Chapter 2

Network Models
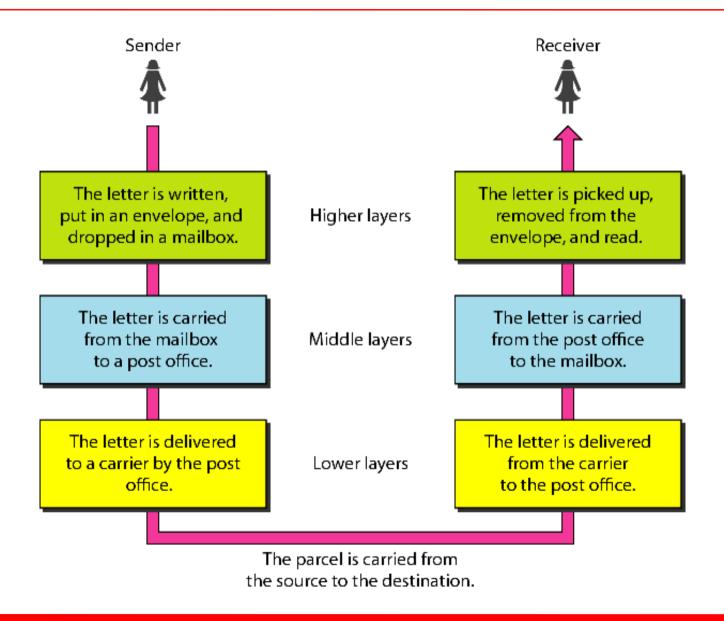
We use the concept of layers in our daily life. As an example, let us consider two friends who communicate through postal mail. The process of sending a letter to a friend would be complex if there were no services available from the post office.

Topics discussed in this section:

Sender, Receiver, and Carrier
Hierarchy

Figure 2.1 Tasks involved in sending a letter

2.3

2-2   THE OSI MODEL

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 late 1970s.

Topics discussed in this section:

Layered Architecture
Peer-to-Peer Processes
Encapsulation

2.4

Note

ISO is the organization.
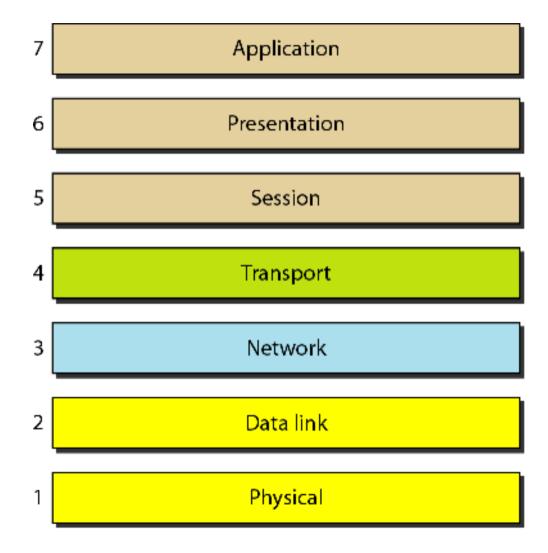OSI is the model.

Figure 2.2 *Seven layers of the OSI model*

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

Figure 2.3 *The interaction between layers in the OSI model*
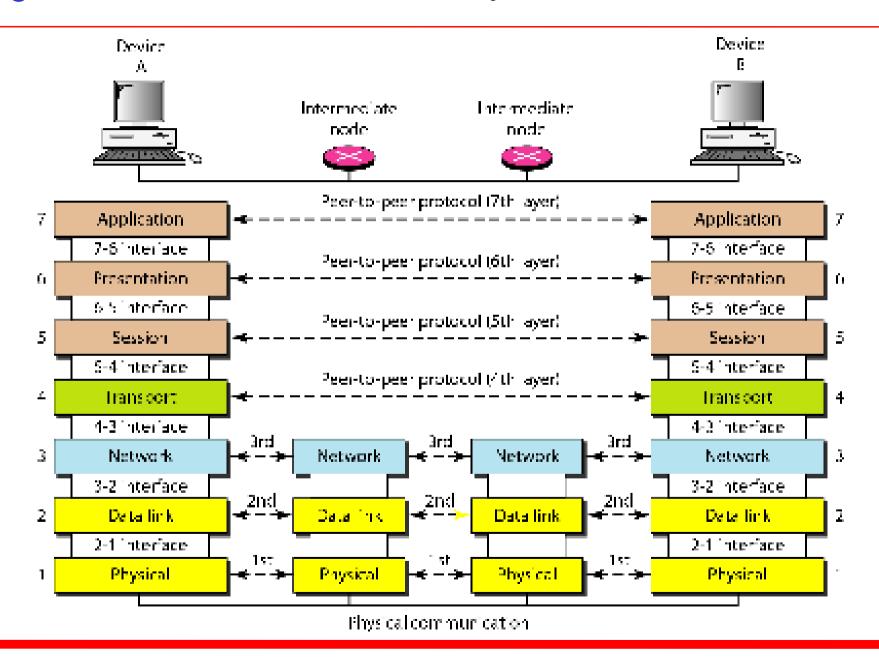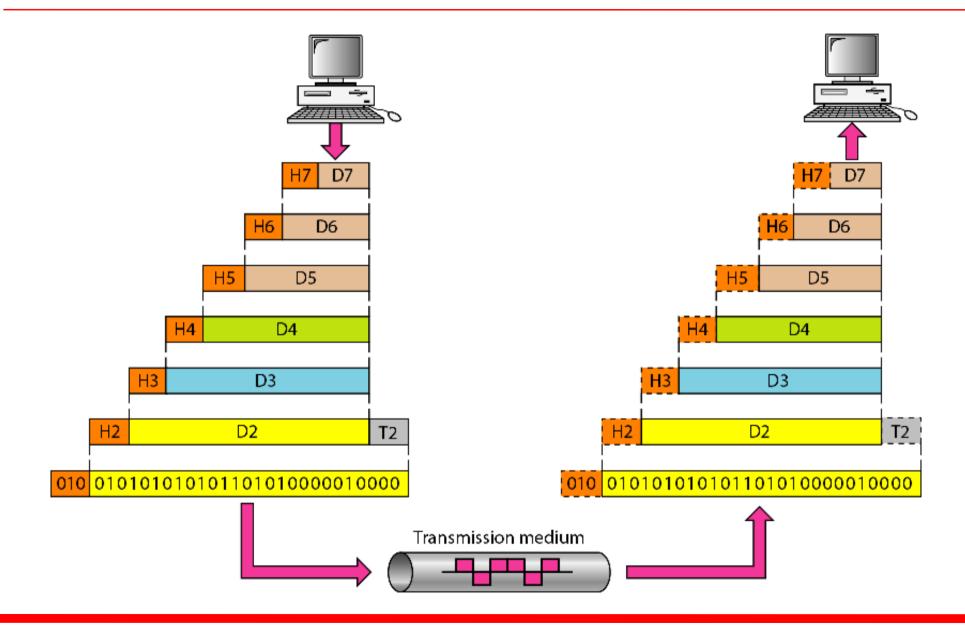
Figure 2.4 *An exchange using the OSI model*

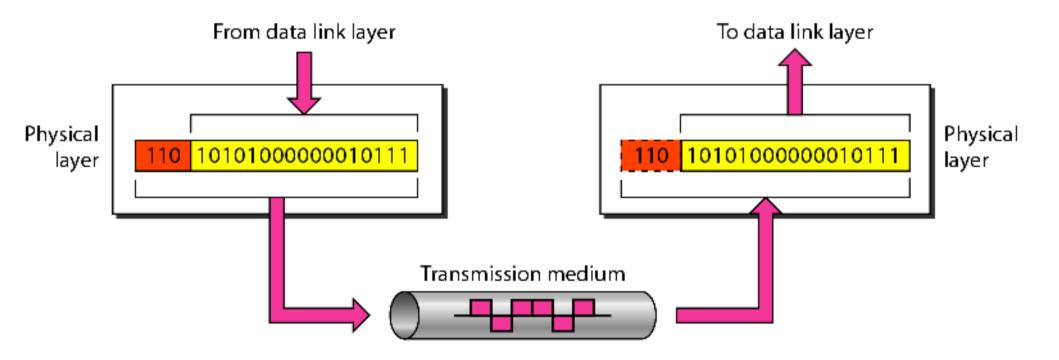Transmission medium

2-3   LAYERS IN THE OSI MODEL

In this section we briefly describe the functions of each layer in the OSI model.

Topics discussed in this section:

Physical Layer
Data Link Layer
Network Layer
Transport Layer
Session Layer
Presentation Layer
Application Layer
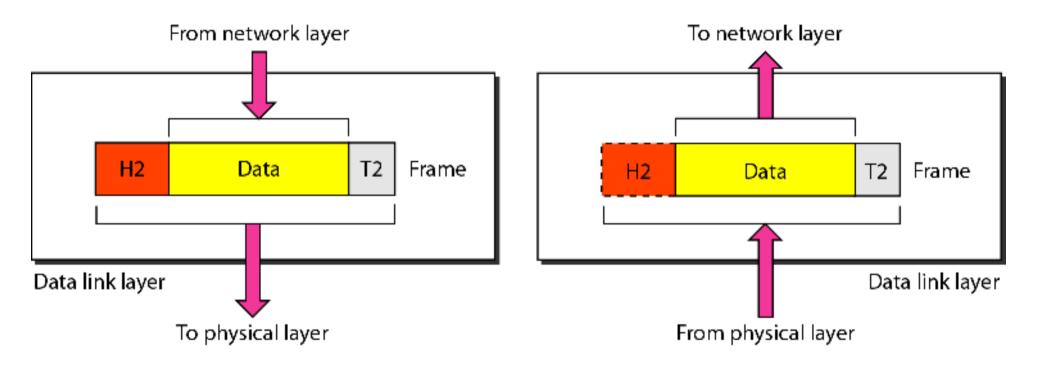
Figure 2.5 *Physical layer*

Note

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

Figure 2.6 *Data link layer*

Note

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

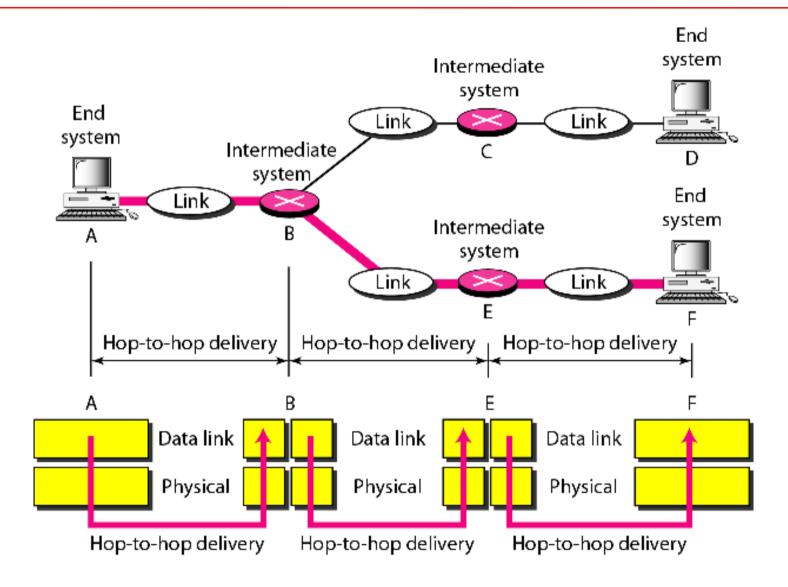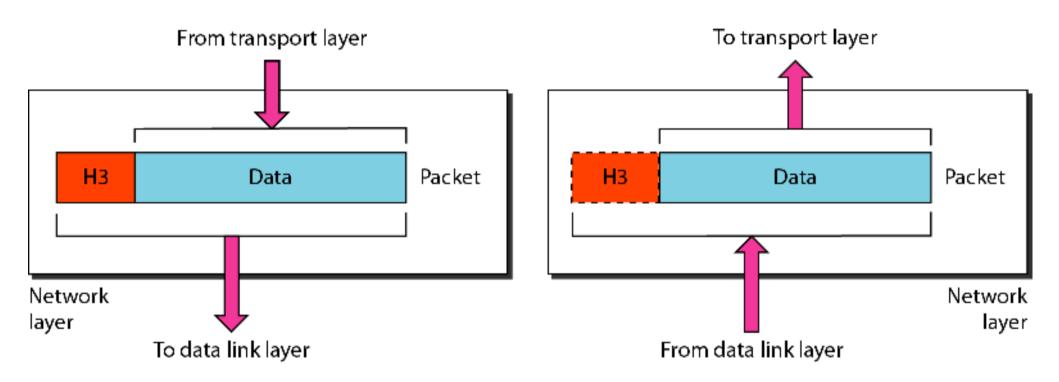# Figure 2.7 *Hop-to-hop delivery*

Figure 2.8 *Network layer*

Note

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

Figure 2.9 *Source-to-destination delivery*

Figure 2.10 *Transport layer*

From session layer

To session layer

H4 | Data   H4 | Data   H4 | Data

Segments

Transport layer

To network layer

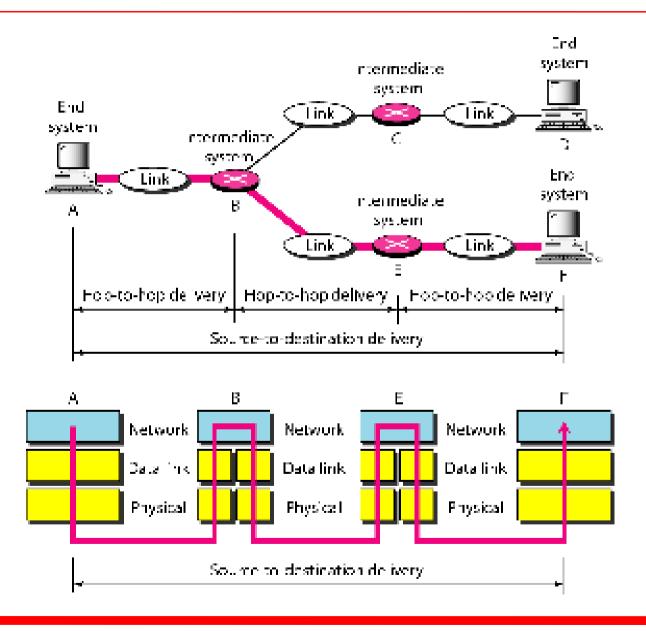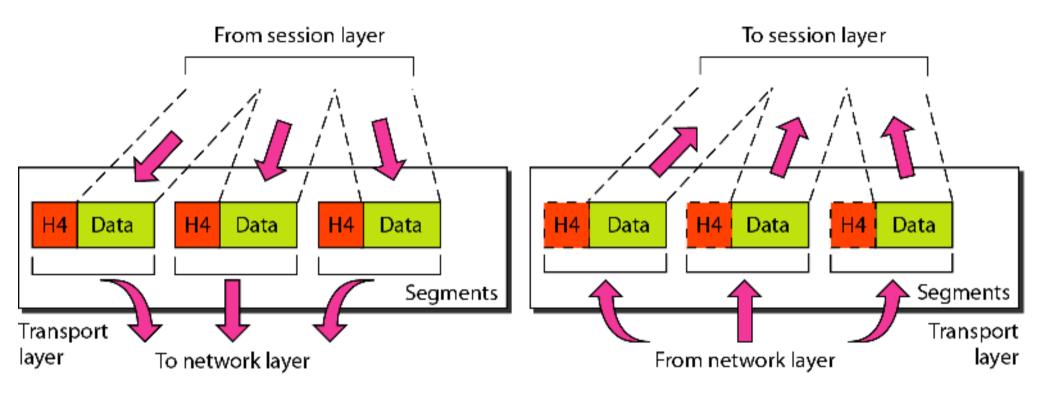H4 | Data   H4 | Data   H4 | Data

Segments

From network layer

Transport layer

Note

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

Figure 2.11 *Reliable process-to-process delivery of a message*

Processes

Processes

An internet

Network layer
Host-to-host delivery

Transport layer
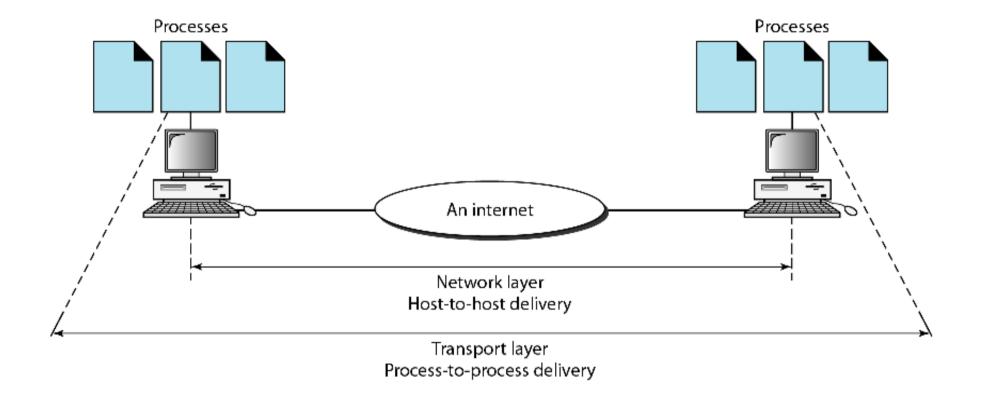Process-to-process delivery

2.20

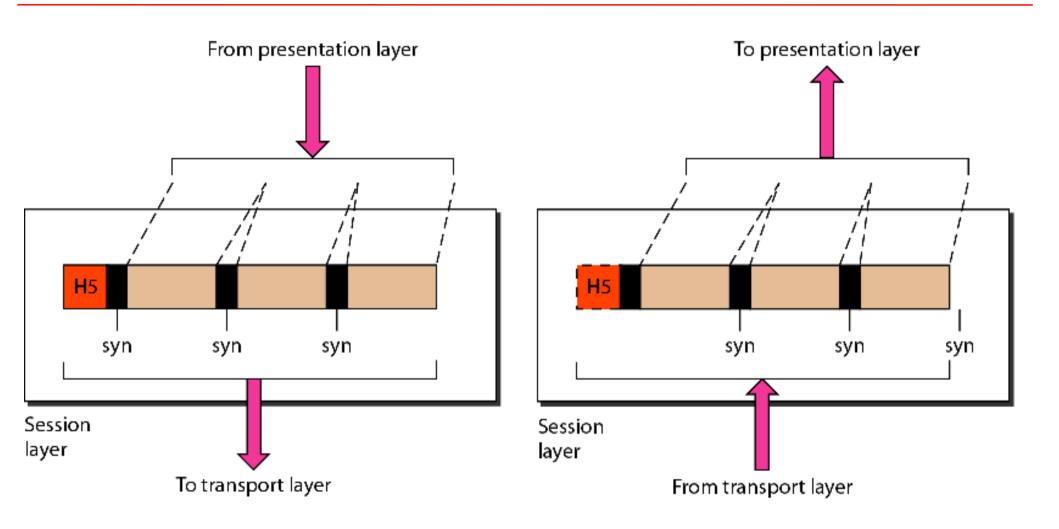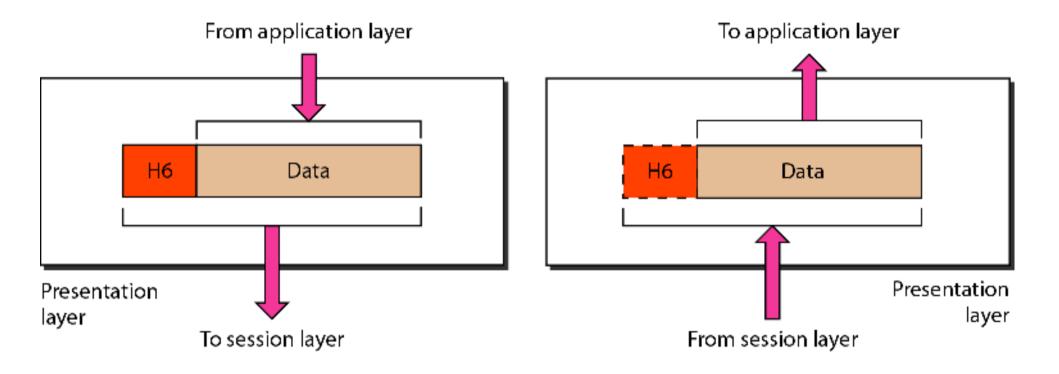# Figure 2.12 *Session layer*

Note

The session layer is responsible for dialog control and synchronization.
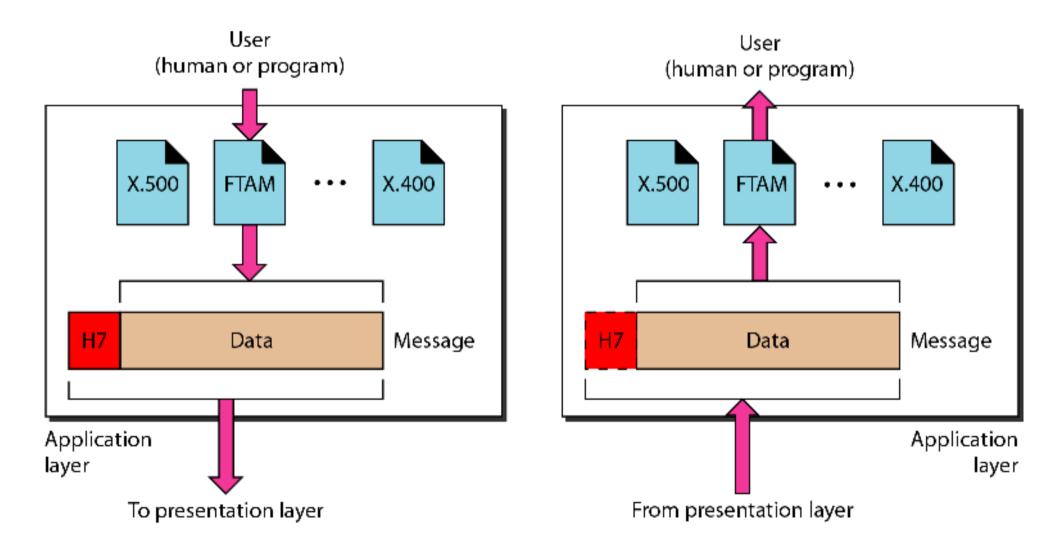
Figure 2.13 *Presentation layer*

Note

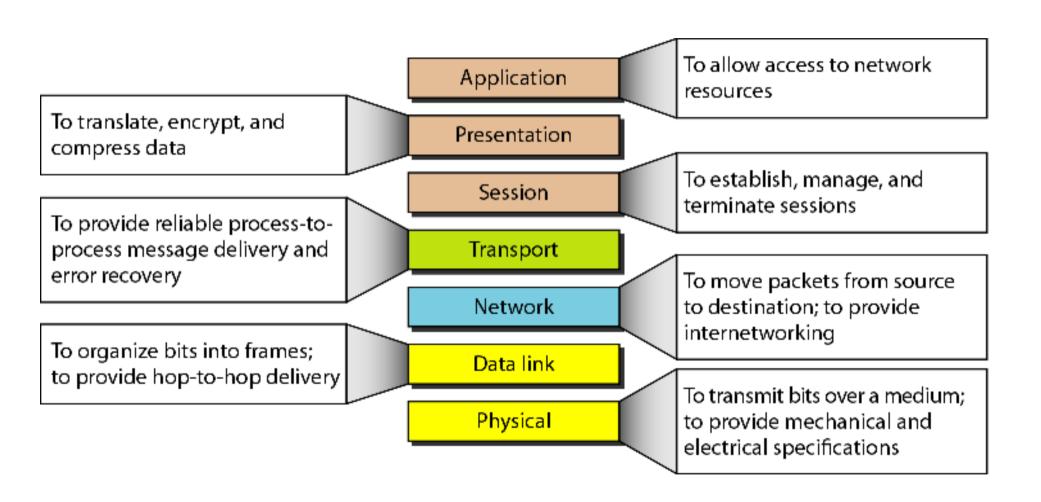The presentation layer is responsible for translation, compression, and encryption.

Figure 2.14 *Application layer*

Note

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

Figure 2.15 *Summary of layers*

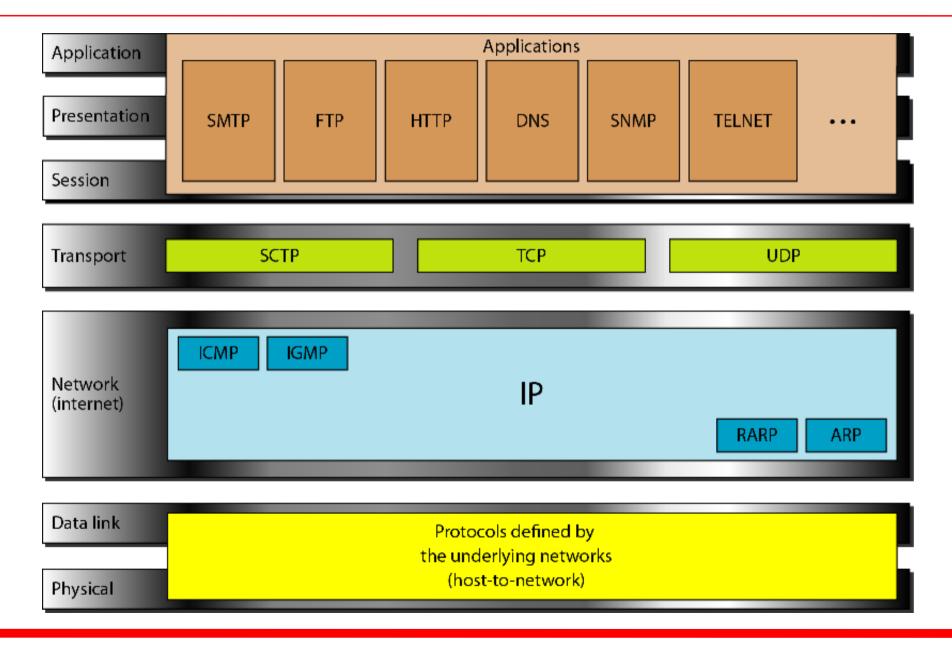| Layer	Function
Application	To allow access to network resources
Presentation	To translate, encrypt, and compress data
Session	To establish, manage, and terminate sessions
Transport	To provide reliable process-to-process message delivery and error recovery
Network	To move packets from source to destination; to provide internetworking
Data link	To organize bits into frames; to provide hop-to-hop delivery
Physical	To transmit bits over a medium; to provide mechanical and electrical specifications

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.

Topics discussed in this section:

Physical and Data Link Layers
Network Layer
Transport Layer
Application Layer

2.28

Figure 2.16 *TCP/IP and OSI model*

2.29

2-5   ADDRESSING

Four levels of addresses are used in an internet employing the TCP/IP protocols: physical, logical, port, and specific.

Physical Addresses
Logical Addresses
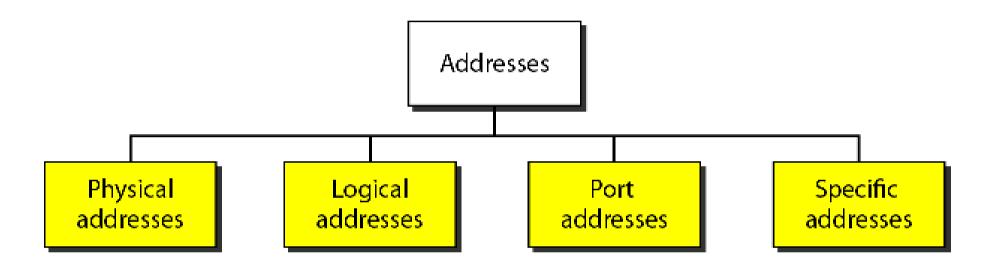Port Addresses
Specific Addresses

Figure 2.17 *Addresses in TCP/IP*

Figure 2.18 *Relationship of layers and addresses in TCP/IP*

Application layer	Processes	→	Specific addresses
Transport layer	SCTP TCP UDP	→	Port addresses
Network layer	IP and other protocols	→	Logical addresses
Data link layer	Underlying physical networks	→	Physical addresses
Physical layer			

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