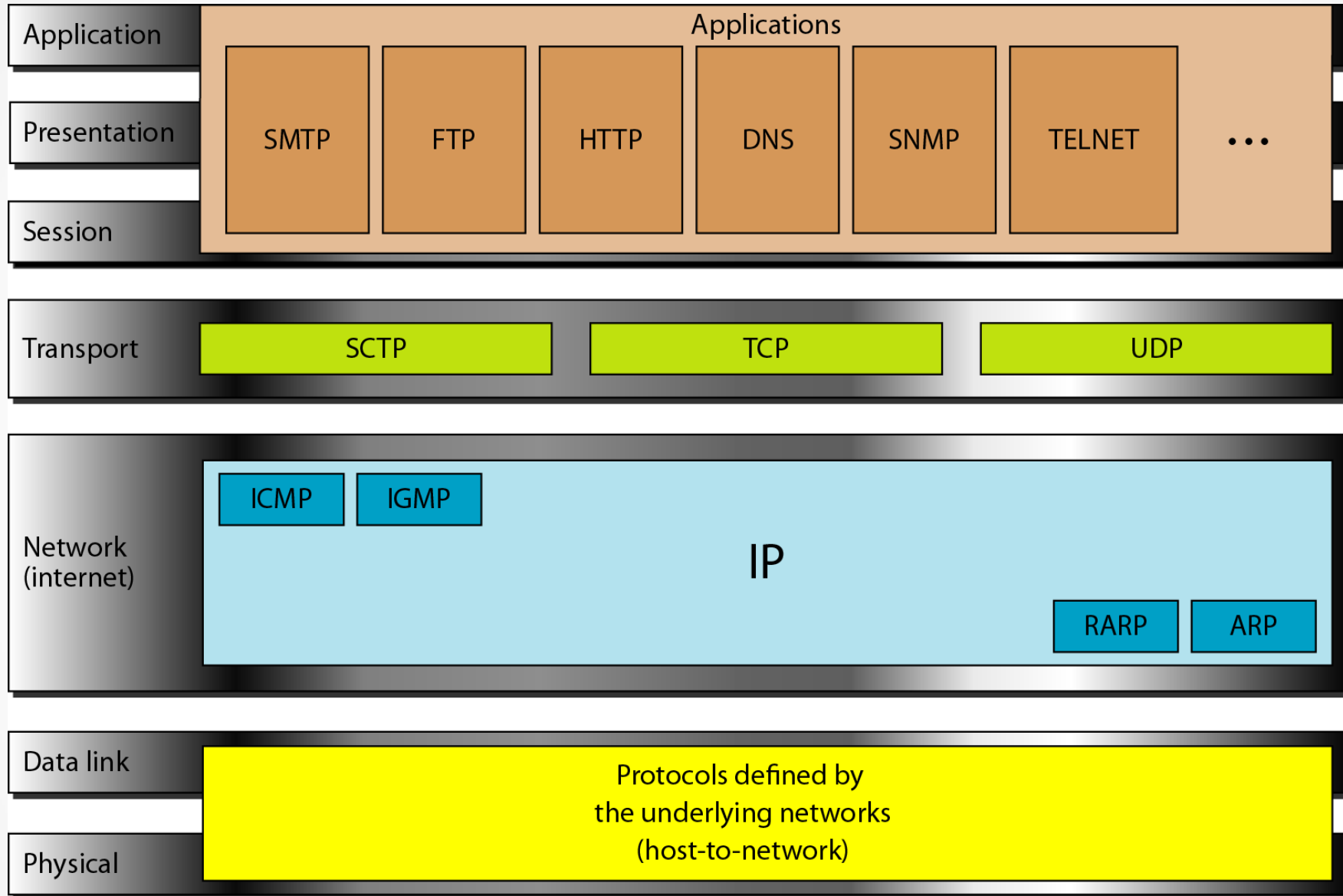| Physical | To transmit bits over a medium; to provide mechanical and electrical specifications |

Source: Data Communications and Networking – Behrouz A. Forouzan

TCP/IP

An exchange using the OSI model

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Thank you