



SRM

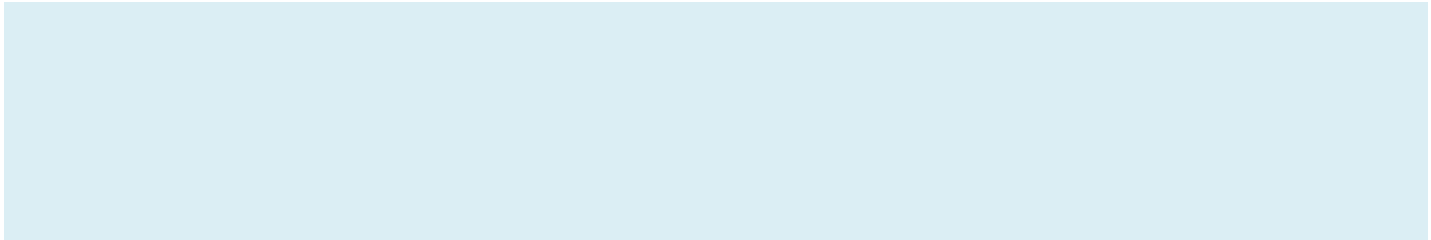
Institute of Science and Technology

21CSC302J-COMPUTER NETWORKS

Unit- I



Network Models



The ISO/OSI Models

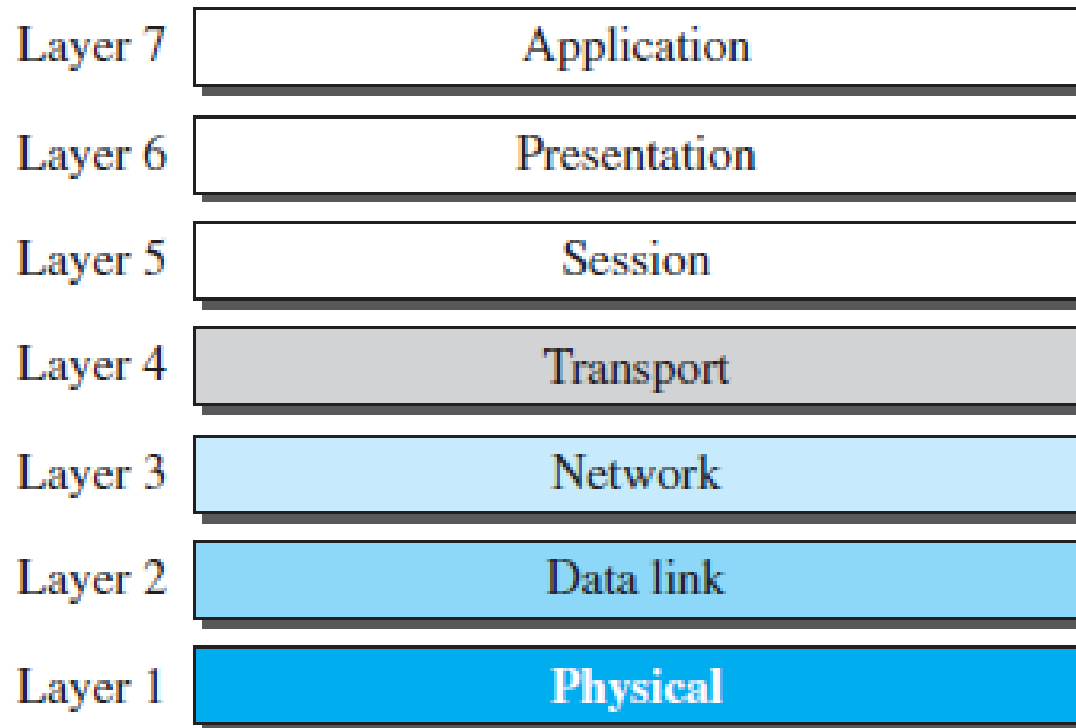
THE OSI MODEL

- An open system is a set of protocols
 - *allows any two different systems to communicate regardless of their underlying architecture.*
- The purpose of the OSI model
 - *To show how to facilitate communication between different systems without requiring changes to the logic of the underlying hardware and software.*
- The OSI model is not a protocol
- It is a model for understanding and designing a network architecture *that is flexible, robust, and interoperable.*₄

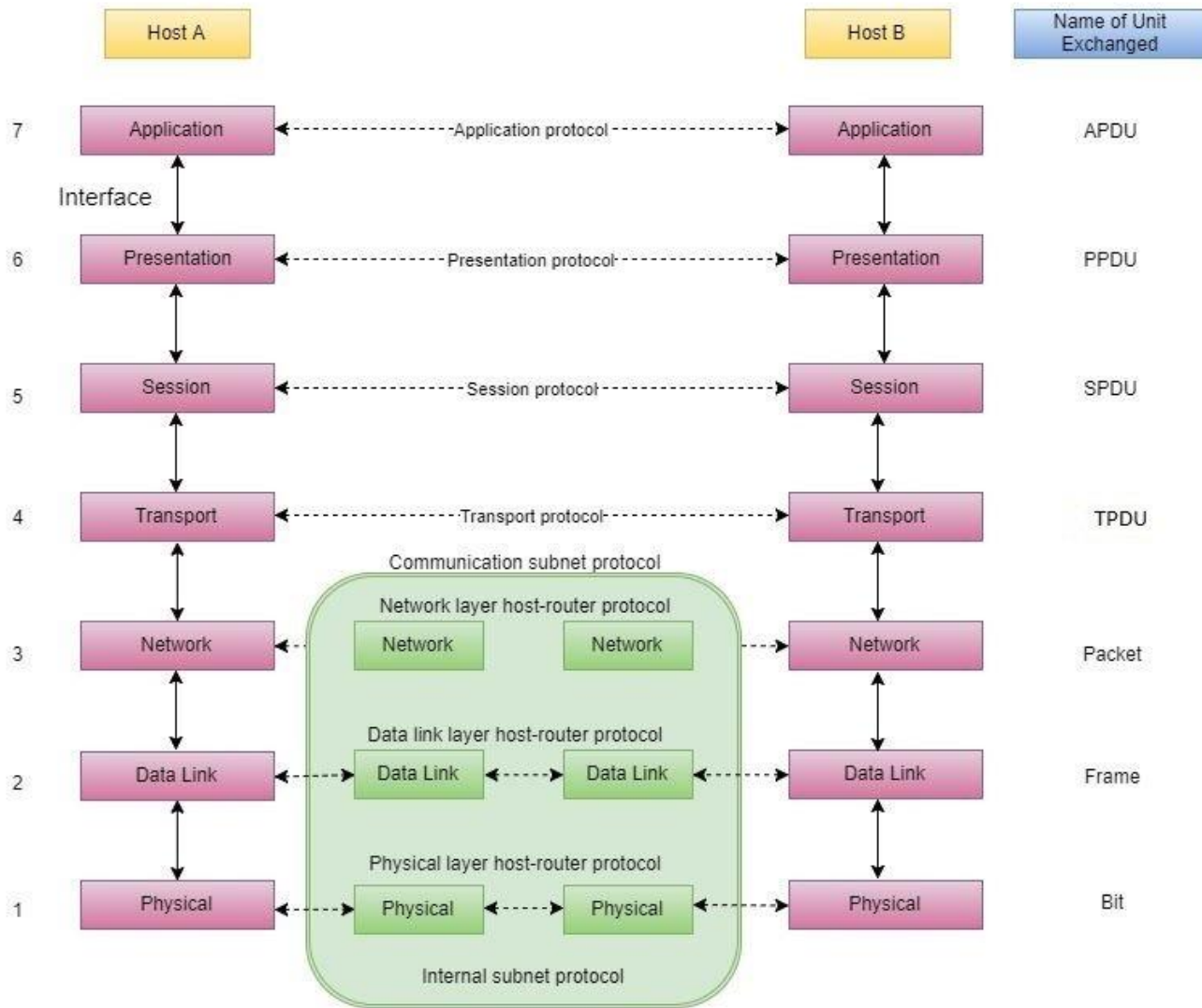
THE OSI MODEL

- A layered framework for the design of network systems
 - *allows communication between all types of computer systems.*
- It consists of seven separate but related layers, each of which defines a part of the process of moving information across a network

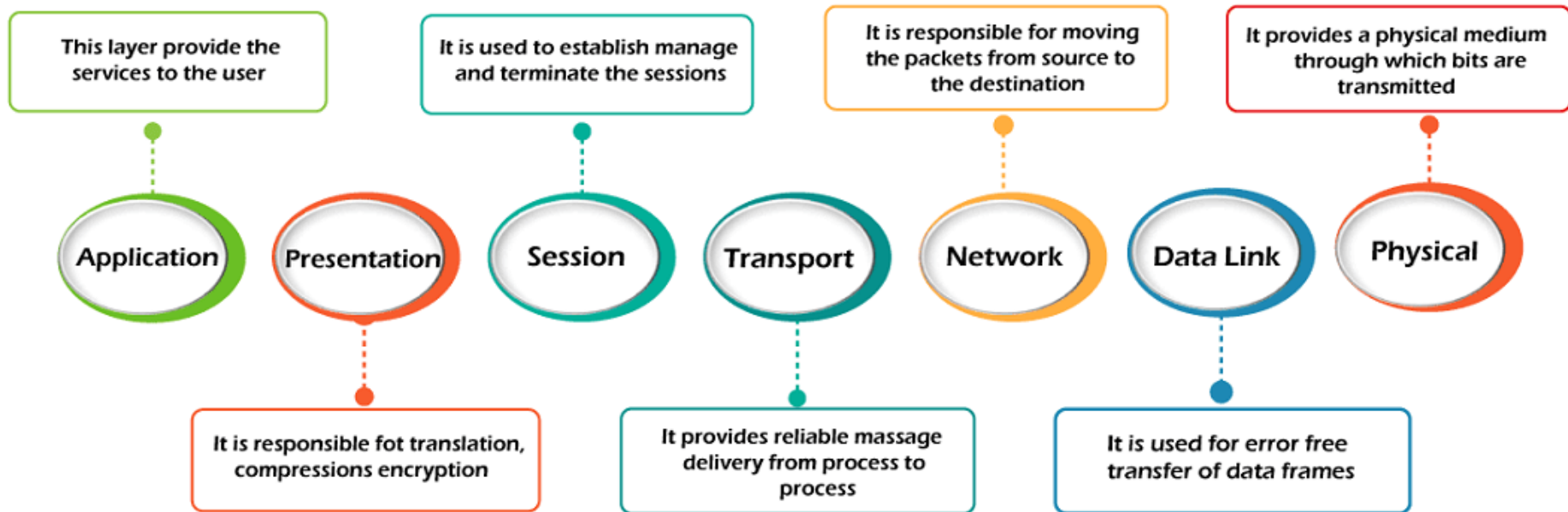
THE OSI MODEL



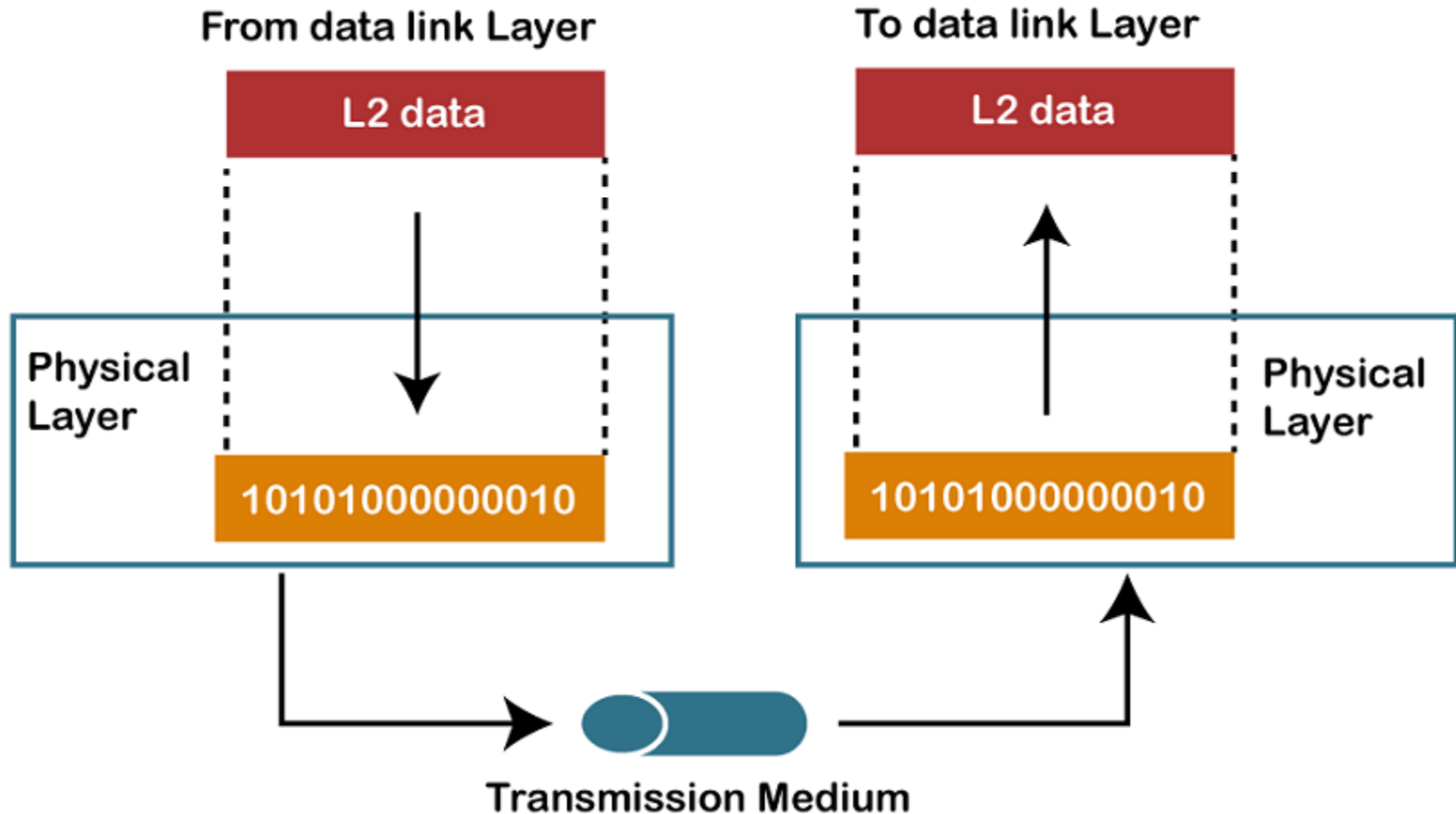
THE OSI MODEL



THE OSI MODEL



Physical Layer

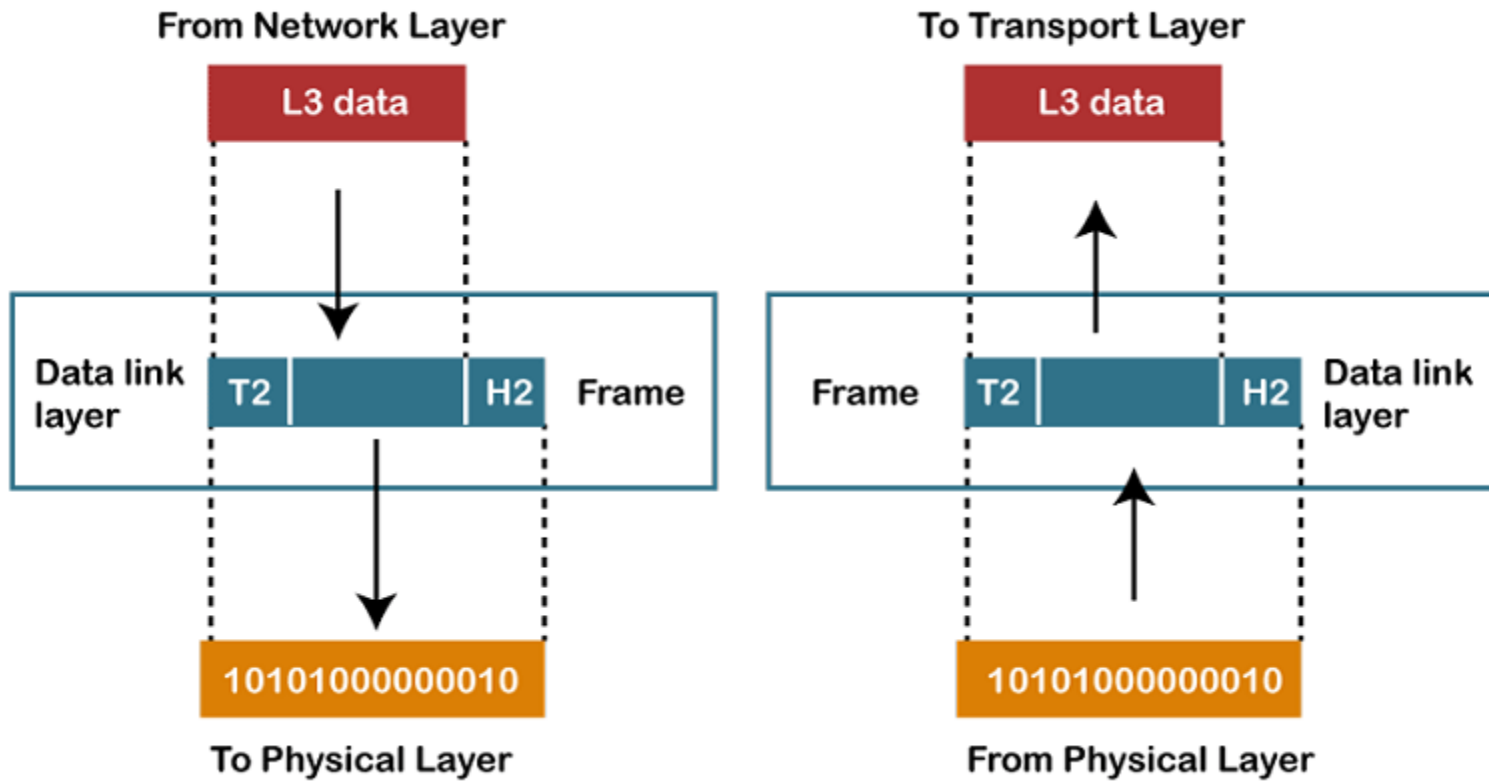




Functions of a Physical layer

- **Line Configuration:** It defines the way how two or more devices can be connected physically.
- **Data Transmission:** It defines the transmission mode whether it is simplex, half-duplex or full-duplex mode between the two devices on the network.
- **Topology:** It defines the way how network devices are arranged.
- **Signals:** It determines the type of the signal used for transmitting the information.

Data Link Layer





Functions of a Data Link Layer

Physical Addressing

The Data link layer adds a header to the frame that contains a destination address. The frame is transmitted to the destination address mentioned in the header.

Flow Control

Flow control is the main functionality of the Data-link layer. It is the technique through which the constant data rate is maintained on both the sides so that no data get corrupted. It ensures that the transmitting station such as a server with higher processing speed does not exceed the receiving station, with lower processing speed.



Functions of a Data Link Layer

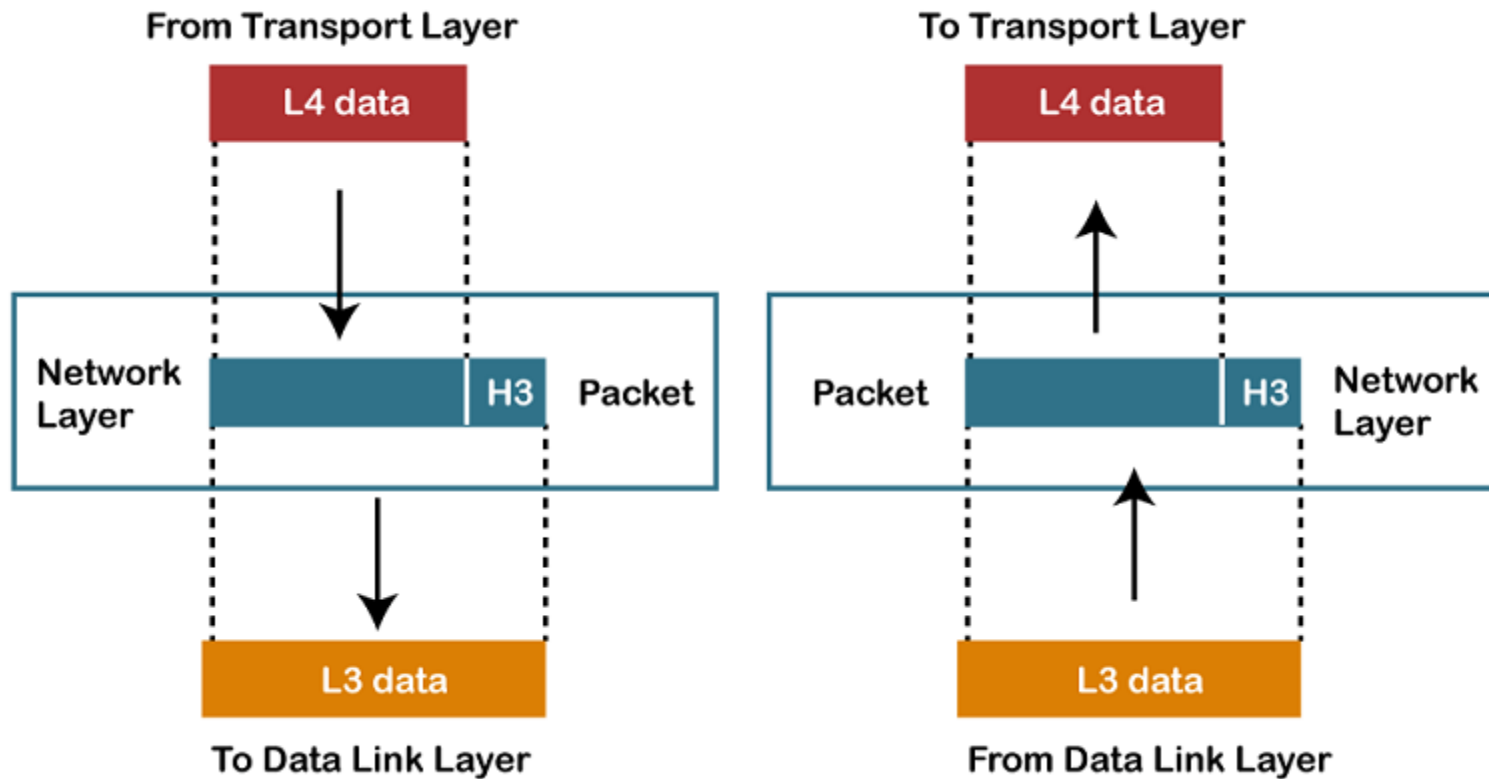
Error Control

Error control is achieved by adding a calculated value CRC (Cyclic Redundancy Check) that is placed to the Data link layer's trailer which is added to the message frame before it is sent to the physical layer. If any error seems to occur, then the receiver sends the acknowledgment for the retransmission of the corrupted frames.

Access Control

When two or more devices are connected to the same communication channel, then the data link layer protocols are used to determine which device has control over the link at a given time.

Network Layer





Functions of a Network layer

Internetworking

An internetworking is the main responsibility of the network layer. It provides a logical connection between different devices.

Addressing

A Network layer adds the source and destination address to the header of the frame. Addressing is used to identify the device on the internet.



Functions of a Network layer

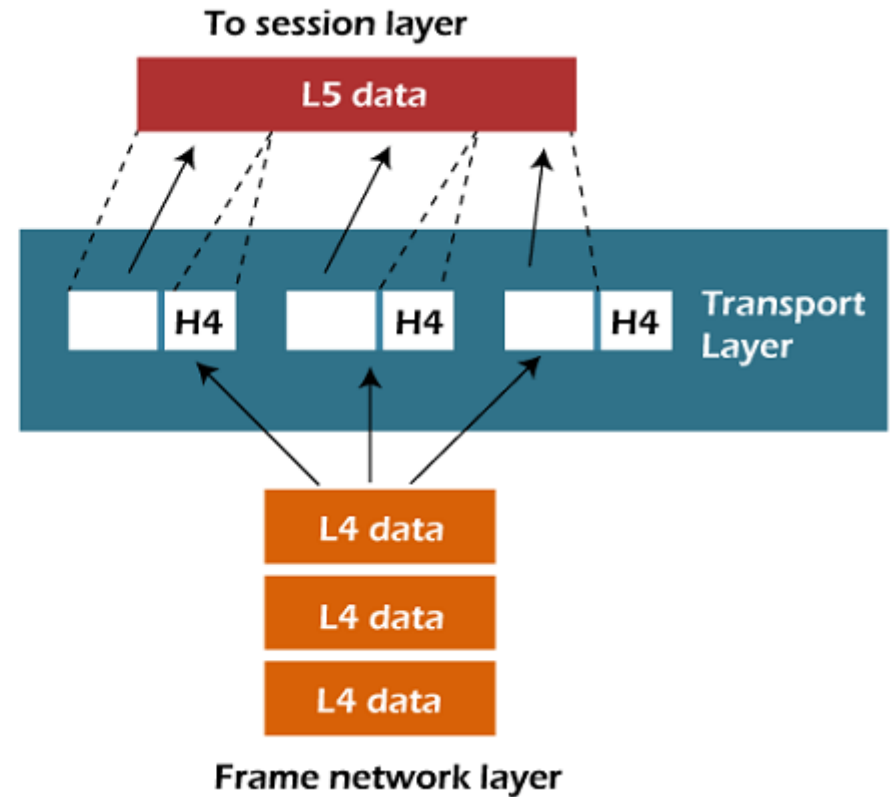
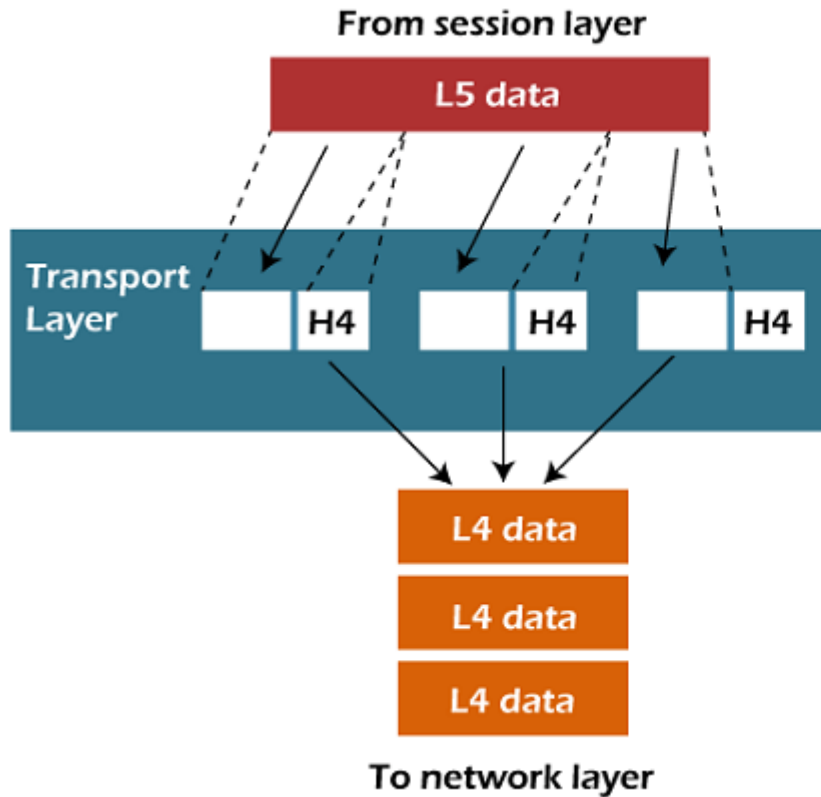
Routing

Routing is the major component of the network layer, and it determines the best optimal path out of the multiple paths from source to the destination.

Packetizing

A Network Layer receives the packets from the upper layer and converts them into packets. This process is known as Packetizing. It is achieved by internet protocol (IP)

Transport Layer





Functions of a Transport layer

Service-point addressing

Computers run several programs simultaneously due to this reason, the transmission of data from source to the destination not only from one computer to another computer but also from one process to another process. The transport layer adds the header that contains the address known as a service-point address or port address. The responsibility of the network layer is to transmit the data from one computer to another computer and the responsibility of the transport layer is to transmit the message to the correct process.



Functions of a Transport layer

Segmentation and reassembly

When the transport layer receives the message from the upper layer, it divides the message into multiple segments, and each segment is assigned with a sequence number that uniquely identifies each segment. When the message has arrived at the destination, then the transport layer reassembles the message based on their sequence numbers



Functions of a Transport layer

Connection control

Transport layer provides two services Connection-oriented service and connectionless service. A connectionless service treats each segment as an individual packet, and they all travel in different routes to reach the destination. A connection-oriented service makes a connection with the transport layer at the destination machine before delivering the packets. In connection-oriented service, all the packets travel in the single route



Functions of a Transport layer

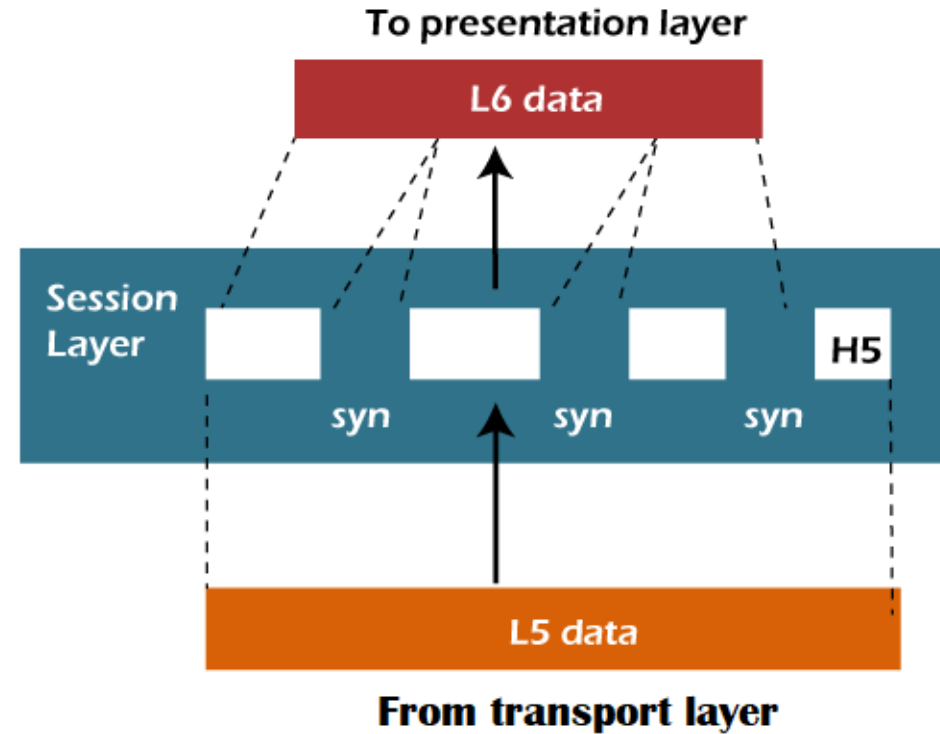
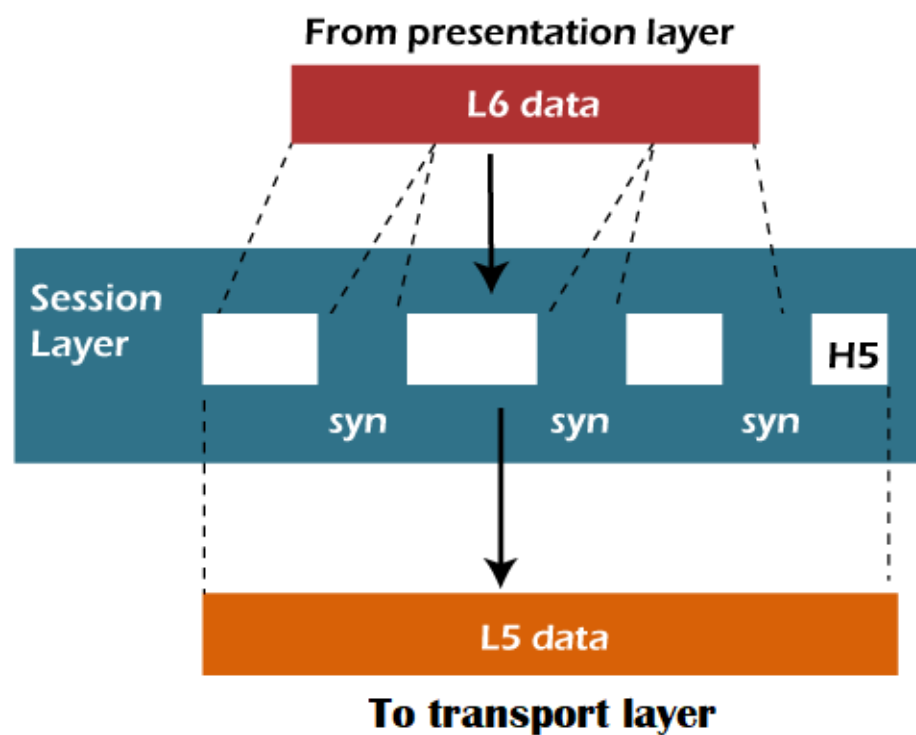
Flow control

The transport layer also responsible for flow control but it is performed end-to-end rather than across a single link.

Error control

The transport layer is also responsible for Error control. Error control is performed end-to-end rather than across the single link. The sender transport layer ensures that message reach at the destination without any error.

Session Layer





Functions of a Session layer

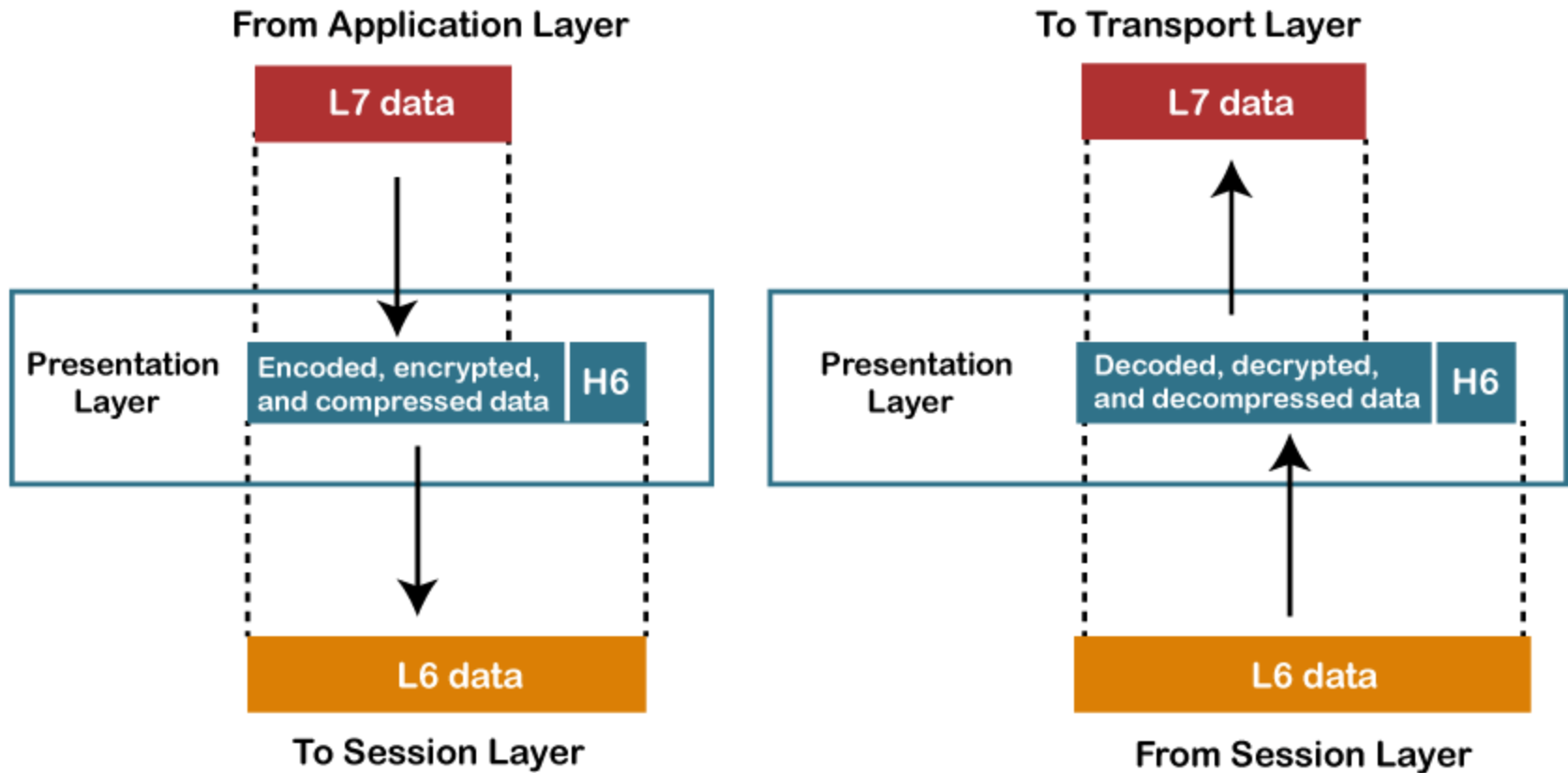
Dialog control

Session layer acts as a dialog controller that **creates a dialog between two processes** or *it allows the communication between two processes which can be either half-duplex or full-duplex.*

Synchronization

Session layer adds some checkpoints when transmitting the data in a sequence. If some error occurs in the middle of the transmission of data, then the transmission will take place again from the checkpoint. This process is known as Synchronization and recovery.

Presentation Layer





Functions of a Presentation layer

Translation

The processes in two systems exchange the information in the form of character strings, numbers and so on. Different computers use different encoding methods, the presentation layer *handles the interoperability between the different encoding methods.*

It *converts the data from sender-dependent format into a common format* and *changes the common format into receiver-dependent format at the receiving end.*

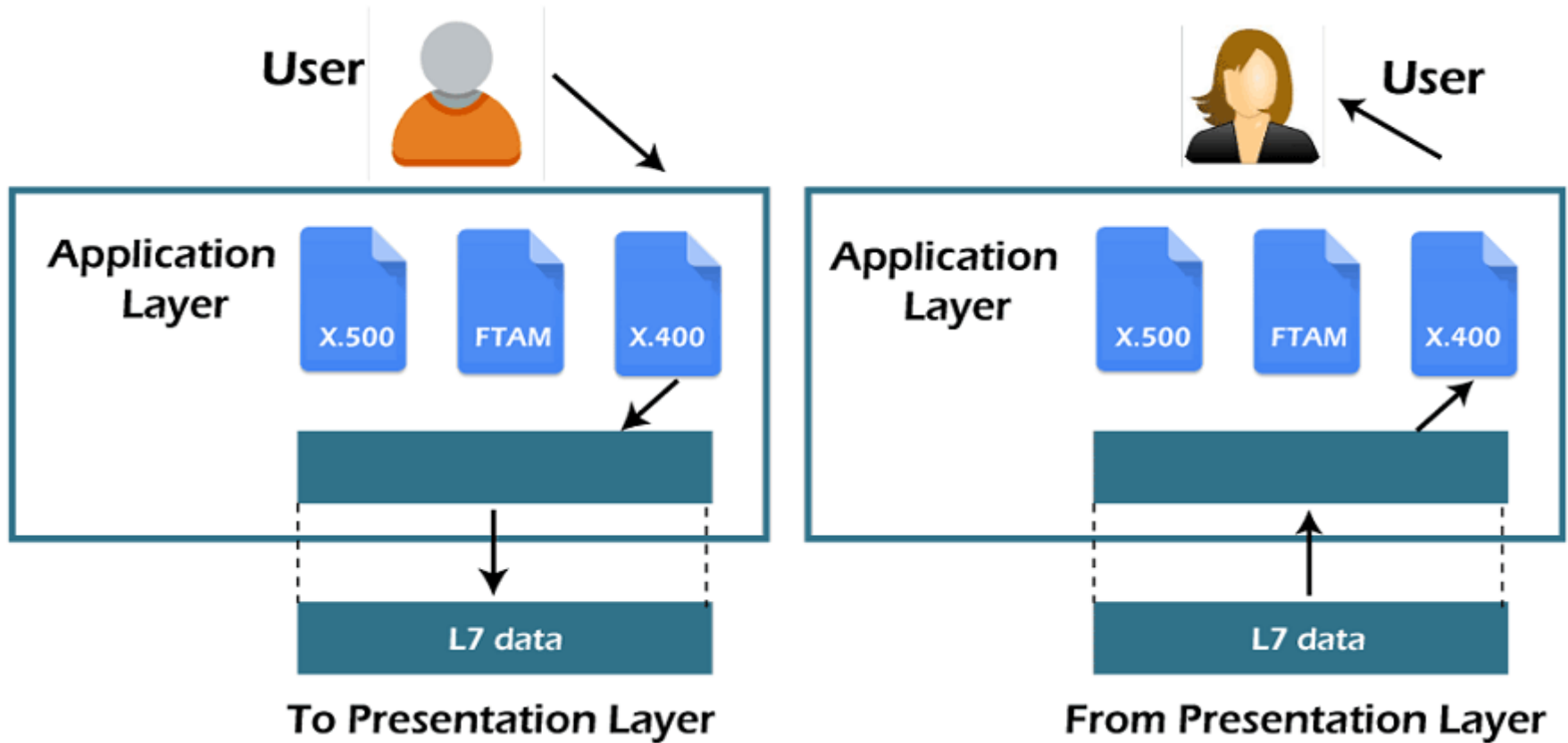
Encryption

Encryption is needed to maintain privacy. Encryption is a process of converting the sender-transmitted information into another form and sends the resulting message over the network.

Compression

Data compression is a process of compressing the data, i.e., it reduces the number of bits to be transmitted. Data compression is very important in multimedia such as text, audio, video.

Application Layer



File transfer, access, and management (FTAM)

An application layer allows a user to access the files in a remote computer, to retrieve the files from a computer and to manage the files in a remote computer.

Mail Services

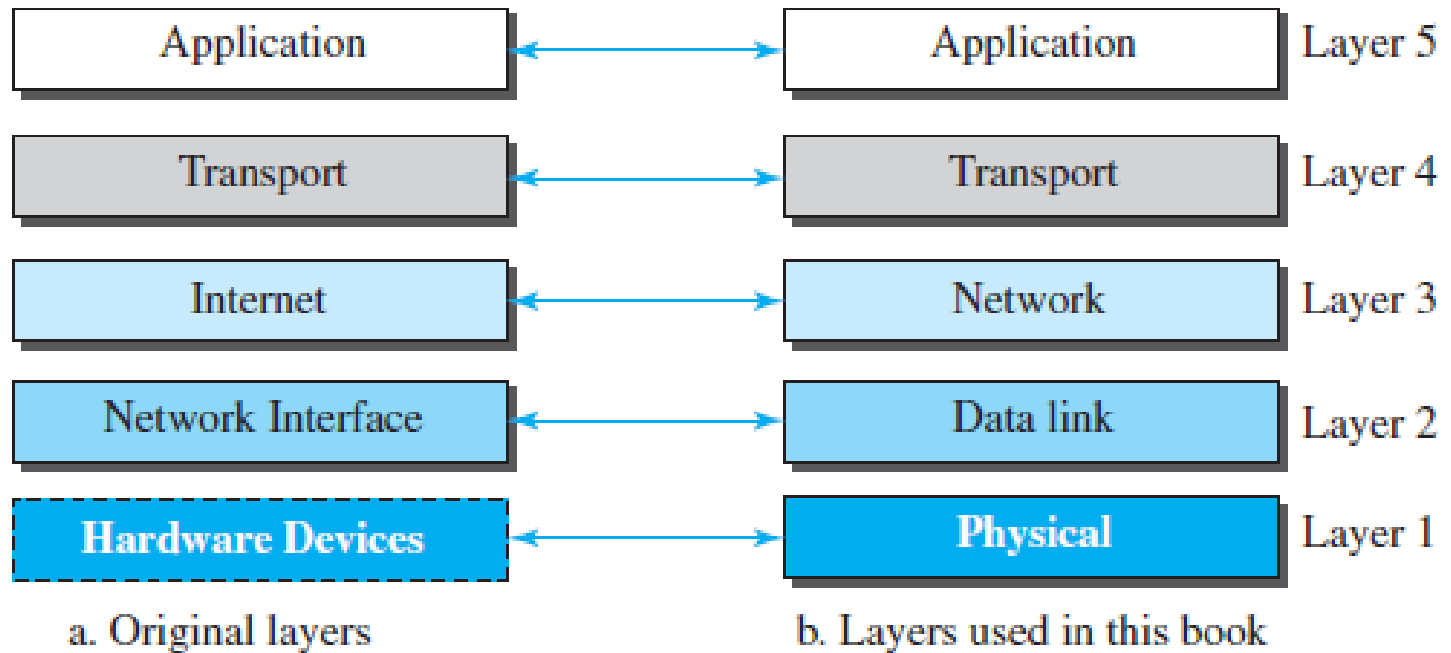
An application layer provides the facility for email forwarding and storage

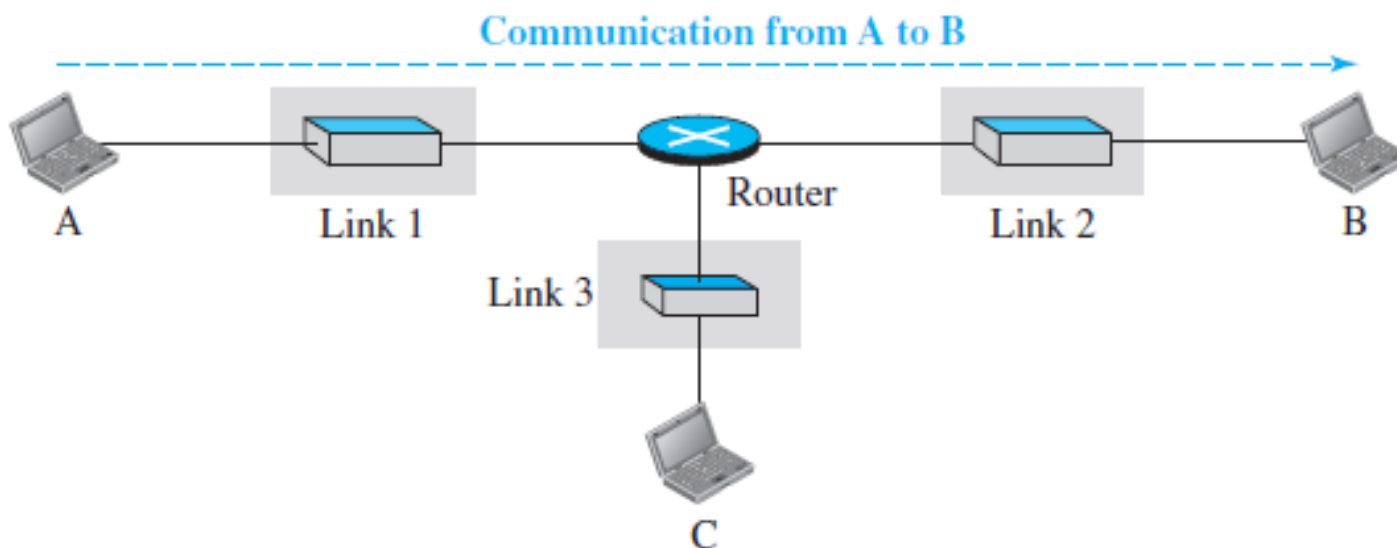
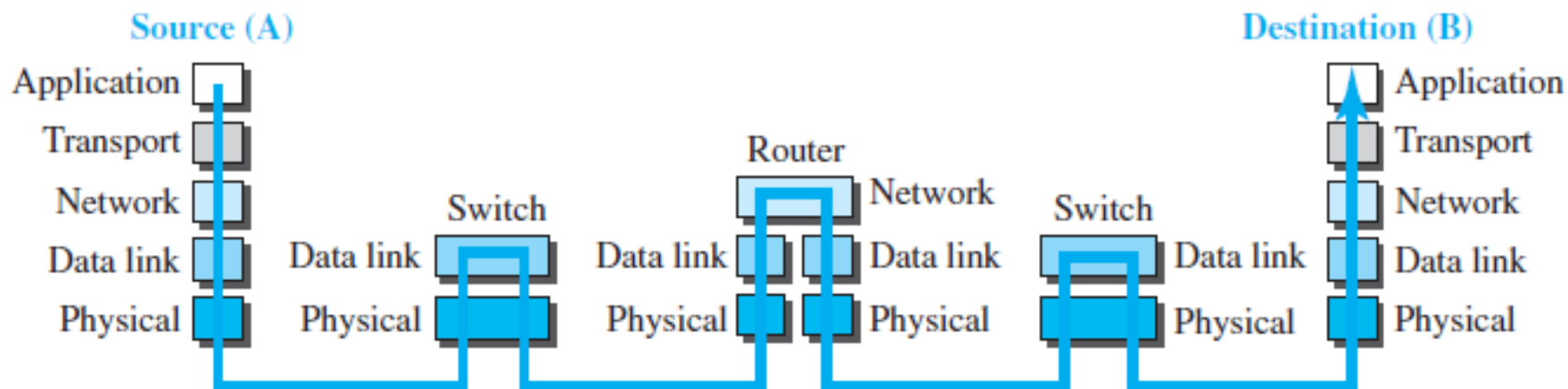


Directory Services

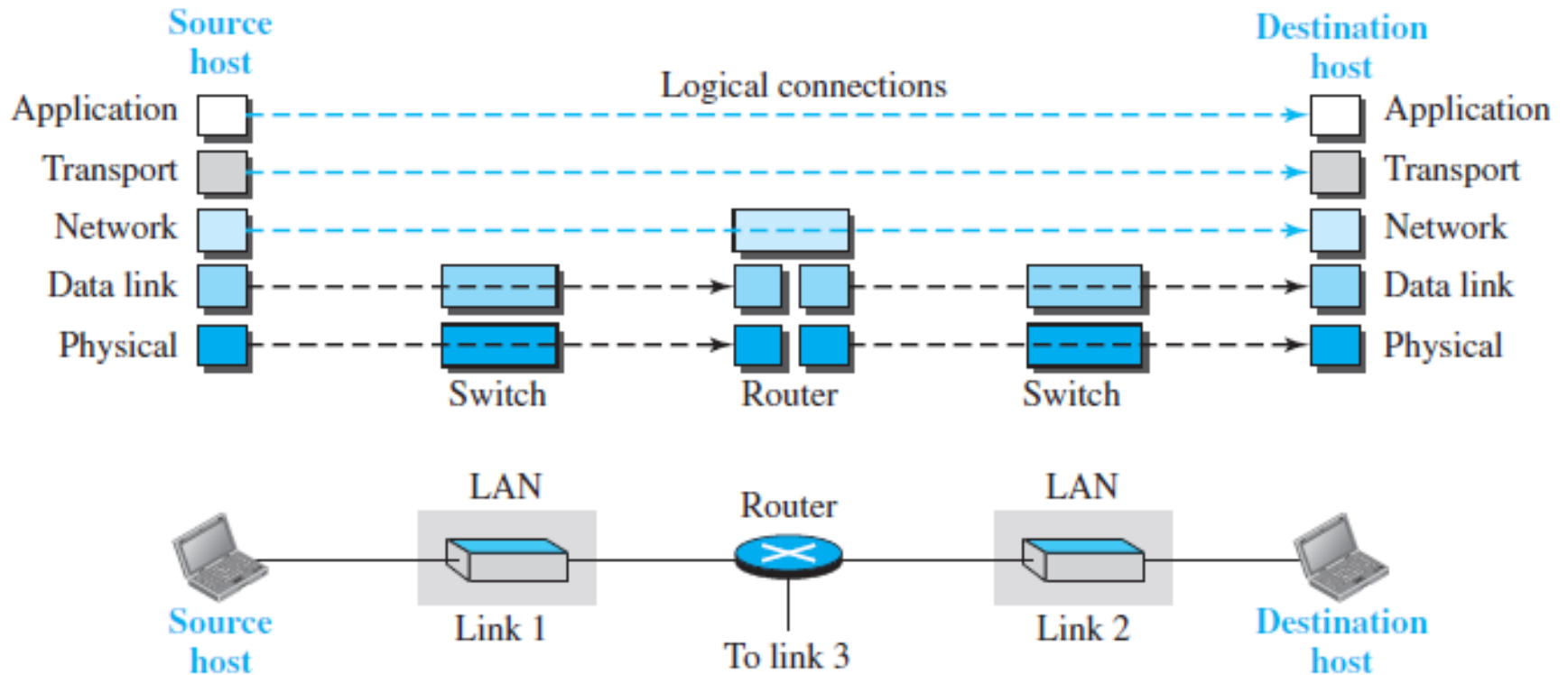
An application provides the distributed database sources and is used to provide that global information about various objects.

TCP/IP PROTOCOL SUITE



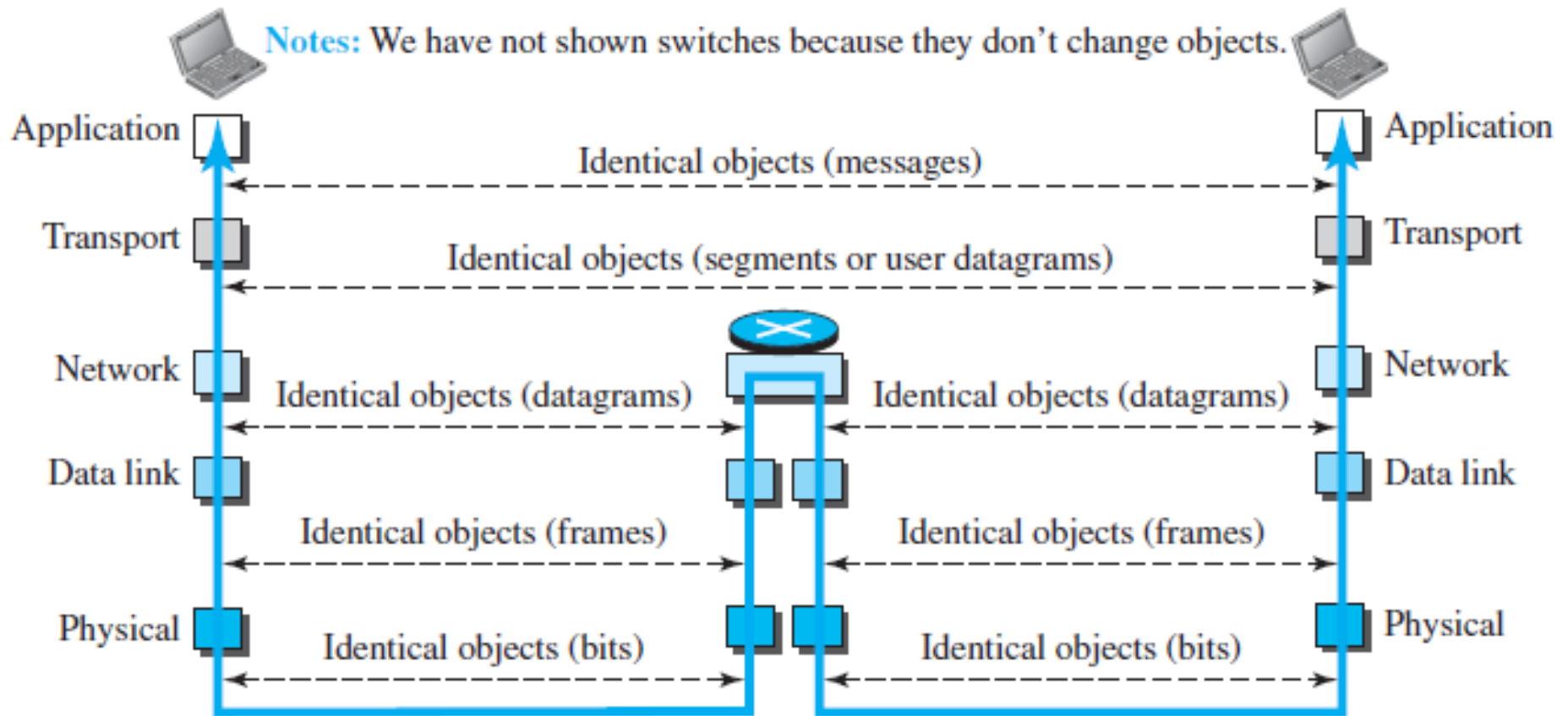


Communication through an internet



Logical connections between layers of the TCP/IP protocol suite

Notes: We have not shown switches because they don't change objects.

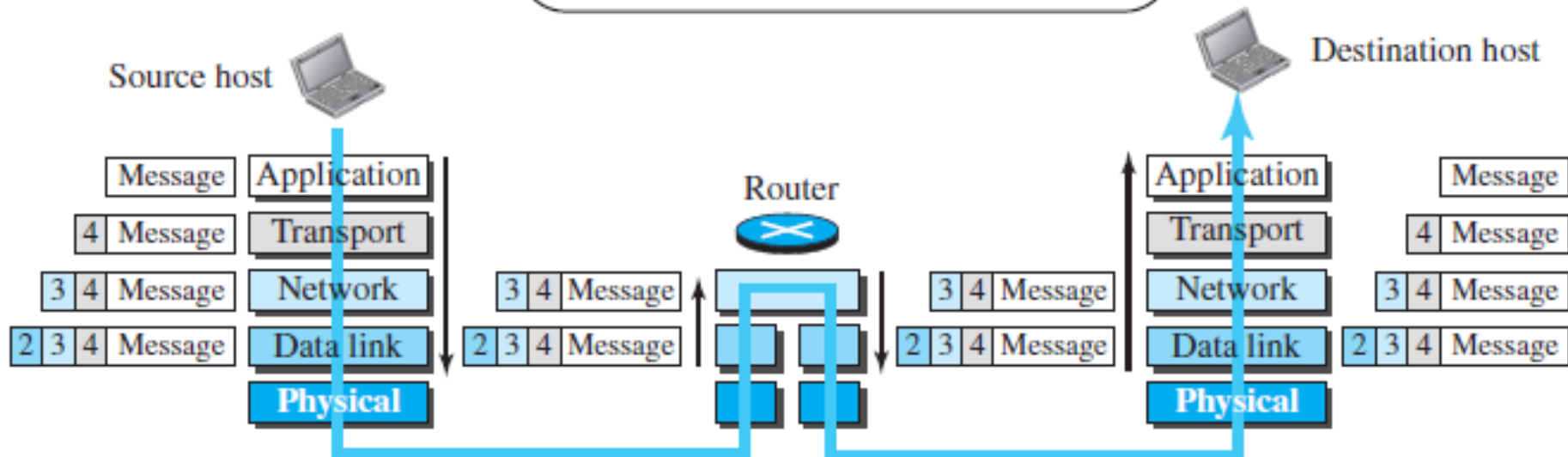


Identical objects in the TCP/IP protocol suite

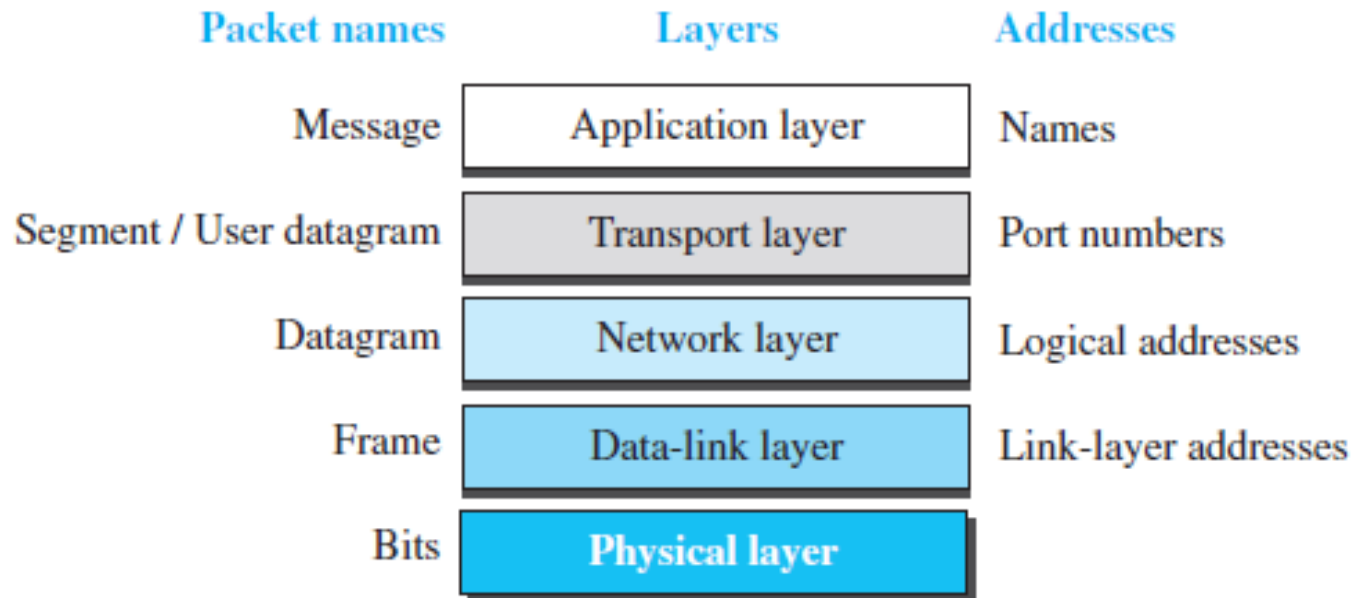
Encapsulation and Decapsulation

Legend

- 4 Header at transport layer ↓ Encapsulate
- 3 Header at network layer ↑ Decapsulate
- 2 Header at data-link layer



Addressing



Quiz

1. A router connects three links (networks). How many of each of the following layers can the router be involved with?

Physical layer

Data Link layer

Network layer

2. A host communicates with another host using the TCP/IP protocol suite. What is the unit of data sent or received at each of the following layers?

Application
layer

Data Link layer

Network layer

3. Which of the following data units is encapsulated in a frame?

A user datagram

A datagram

A segment

2. A host communicates with another host using the TCP/IP protocol suite. What is the unit of data sent or received at each of the following layers?

Application
layer

Data Link layer

Network layer

Thank You