Chapter 2

Network Models

Figure 2.1   Sending a letter

Sender

Receiver

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

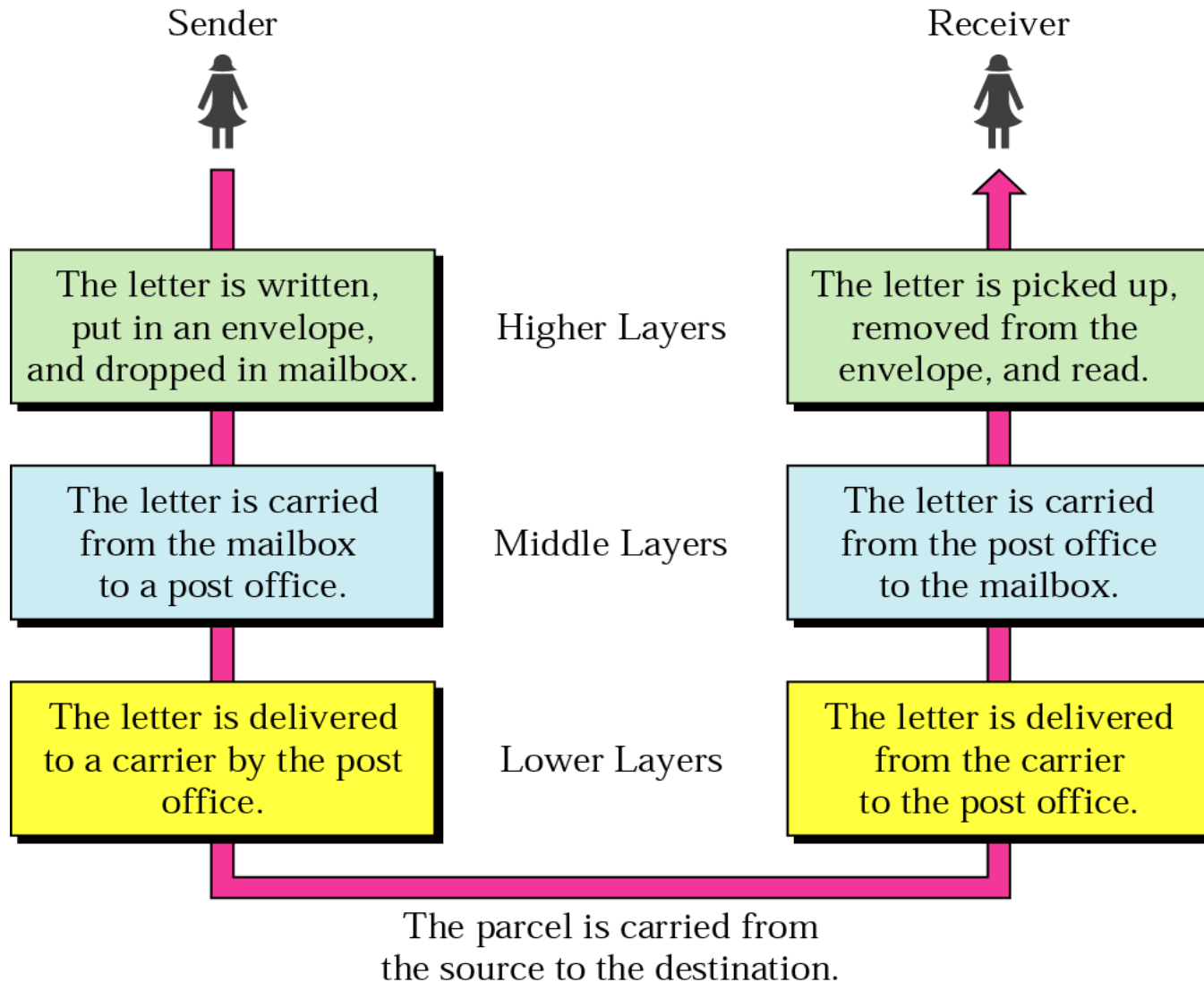The parcel is carried from the source to the destination.
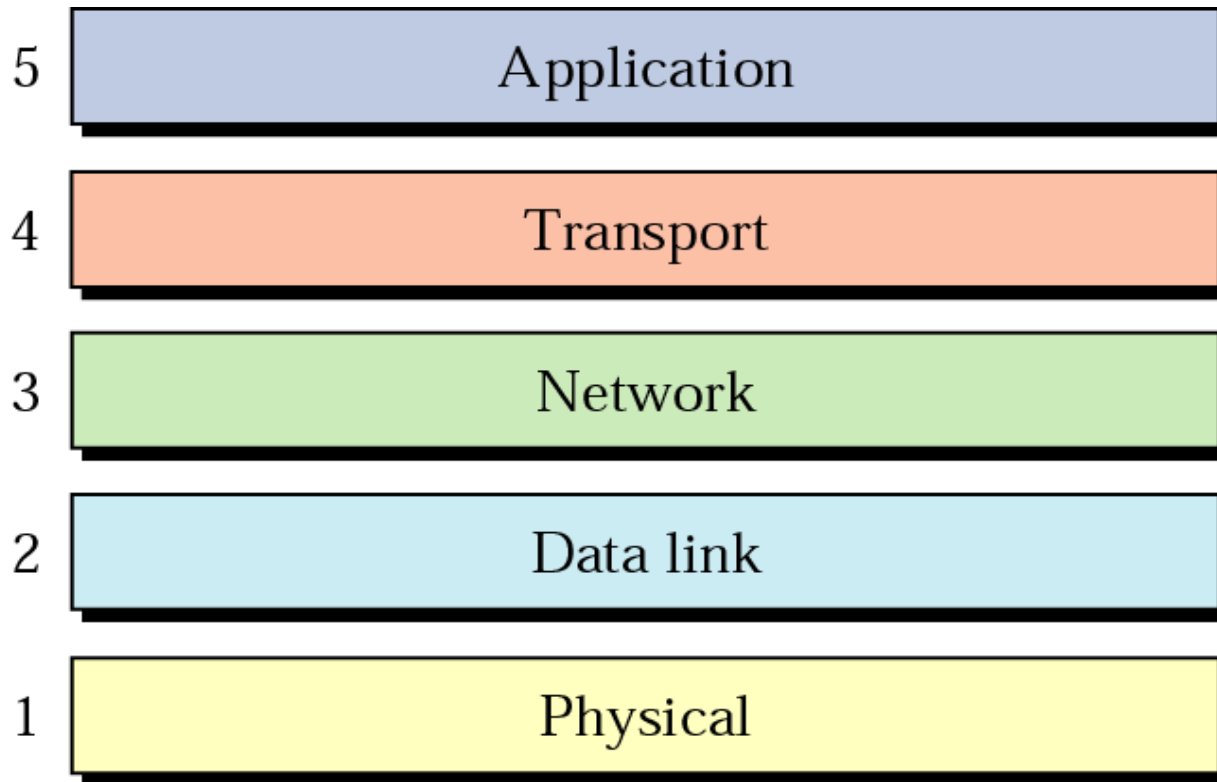
Figure 2.2 *Internet layers*

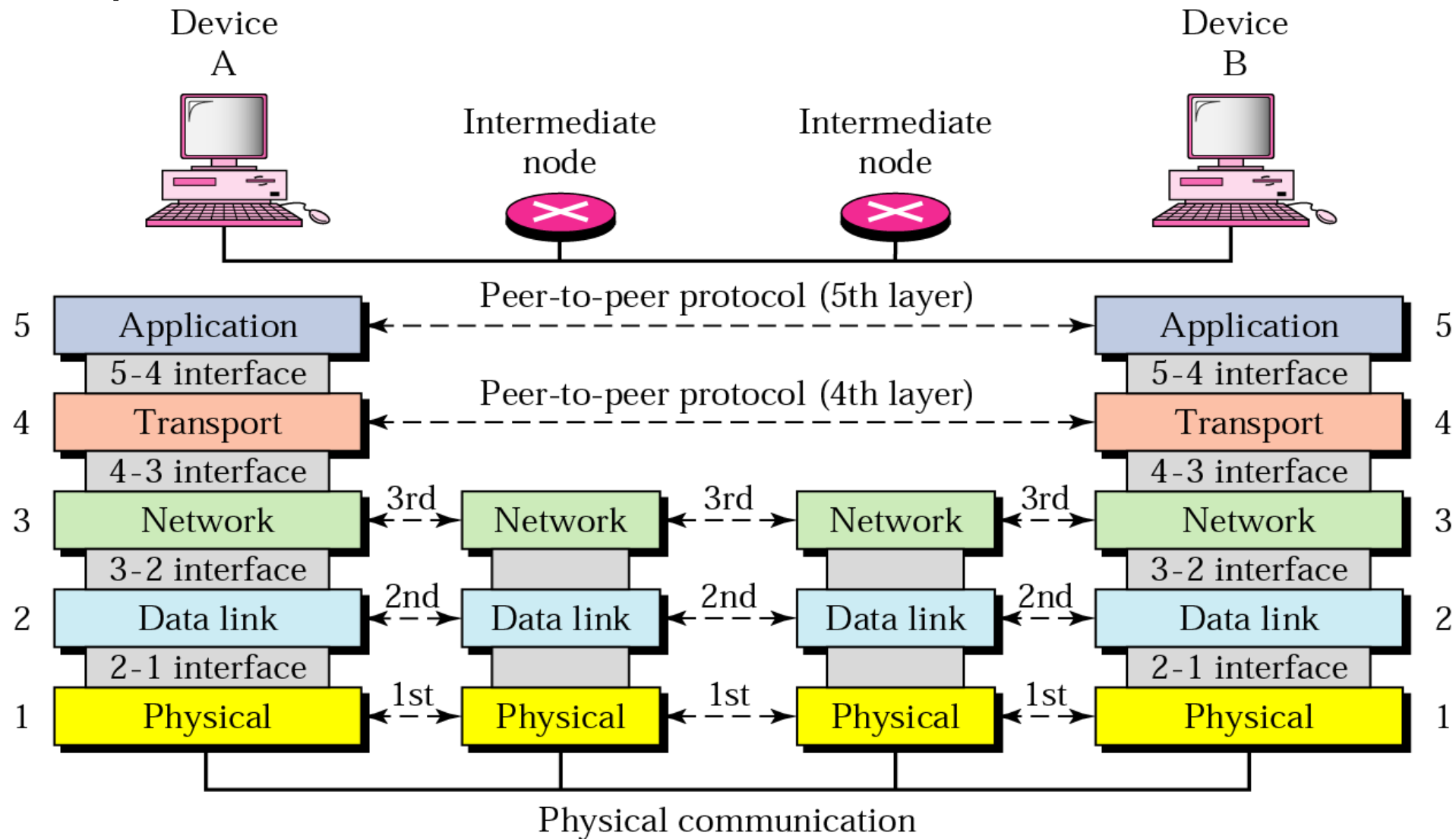# Figure 2.3   Peer-to-peer processes
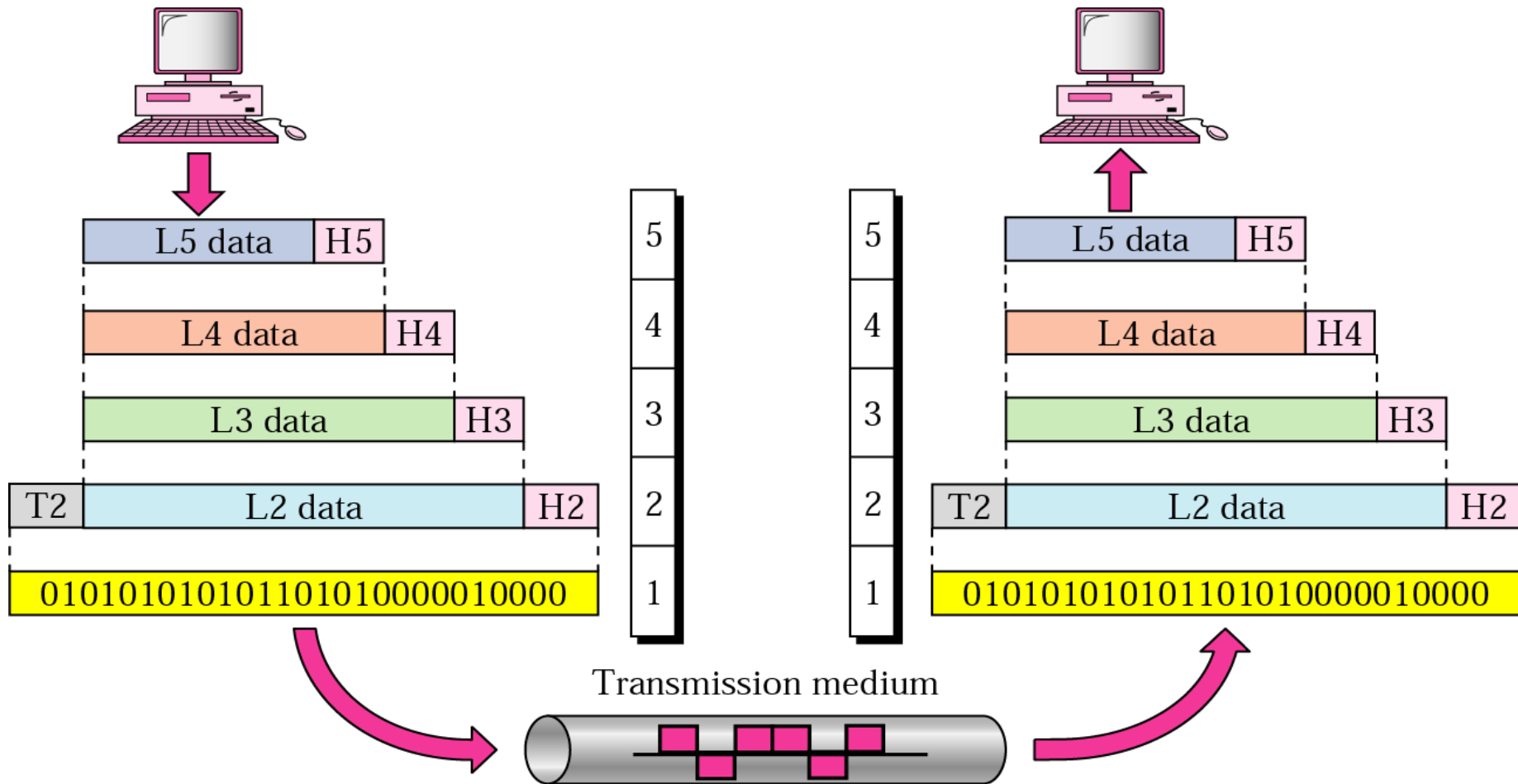
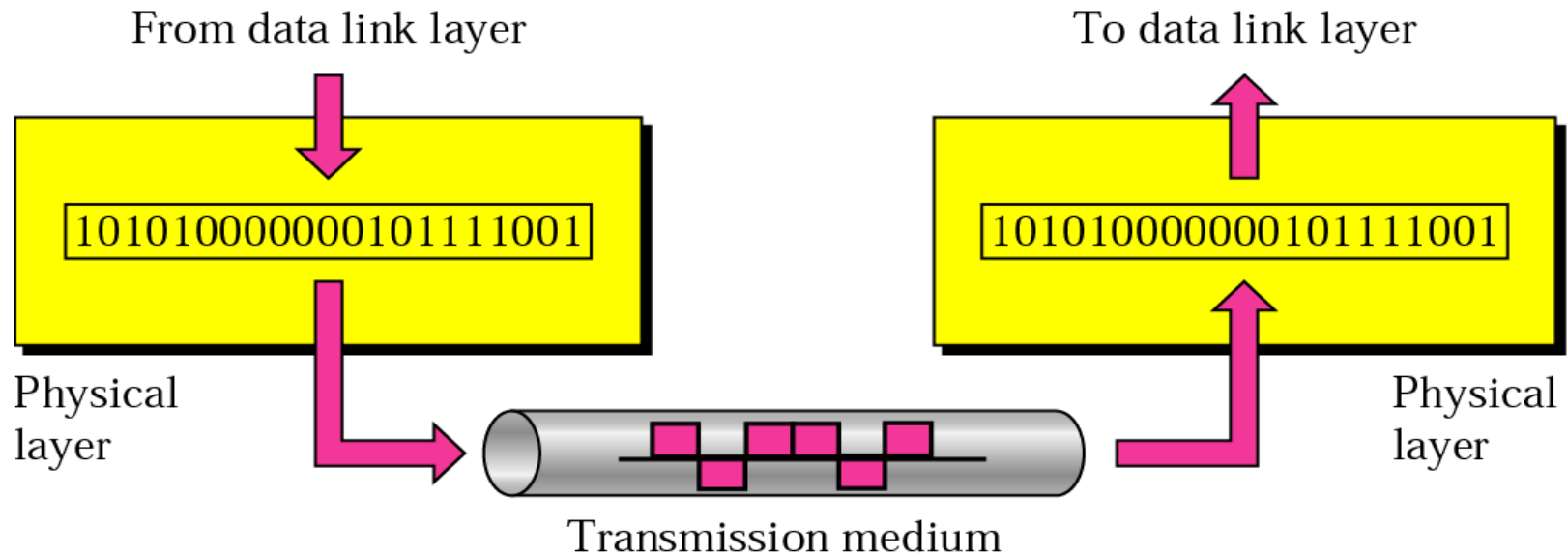# Figure 2.4 An exchange using the Internet model
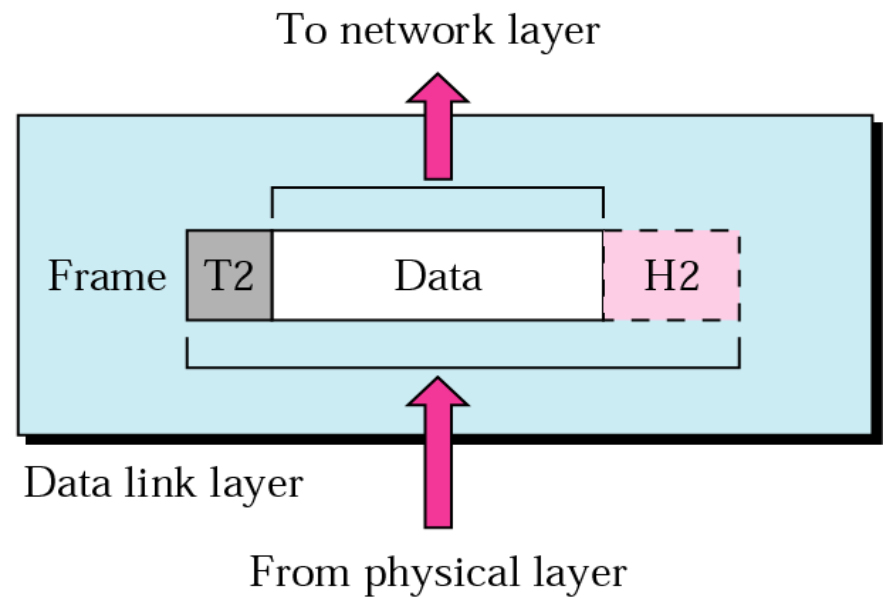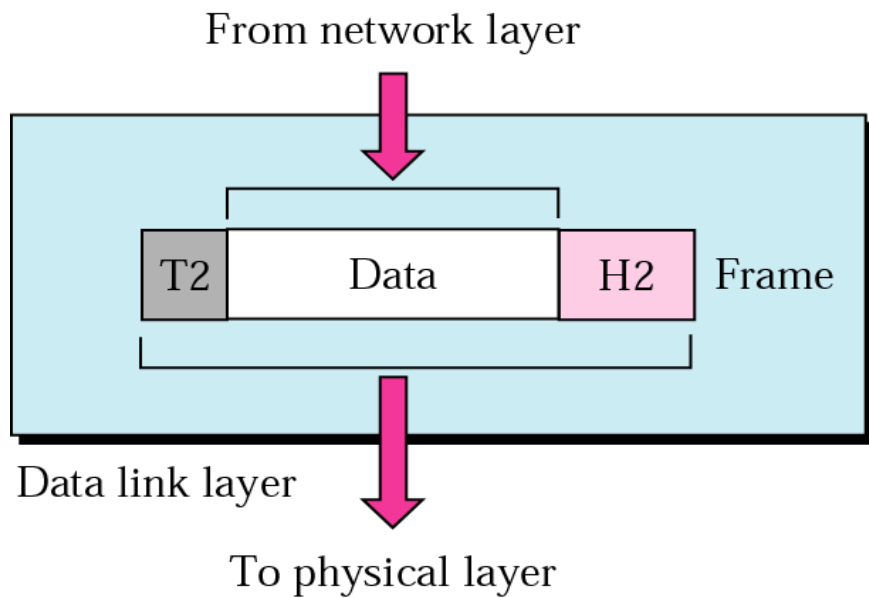
Figure 2.5 *Physical layer*

Note:

The physical layer is responsible for transmitting individual bits from one node to the next.

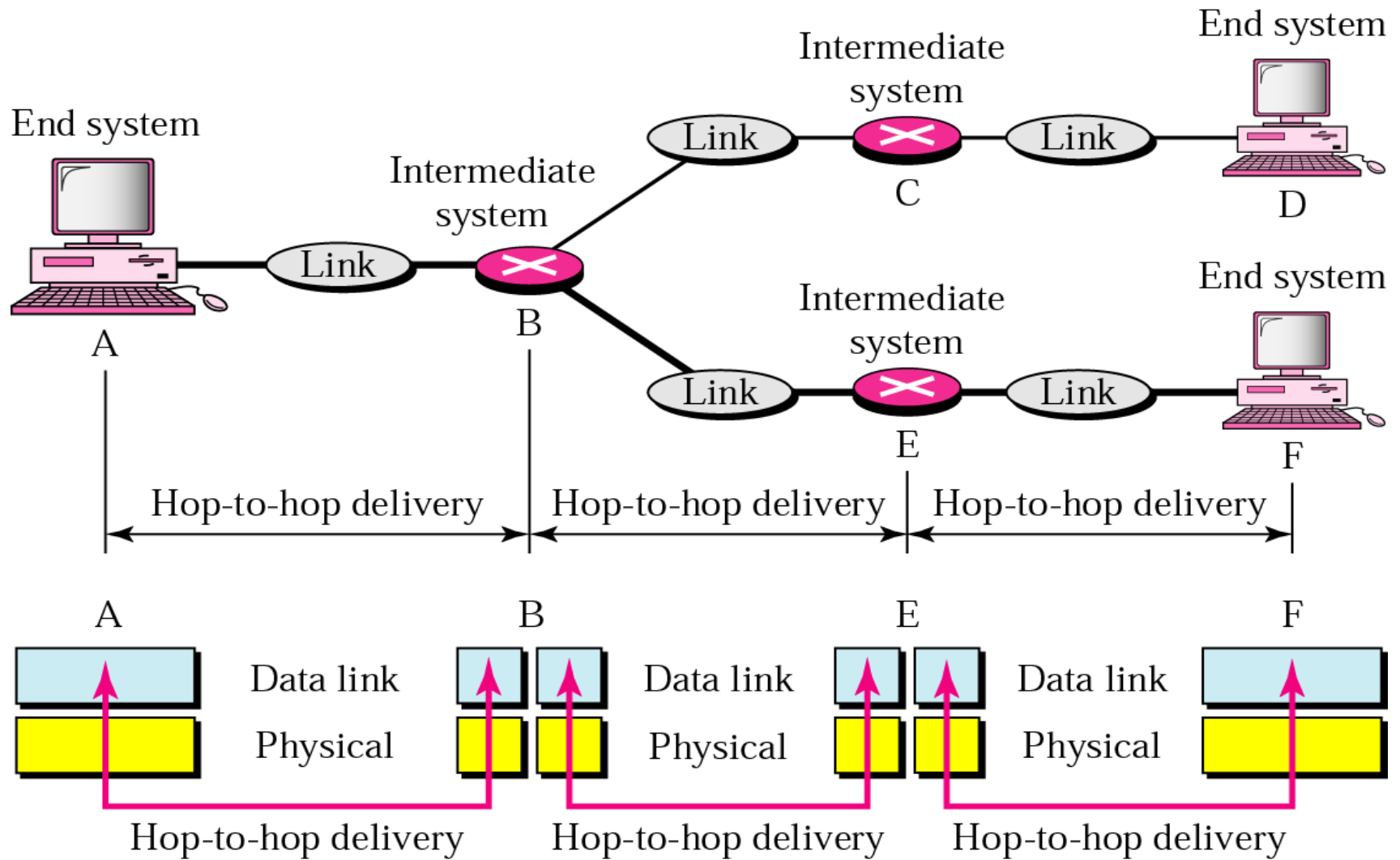**Figure 2.6** *Data link layer*

Note:

The data link layer is responsible for transmitting frames from one node to the next.

Figure 2.7   Node-to-node delivery

Example 1

In Figure 2.8 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
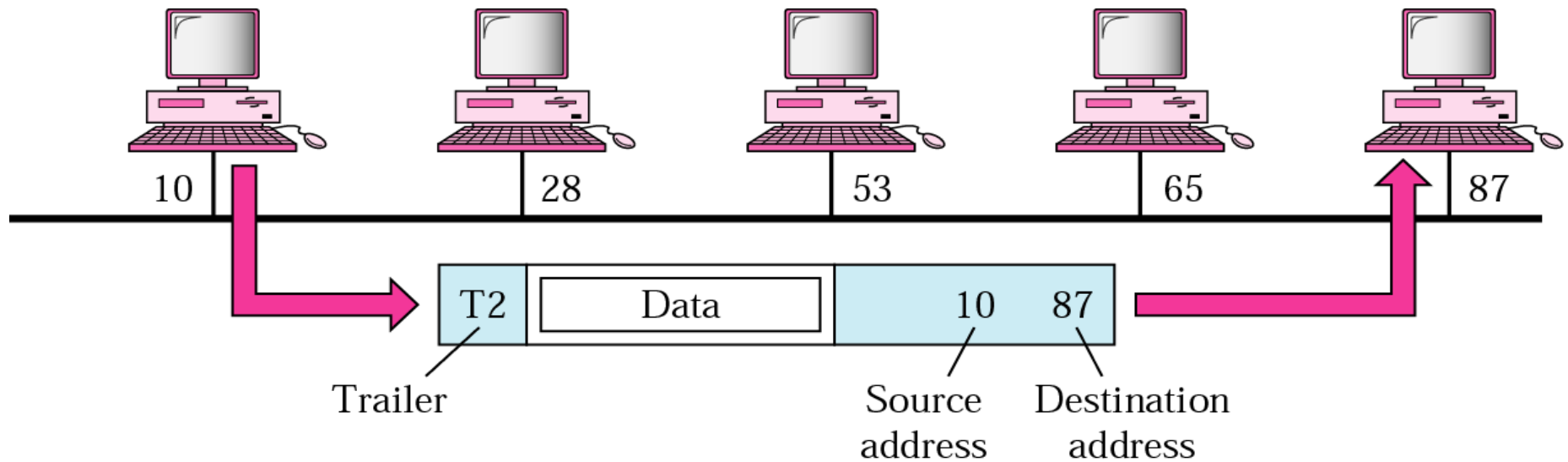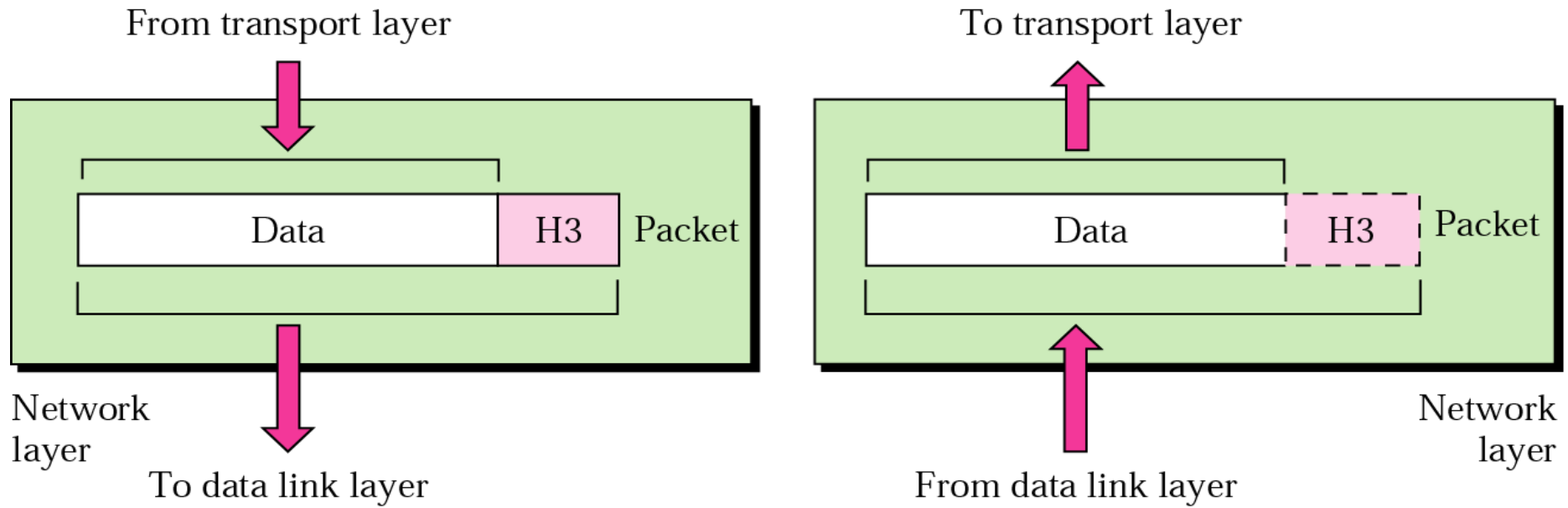
Figure 2.8 Example 1

Figure 2.9 *Network layer*

From transport layer

Data H3 Packet

Network layer

To data link layer

To transport layer

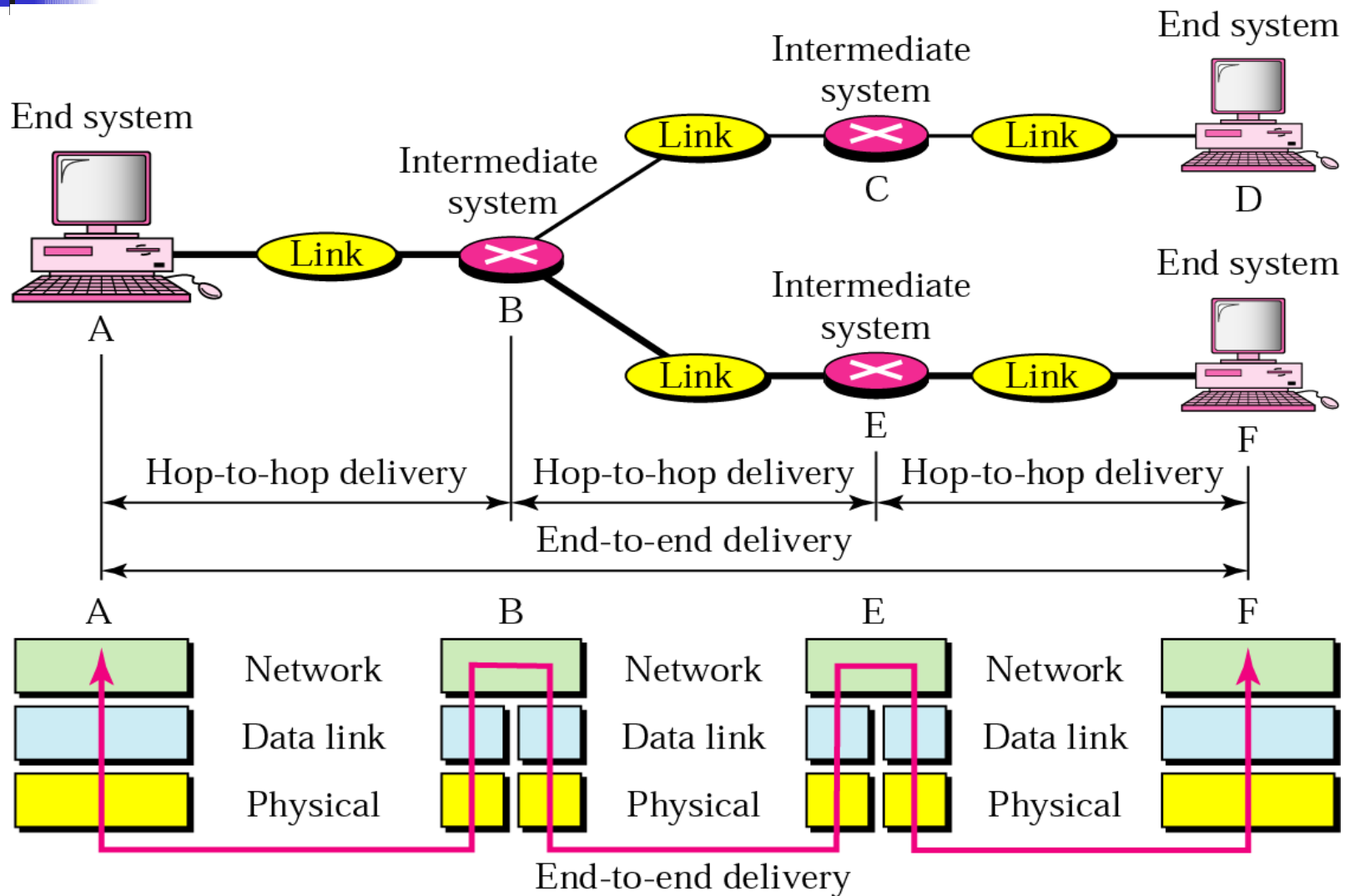Data H3 Packet

Network layer

From data link layer

Note:

The network layer is responsible for the delivery of packets from the original source to the final destination.

Figure 2.10   Source-to-destination delivery

Example 2

In Figure 2.11 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 jurisdiction. What we need here are universal addresses that can pass through the LAN boundaries. The network (logical) addresses have this characteristic.
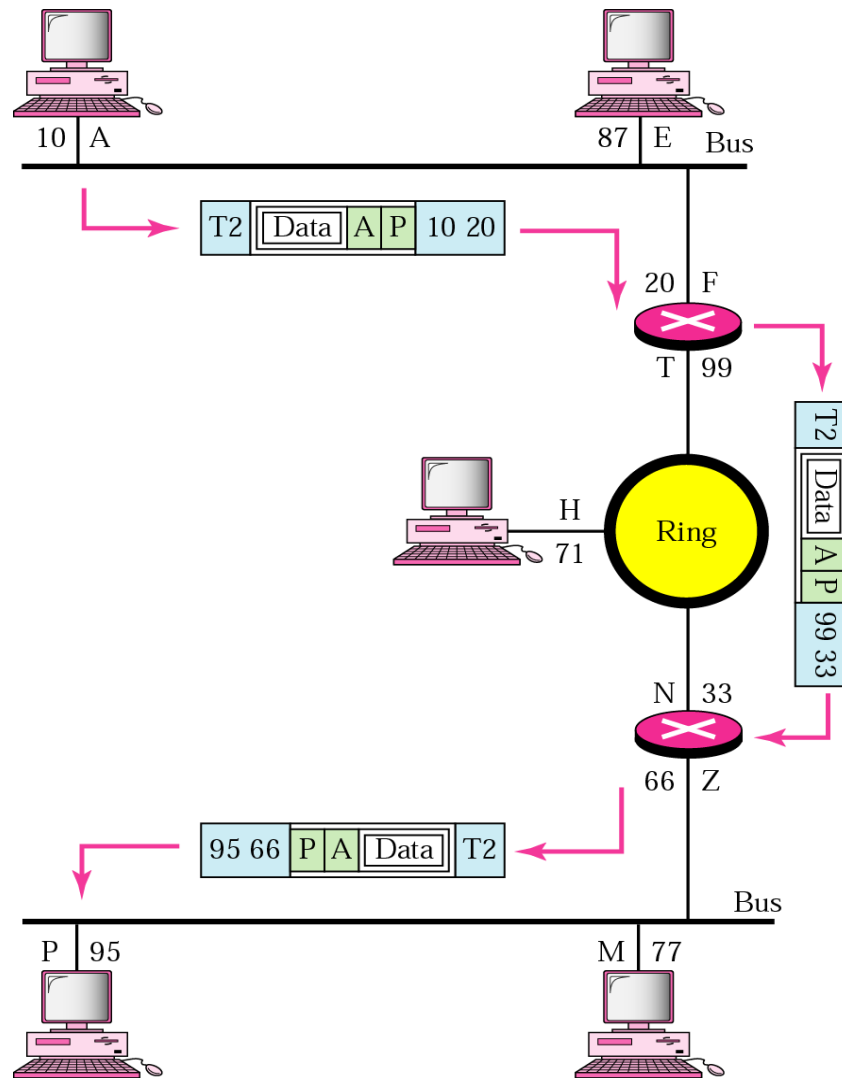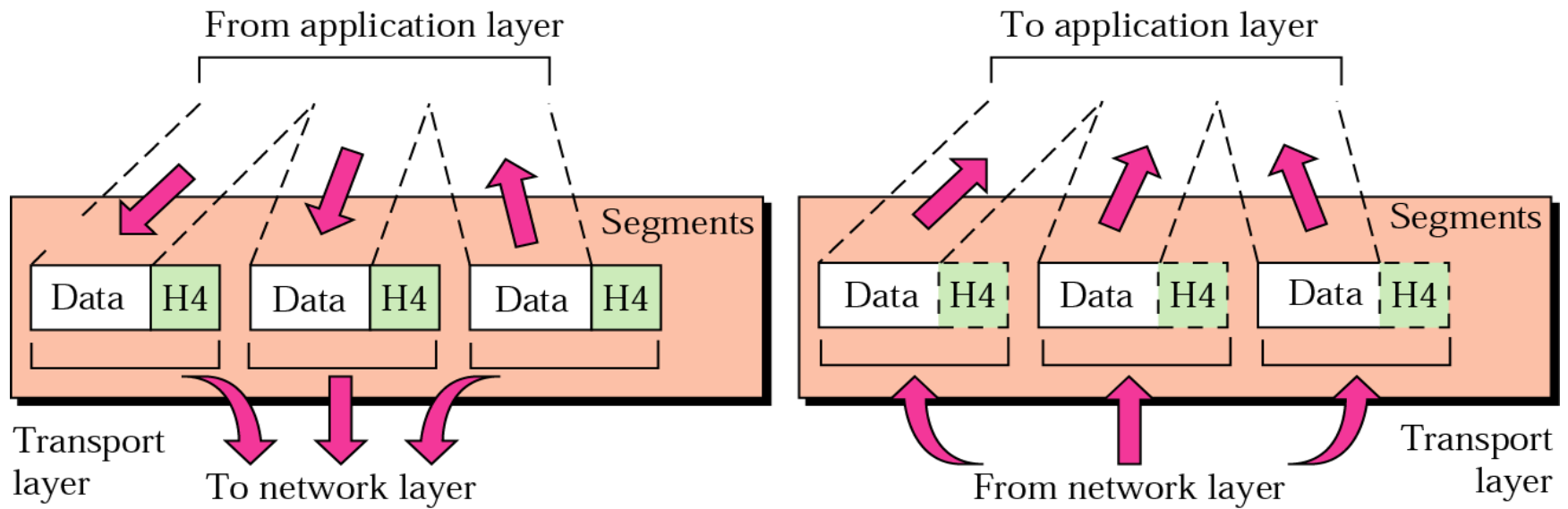
Figure 2.11   Example 2
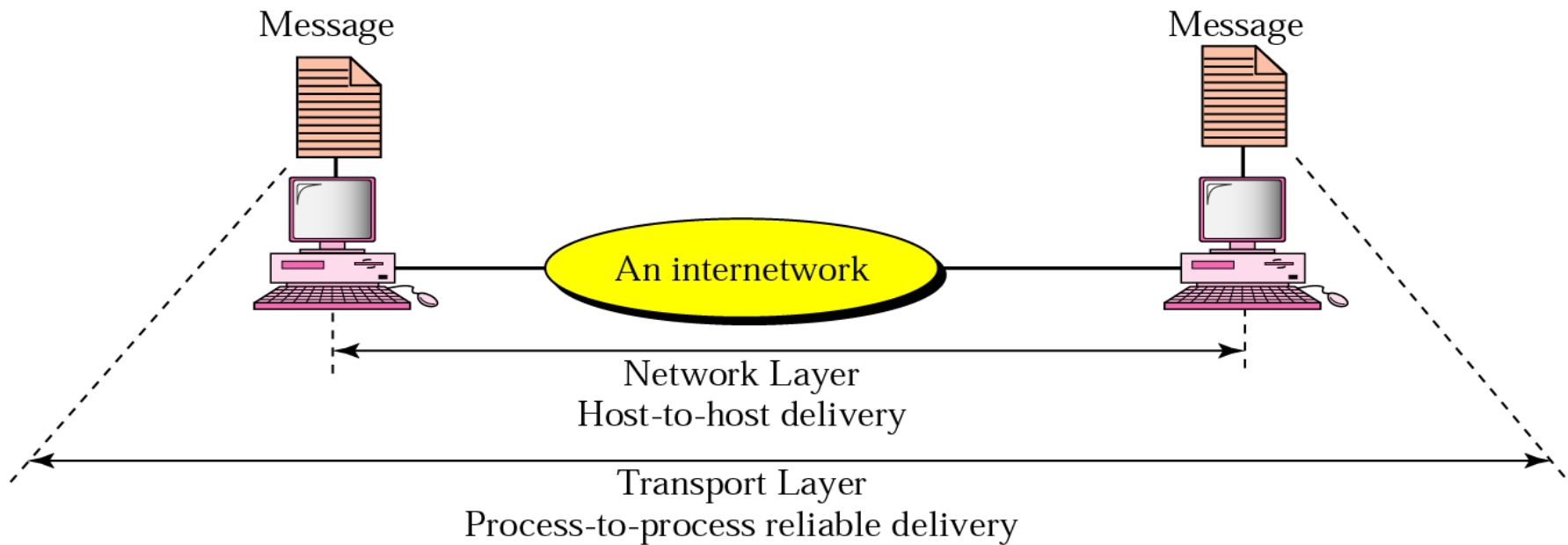
Figure 2.12 *Transport layer*

Note:

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

Figure 2.12   Reliable process-to-process delivery of a message

Example 3

Figure 2.14 shows an example of transport layer communication. 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.
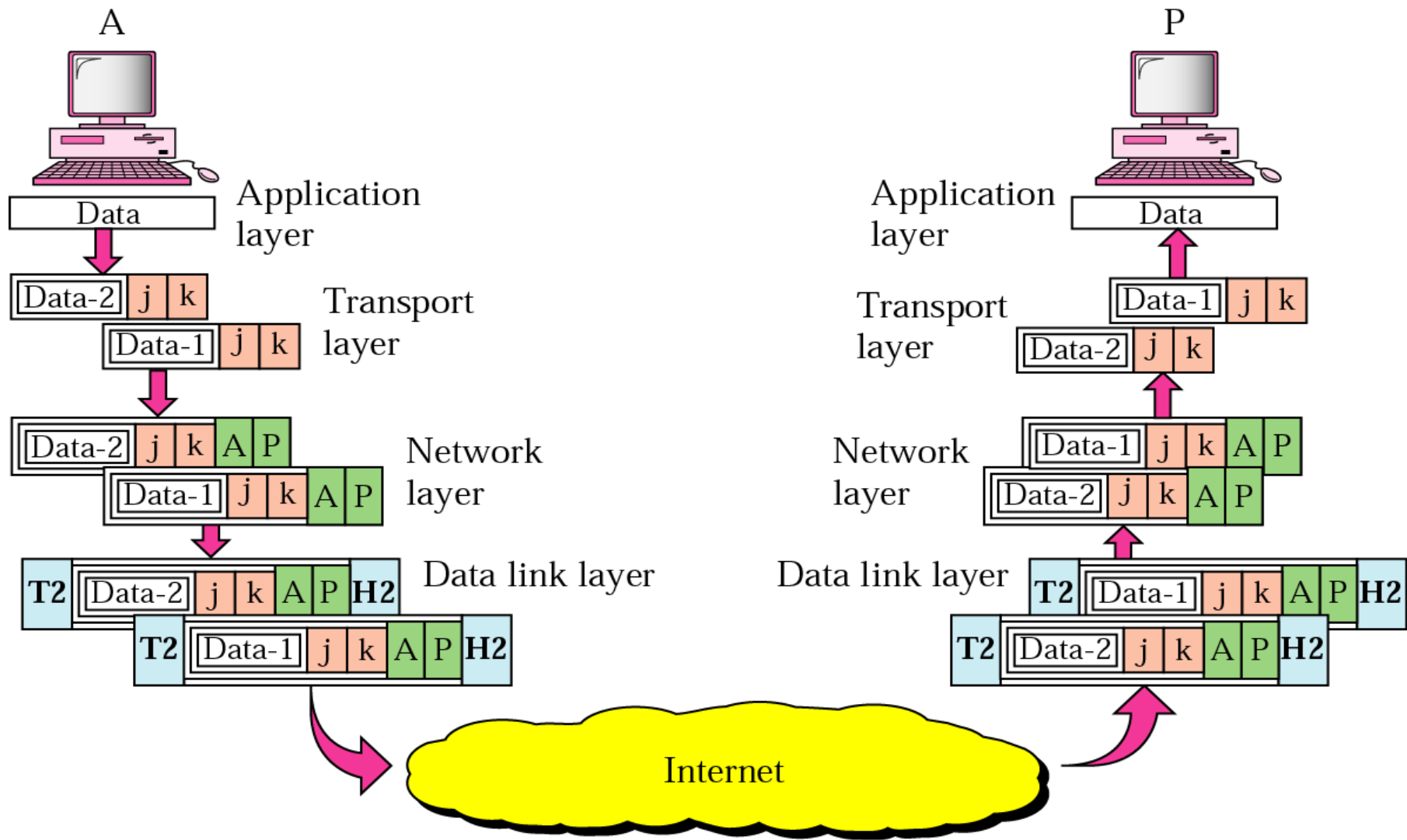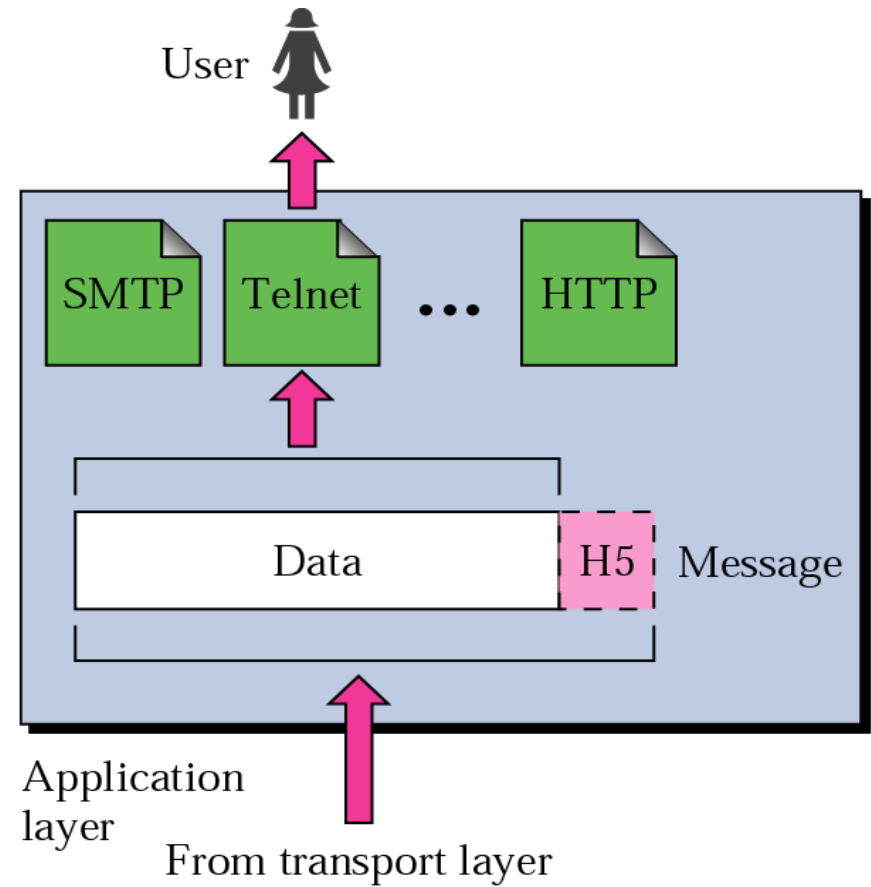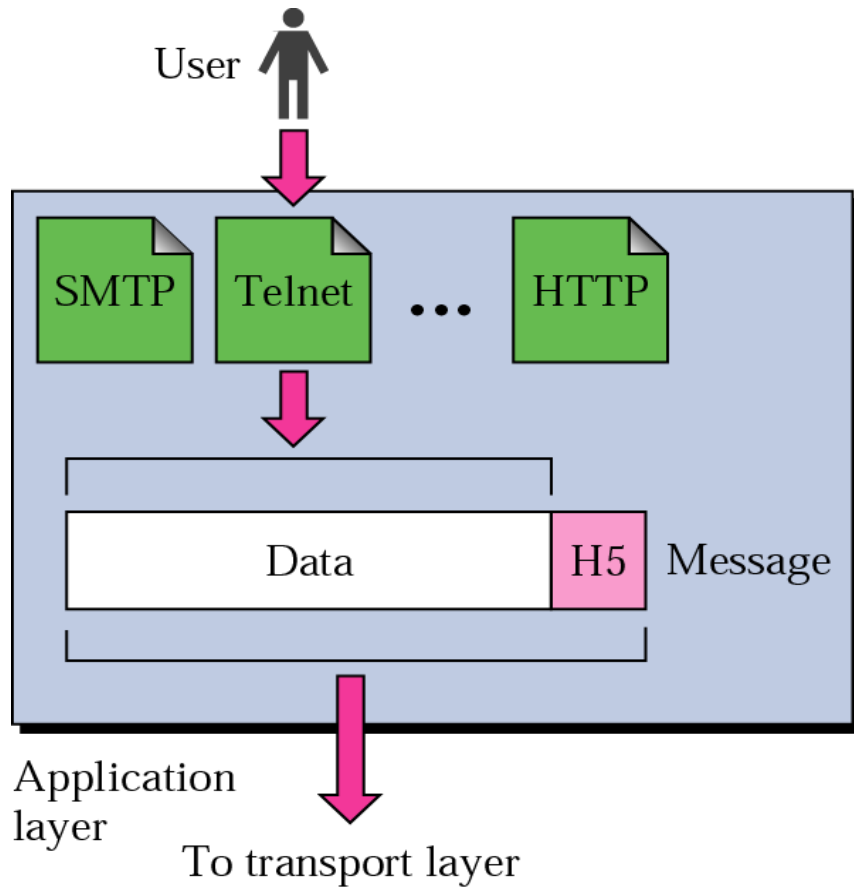
Figure 2.14 *Example 3*

Figure 2.15   Application layer

Note:

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

Figure 2.16 Summary of duties

To provide reliable process-to-process message delivery and error recovery	Application	To allow access to network resources	
	Transport		
To organize bits into frames; to provide hop-to-hop delivery	Network	To move packets from source to destination; to provide internetworking	
	Data link		
	Physical	To transmit bits over a medium; to provide mechanical and electrical specifications	

Figure 2.17   OSI model

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