Layered Network Architecture, Review of ISO-OSI Model

PROTOCOLS

- *A protocol is synonymous with rule. It consists of a set of rules that govern data communications. It determines what is communicated, how it is communicated and when it is communicated. The key elements of a protocol are syntax, semantics and timing*
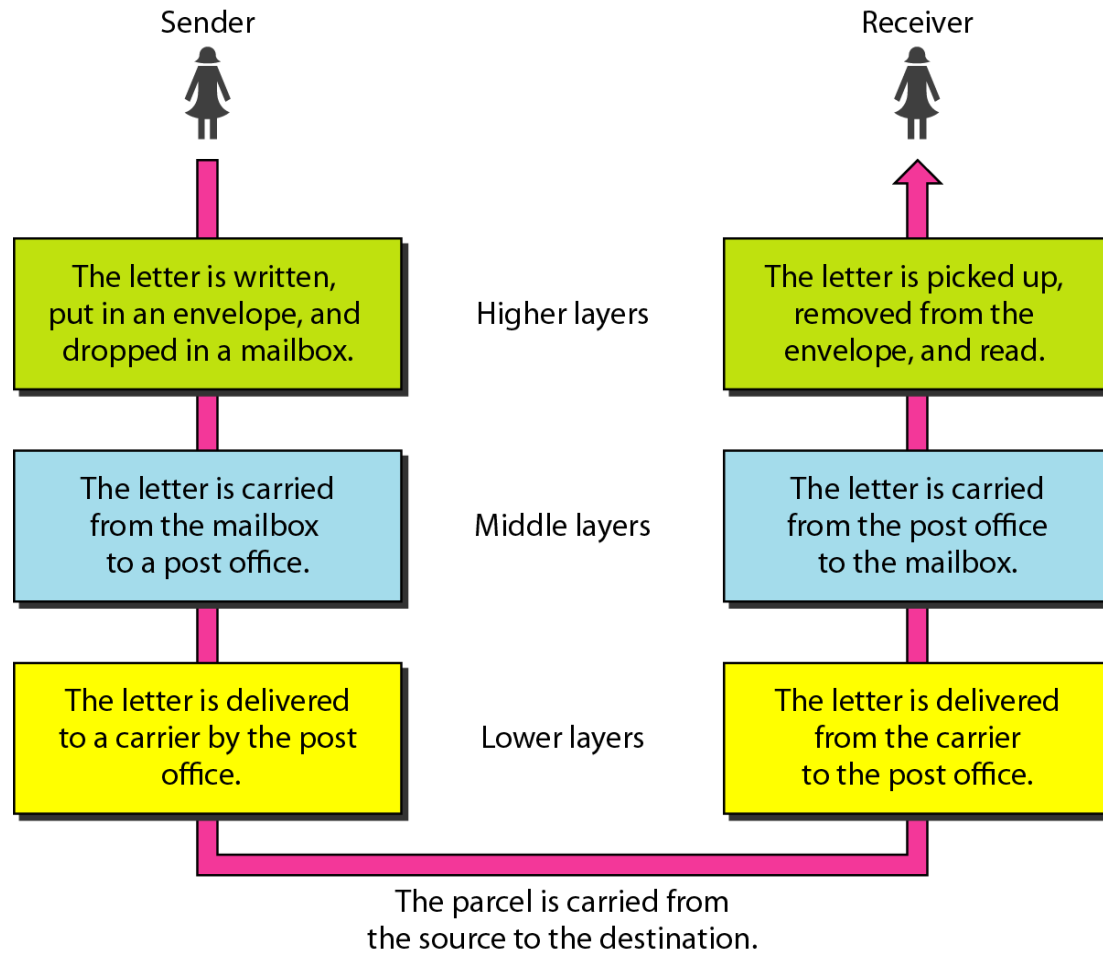
Elements of a Protocol

- **Syntax**
  - Structure or format of the data
  - Indicates how to read the bits - field delineation

- **Semantics**
  - Interprets the meaning of the bits
  - Knows which fields define what action

- **Timing**
  - When data should be sent and what
  - Speed at which data should be sent or speed at which it is being received.

LAYERED TASKS

- *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.*
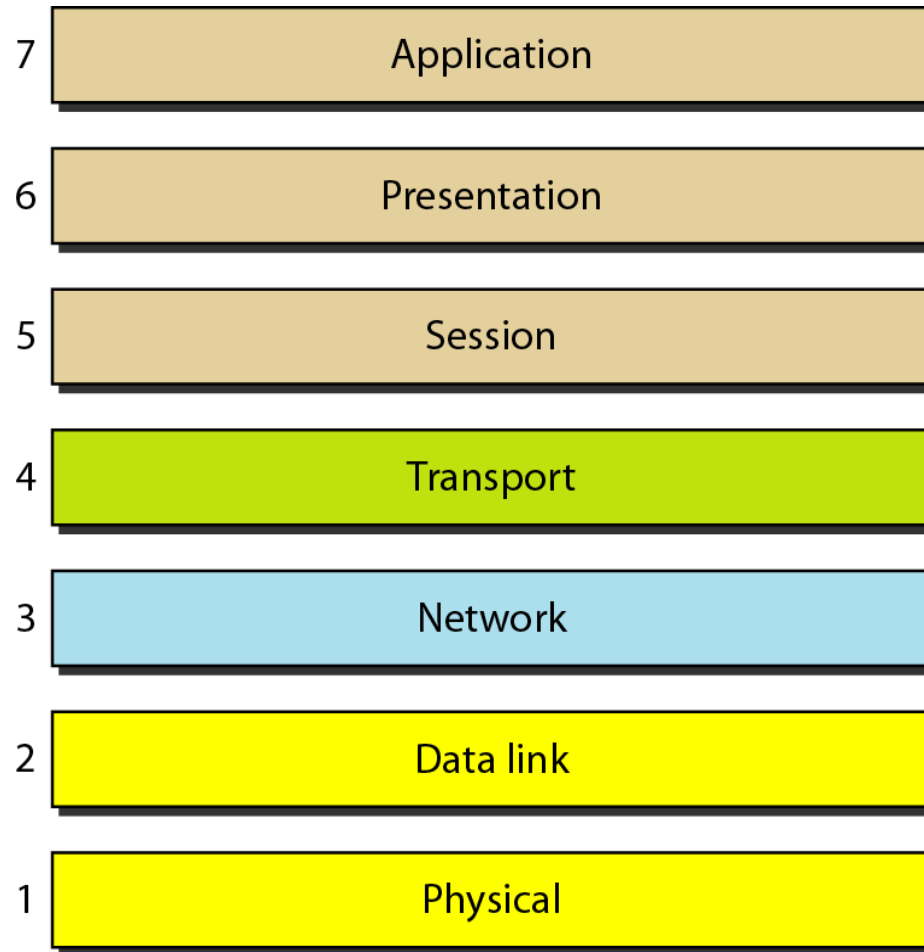
Tasks involved in sending a letter

Sender

Receiver

| The letter is written, put in an envelope, and dropped in a mailbox. | Higher layers | The letter is picked up, removed from the envelope, and read. |

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

| The letter is delivered to a carrier by the post office. | Lower layers | The letter is delivered from the carrier to the post office. |

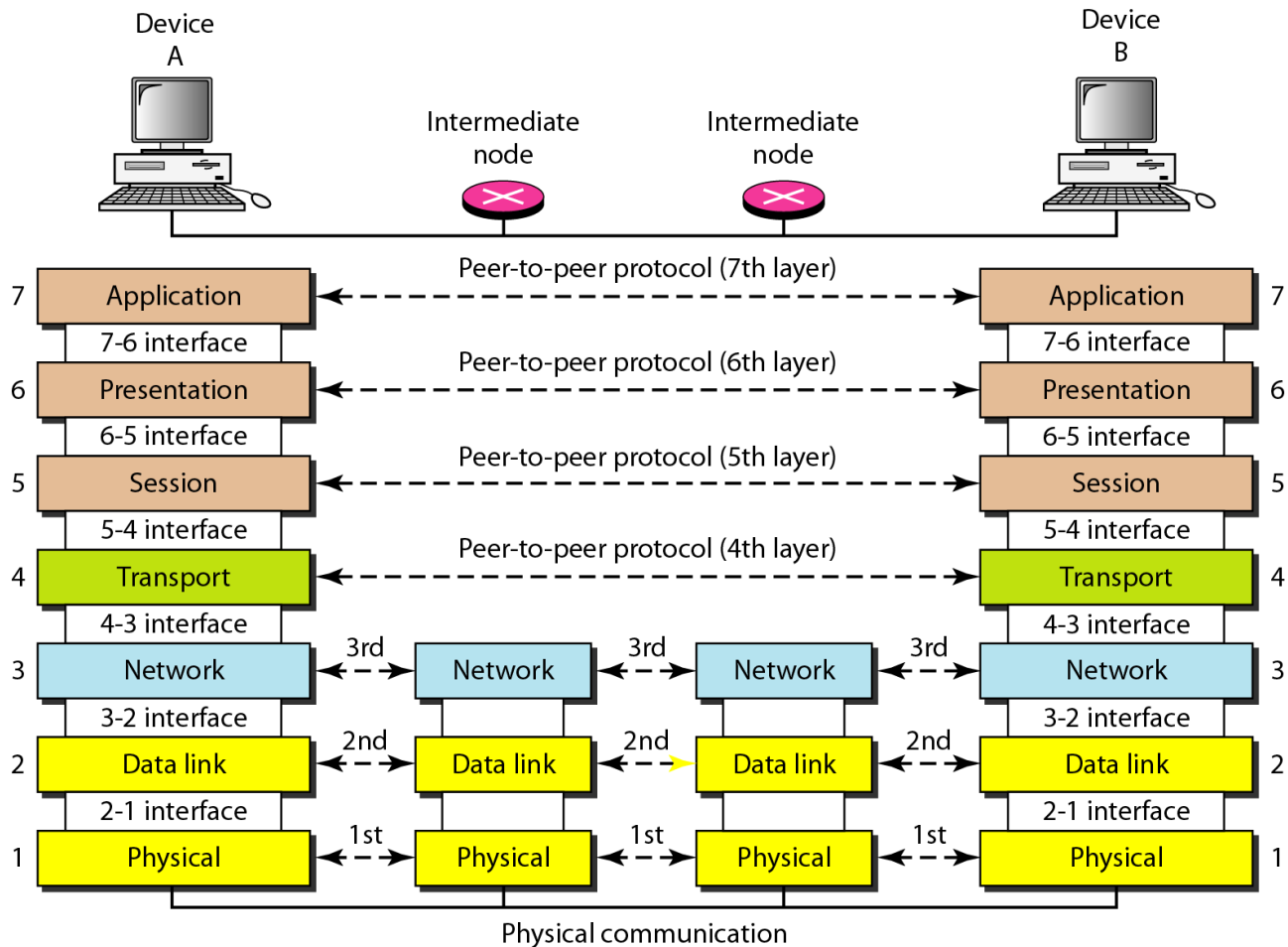The parcel is carried from the source to the destination.

THE OSI MODEL

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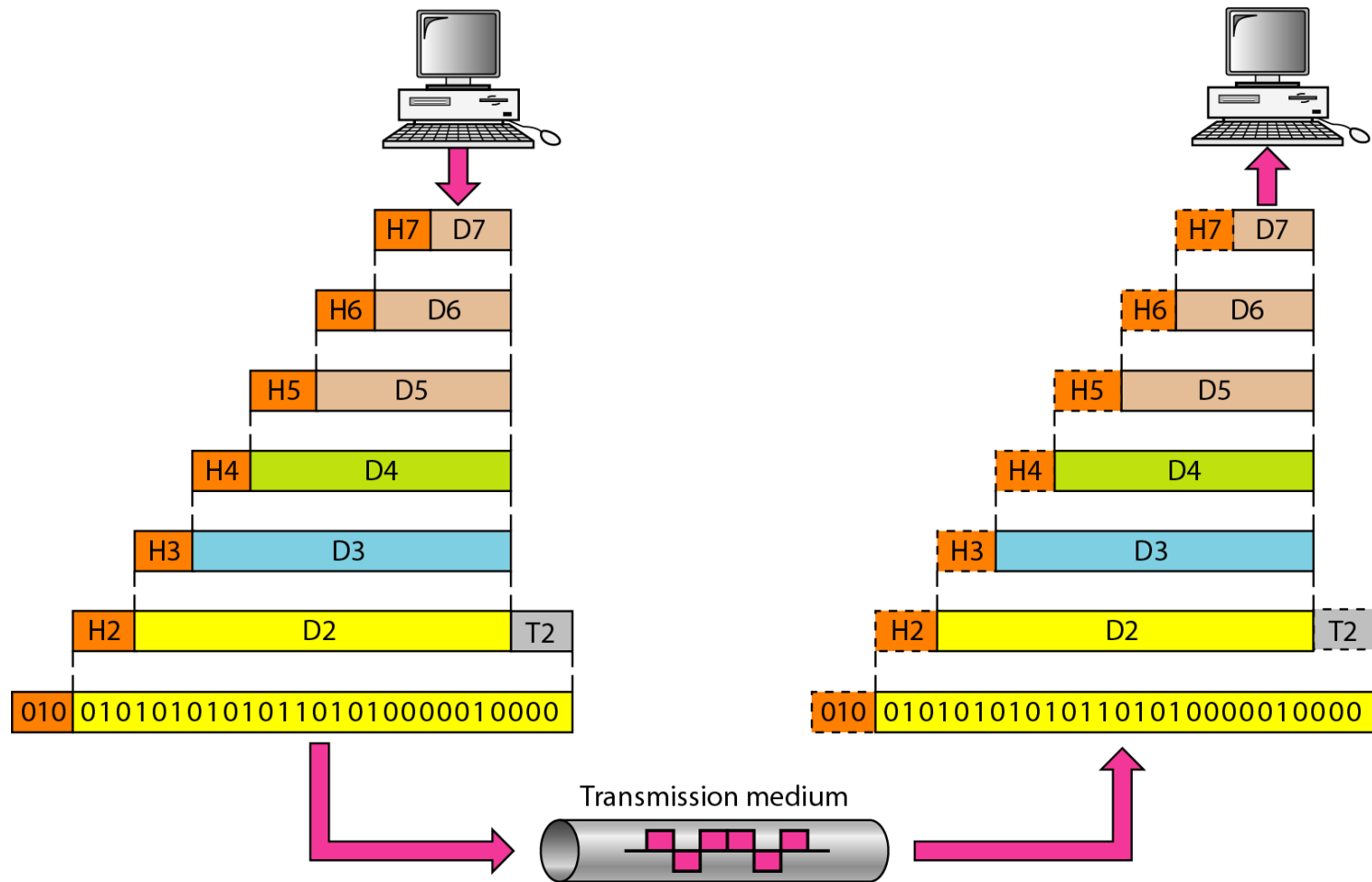
- ISO is the organization.
OSI is the model.

Seven layers of the OSI model

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

The interaction between layers in the OSI model
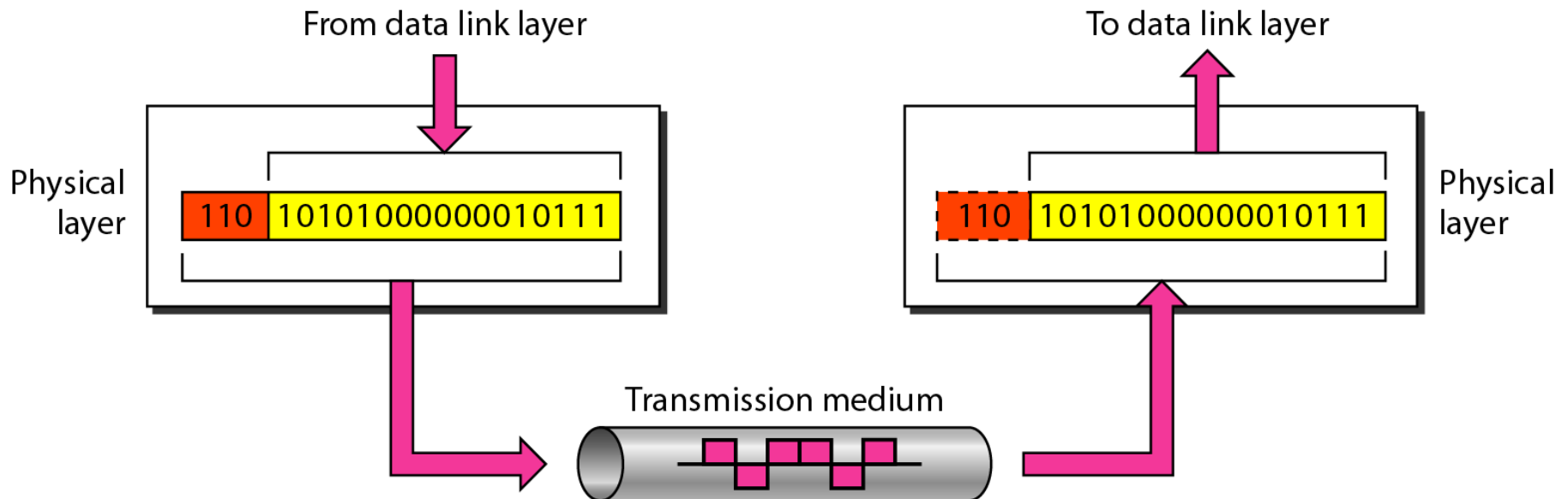
An exchange using the OSI model

LAYERS IN THE OSI MODEL

1. Physical Layer
2. Data Link Layer
3. Network Layer
4. Transport Layer
5. Session Layer
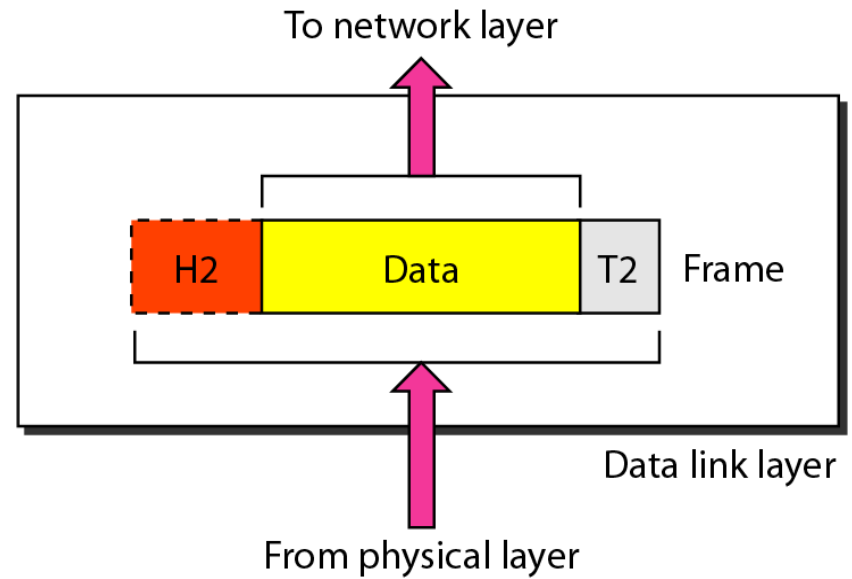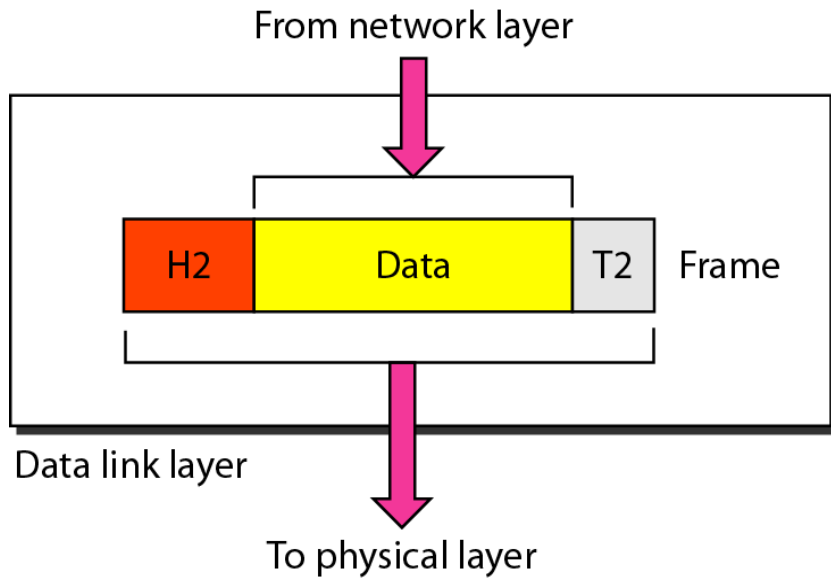6. Presentation Layer
7. Application Layer

Physical layer:

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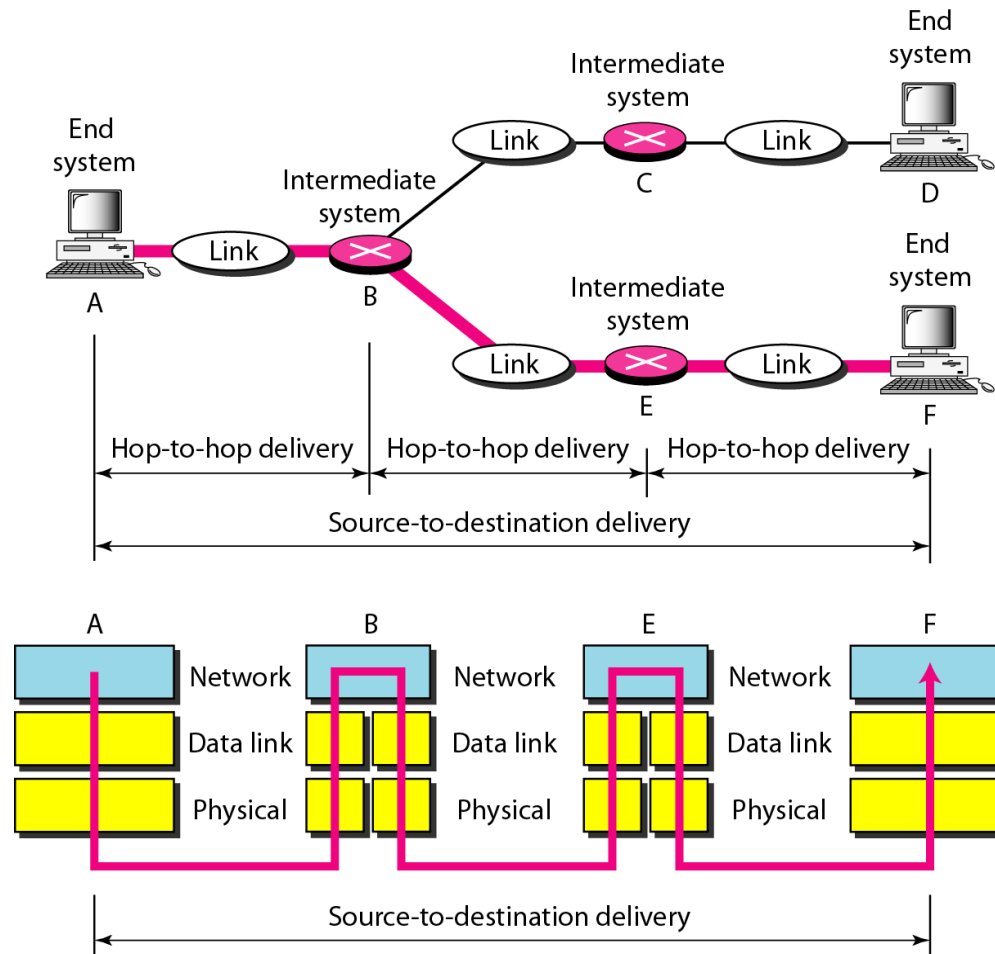
From data link layer

To data link layer

Physical layer

Physical layer

110 | 1010100000010111

110 | 1010100000010111

Transmission medium

Data link layer

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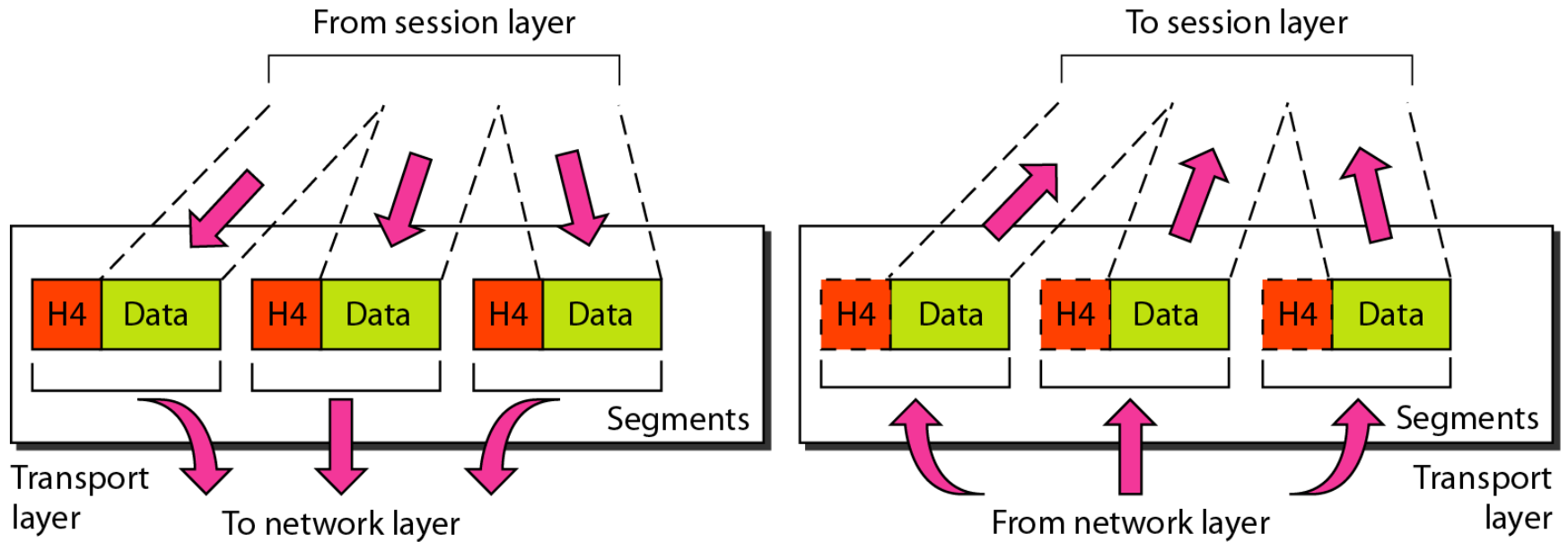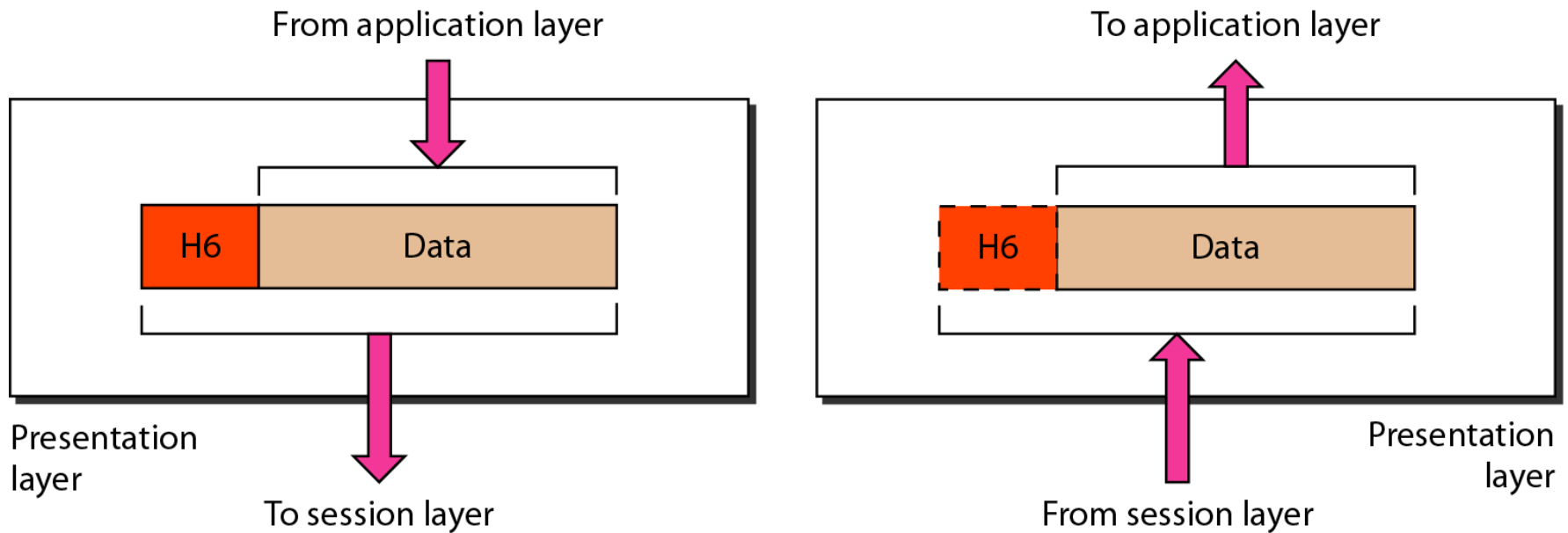
Source-to-destination delivery

Transport layer

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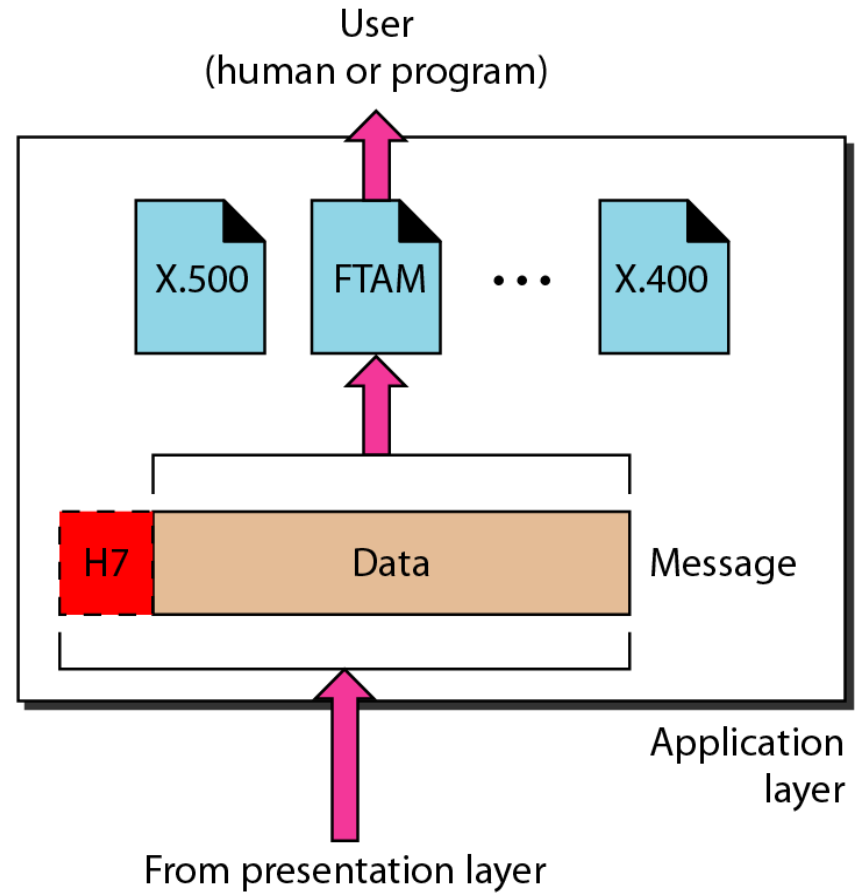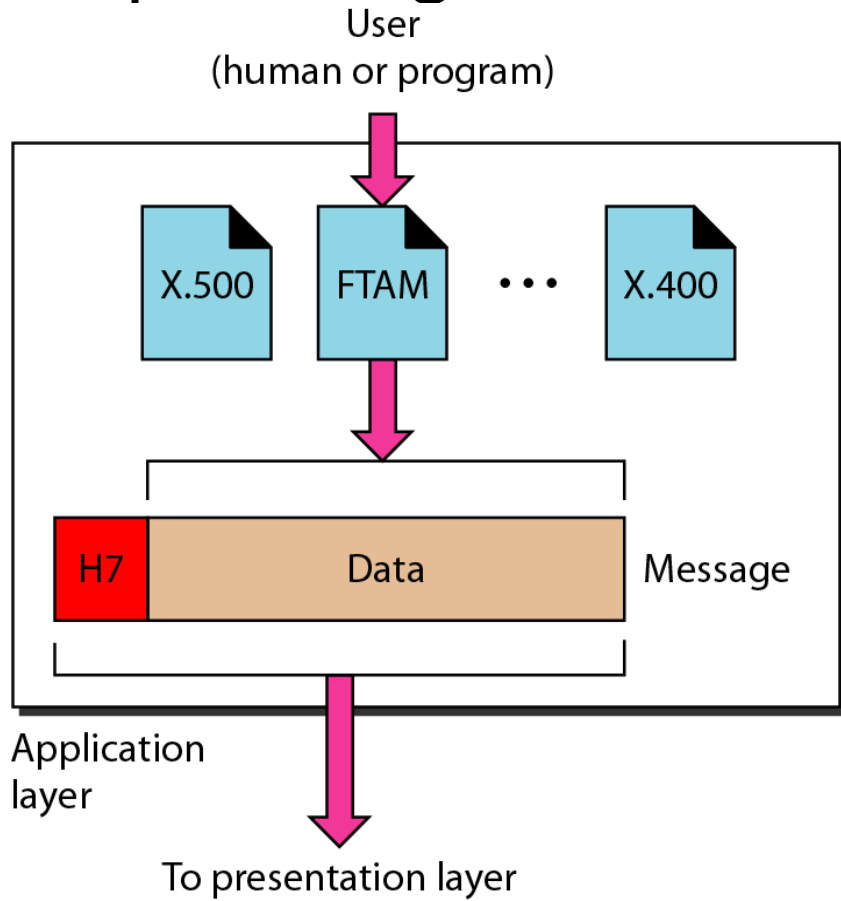
Presentation layer

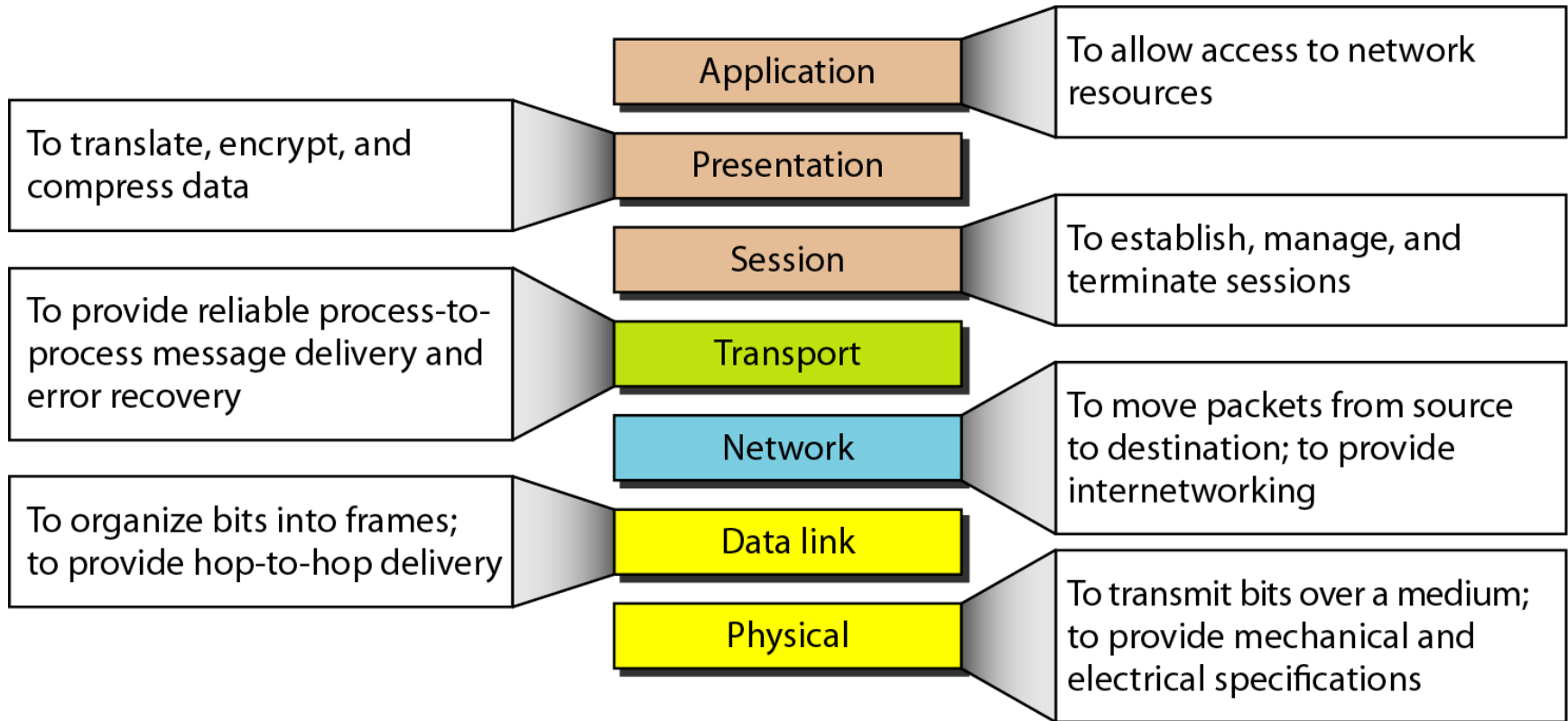- The presentation layer is responsible for translation, compression, and encryption.

Application layer

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

Summary of layers

	Application	To allow access to network resources
To translate, encrypt, and compress data	**Presentation**	
	Session	To establish, manage, and terminate sessions
To provide reliable process-to-process message delivery and error recovery	**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

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.*

Text and Reference Books:

- A. S Tanenbaum, "Computer Networks, PHI
- Forouzan, "Data Communication and Networking", TMH