

Layered Architecture

Layers

Layer 7. [Application](#)

Layer 6. [Presentation](#)

Layer 5. [Session](#)

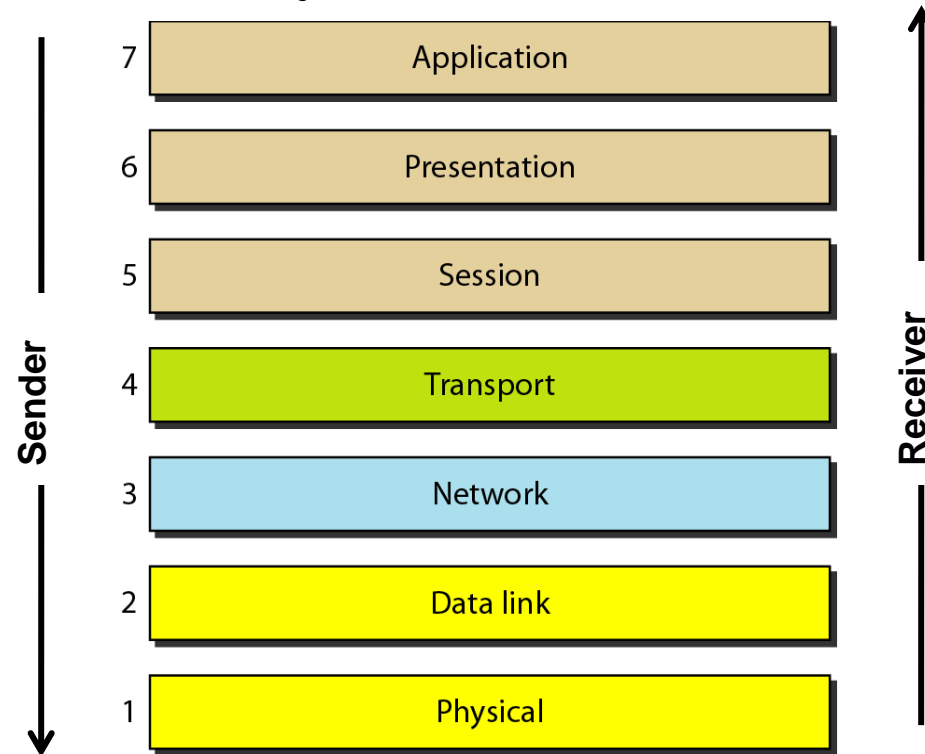
Layer 4. [Transport](#)

Layer 3. [Network](#)

Layer 2. [Data Link](#)

Layer 1. [Physical](#)

Seven layers of the OSI model



Layered Architecture

- A layered model
- Each layer performs a subset of the required communication functions
- Each layer relies on the next lower layer to perform more primitive functions
- Each layer provides services to the next higher layer
- Changes in one layer should not require changes in other layers
- The processes on each machine at a given layer are called peer-to-peer process

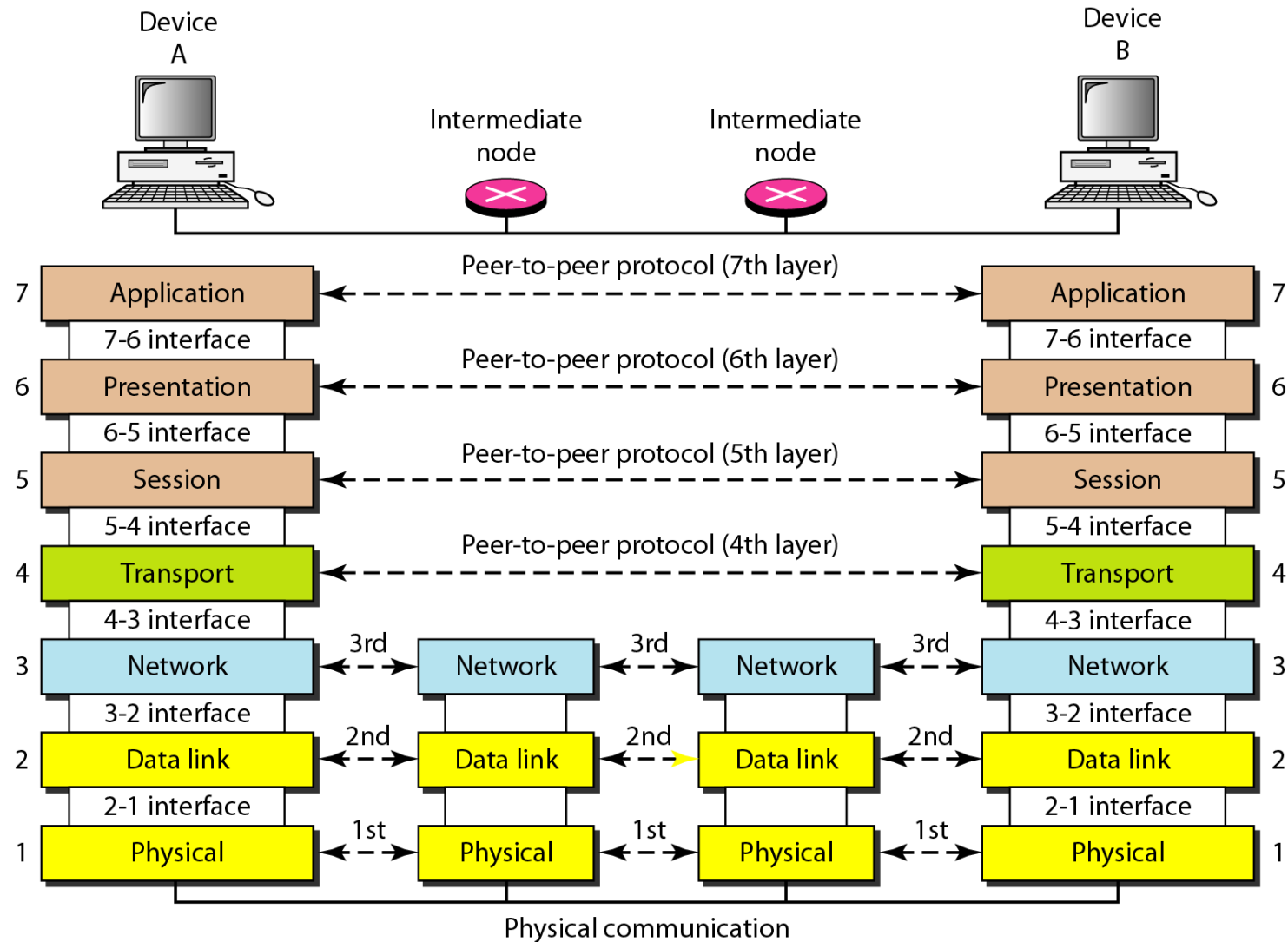
PEER – TO – PEER PROCESS

- Communication must move downward through the layers on the sending device, over the communication channel, and upward to the receiving device
- Each layer in the sending device adds its own information to the message it receives from the layer just above it and passes the whole package to the layer just below it
- At the receiving device, the message is unwrapped layer by layer, with each process receiving and removing the data meant for it

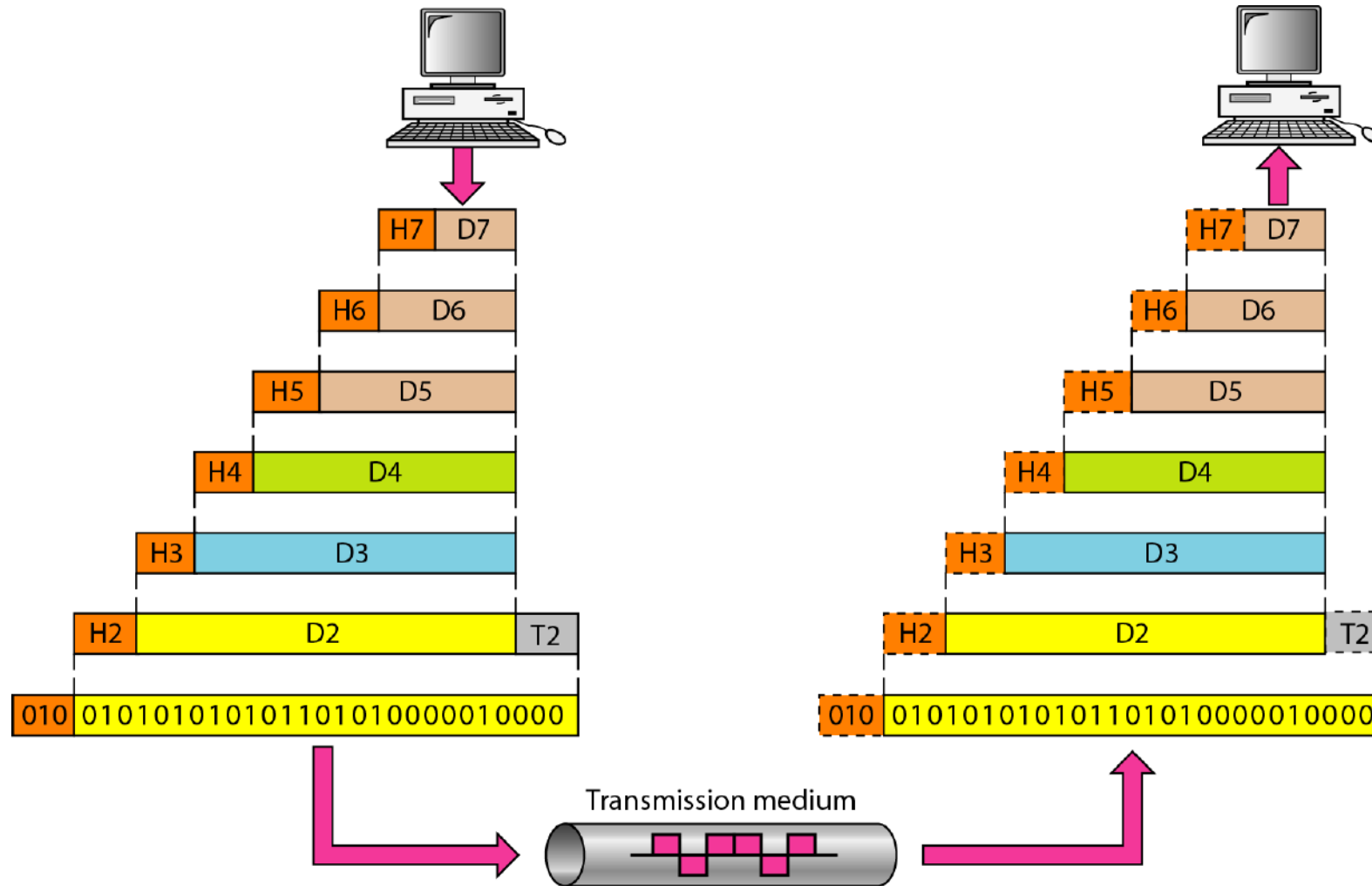
PEER – TO – PEER PROCESS

- The passing of the data and network information down through the layers of the sending device and backup through the layers of the receiving device is made possible by interface between each pair of adjacent layers
- Interface defines what information and services a layer must provide for the layer above it.

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**

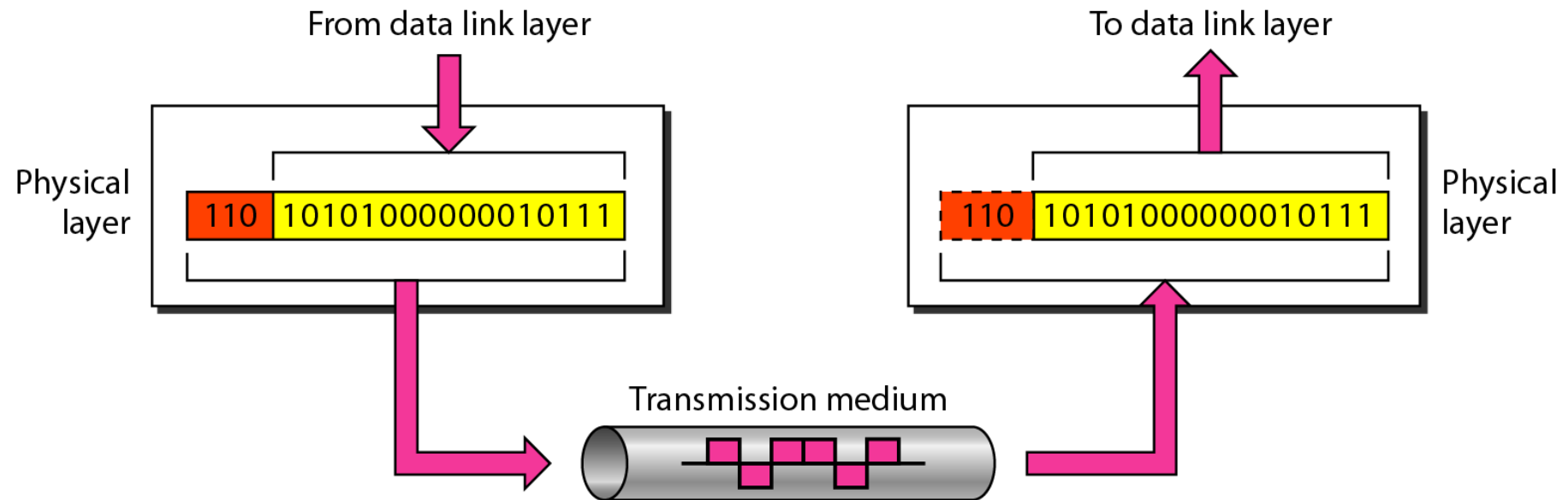
Physical Layer

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

■ Function

- Physical characteristics of interfaces and media
- Representation of bits
- Data rate
- Synchronization of bits
- Line configuration (point-to-point or multipoint)
- Physical topology (mesh, star, ring or bus)
- Transmission mode (simplex, half-duplex or duplex)

Physical layer

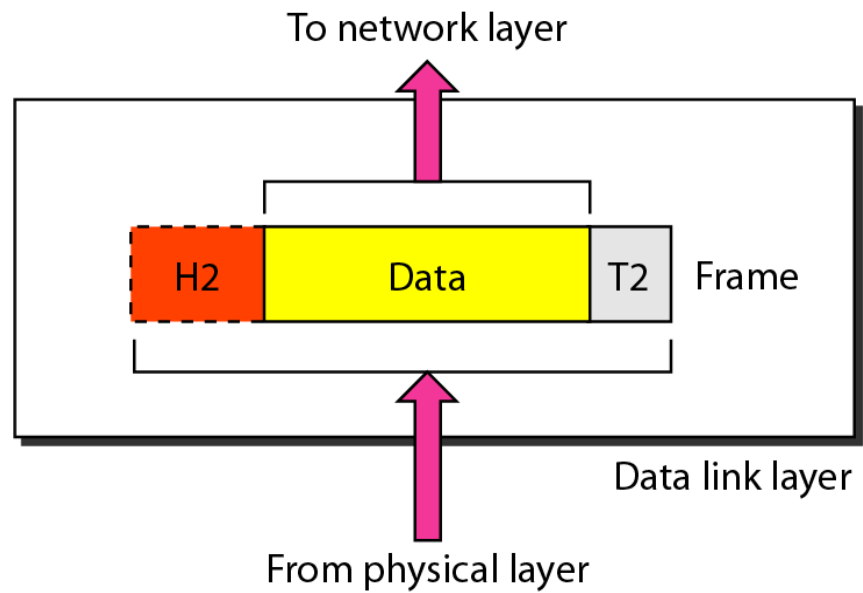
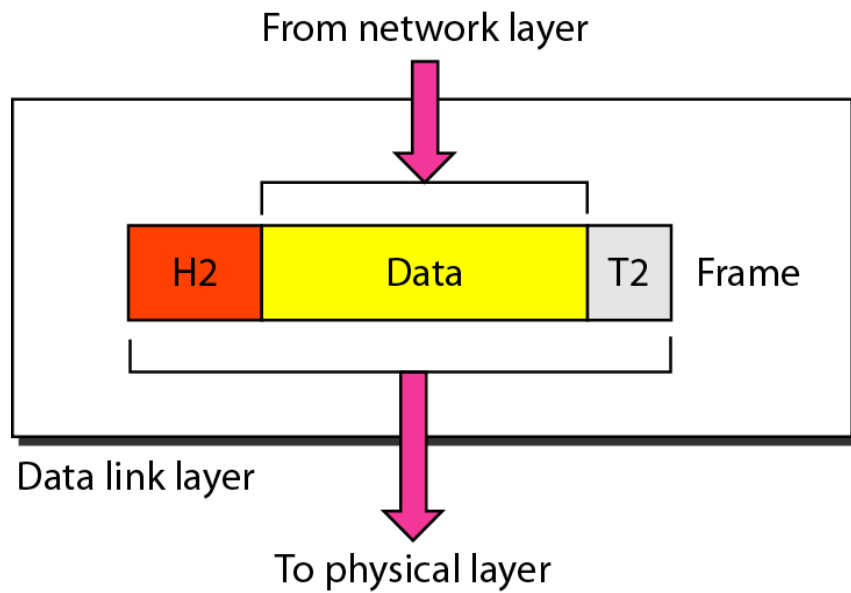


Data Link Layer

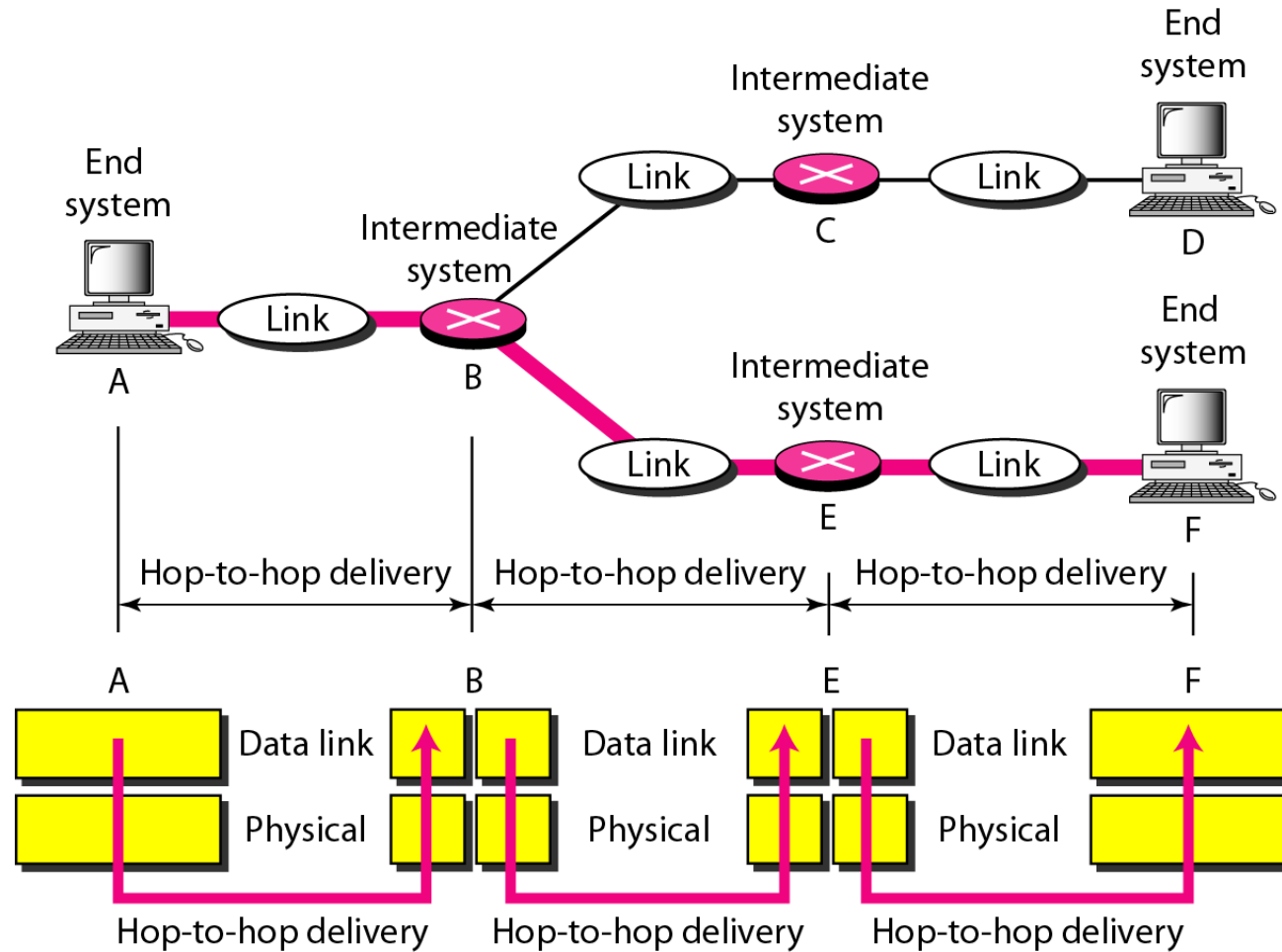
The data link layer is responsible for moving frames from one hop (node) to the next.

- **Function**
 - Framing
 - Physical addressing
 - Flow control
 - Error control
 - Access control

Data link layer

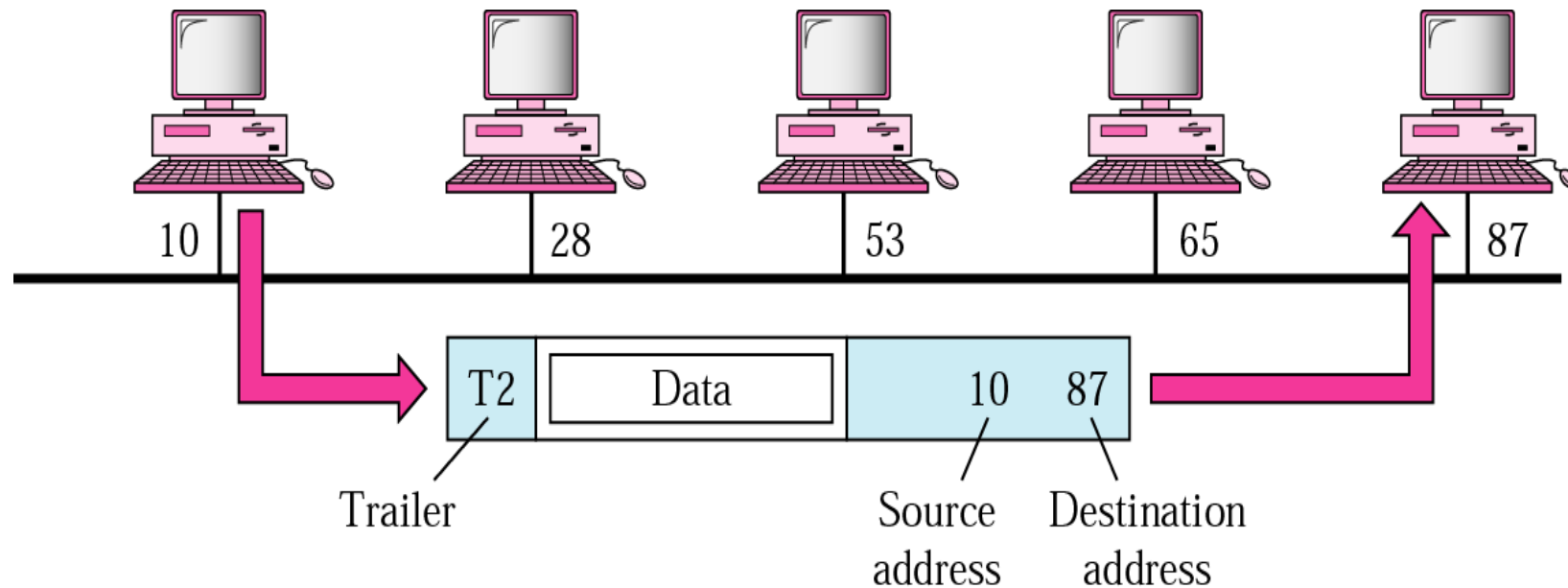


Hop-to-hop delivery



Example 1

In following Figure a node with physical address **10** sends a frame to a node with physical address **87**. The two nodes are connected by a link. At the data link level this frame contains physical addresses in the header. These are the only addresses needed. The rest of the header contains other information needed at this level. The trailer usually contains extra bits needed for error detection

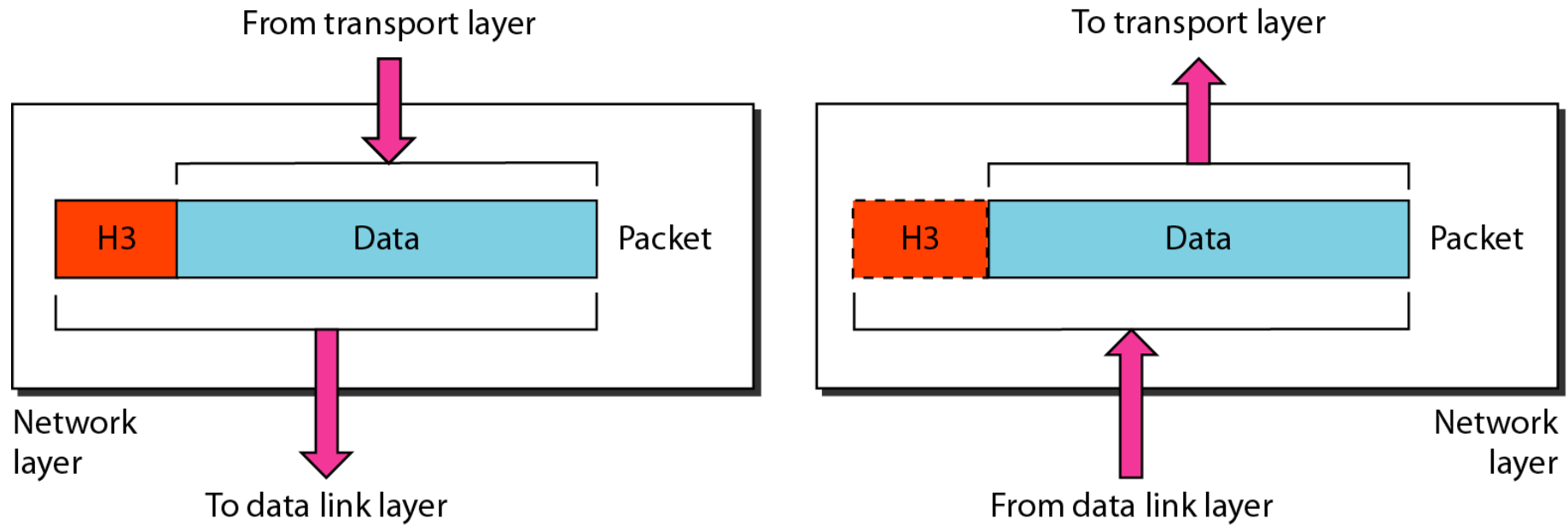


Network Layer

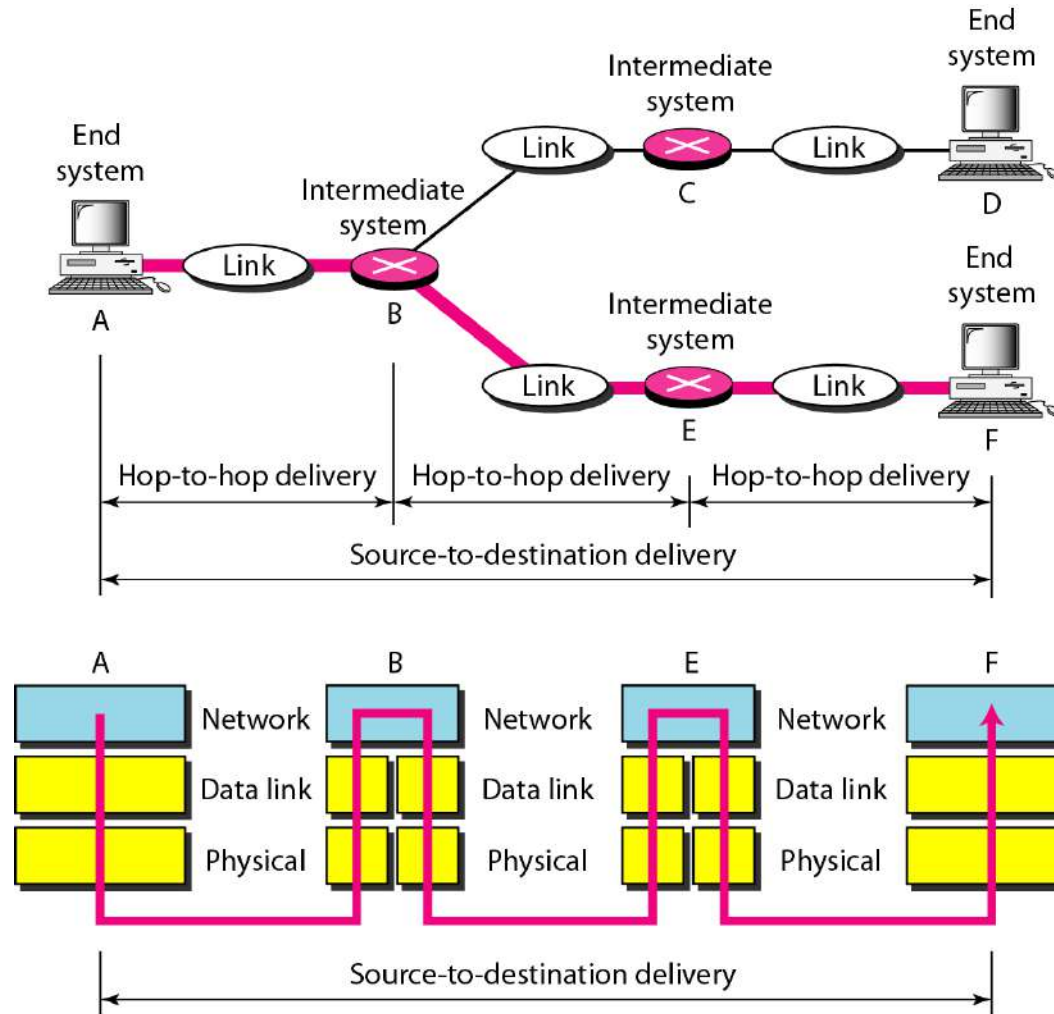
The network layer is responsible for the delivery of individual packets from the source host to the destination host.

- Source-to-destination delivery
- Responsible from the delivery of packets from the original source to the final destination
- Functions
 - Logical addressing
 - routing

Network layer

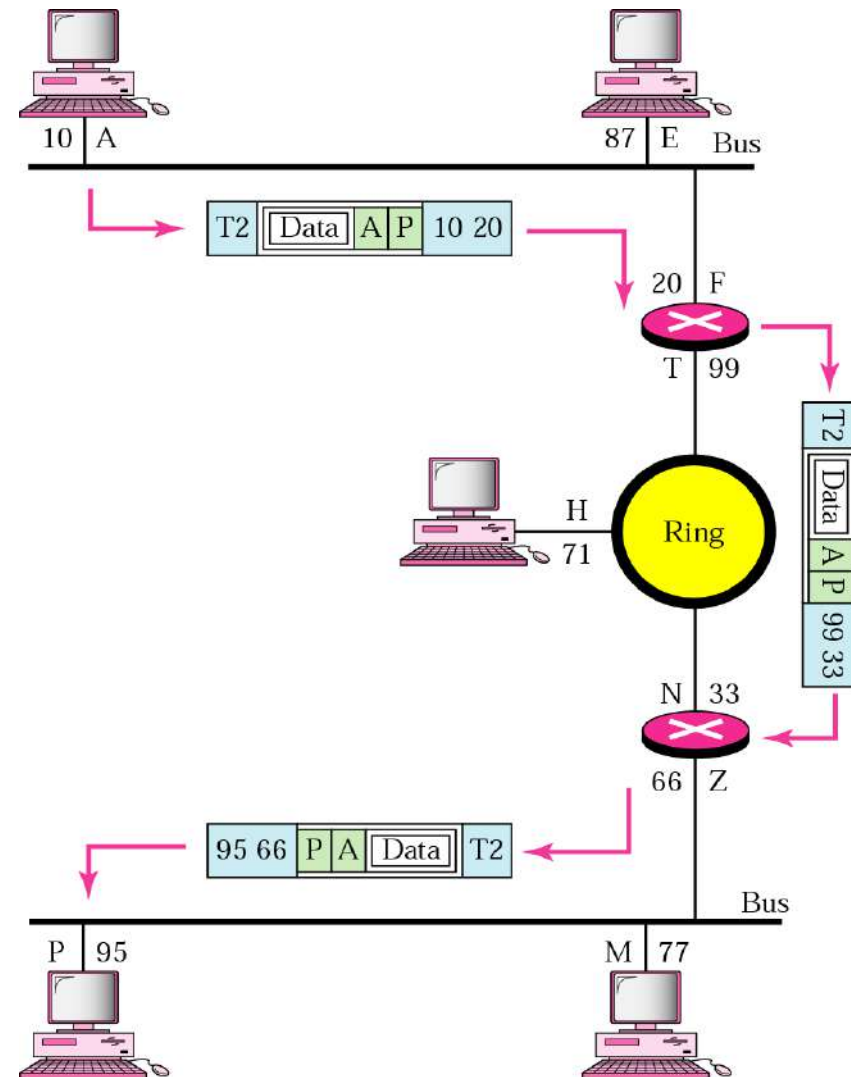


Source-to-destination delivery



Example 2

We want to send data from a node with network address **A** and physical address 10, located on one LAN, to a node with a network address **P** and physical address 95, located on another LAN. Because the two devices are located on different networks, we cannot use physical addresses only; the physical addresses only have local influence. What we need here are **universal addresses** that can pass through the LAN boundaries. The network (logical) addresses have this characteristic.



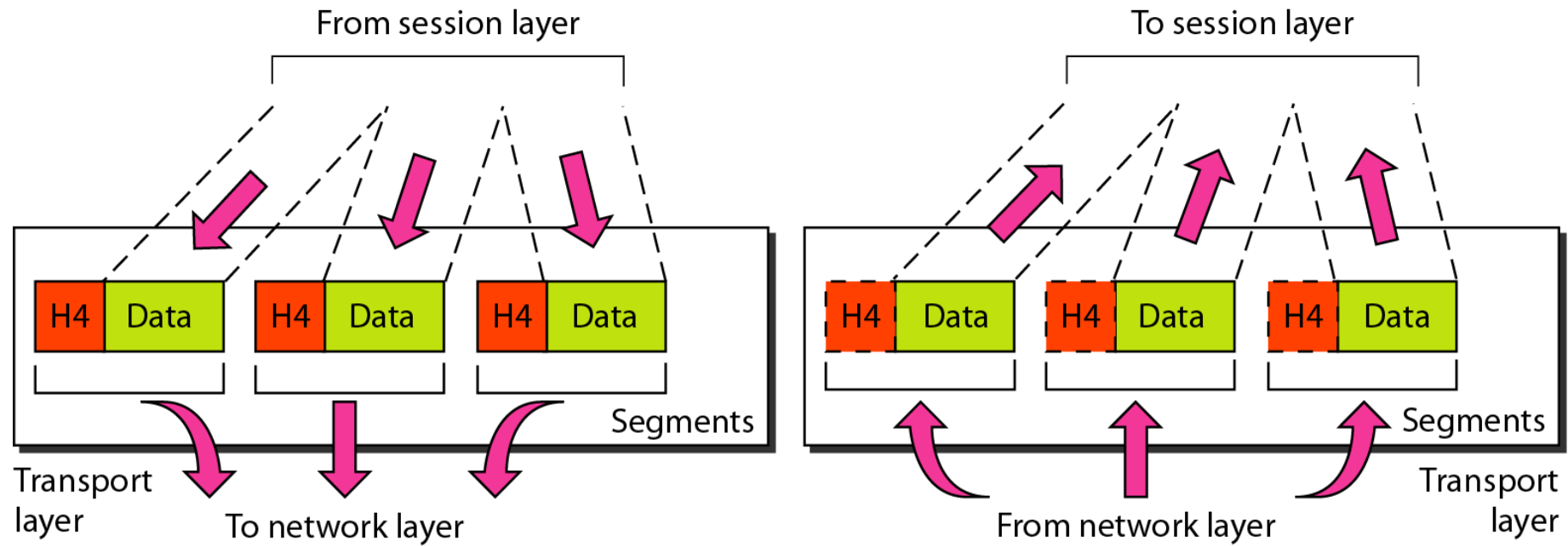
Transport Layer

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

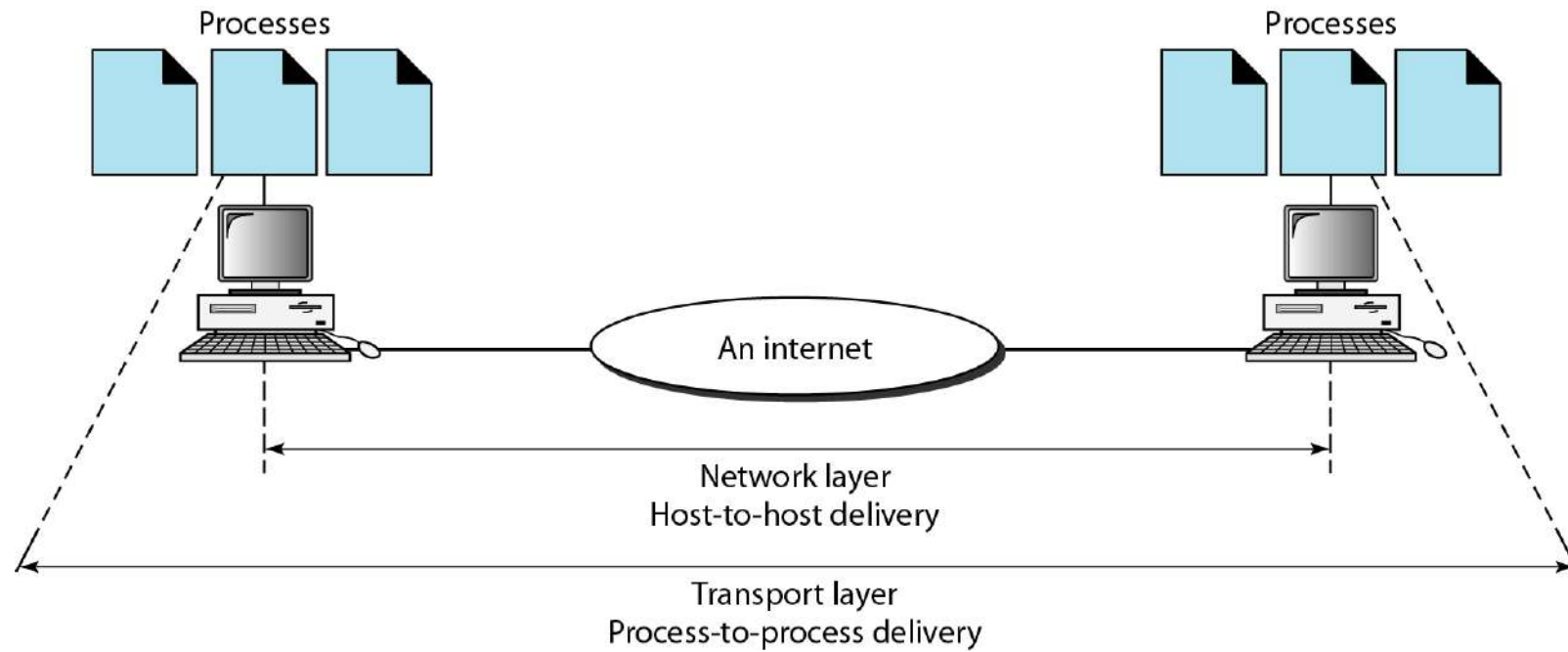
- Process-to- process delivery
- Functions
 - Port addressing
 - Segmentation and reassembly
 - Connection control (Connection-oriented or connection-less)
 - Flow control
 - Error control

Transport layer

Segmentation and reassembly

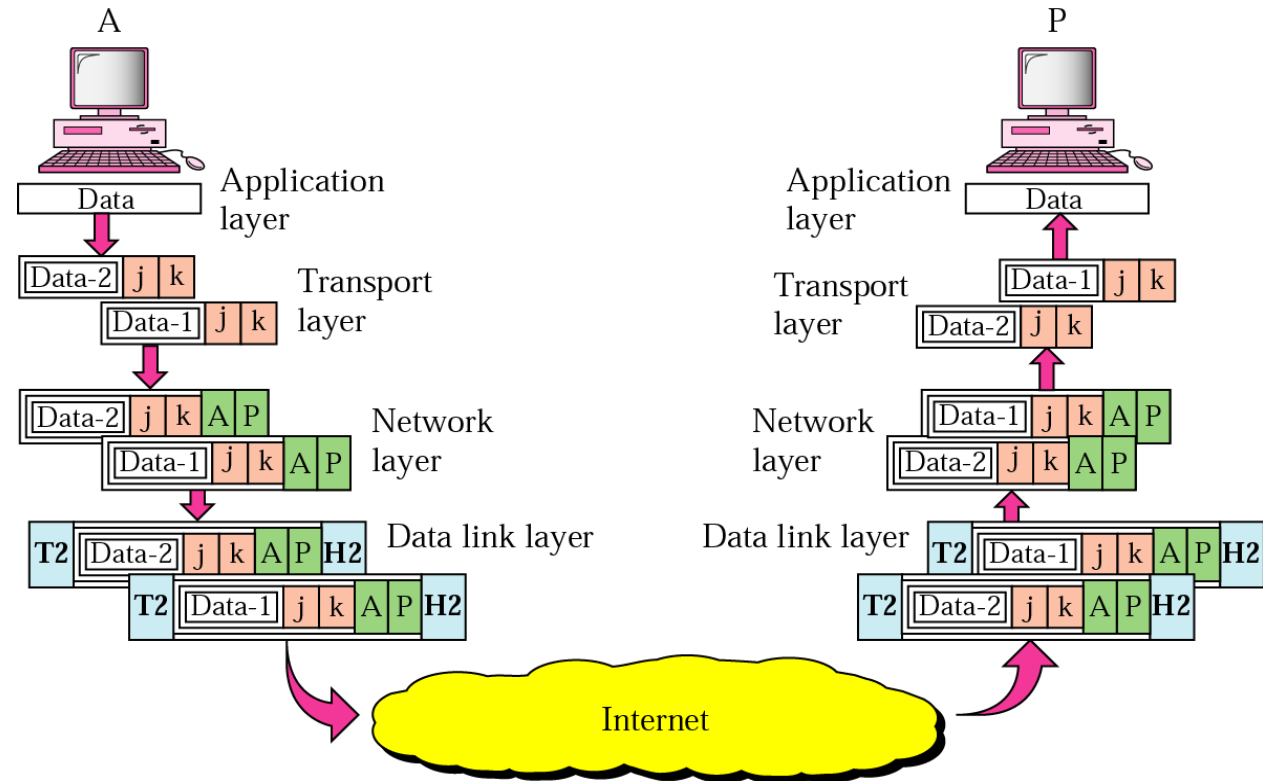


Reliable process-to-process delivery of a message



Example 3

Data coming from the upper layers have port addresses **j** and **k** (**j** is the address of the sending process, and **k** is the address of the receiving process). Since the data size is larger than the network layer can handle, the data are split into two packets, each packet retaining the port addresses (**j** and **k**). Then in the network layer, network addresses (**A** and **P**) are added to each packet.



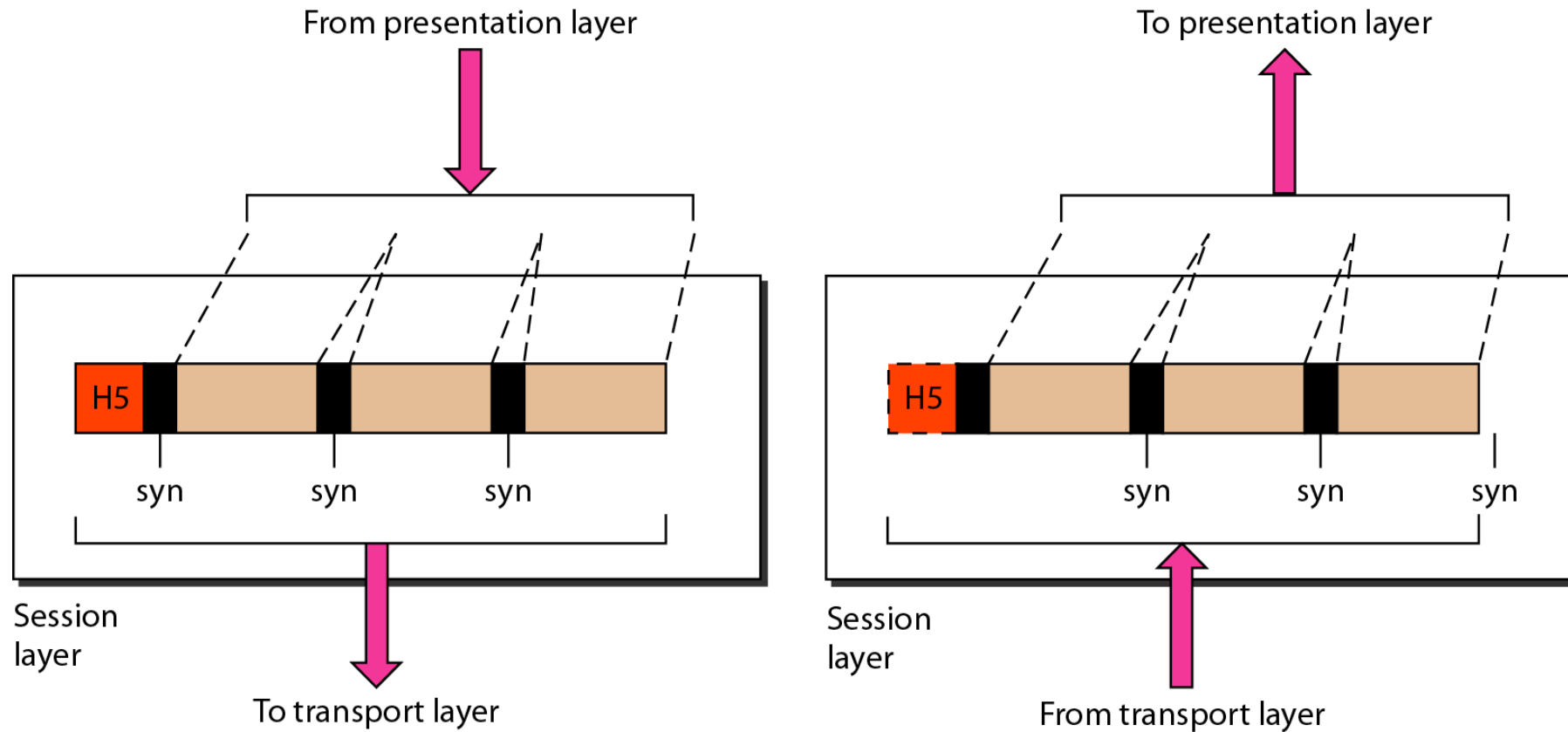
Session Layer

The session layer is responsible for dialog control and synchronization.

- **It establishes, maintains and synchronize the interaction between communicating system**
- **Function**
 - **Dialog control**
 - **Synchronization (checkpoints)**

Session layer

Synchronization

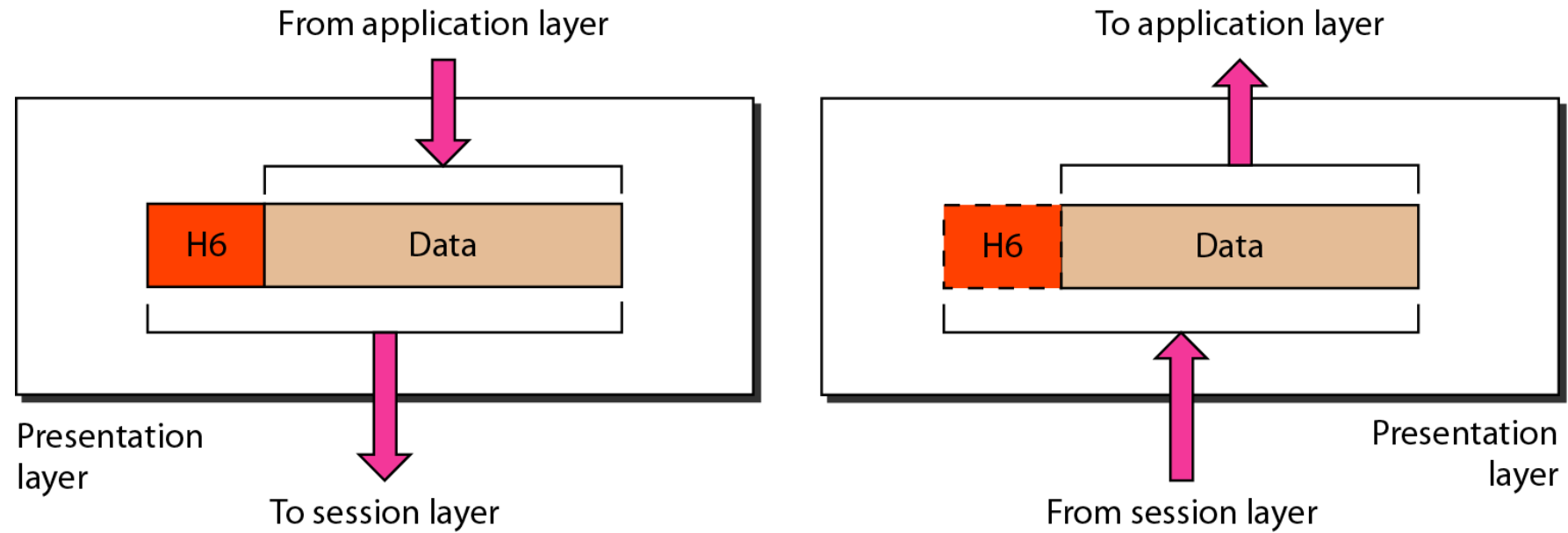


Presentation Layer

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

- **Concerned with the syntax and semantics of the information exchanged between two system**
- **Functions**
 - **Translation** (EBCDIC-coded text file → ASCII-coded file)
 - **Encryption and Decryption**
 - **Compression**

Presentation layer



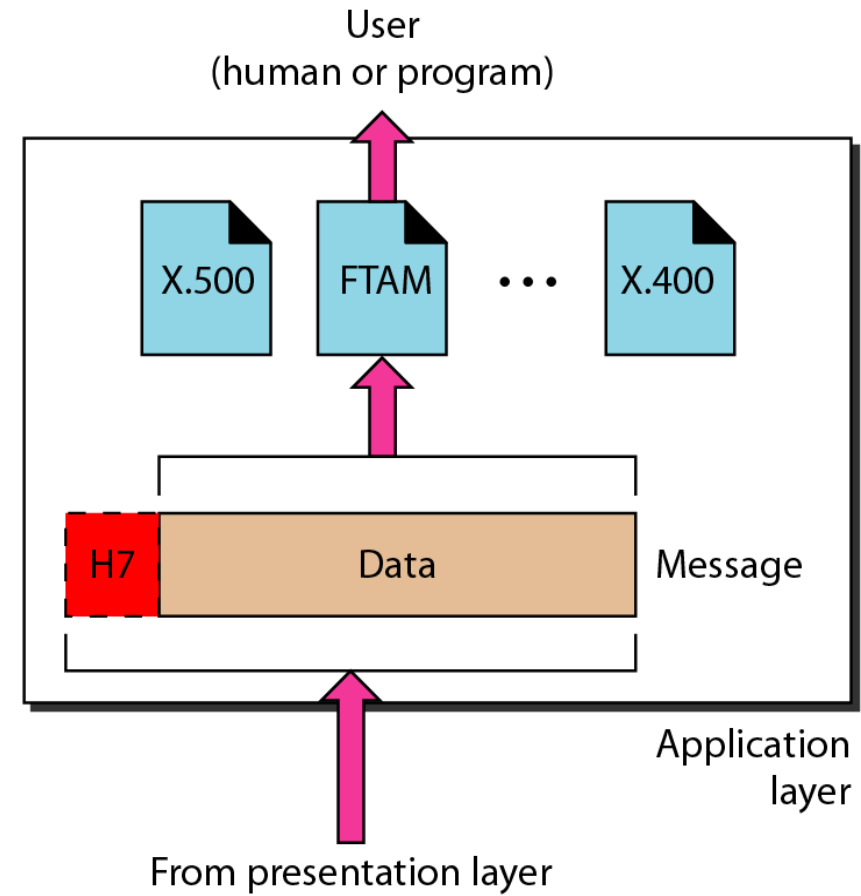
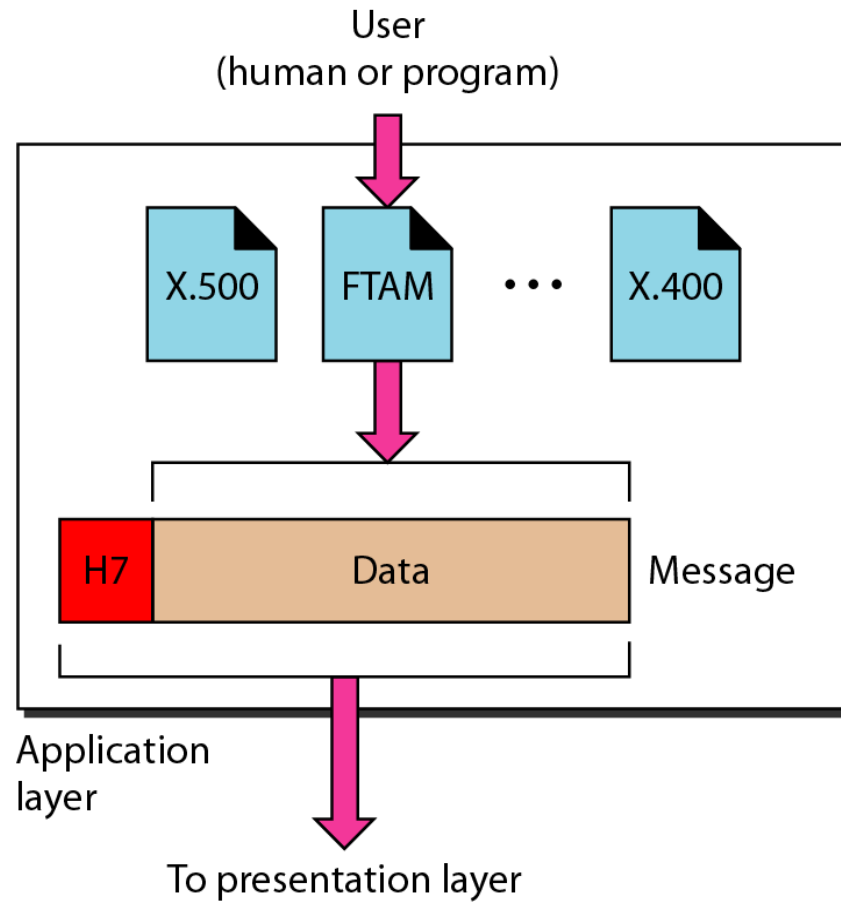
Application Layer

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

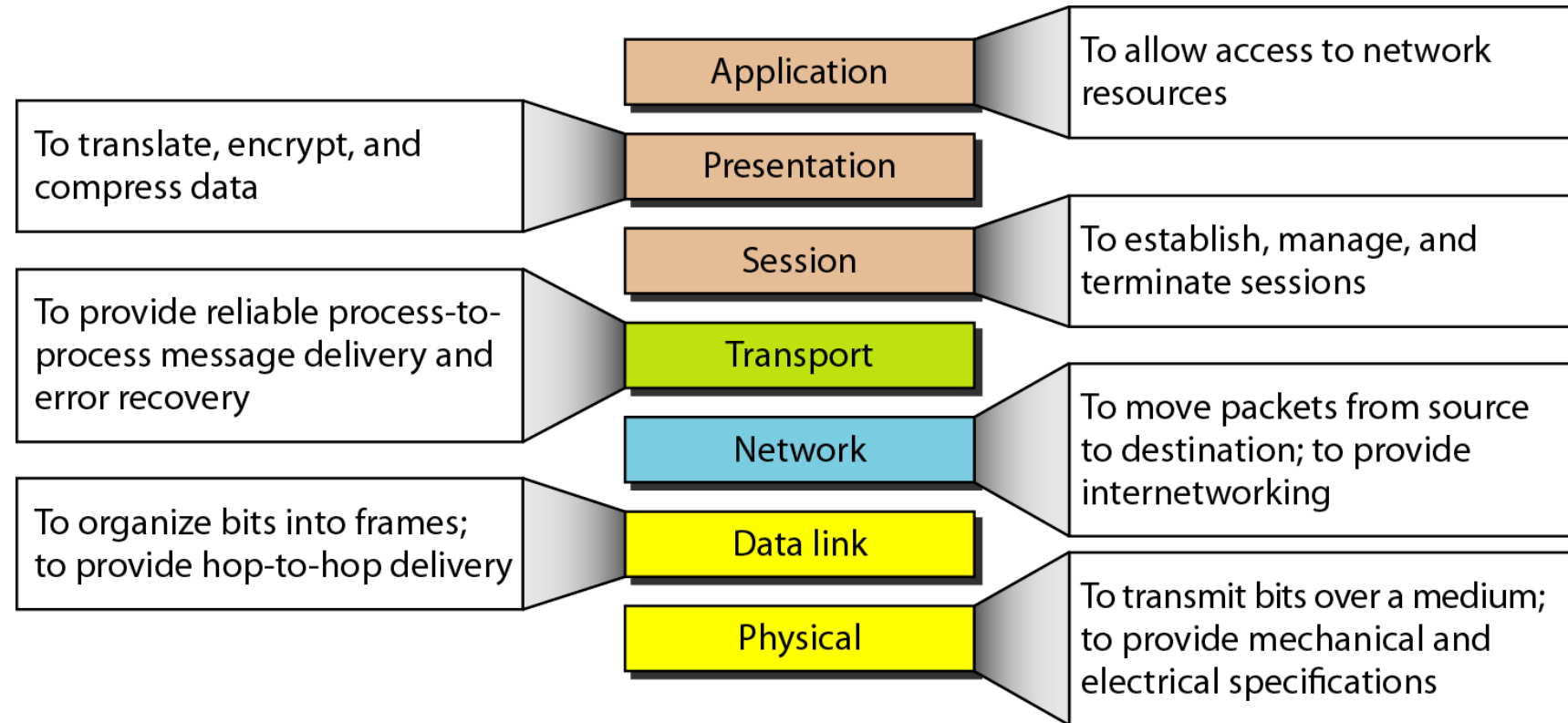
- **Functions**

- Network virtual terminal (Remote log-in)
- File transfer and access
- Mail services
- Directory services (Distributed Database)
- Accessing the World Wide Web

Application layer



Summary of layers



Summary of layers

OSI Model			
	Data unit	Layer	Function
User support layers	Data	7. Application	Network process to application
		6. Presentation	Data representation and encryption
		5. Session	Inter-host communication
User ↔ Network	Segment	4. Transport	End-to-end connections and reliability
Network support layers	Packet	3. Network	Path determination and logical addressing
	Frame	2. Data Link	Physical addressing
	Bit	1. Physical	Media, signal and binary transmission

Sender ↓ ↑ Receiver