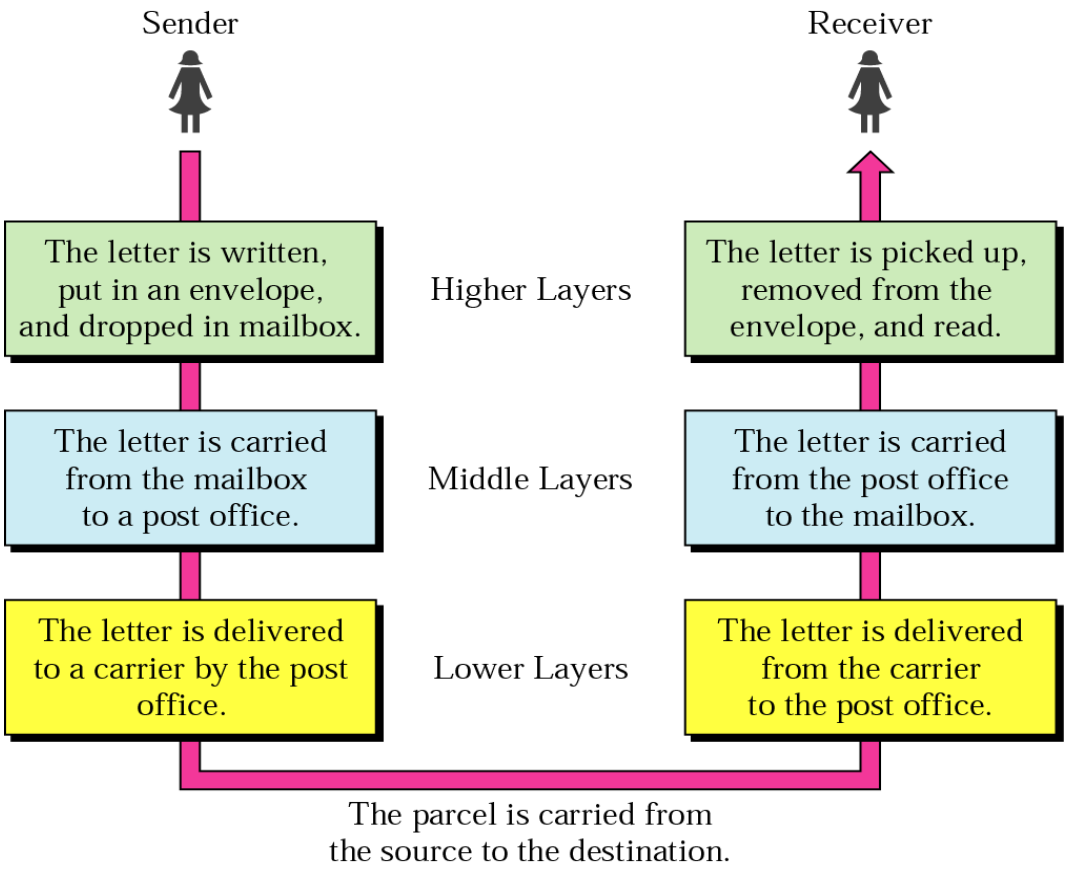
Chapter 2. Network Models

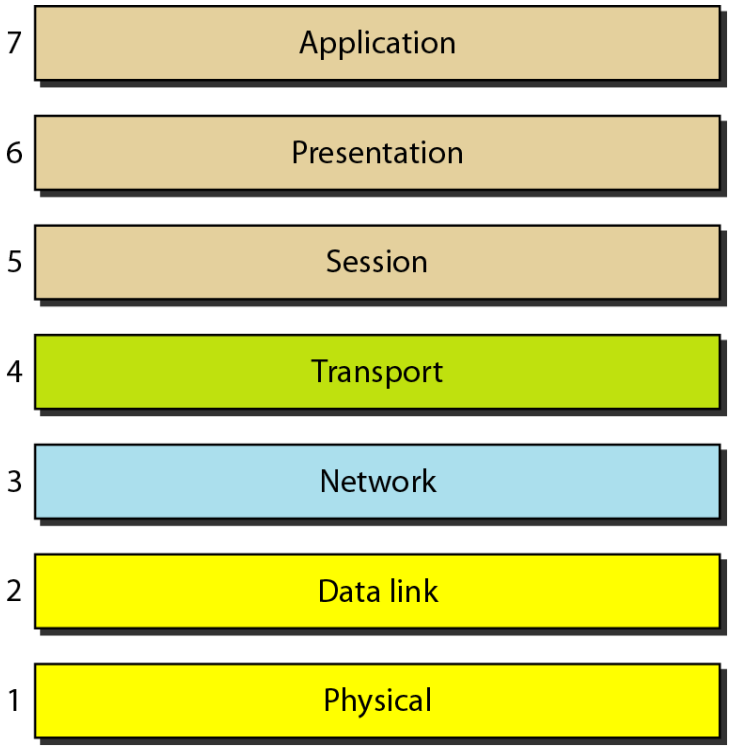
1. Layered Tasks
2. The OSI Model
3. Layers in the OSI Model
4. TCP/IP Protocol Suite
5. Addressing

Layered Model: Sending a Letter



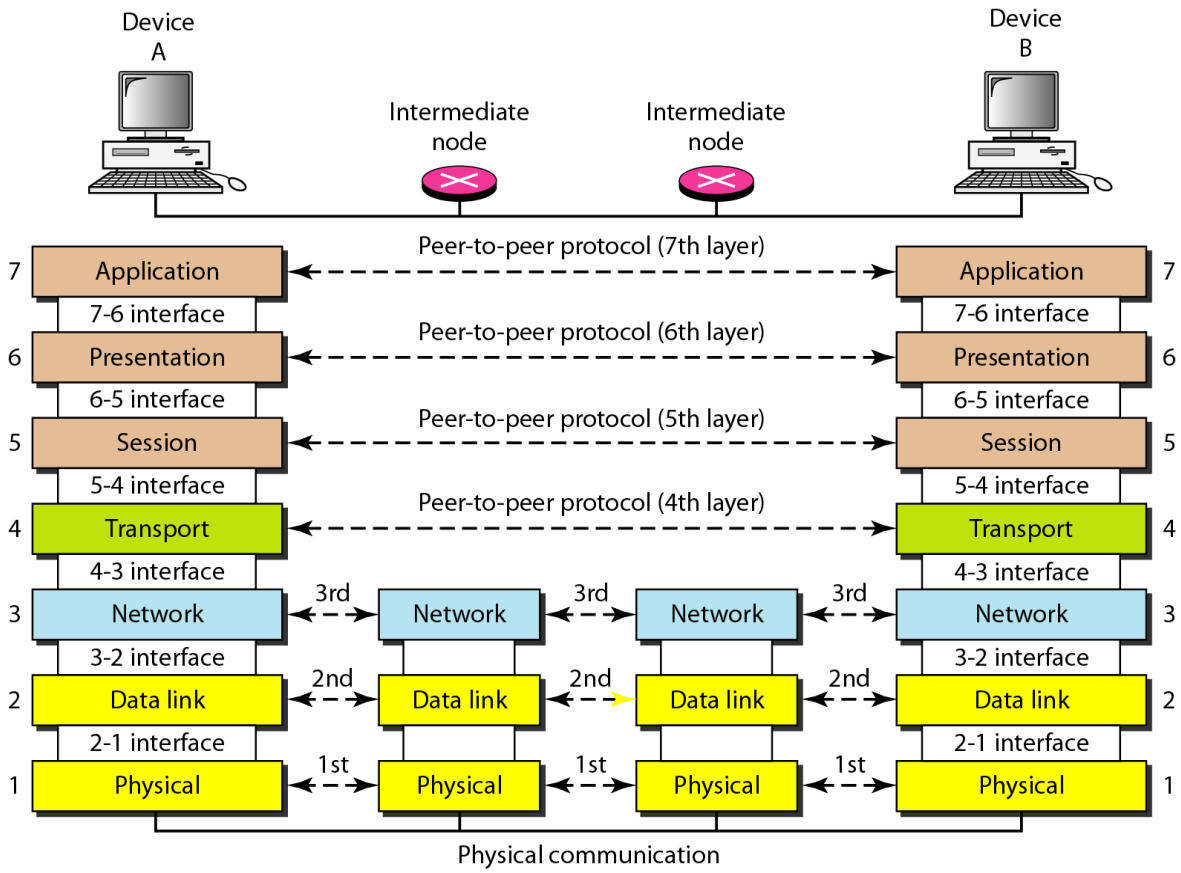
OSI Model

- ISO is the organization. OSI is the model



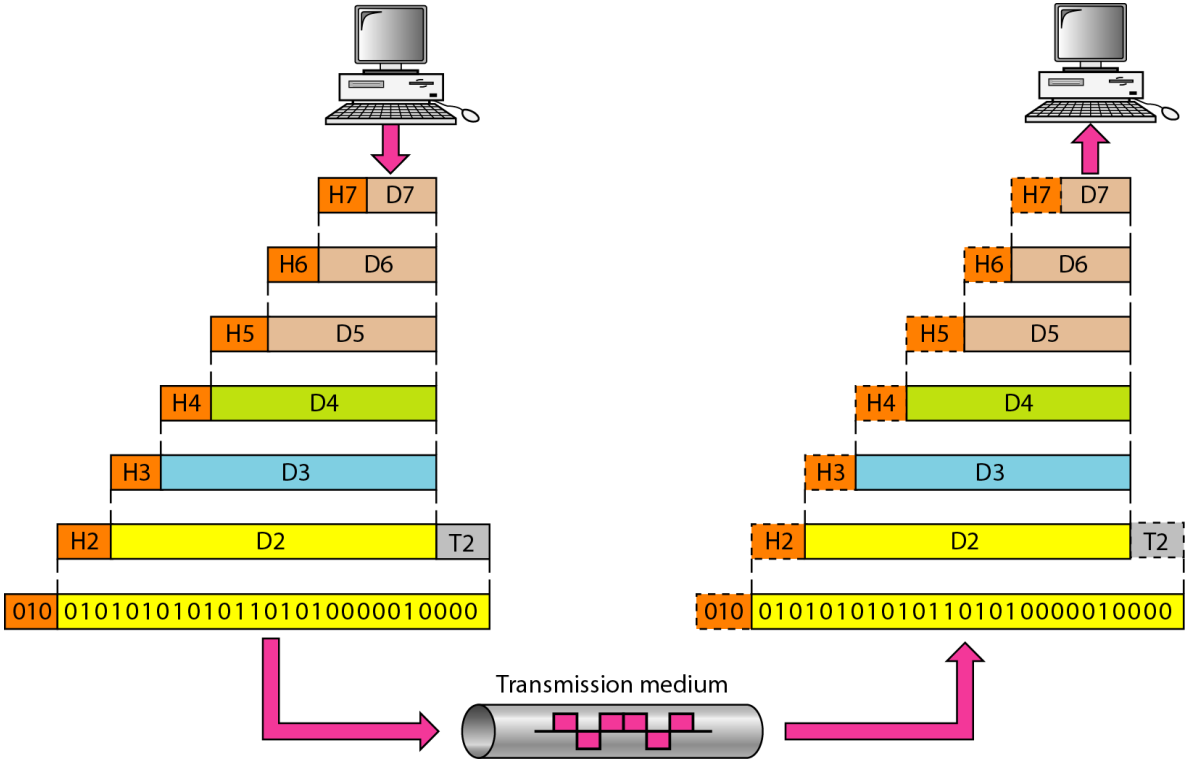
Interaction between layers in the OSI model

- Layer and interface



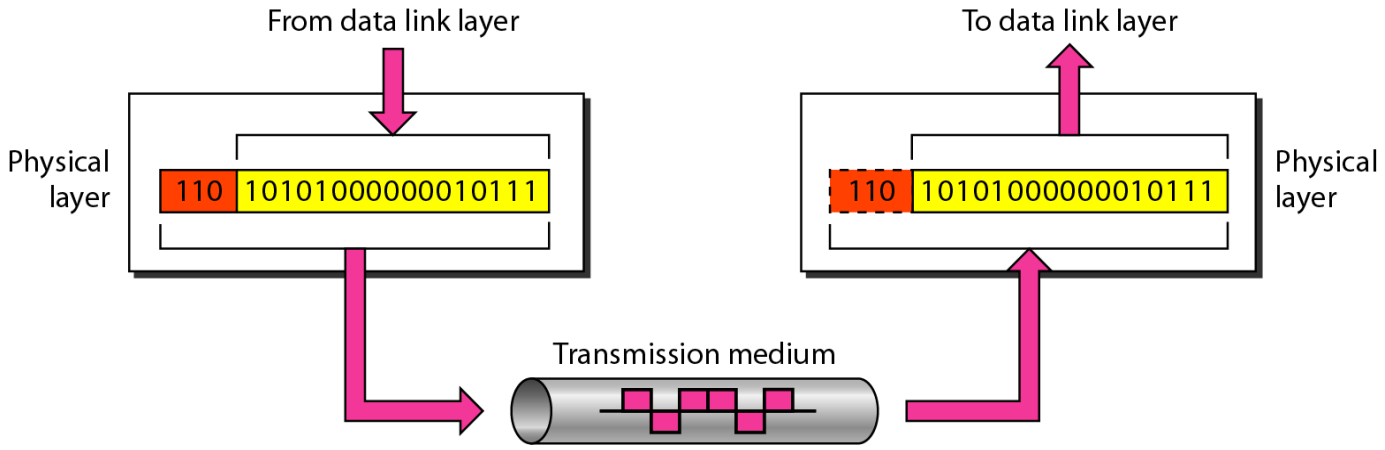
An exchange using the OSI model

- Encapsulation with header and possibly trailer



Physical Layer

- The physical layer is responsible for movements of individual bits from one hop (node) to the next
- Mechanical and electrical specification, the procedures and functions

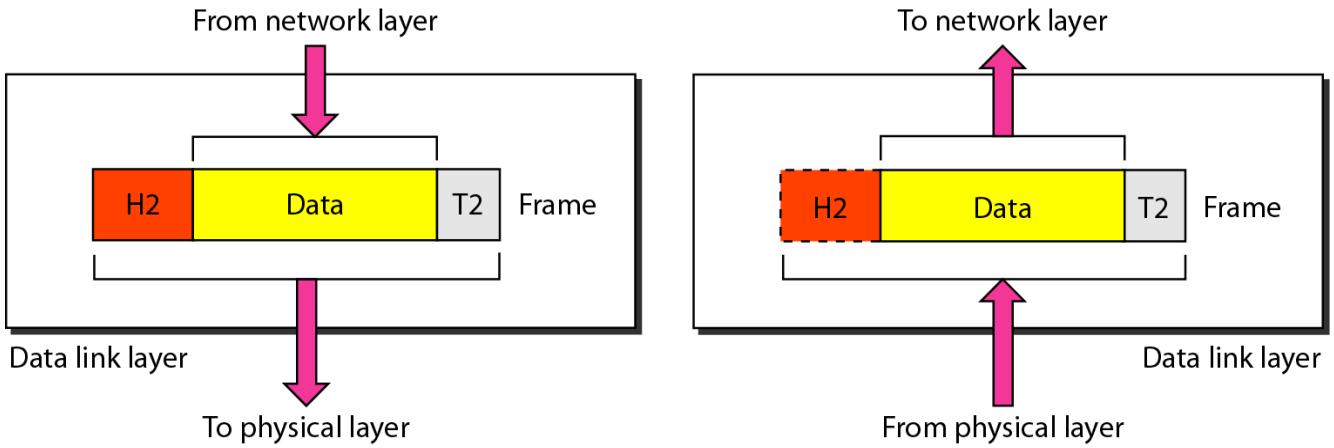


Physical Layer: Duties

- Physical characteristics of interfaces and media
- Representation of bits
  - Encoded into signals – electrical or optical
- Data rate
- Synchronization of bits
- Line configuration
- Physical topology
- Transmission mode

Data Link Layer

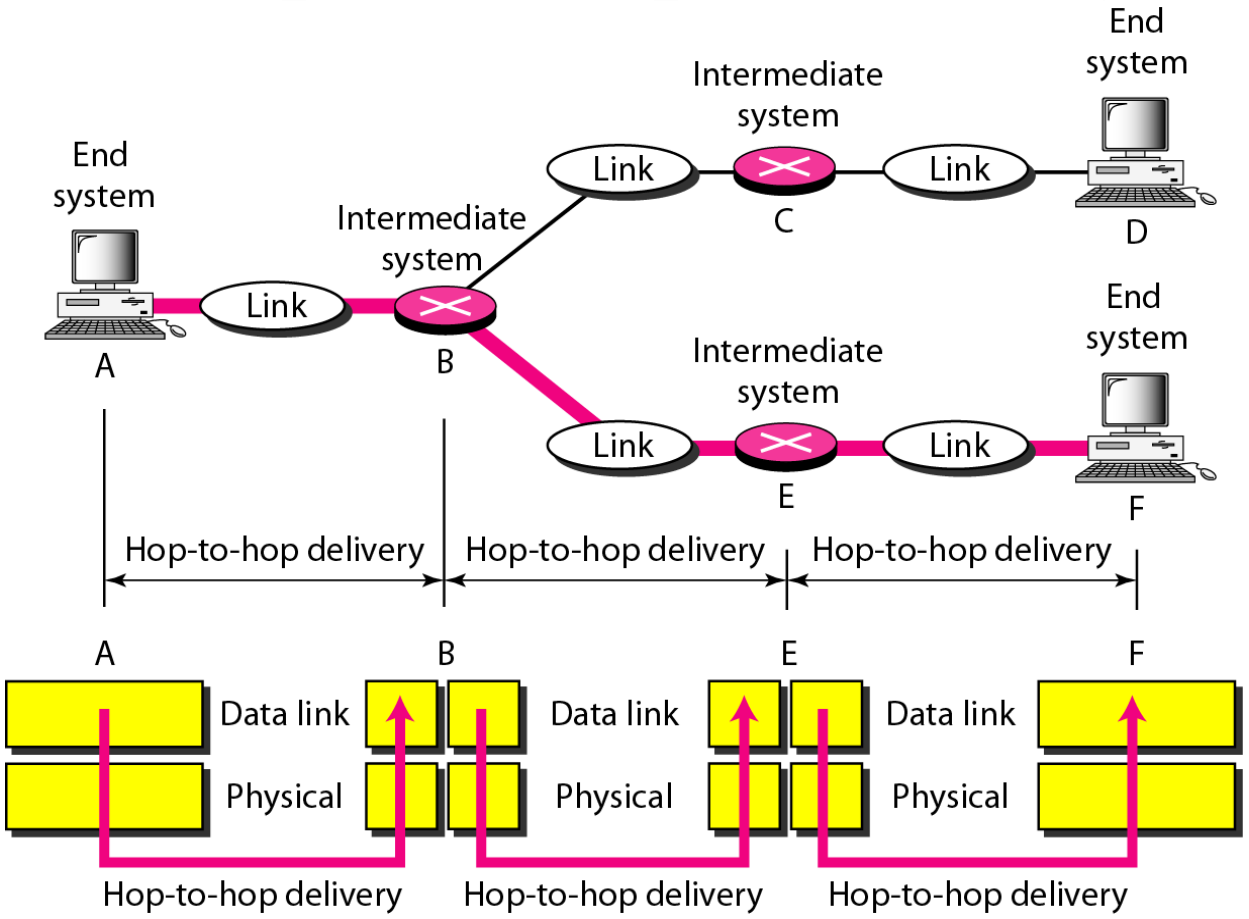
- The data link layer is responsible for moving frames from one hop (node) to the next
- Transform the physical layer to a reliable (error-free) link



Data Link Layer: Duties

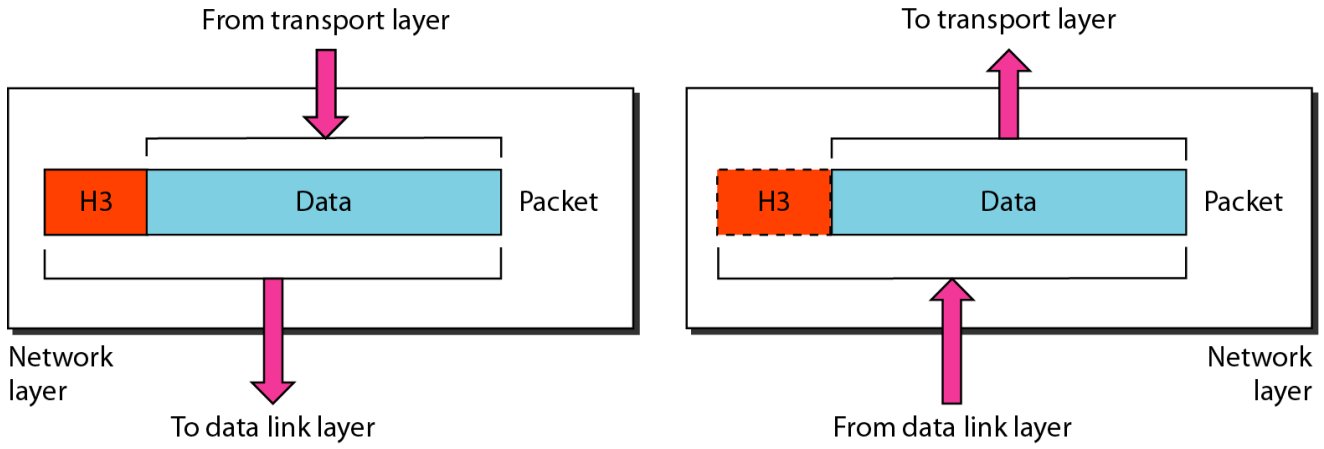
- Framing
- Physical addressing
- Flow control
- Error control
- Access control

Hop-to-Hop Delivery



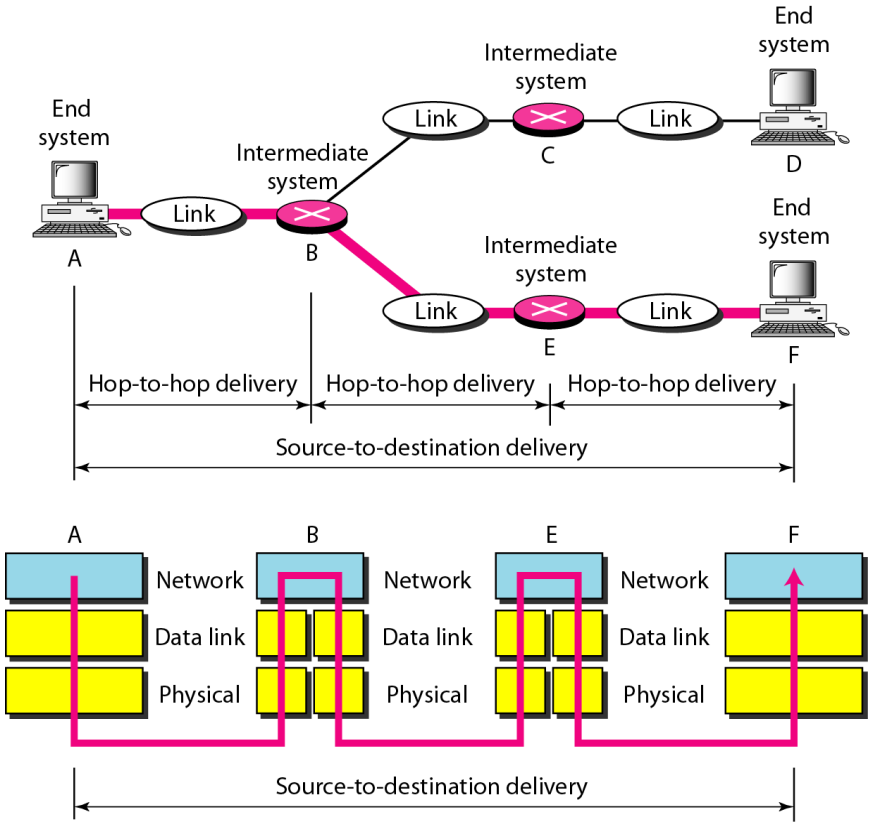
Network Layer

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



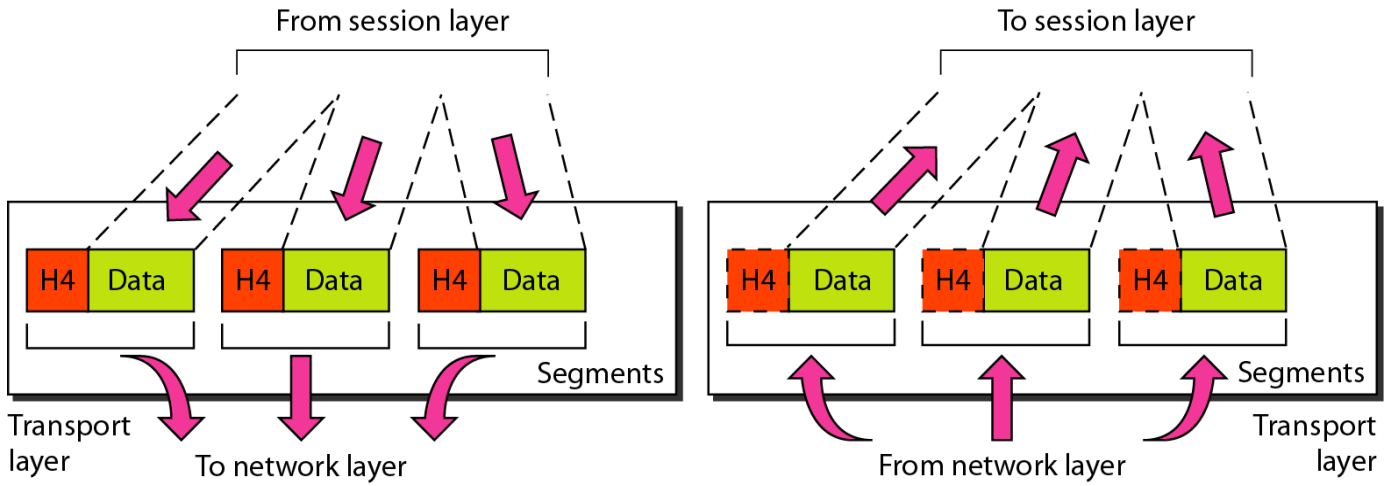
Network Layer: Duties

- Logical addressing and routing



Transport Layer

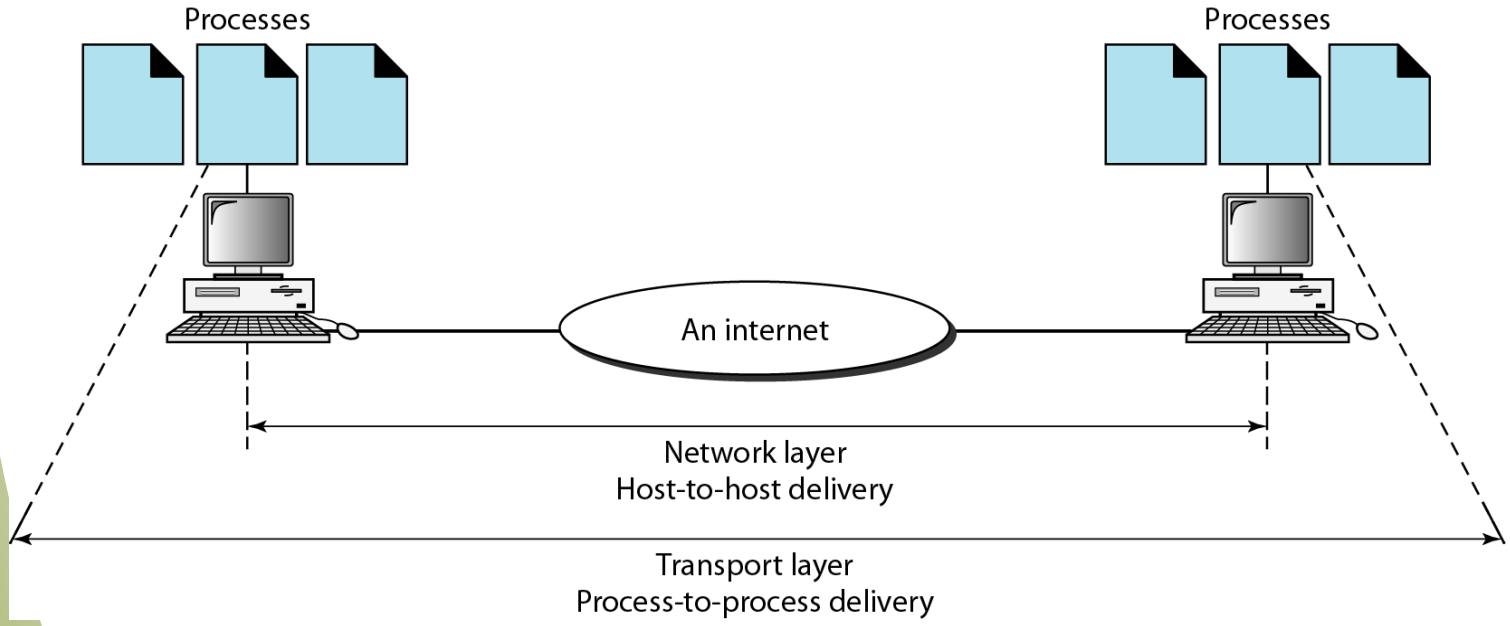
- The transport layer is responsible for delivery of a message from one process to another



Transport Layer: Duties

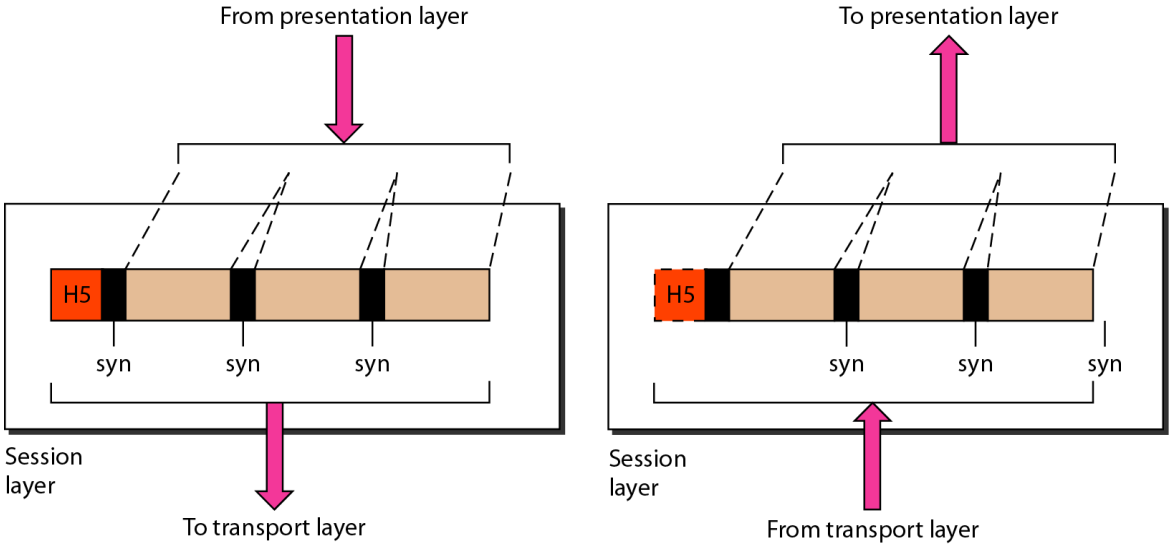
- Service-point (port) addressing
- Segmentation and reassembly
- Connection control
- Flow control
- Error control

Reliable Process-to-Process Delivery of a Message



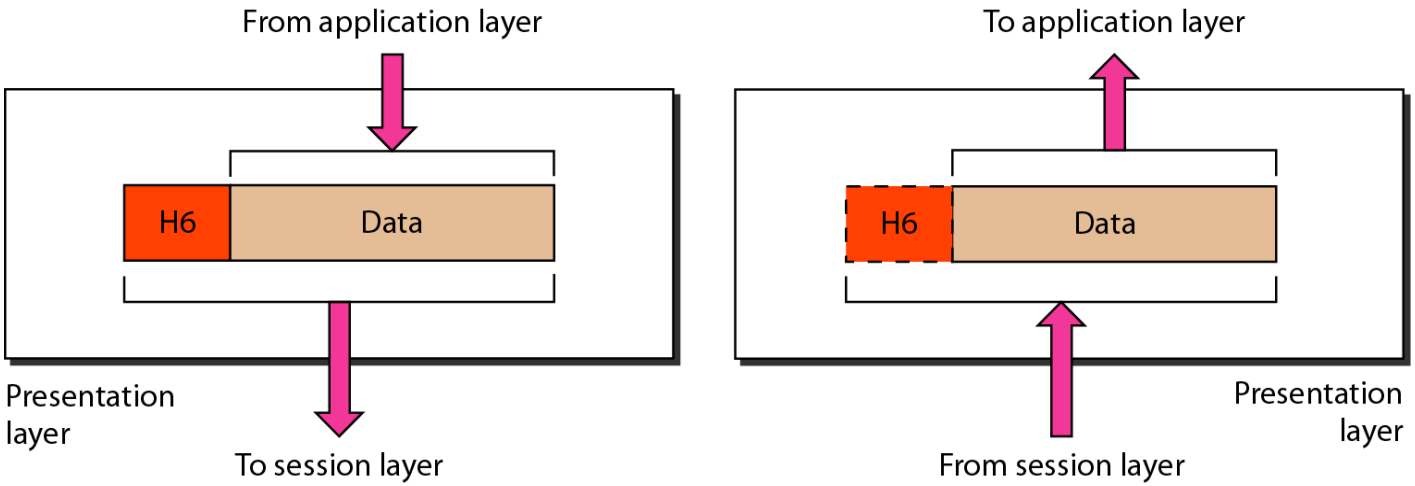
Session Layer

- Session layer is responsible for dialog control and synchronization



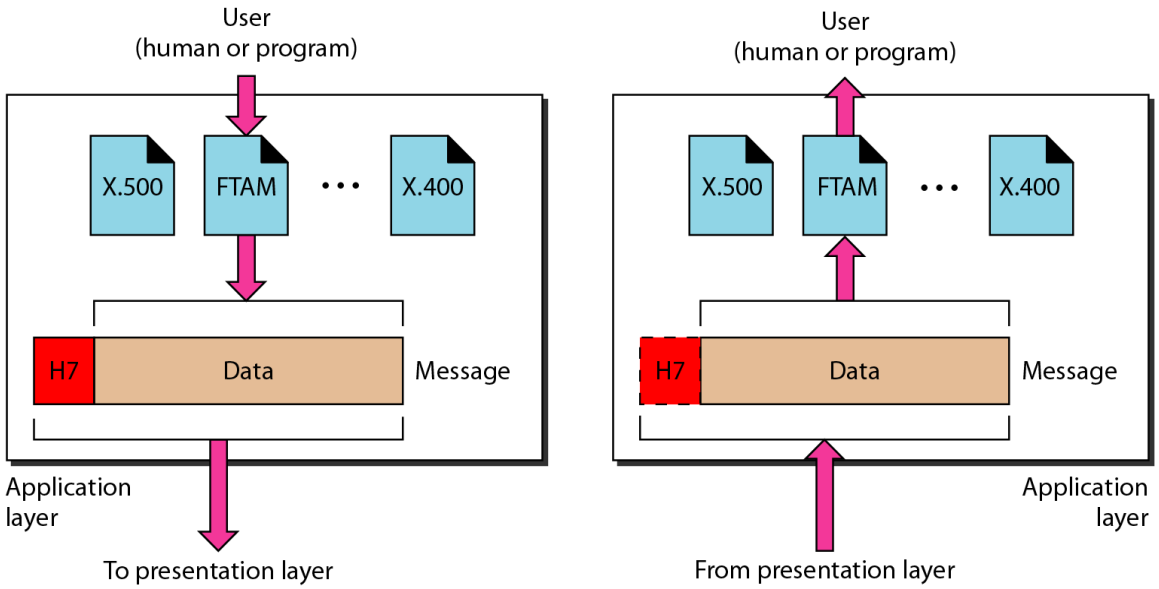
Presentation Layer

- Presentation layer is responsible for translation, compression, and encryption



Application Layer

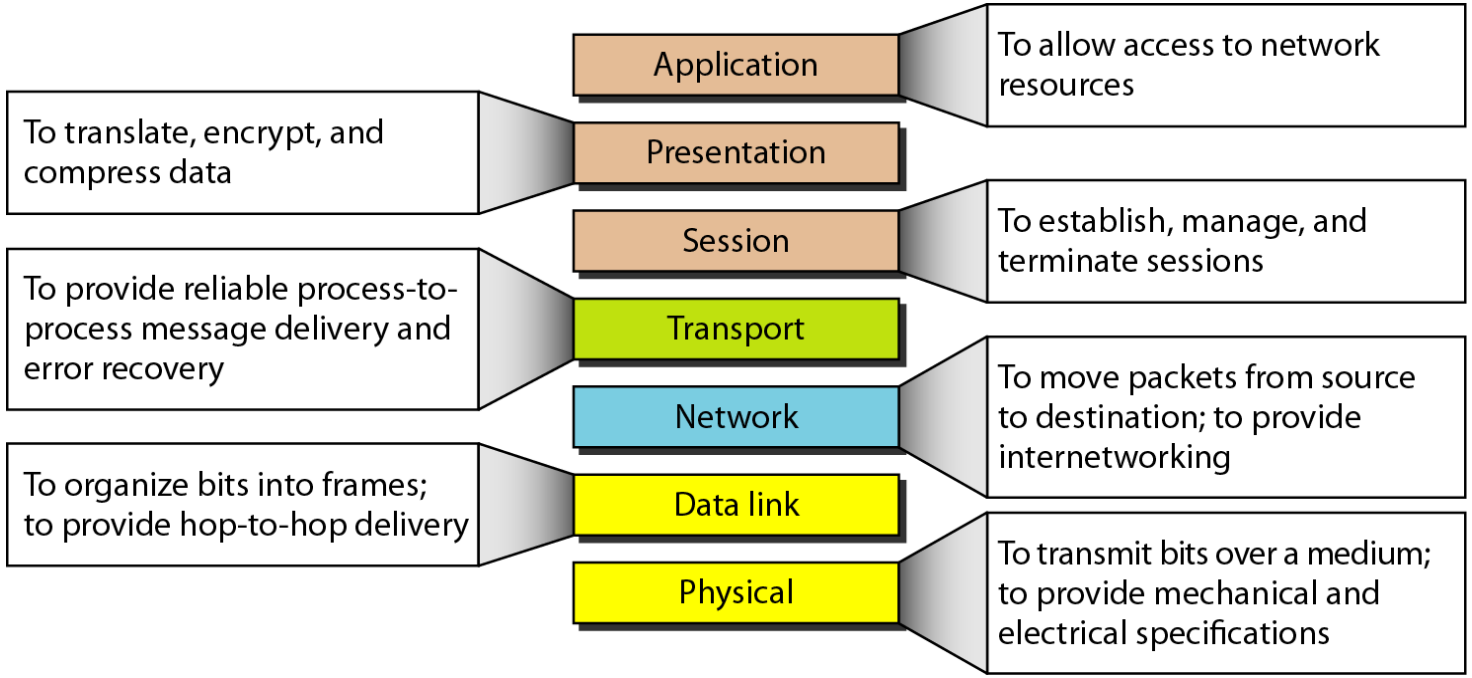
- Application layer is responsible for providing services to the user



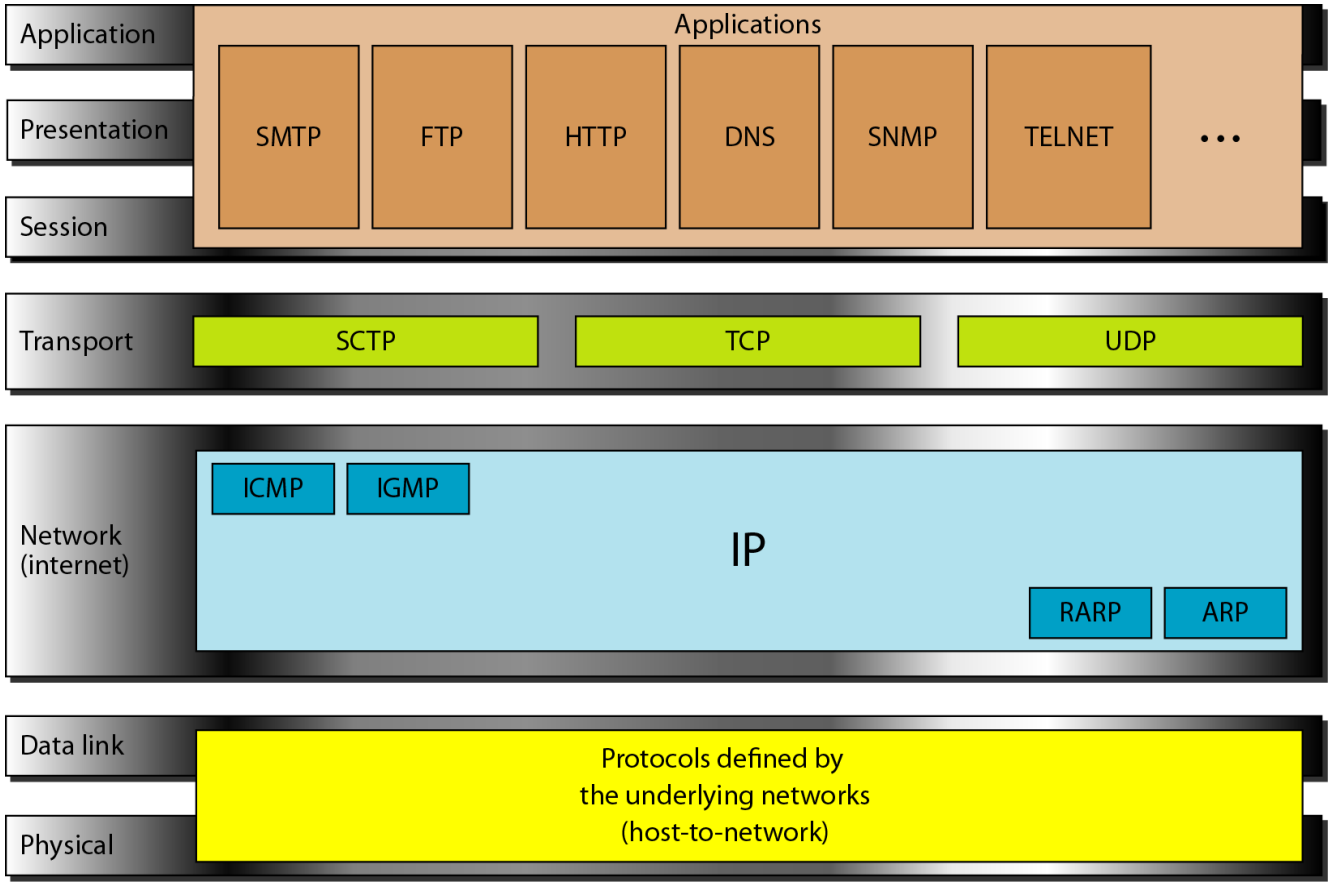
Application Layer: Services

- Network virtual terminal
- Mail services
- File transfer, access, and management
- Directory services

Summary of Layers



TCP/IP and OSI Model

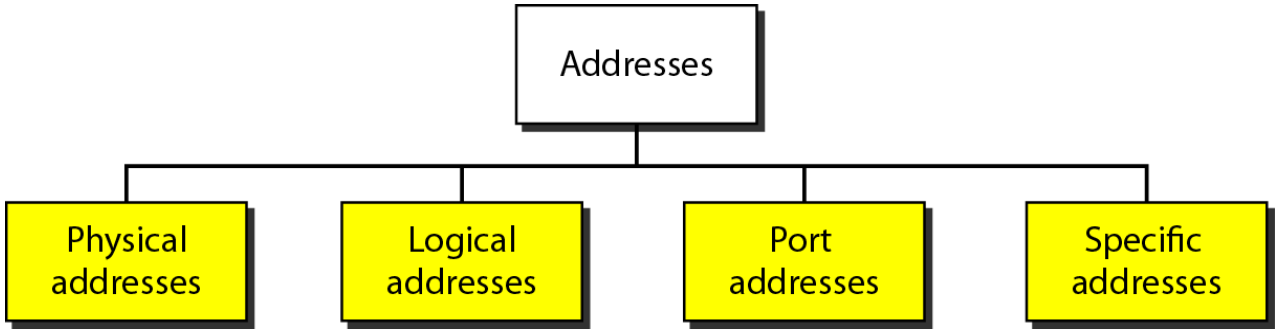


TCP/IP Protocol Suite

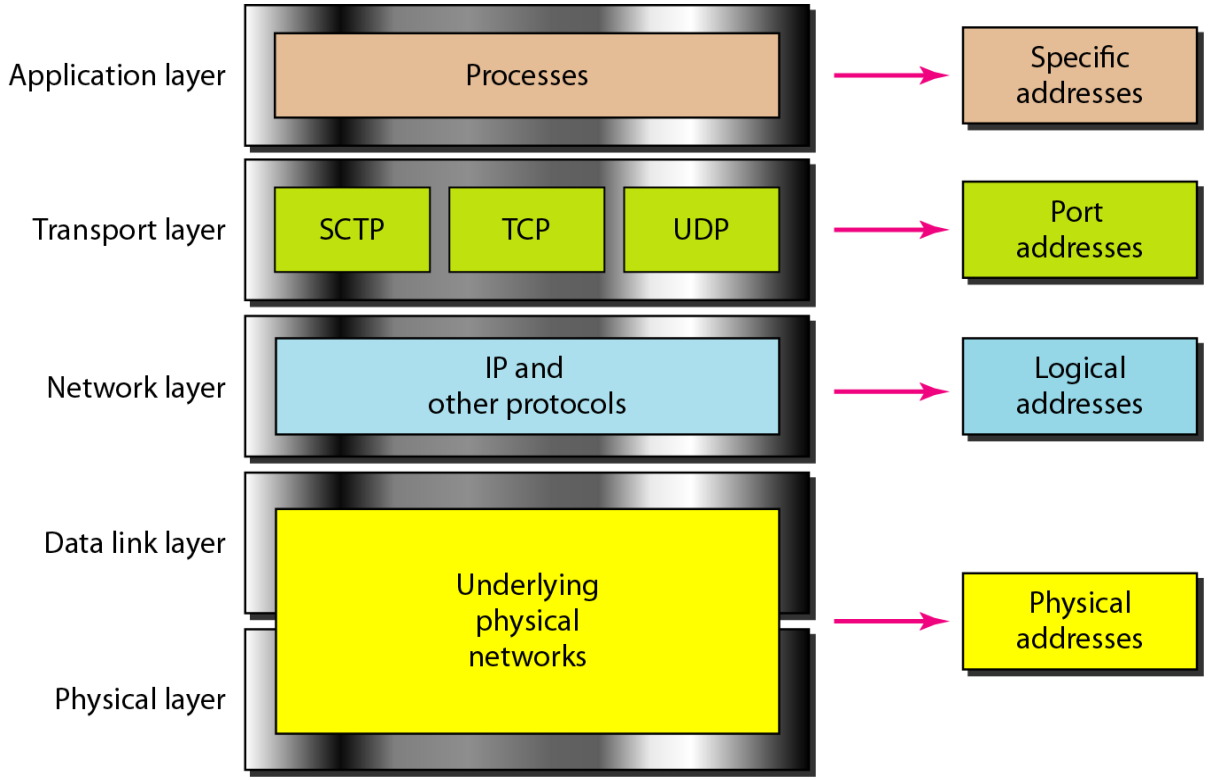
- Host-to-network : Physical and data link layer
  - No specific protocol
- Network layer
  - IP(Internet Protocl), ARP(Address Resolution Protocol), RARP(Reverse ARP), ICMP(Internet Control Message Protocol), IGMP(Internet Group Message Protocol)
- Transport layer
  - TCP(Transmission Control Protocol), UDP(User Datagram Protocl), SCTP(Stream Control Transmission Protocol),
- Application Layer
  - Combined session, presentation, and application layers

Addressing

- Four levels of addresses in TCP/IP protocols
- Physical (link), logical (IP, network), port, and specific addresses

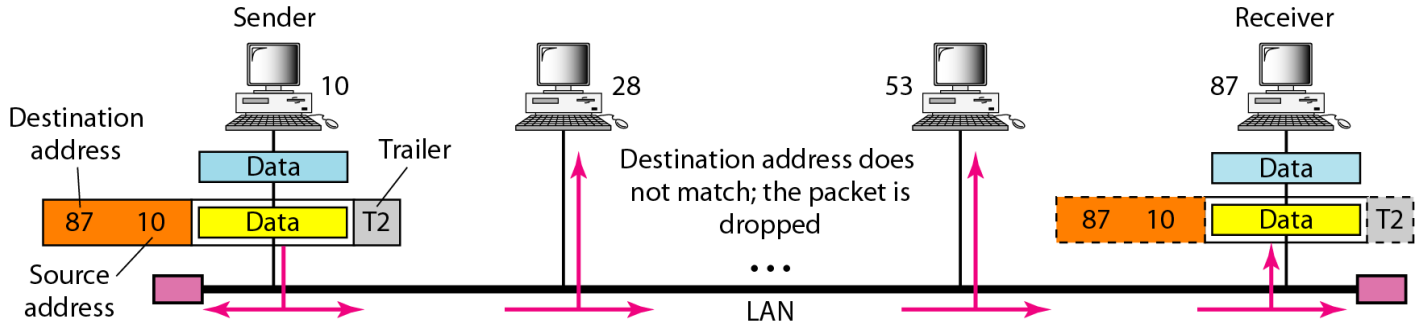


Relationship of Layers and Addresses



Physical Address

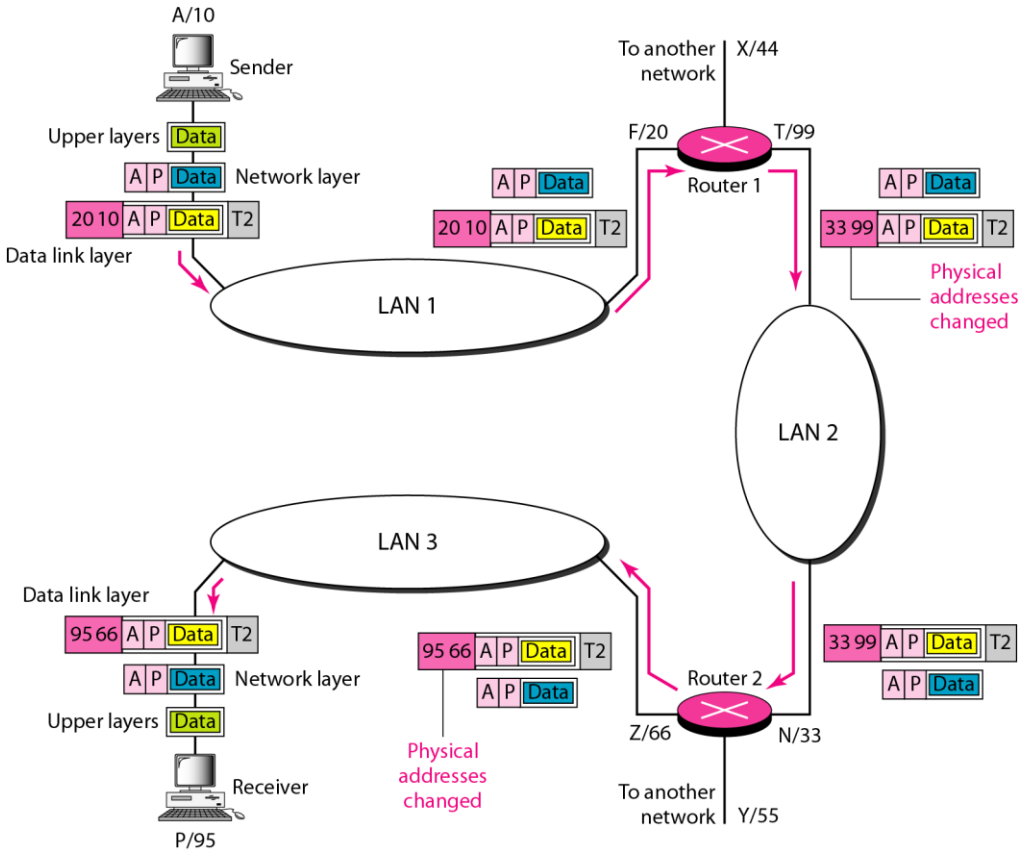
- A node with physical address 10 sends a frame to a node with physical address 87. The two nodes are connected by a link (bus topology LAN). As the figure shows, the computer with physical address 10 is the sender, and the computer with physical address 87 is the receiver.



07:01:02:01:2C:4B

A 6-byte (12 hexadecimal digits) physical address.

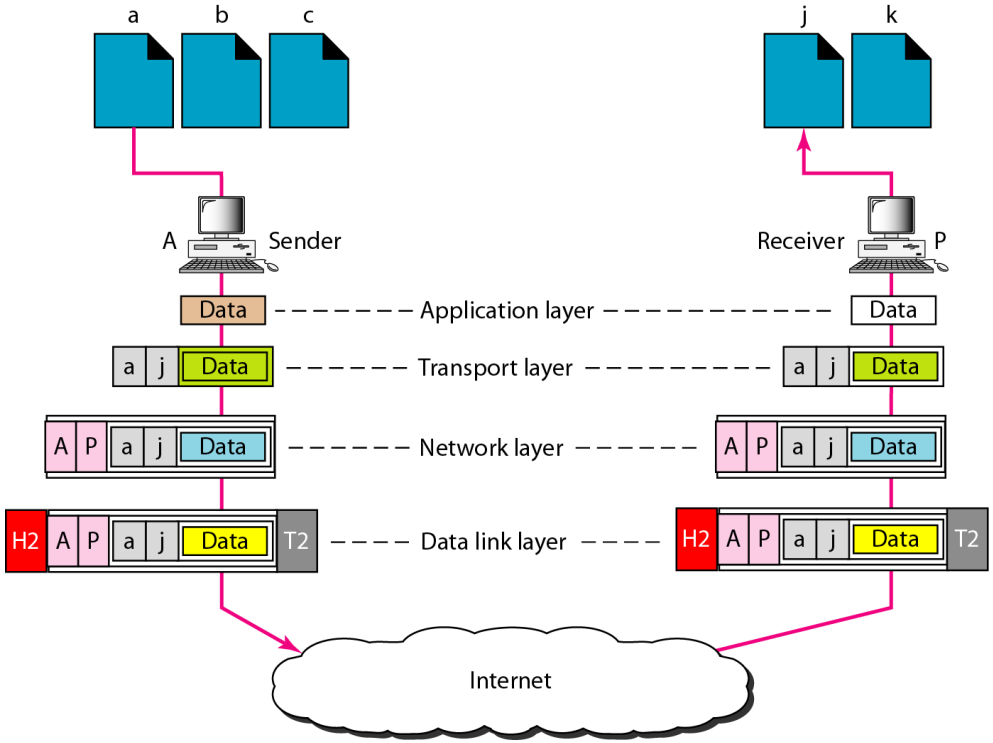
Logical (IP) Address



- The physical addresses will change from hop to hop, but the logical addresses usually remain the same

Port Address

- The physical addresses change from hop to hop, but the logical and port addresses usually remain the same



Specific Address

- Some application have user-friendly addresses that are designed for that specific address
- Example 1: e-mail address: nayeema.cse@diu.edu.bd
  - Defines the recipient of an e-mail
- Example 2: URL (Universal Resource Locator) : www.cse.univdhaka.edu
  - Used to find a document on the WWW

Assignments

Problems: 16 - 21, 23- 28.