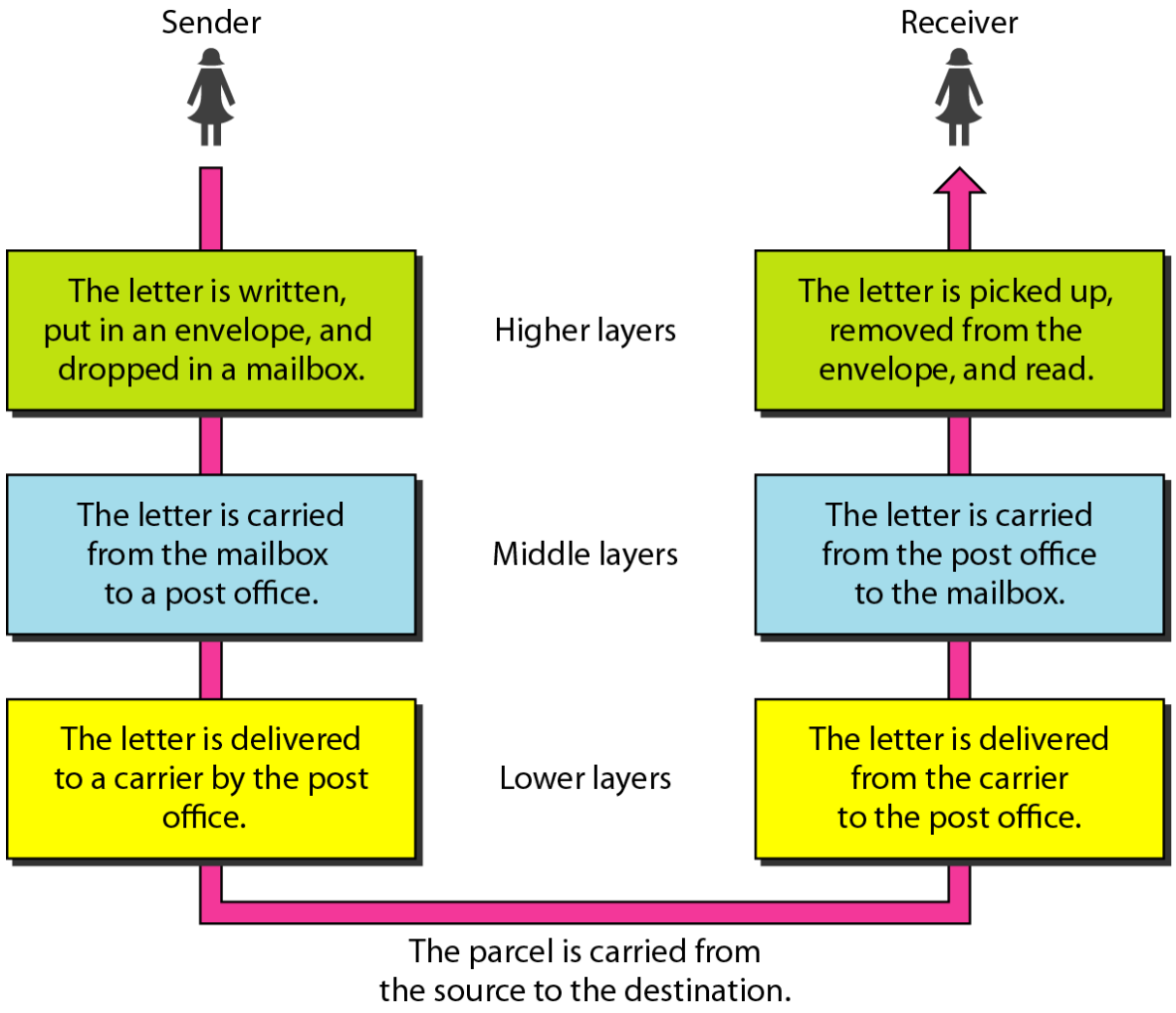
Chapter 2

Network Models

Layered Task:

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.

Tasks involved in sending a letter

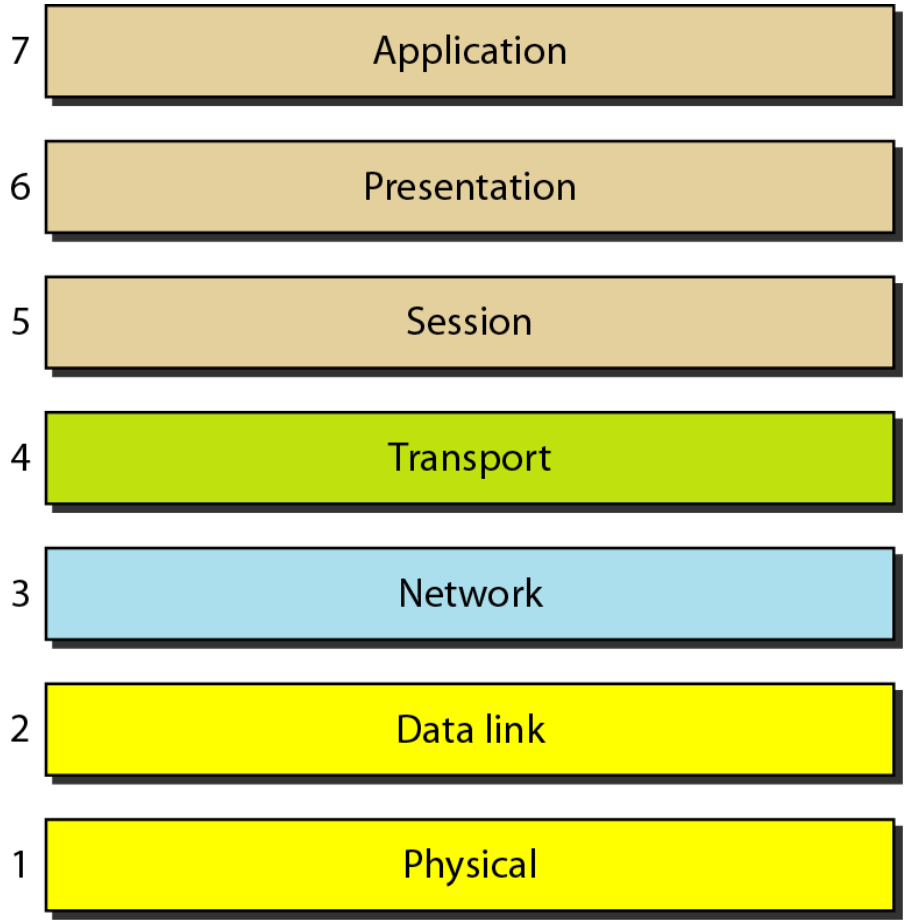


OSI Model:

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 the late 1970s.

ISO is the organization.
OSI is the model.

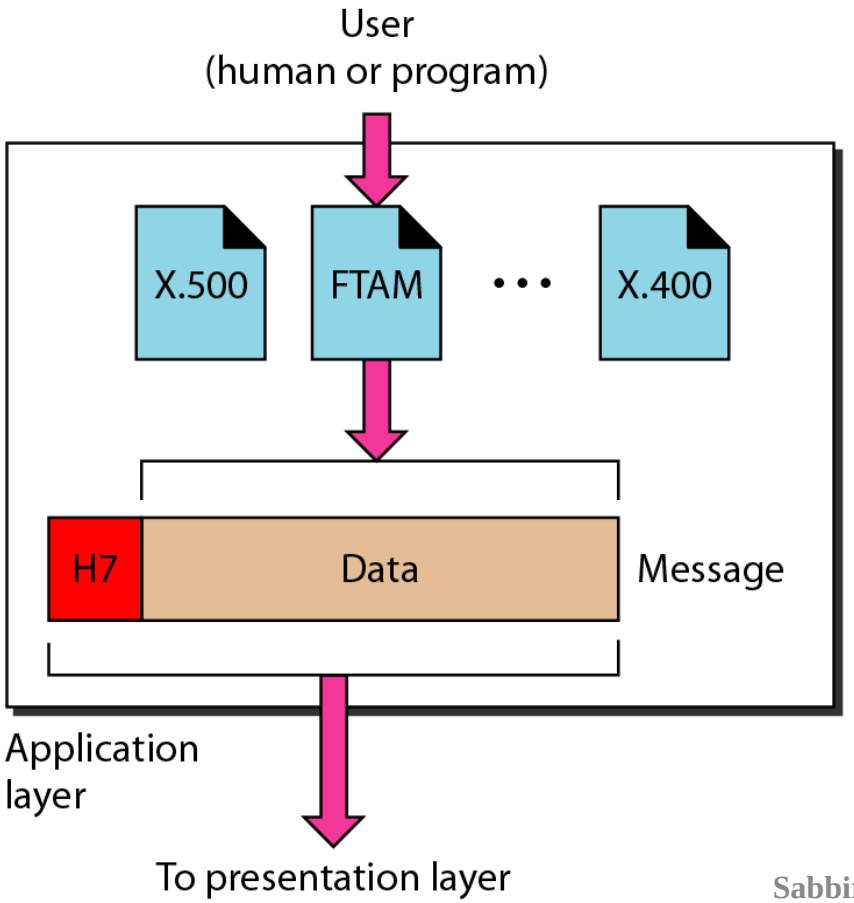
Seven layers of the OSI model:

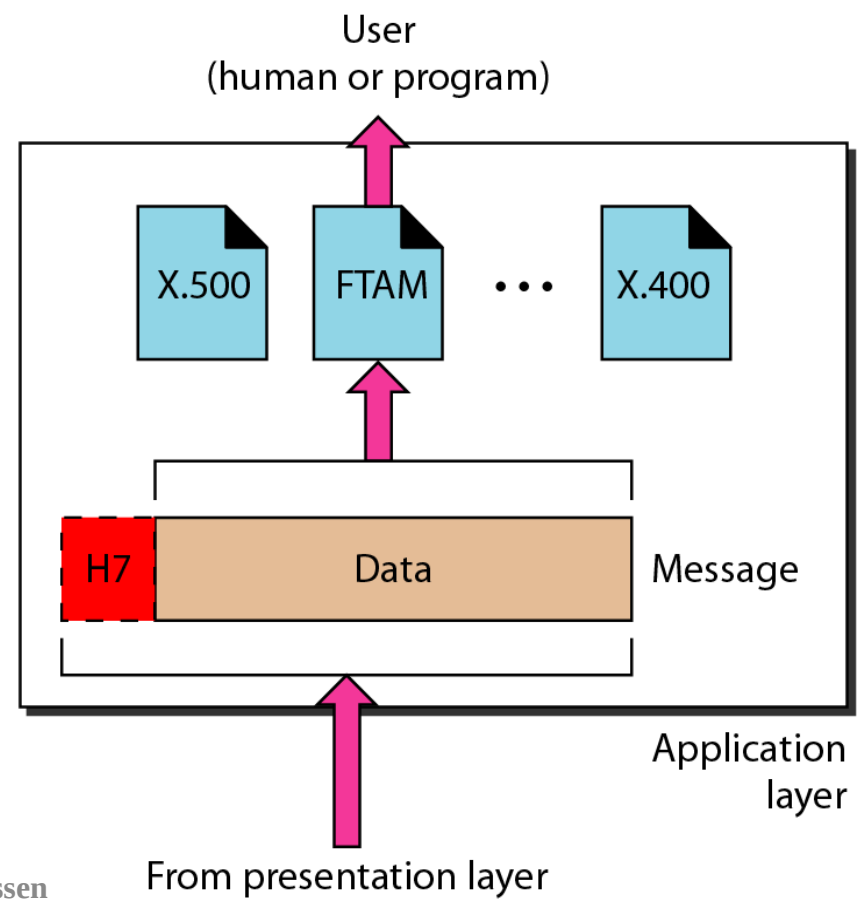


Application layer:

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

Services: Computer Application Chrome, Mozilla Firefox

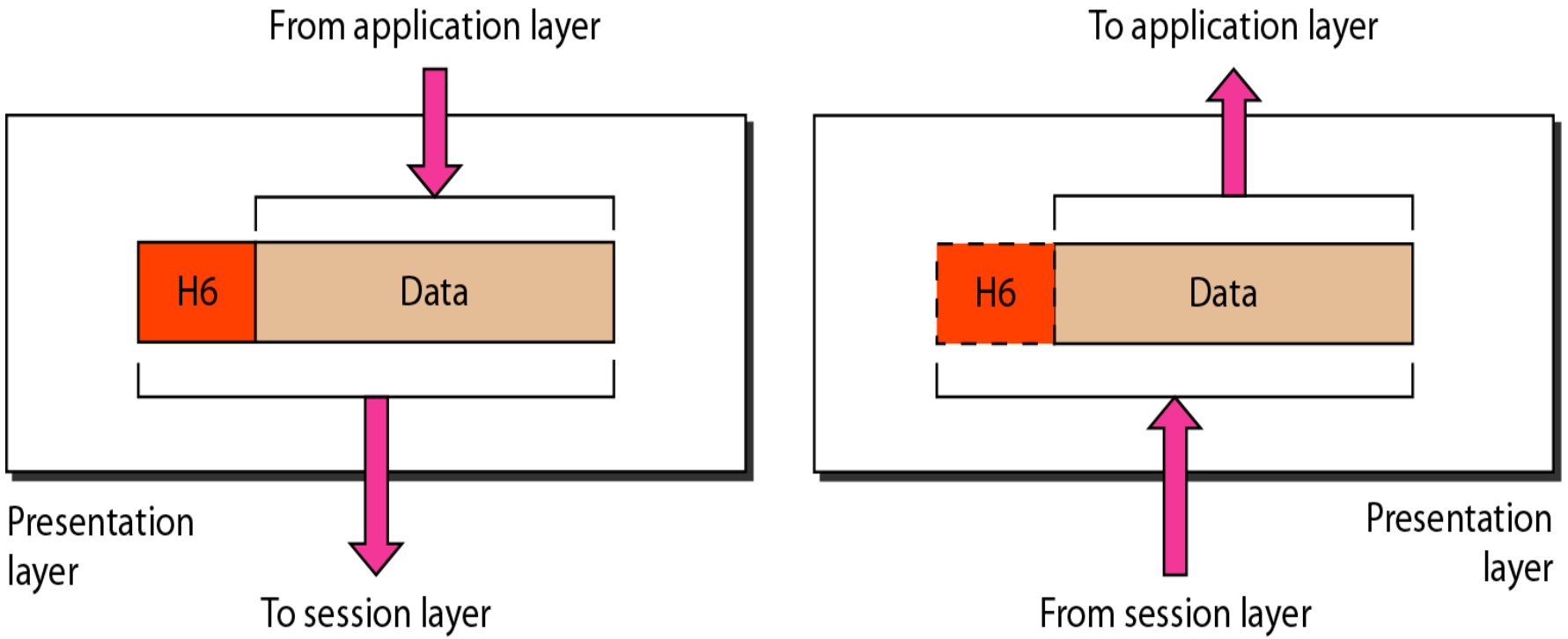




Presentation layer:

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

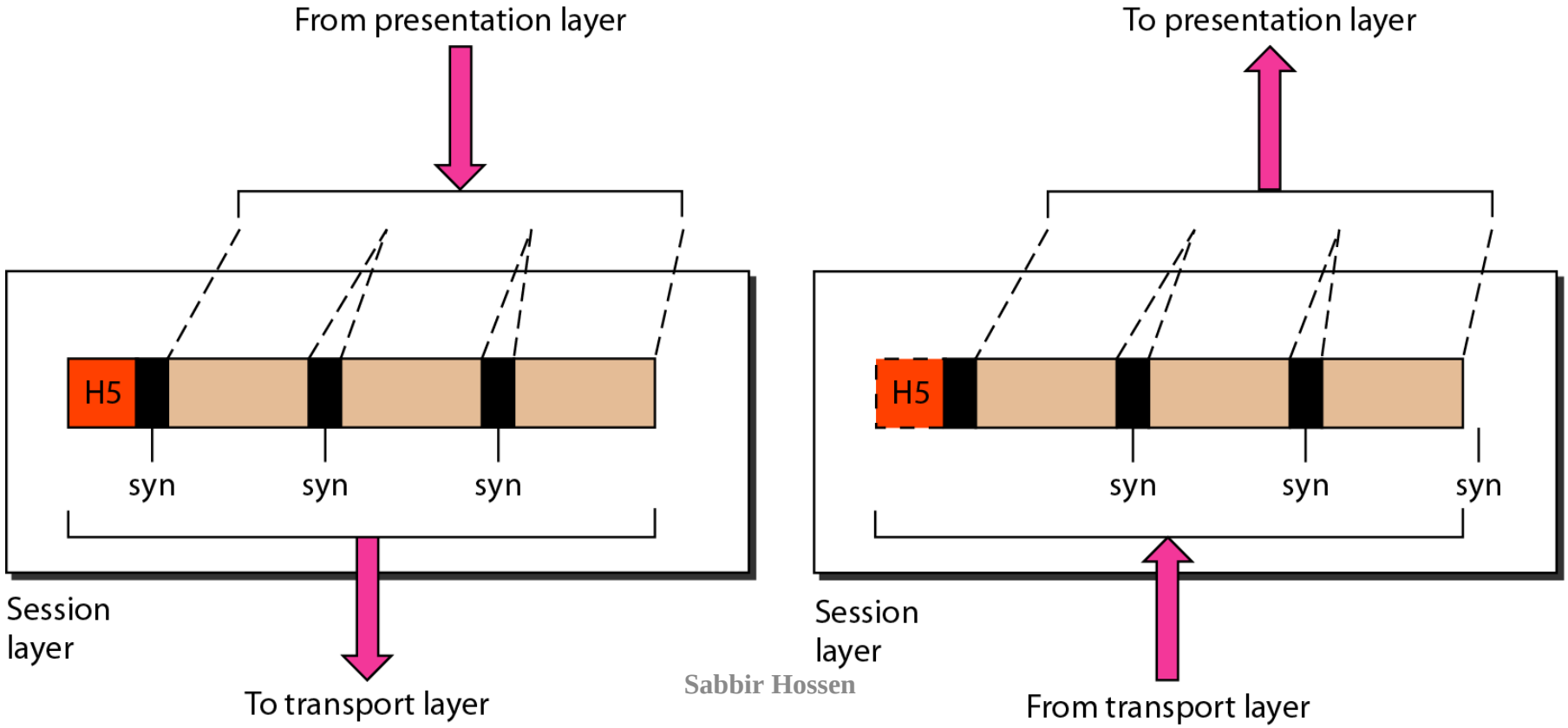
Services: Translation, Data Compression, Encryption



Session layer:

The session layer is responsible for establishing, managing and terminating connections between applications

Services: Session Management, Authentication, Authorization, Interaction management (Simplex, half-duplex, full-duplex)

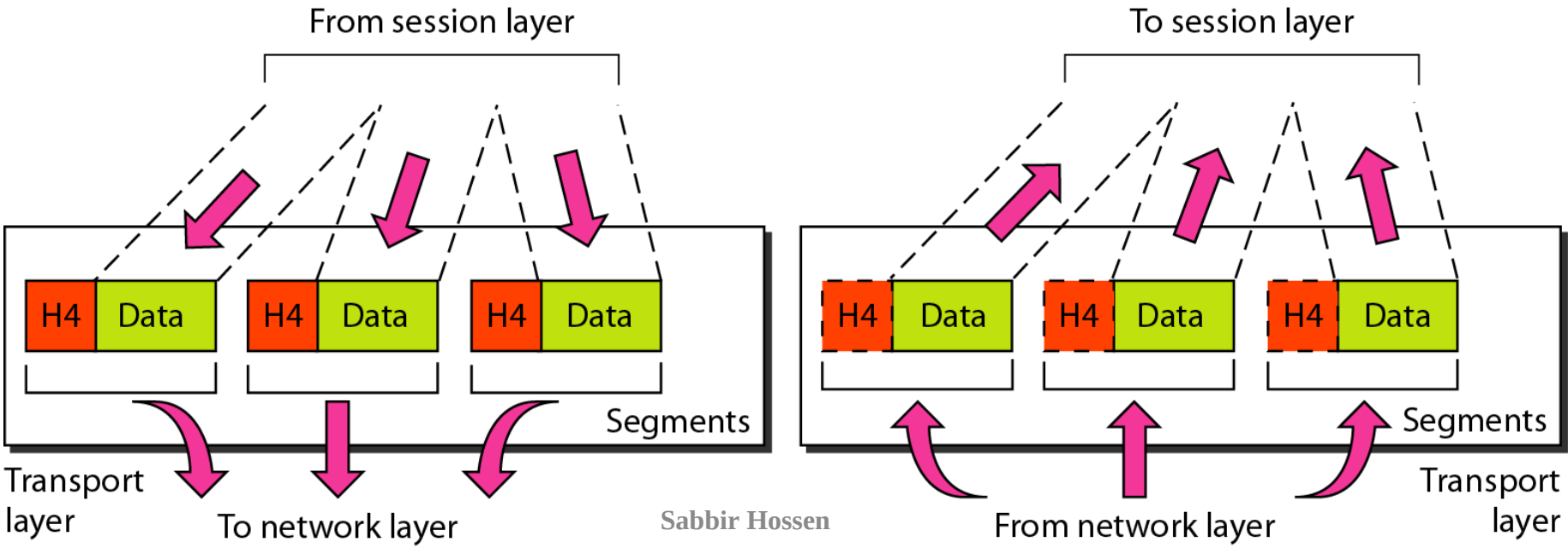


Transport layer:

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

Services

- Port addressing
- Segmentation and reassembly
- Connection control
- Flow control (end-to-end)
- Error control (end-to-end)

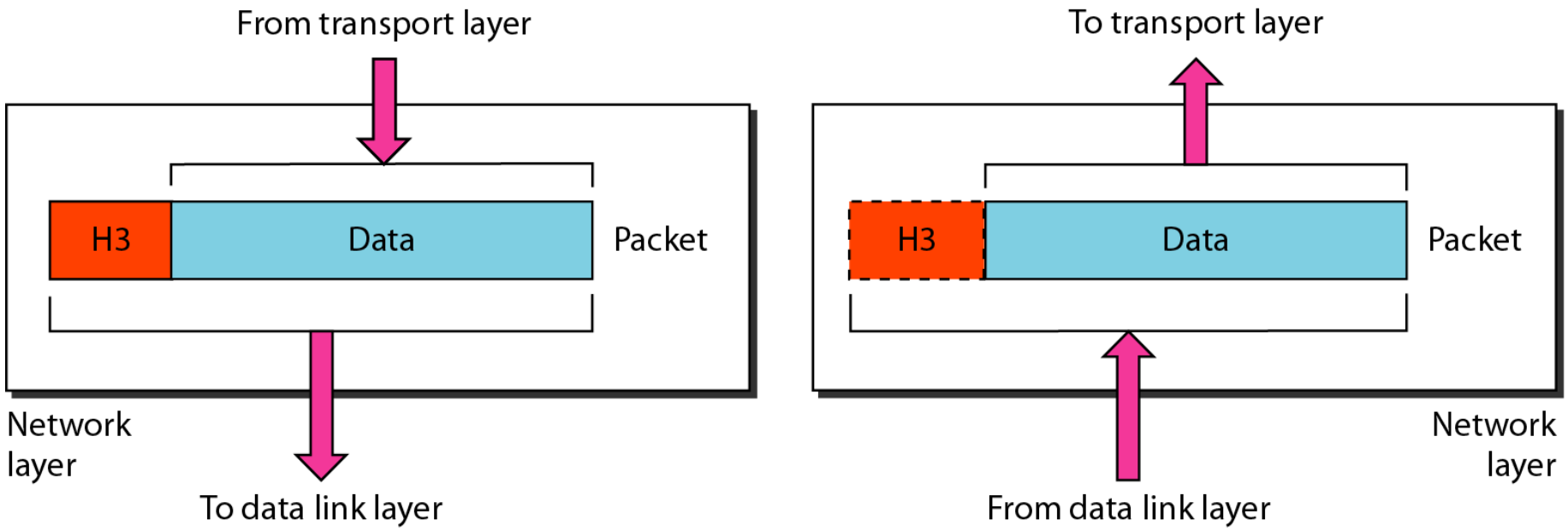


Network layer:

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

Services

- Logical addressing
- IPv4, IPv6
- Routing

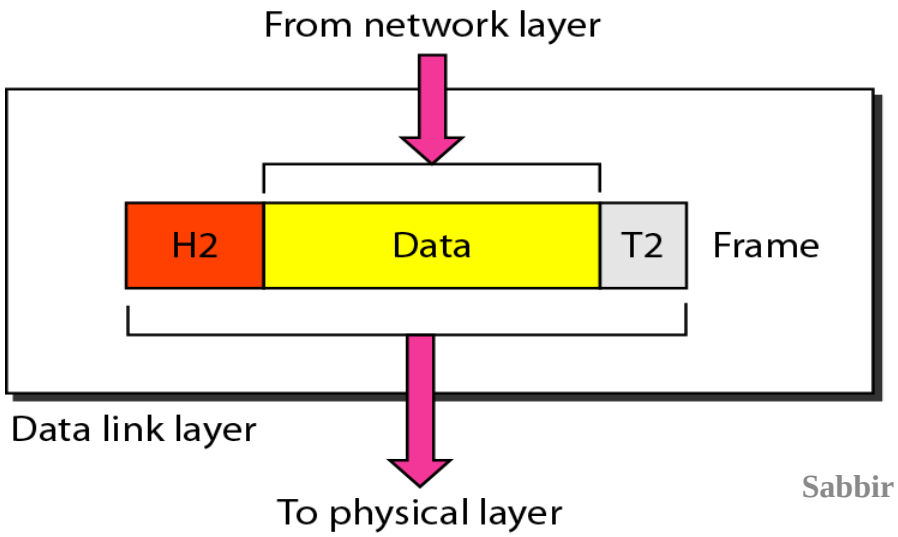


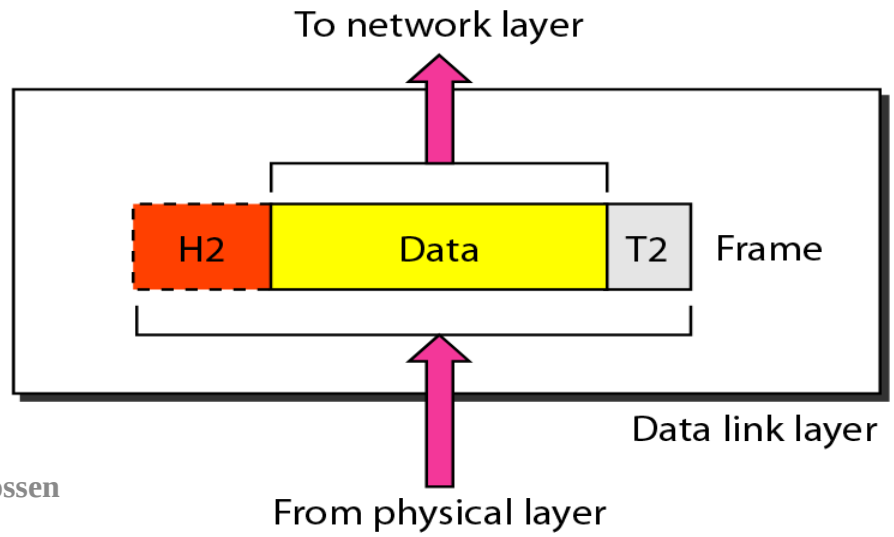
Data link layer:

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

Services

- Framing
- Physical addressing
- Flow control (hop-to-hop)
- Error control (hop-to-hop)
- Access control



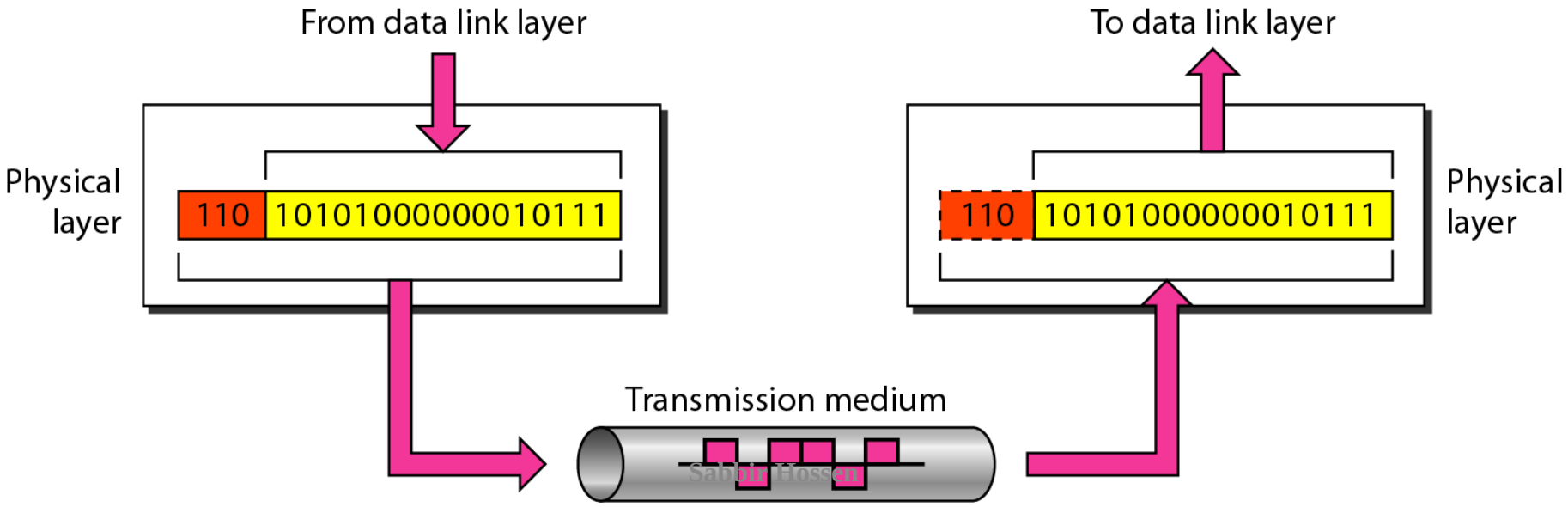


Physical layer:

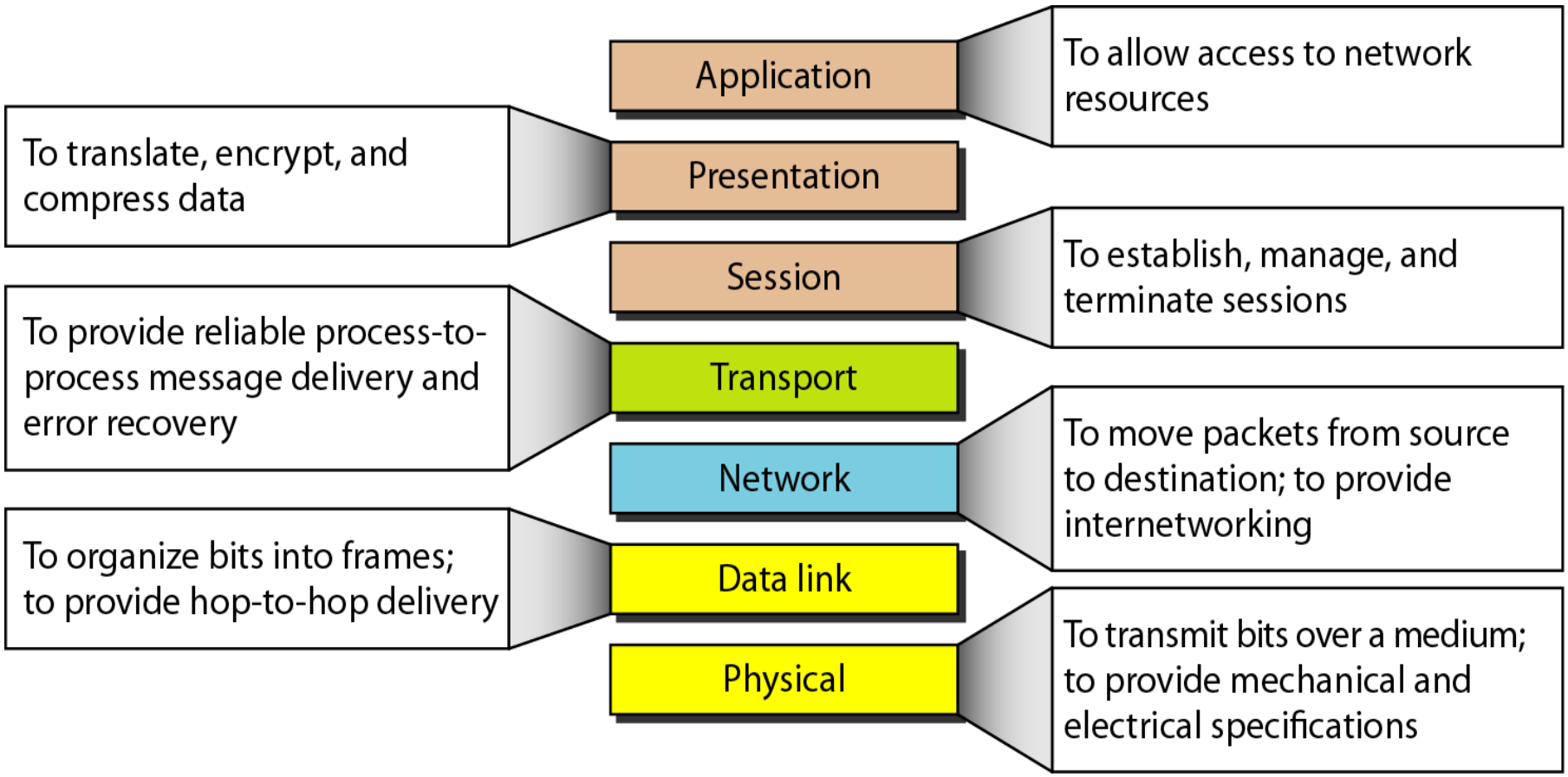
Responsible for transmitting individual bits from one node to the next.

Services:

- Physical characteristics of interfaces and media
- Representation of bits
- Data rate (transmission rate)
- Synchronization of bits



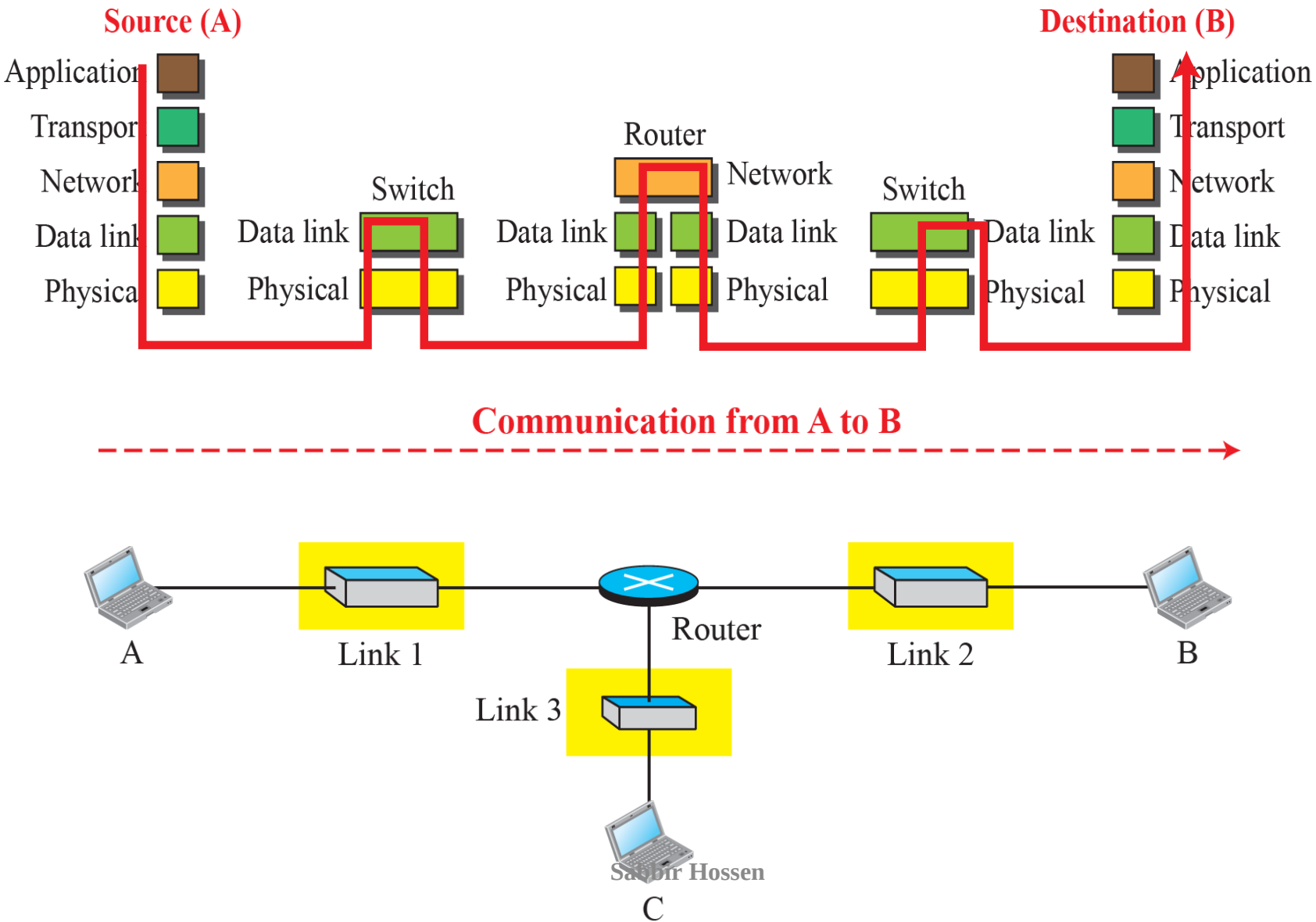
Summary of layers:



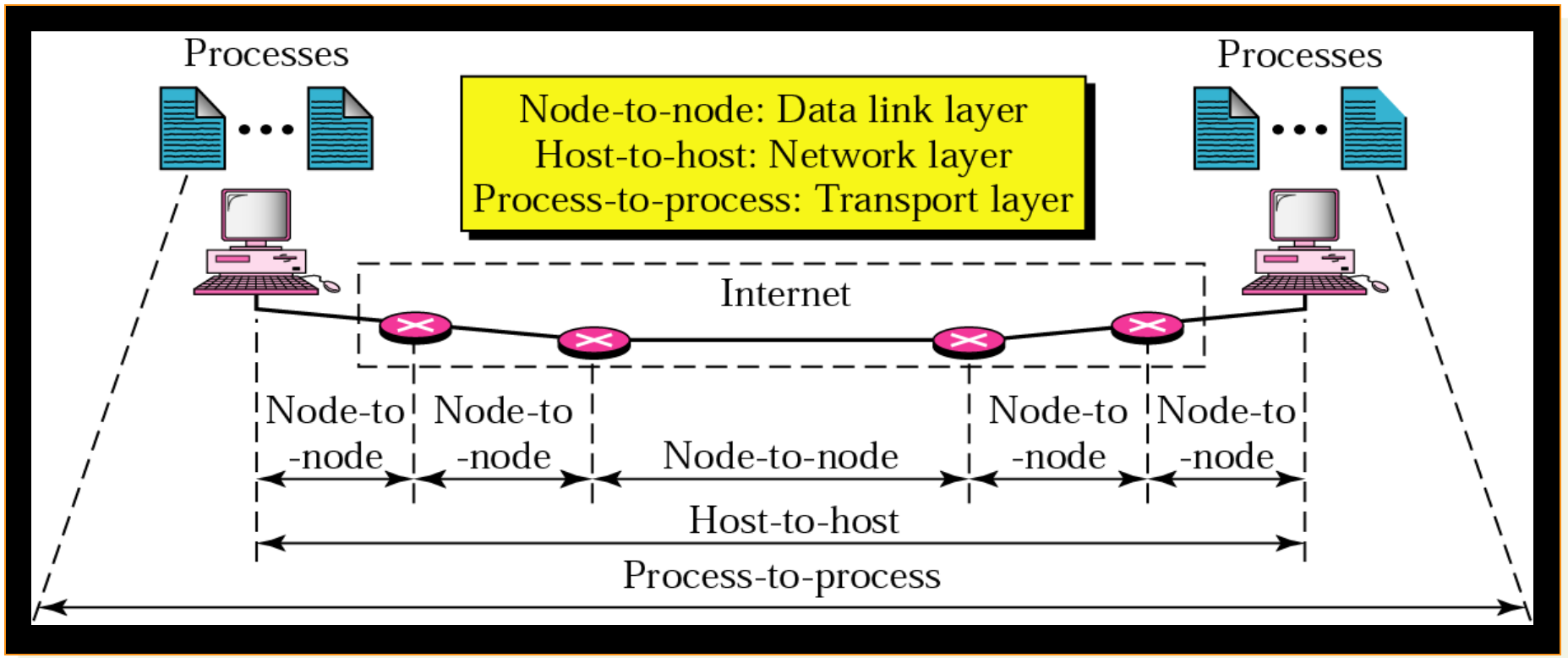
Internet Protocol Suite:

Layer	Protocols
Application	HTTP, FTP, Telnet, SMTP, ...
Transport	TCP, UDP, SCTP, ...
Network	IP (IPv4), IPv6, ICMP, IGMP, ...
Data Link	Ethernet, Wi-Fi, PPP, ...
Physical	RS-232, DSL, 10Base-T, ...

Communication through an internet



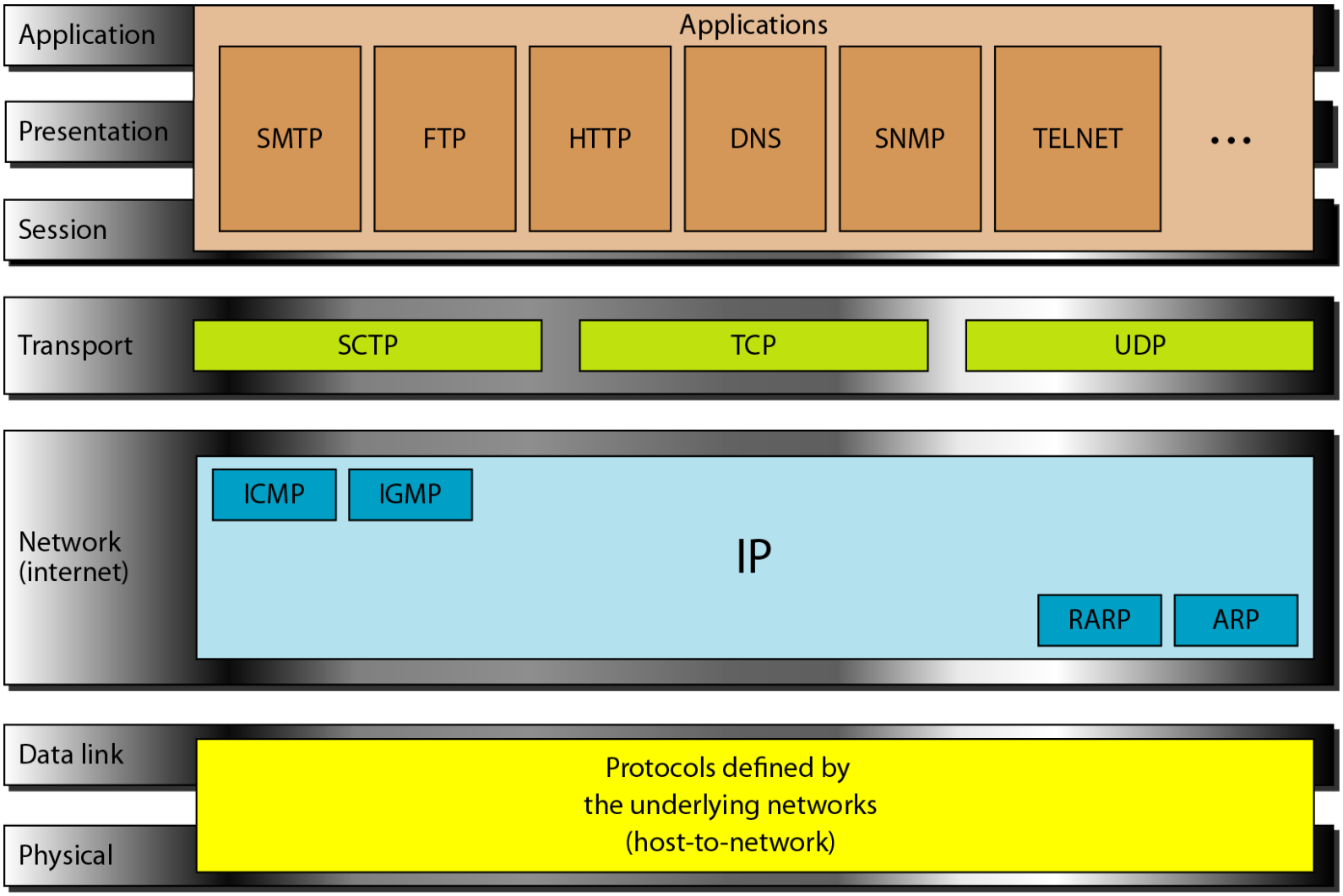
Internet Model:



TCP/IP Protocol:

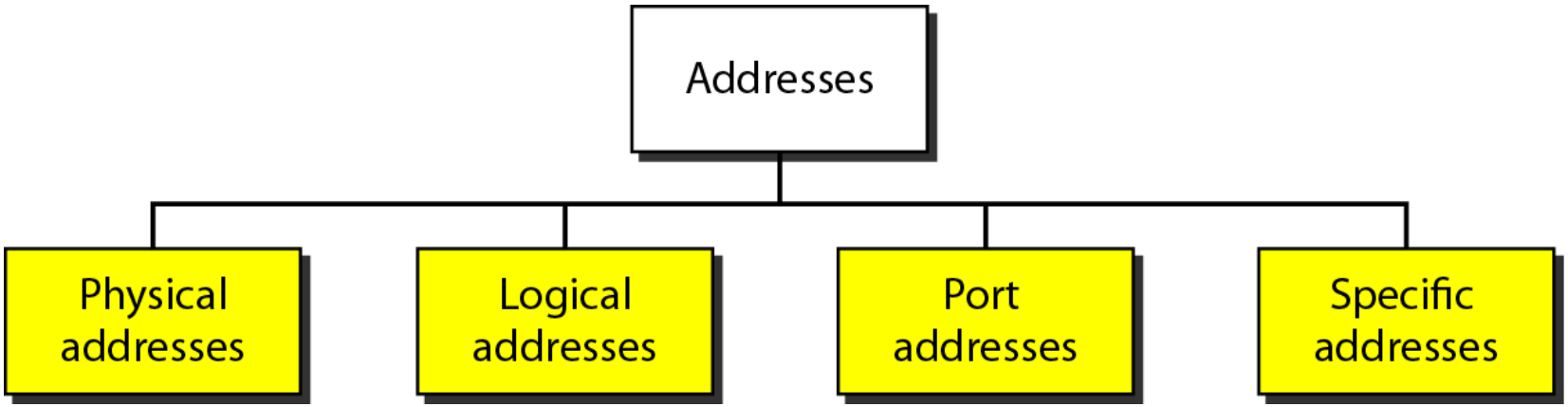
When TCP/IP is compared to OSI, we can say that the TCP/IP protocol suite is made of five layers: physical, data link, network, transport, and application.

TCP/IP and OSI model

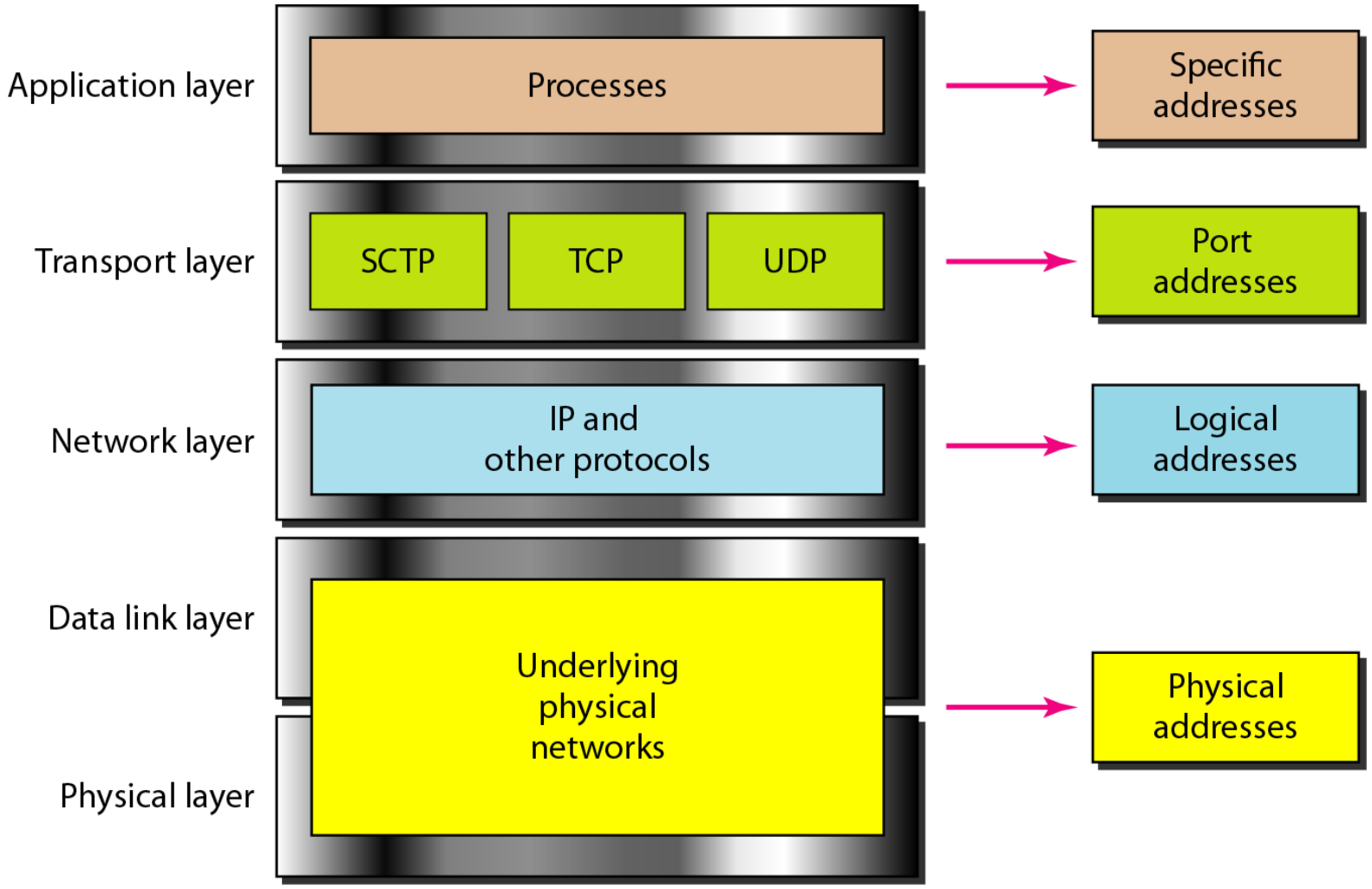


Addressing:

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



Relationship of layers and addresses in TCP/IP



Physical Address

Most local-area networks use a 48-bit (6-byte) physical address written as 12 hexadecimal digits; every byte (2 hexadecimal digits) is separated by a colon, as shown below:

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

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

Logical Address:

Logical Address:

IP Address, 32bit

192.168.0.1

Port Address:

753

A 16-bit port address represented
as one single number.

Specific Address:

Example: google, Facebook, URL

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

References:

1. B.A. Forouzan, *Data Communications and Networking*, 4 rd. Edition.

2. https://www.tutorialspoint.com/data_communication_computer_network/index.htm