National Institute of Technology Karnataka Surathkal
Department of Information Technology

IT 200 **Computer Communication and Networking**

Transmission Fundamentals:
Network Models OSI and TCP/IP

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Dept of Information Technology

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Syllabus

- **Evolution of Data Communication and Networks,**
- **Transmission Fundamentals: Signaling Schemes, Encoding and Modulation, Data Transmission over Networks – Switching Techniques, Layered Architecture of Computer Networks, OSI & TCP/IP Architectures and Layers with protocols.**
- Data Link Control and Protocols, Error Detection and Correction,
- Internetworking & Routing,
- Transport Layer Protocols,
- Applications: E-Mail, HTTP, WWW, Multimedia;
- Implementation of Signaling and Modulation, Bit, Byte & Character Stuffing and Error Detection/Correction Coding Techniques, TCP/IP Level Programming, Routing Algorithms, Exercises comprising simulation of various protocols.

Index

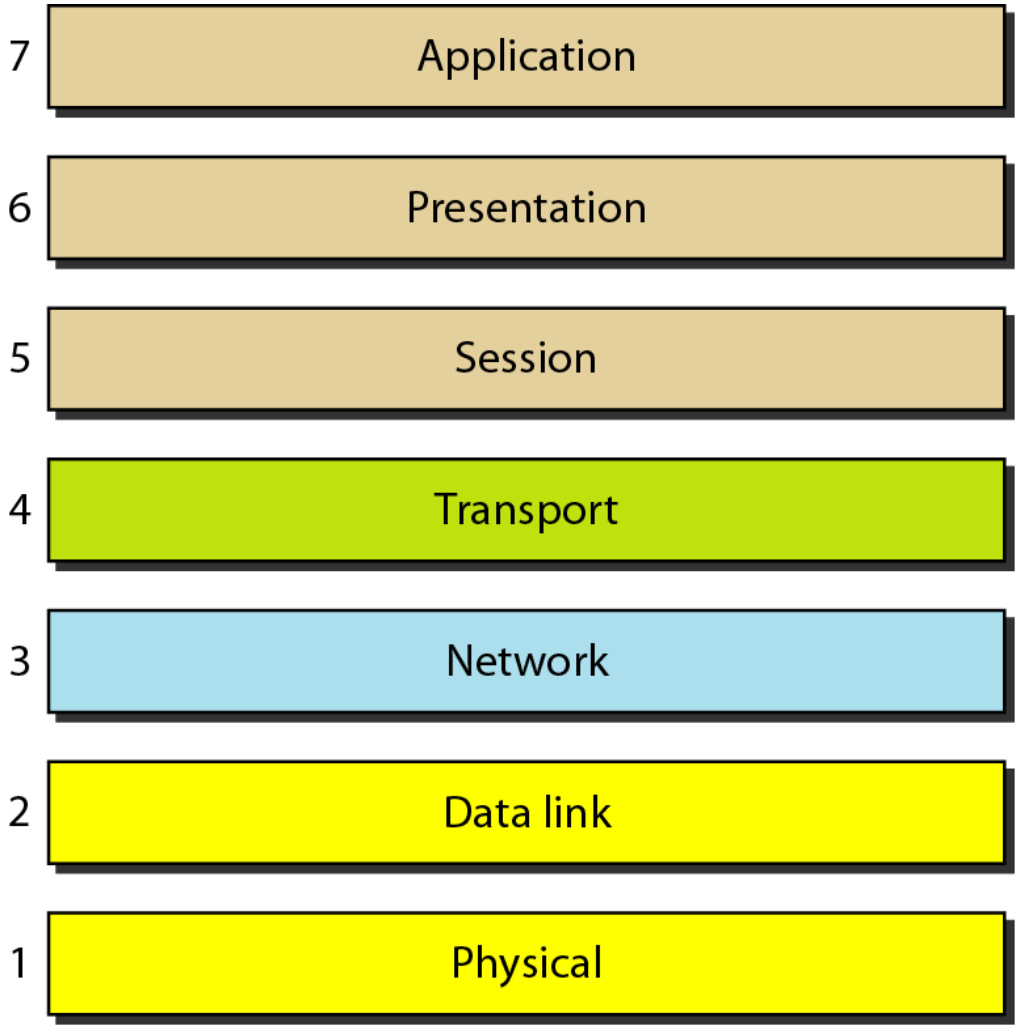
- **Transmission Fundamentals**
- **Layered Architecture of Computer Networks,**
- **OSI TCP/IP Architectures**
- **TCP/IP Architectures**
- **Layers with protocols.**

1. 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 the late 1970s.

ISO is the organization.
OSI is the model.

1. The OSI Model



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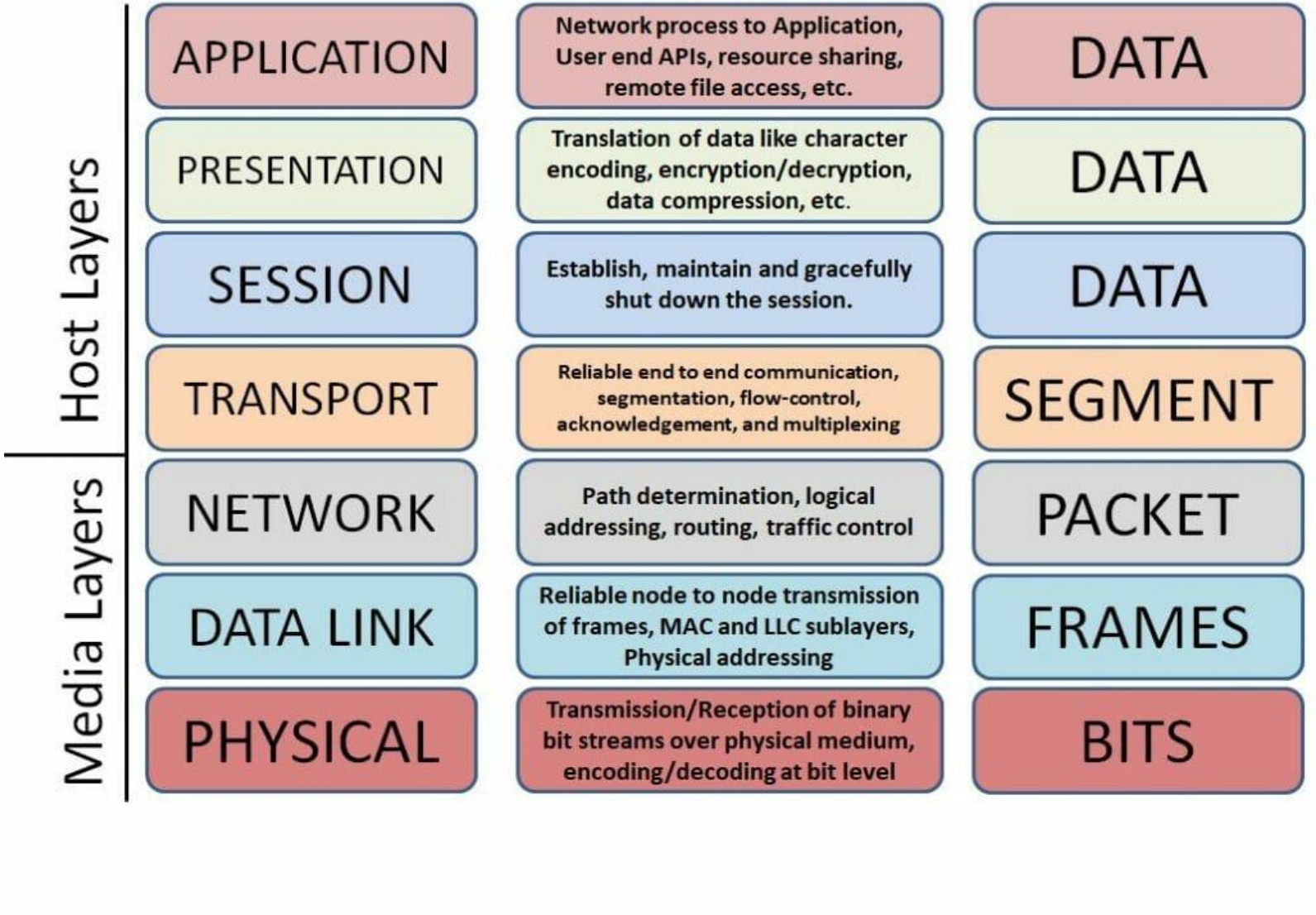
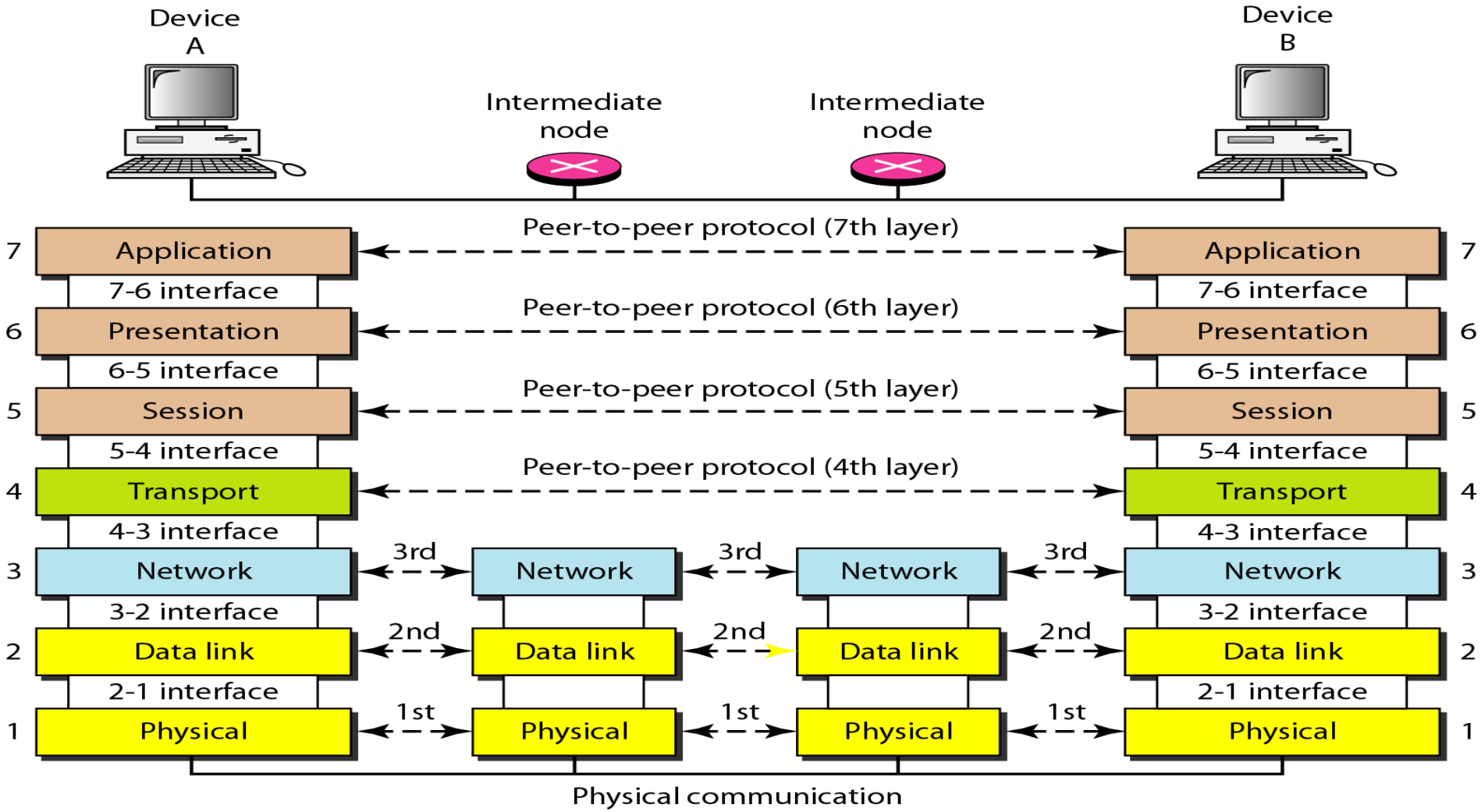


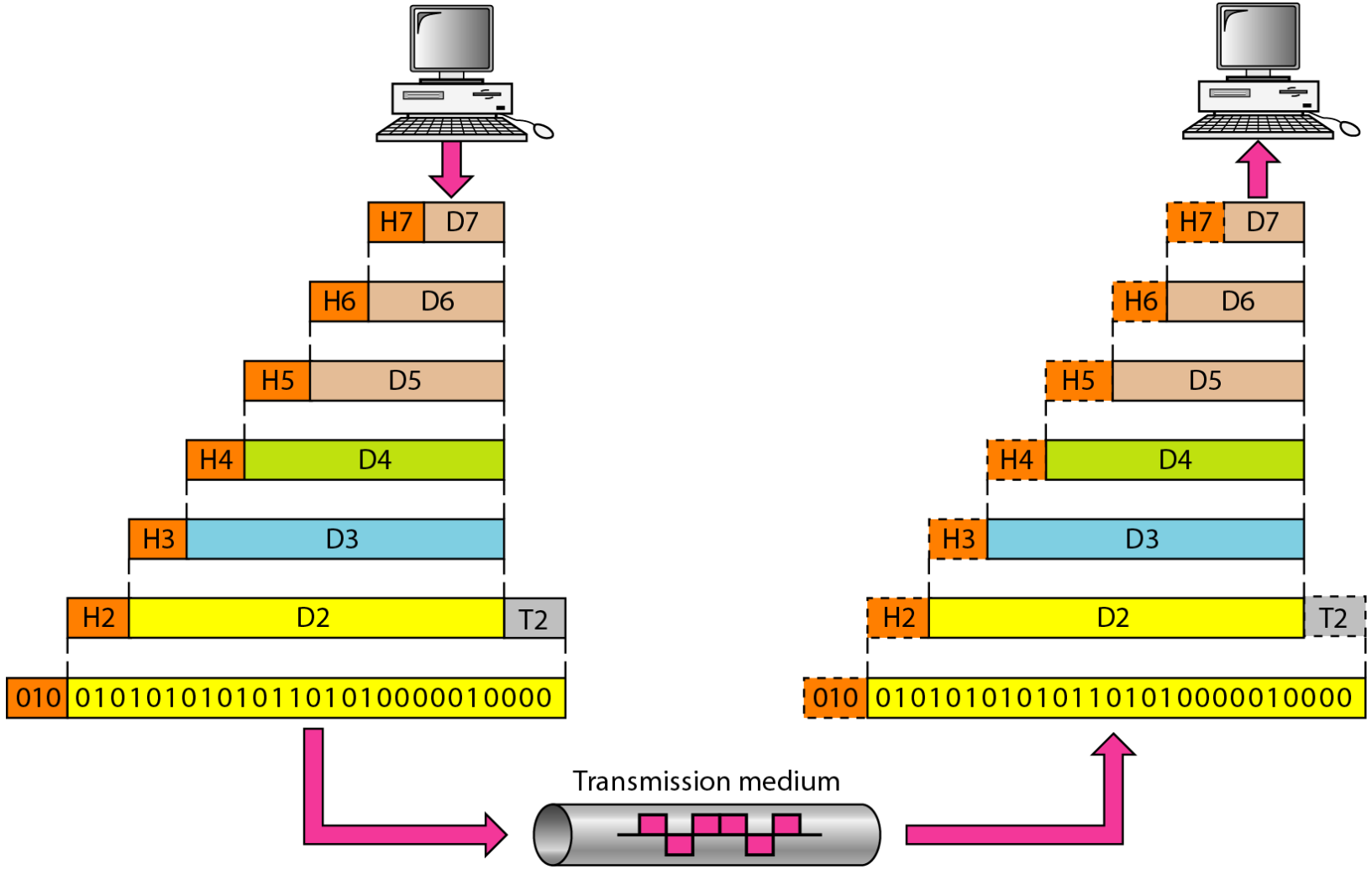
1. The OSI Model

- Hop by hop and End to End protocols



1. Introduction : Data Communication and Network

Each layer adds header for communication with corresponding layer at receiver.

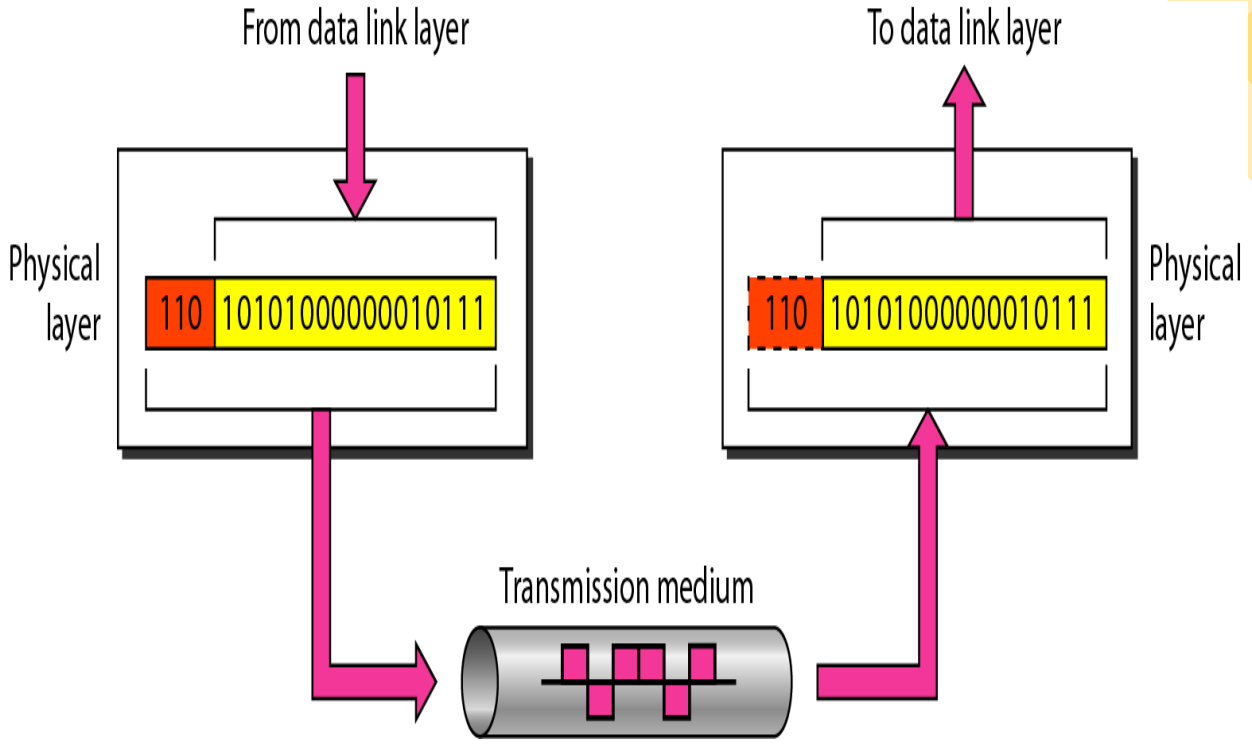


1. The OSI Model : Physical Layer

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

Functions of Physical layer

- Physical characteristics of the interfaces & media
- Representation of bits
- Data rate/ Transmission rate
- Synchronization of bits
- Line configuration- Point to point/ Multipoint
- Physical Topology
- Transmission Mode- Simplex/half-duplex/ full-duplex.



1. The OSI Model : Data Link Layer

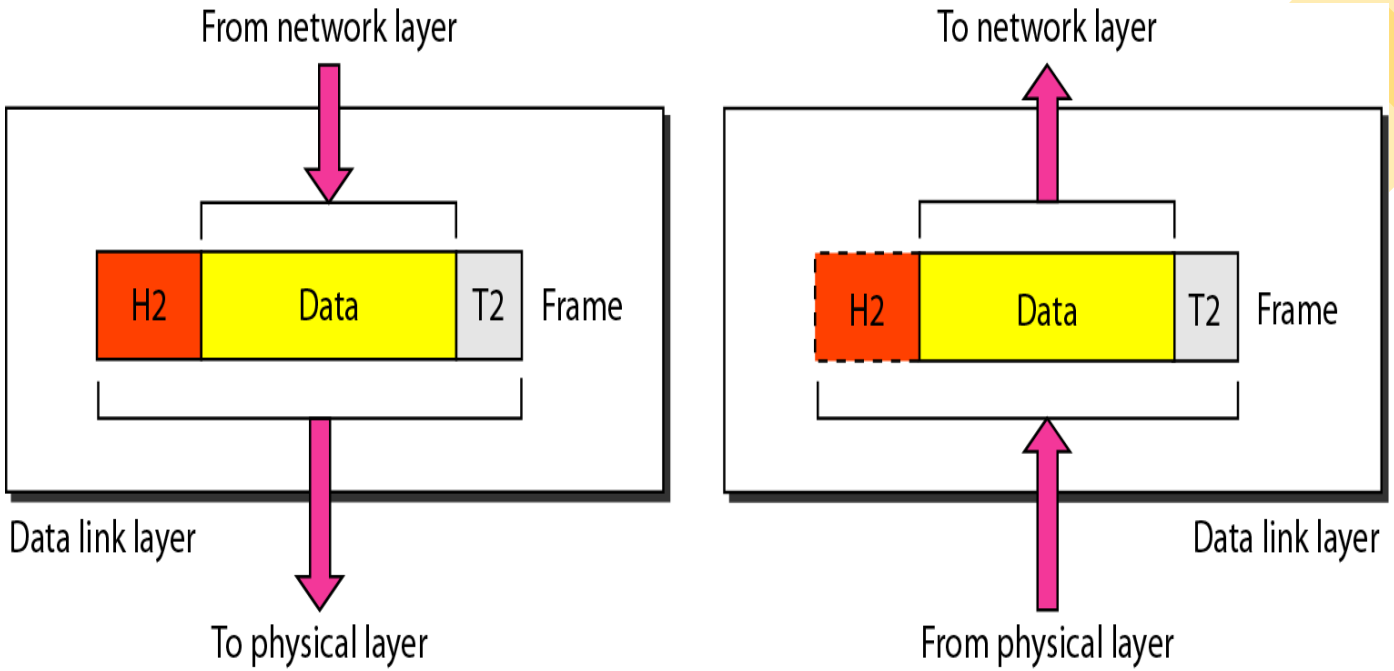
The data link layer is responsible for moving
frames from one hop (node) to the next.

MAC: Media Access Control

LLC: Logical Link Control

Functions of Data Link layer:

- Framing
- Physical addressing
- Flow control
- Error control
- Multiplexing of multiple protocols at a higher layer
- Access control of channel by the devices



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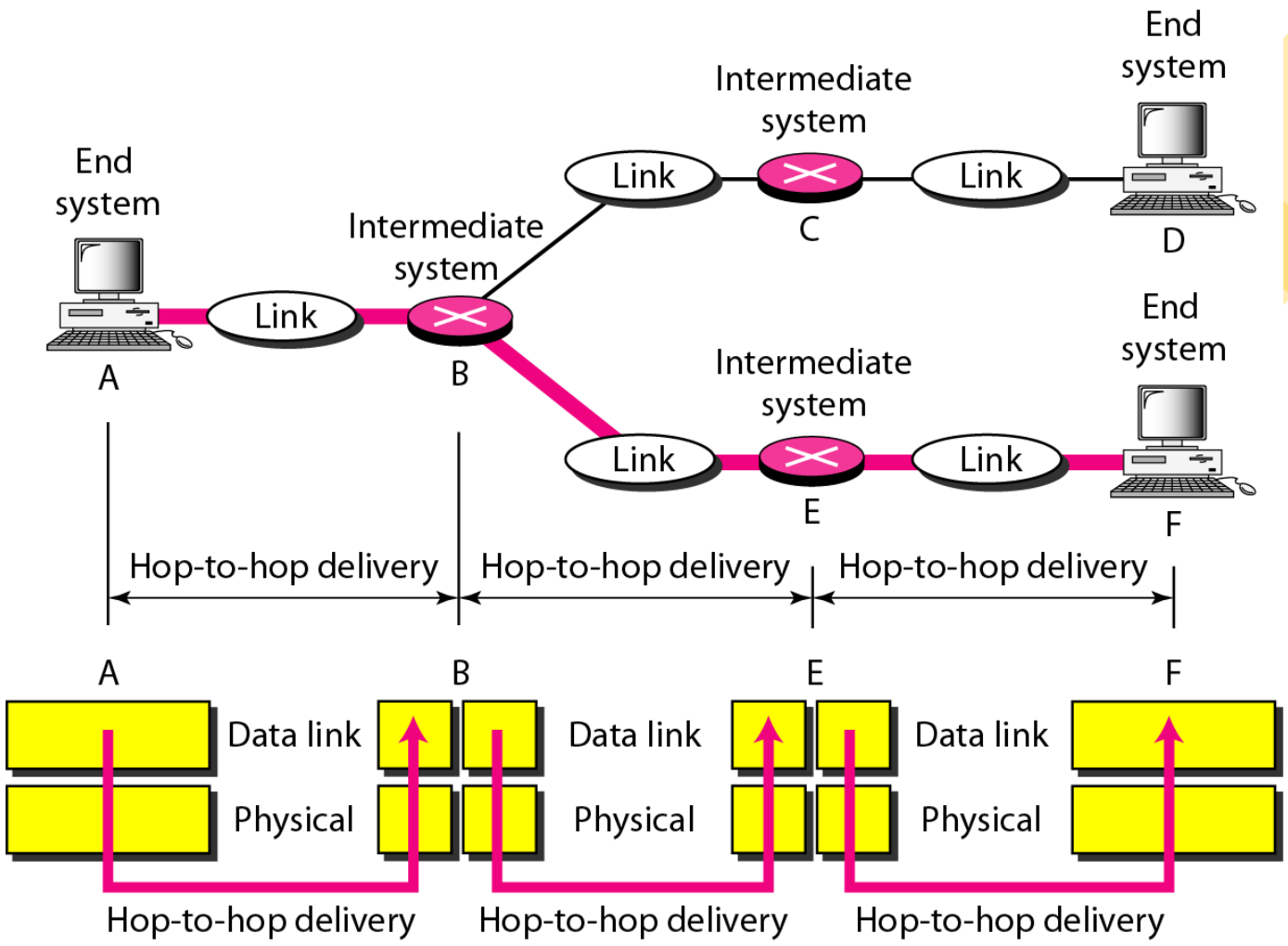
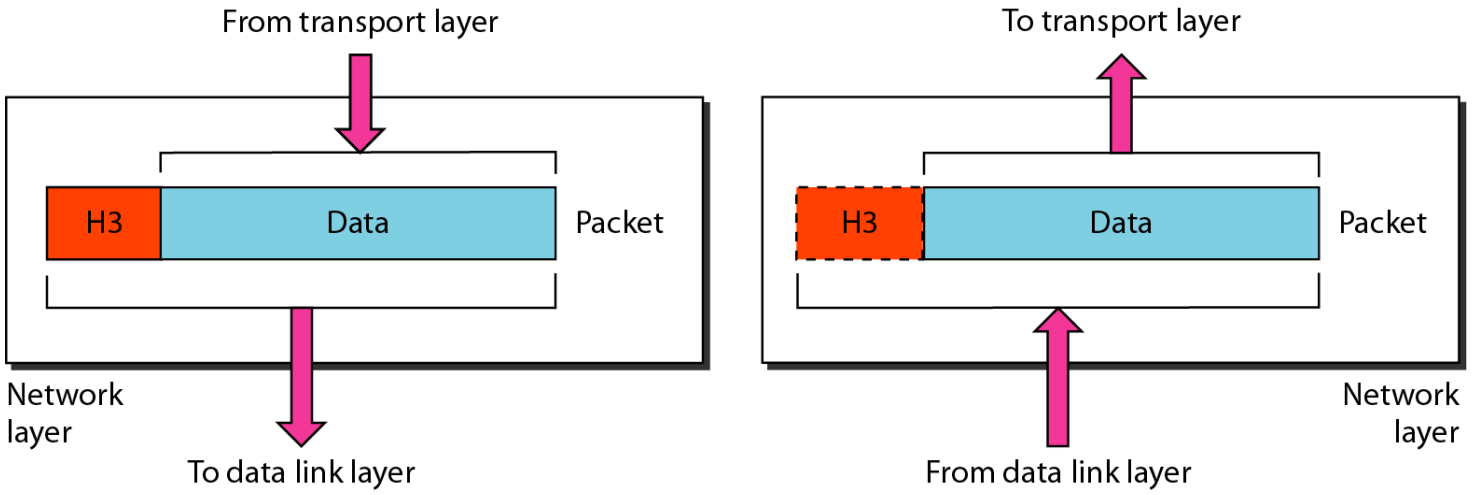


1. The OSI Model : Network Layer

The network layer is responsible for Logical addressing, packet forwarding, routing across multiple networks.

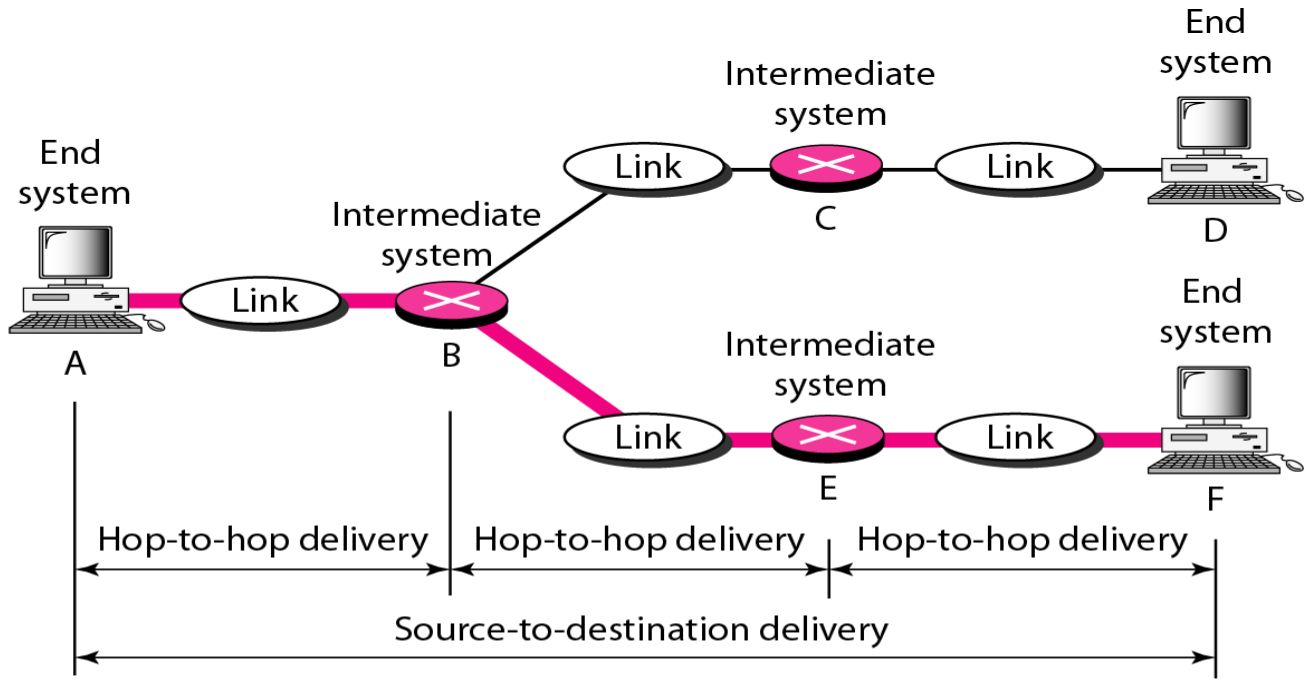
Functions of Network layer:

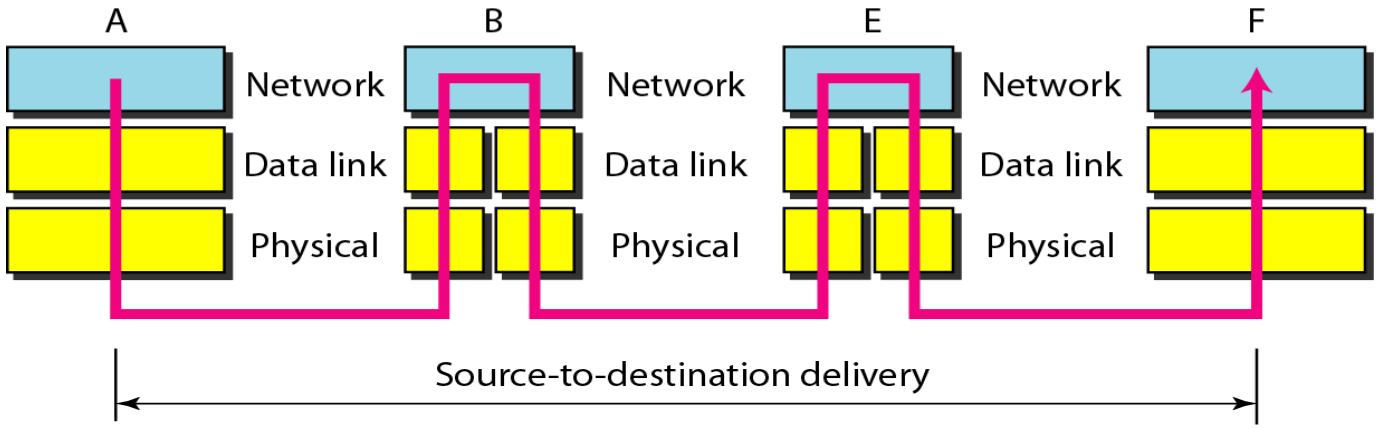
- Host addressing (IP)
- Packet forwarding and routing



1. The OSI Model : Network Layer

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



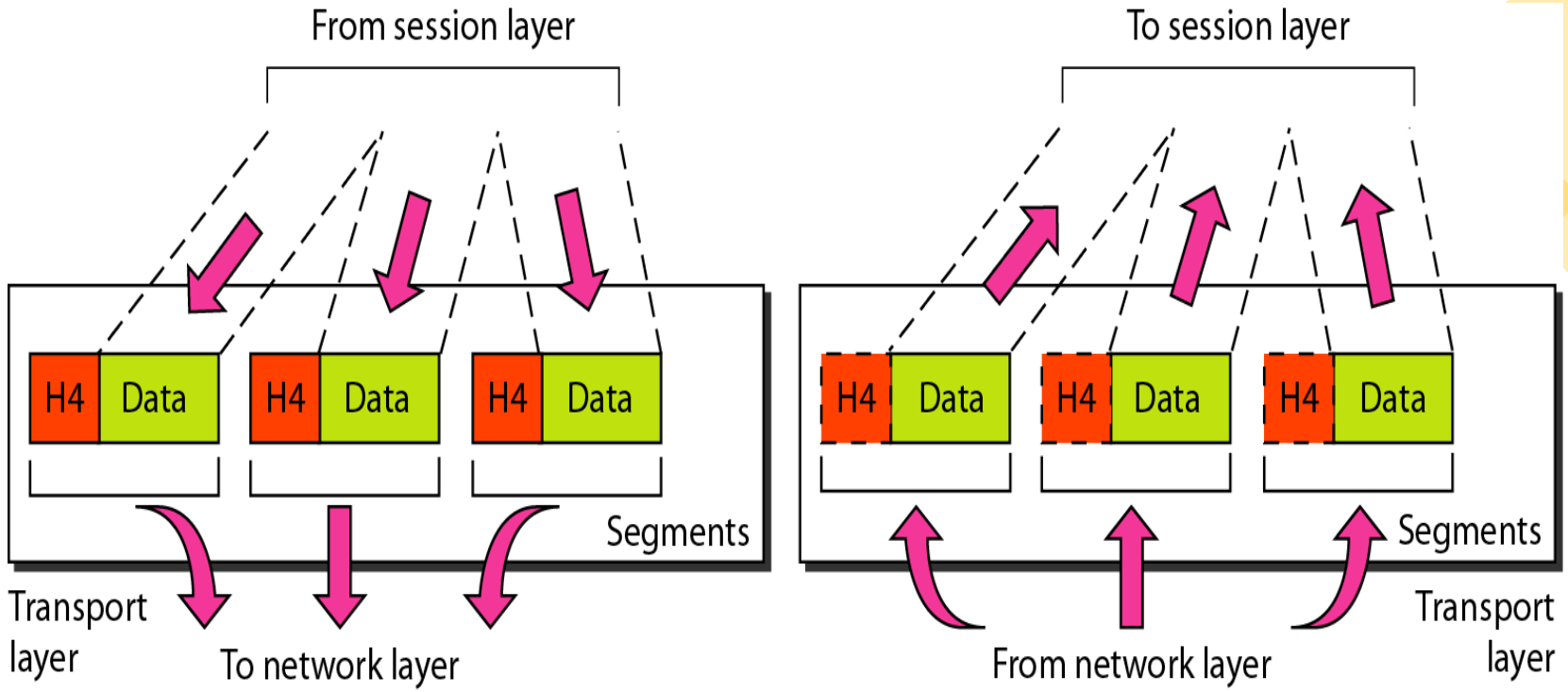


1. The OSI Model: Transport Layer

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

Functions:

- Port addressing
- Segmentation and reassembly
- Connection Control
- Flow control
- Error Control



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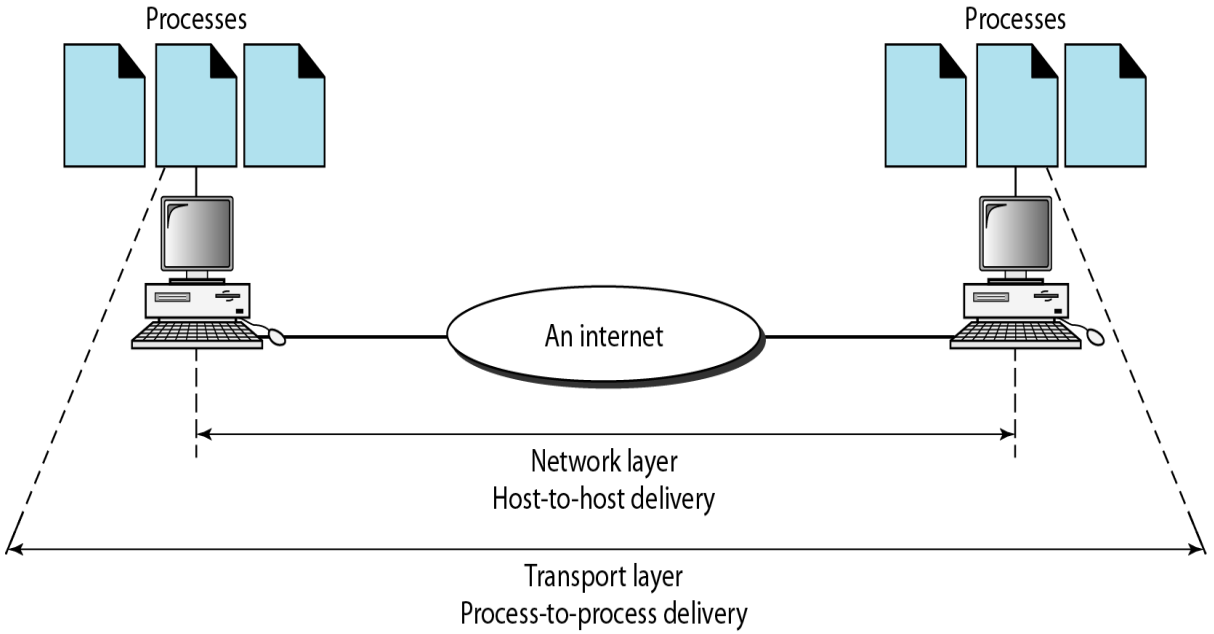
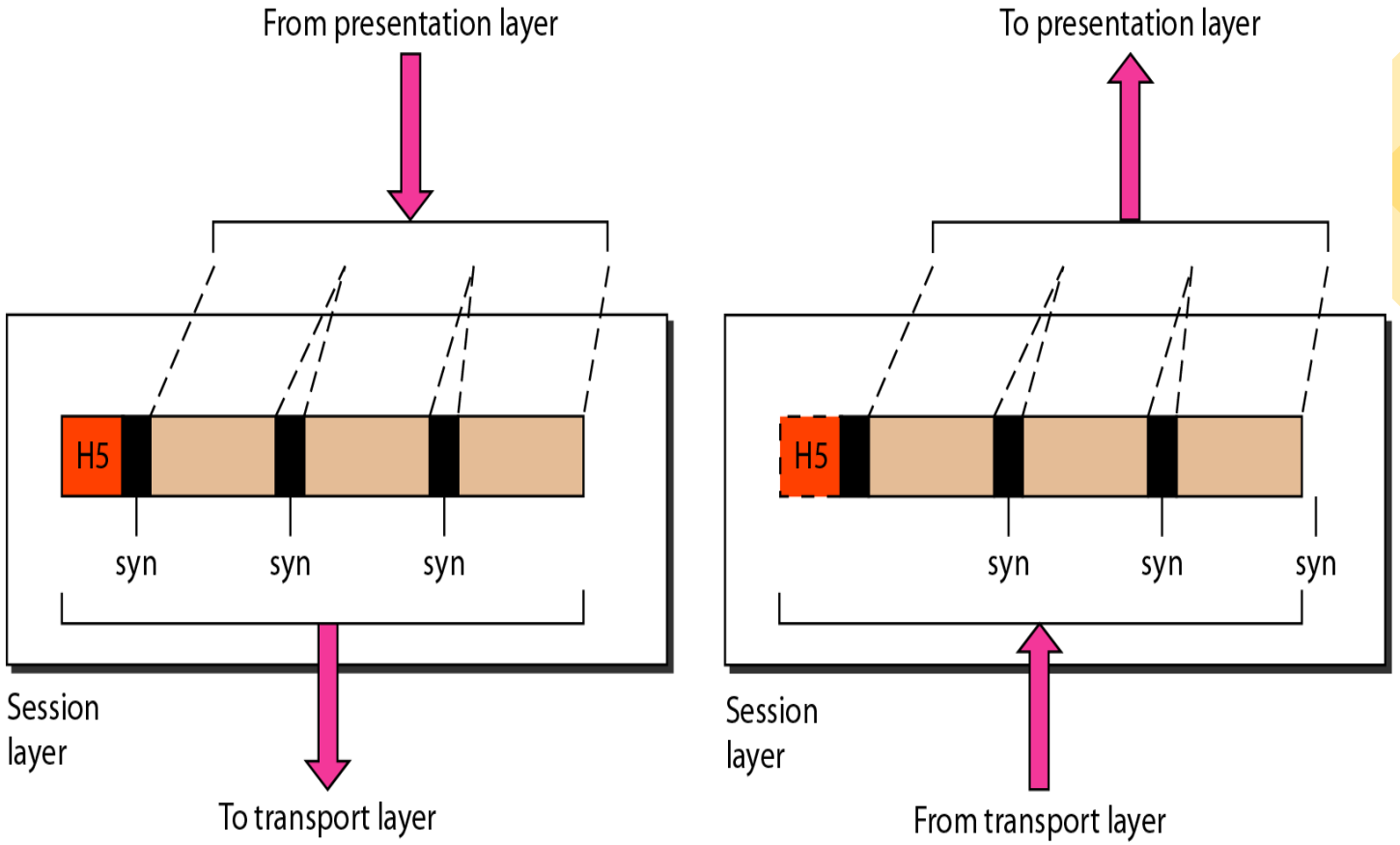


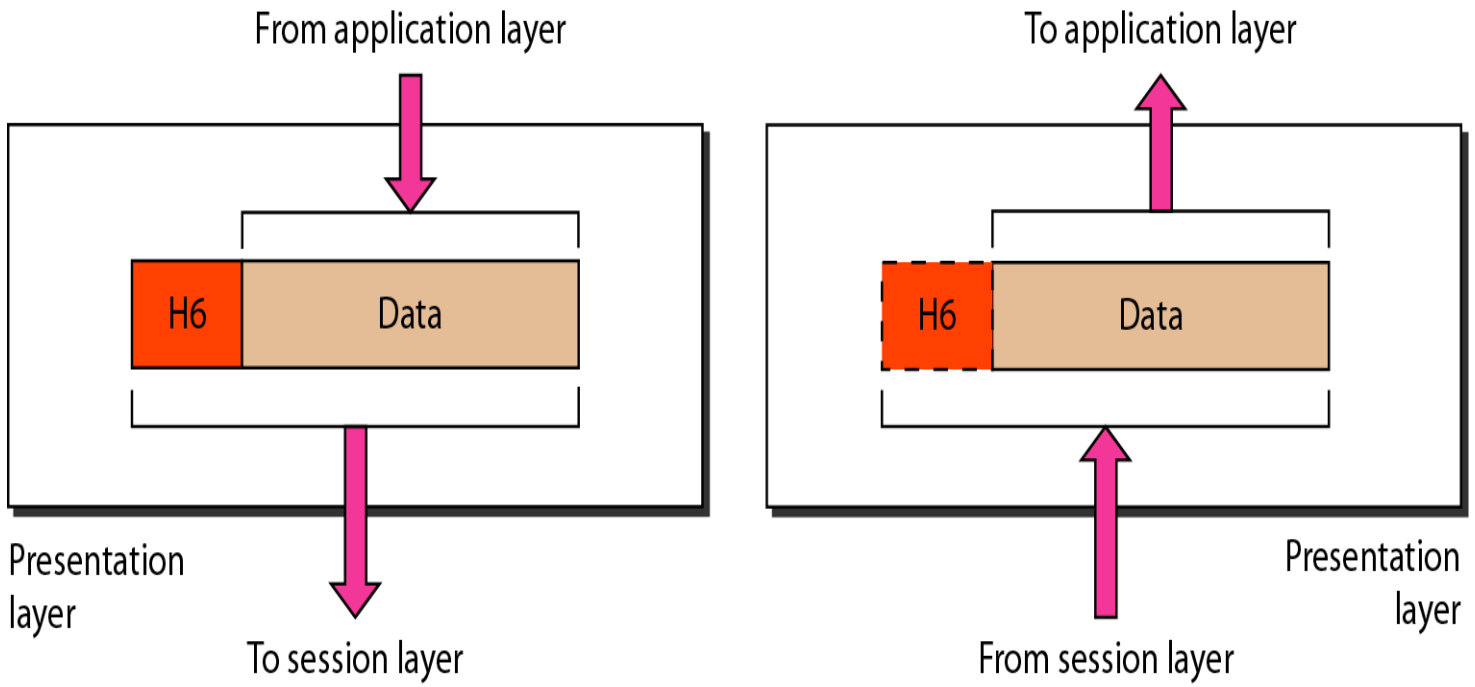
1. The OSI Model : Session Layer

The session layer is responsible for dialog control and synchronization. It is responsible for the **initiation, maintenance, and graceful shut down of a session.**



1. The OSI Model : Presentation Layer

The presentation layer is responsible for **translation, compression, and encryption.** It provides a mapping between the different application layer entities which may use different syntax and semantics.

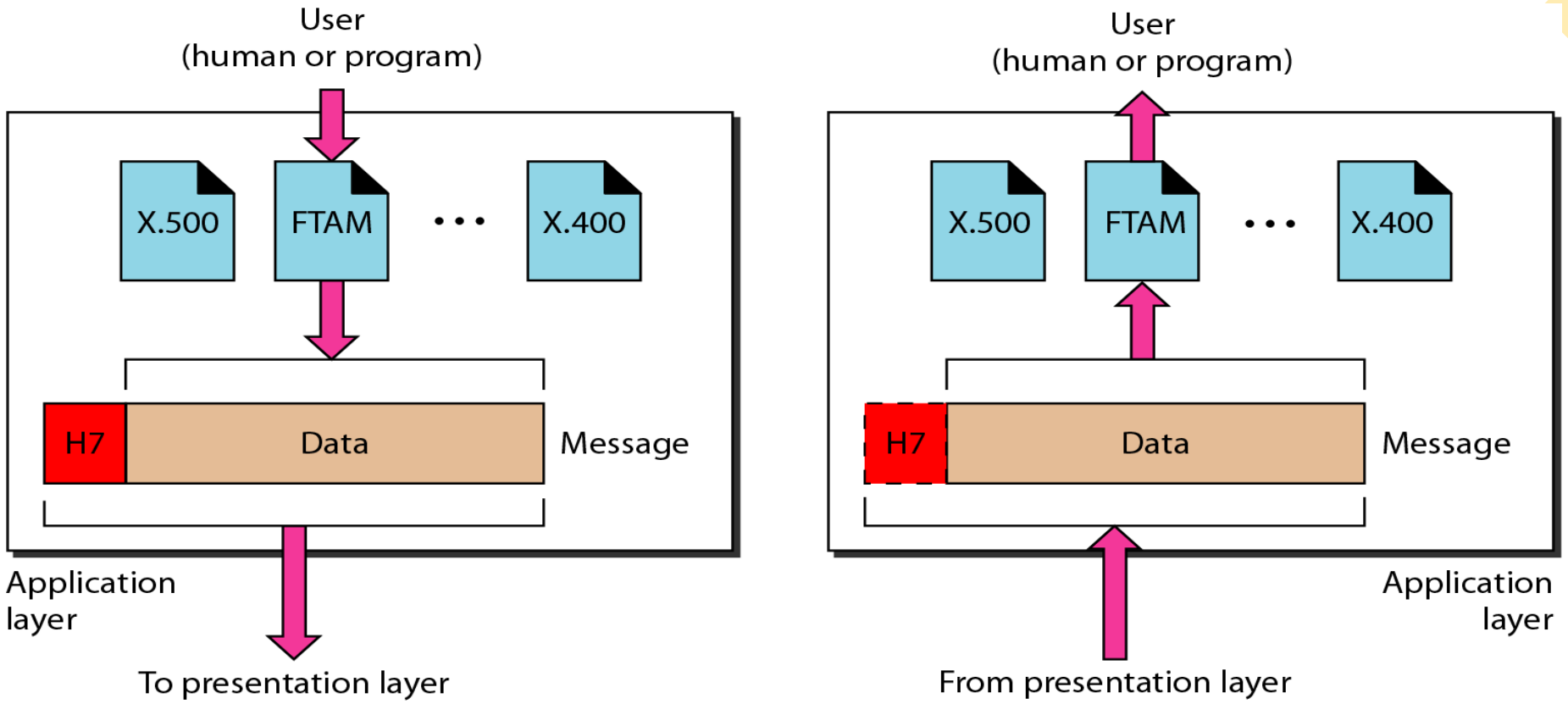


1. The OSI Model: Application layer

The application layer is responsible for providing services to the user. Services: Network Virtual terminal, File transfer, access and Management(FTAM), Email service, Directory service etc

X.500 Series of Computer Networking standard

X.400 Suite of protocols for email message transfer



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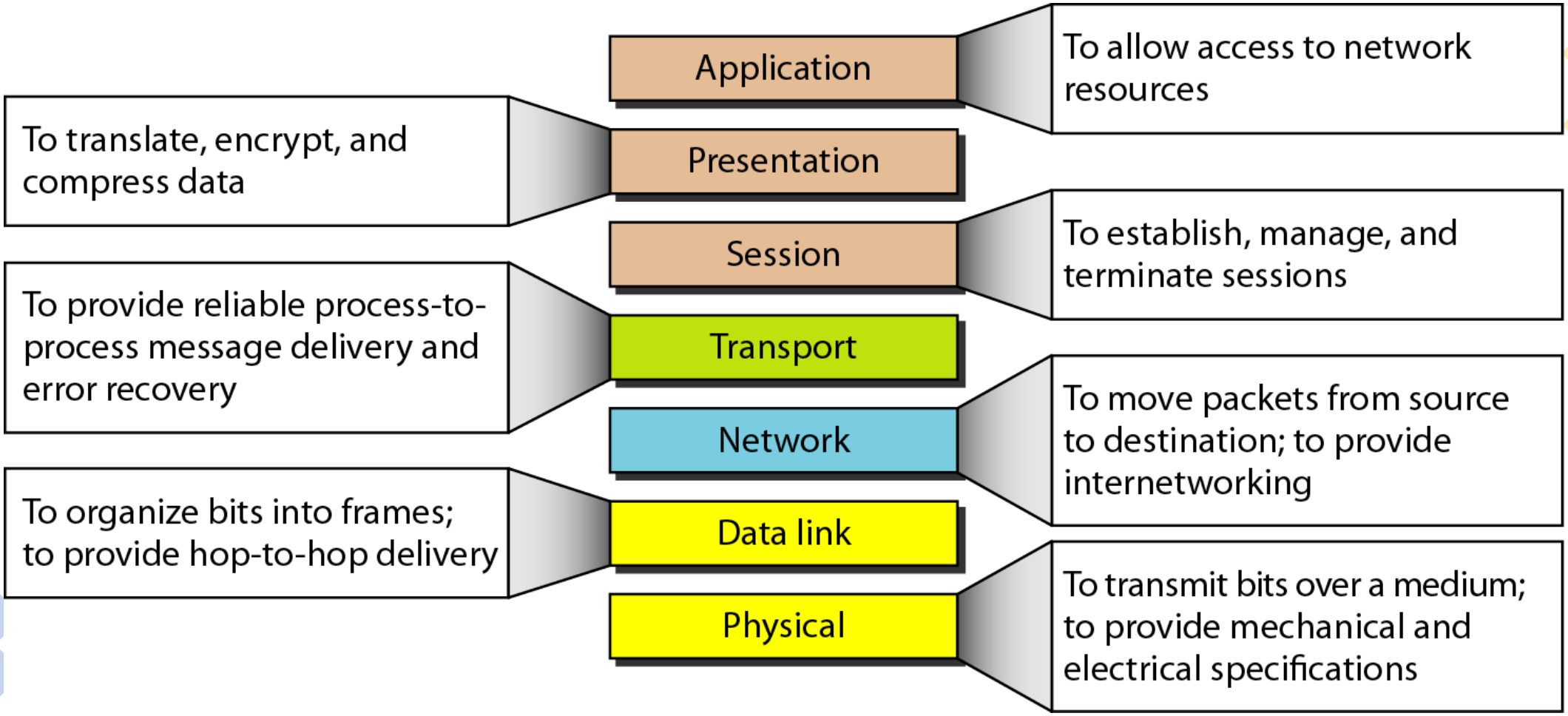
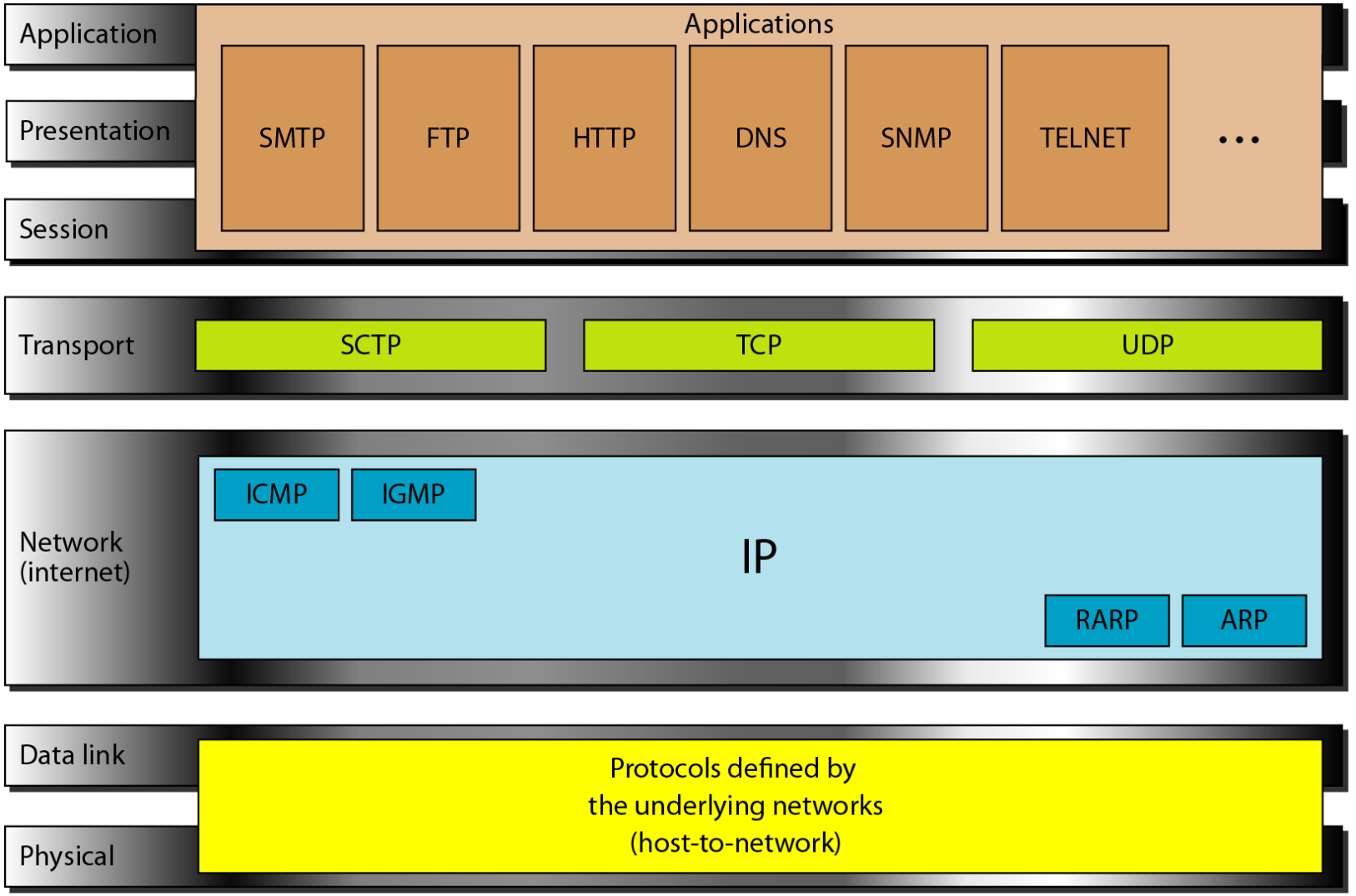


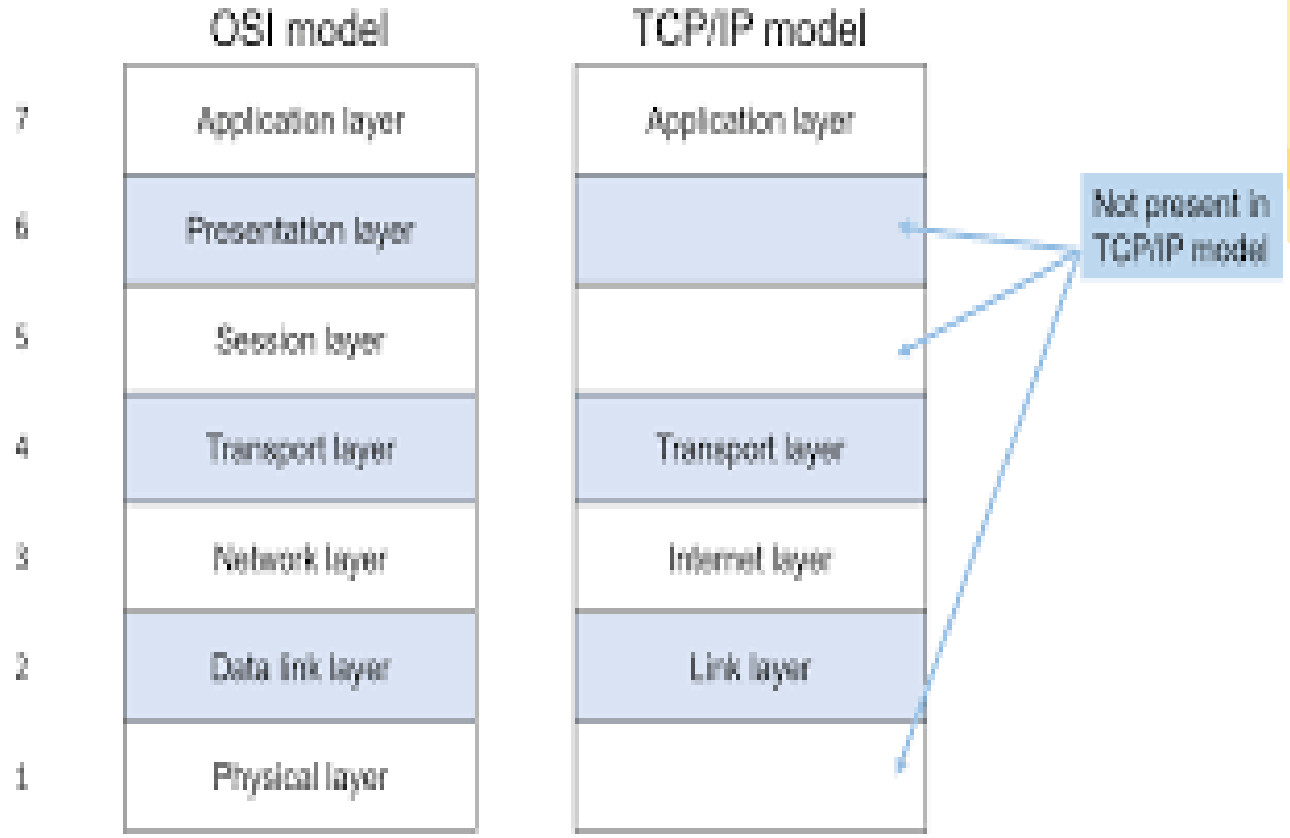
1. OSI Protocols



2. TCP/IP Protocol Suite

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.

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



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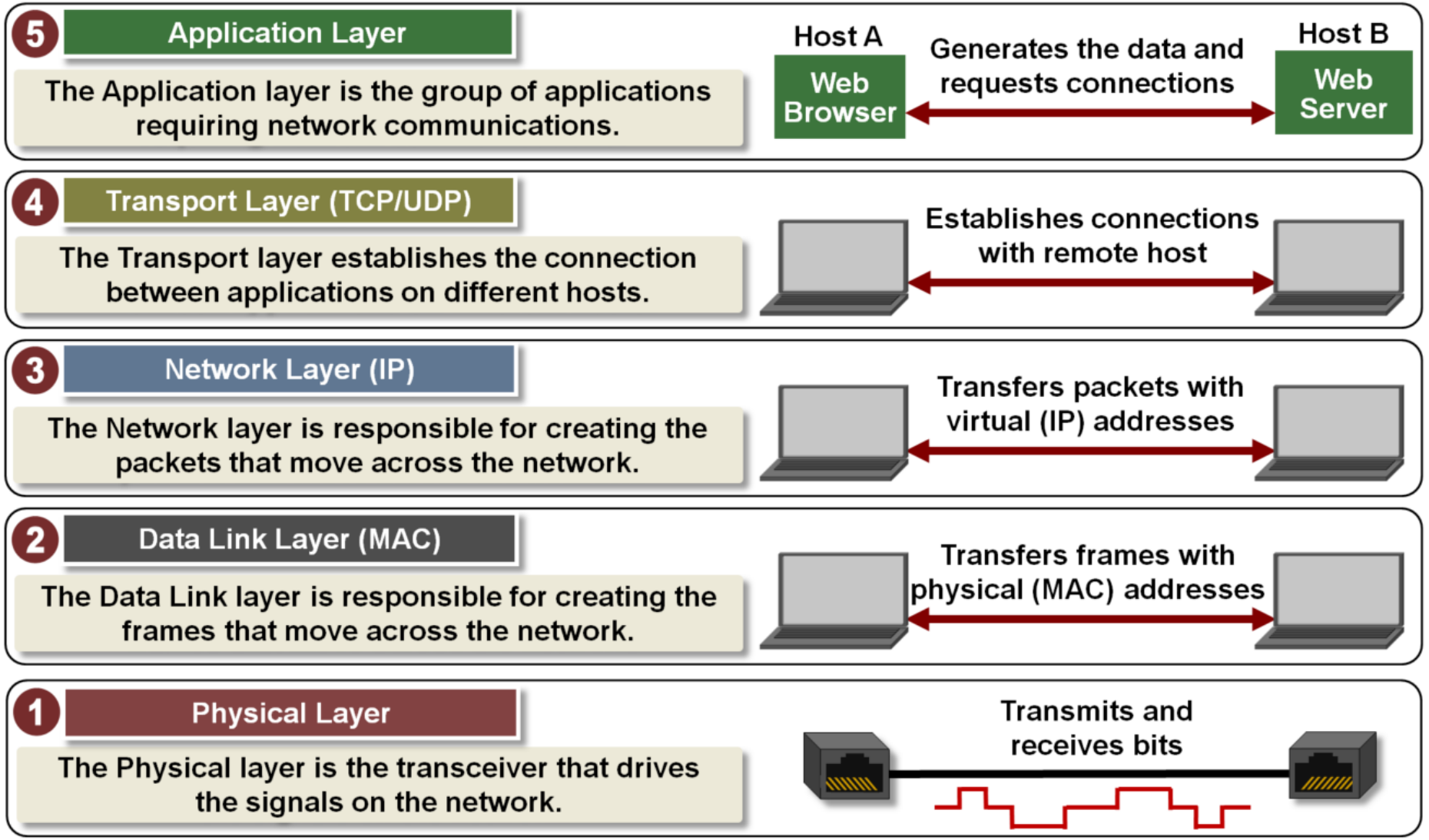

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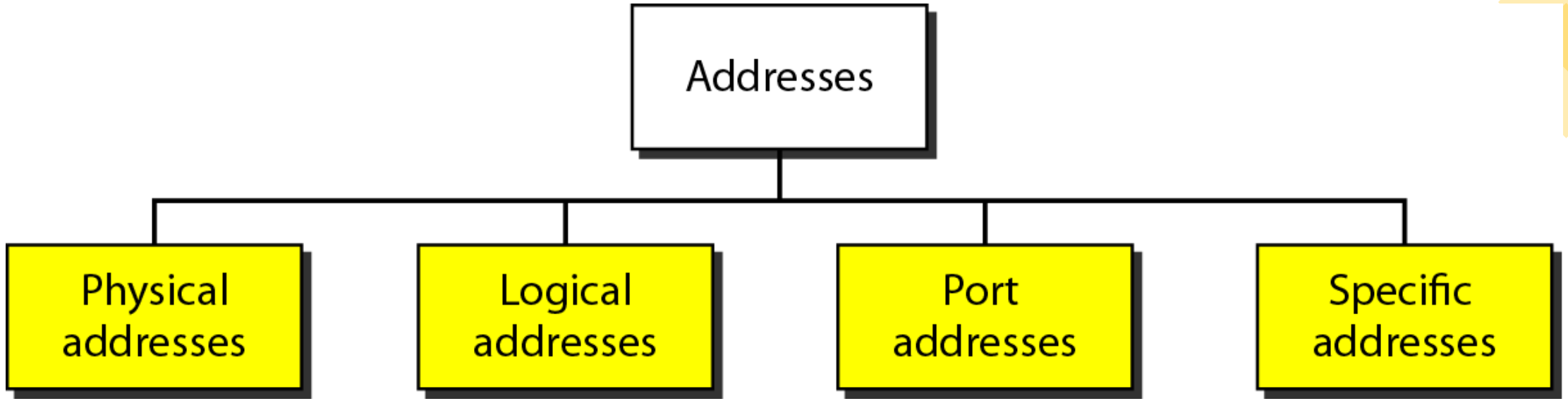

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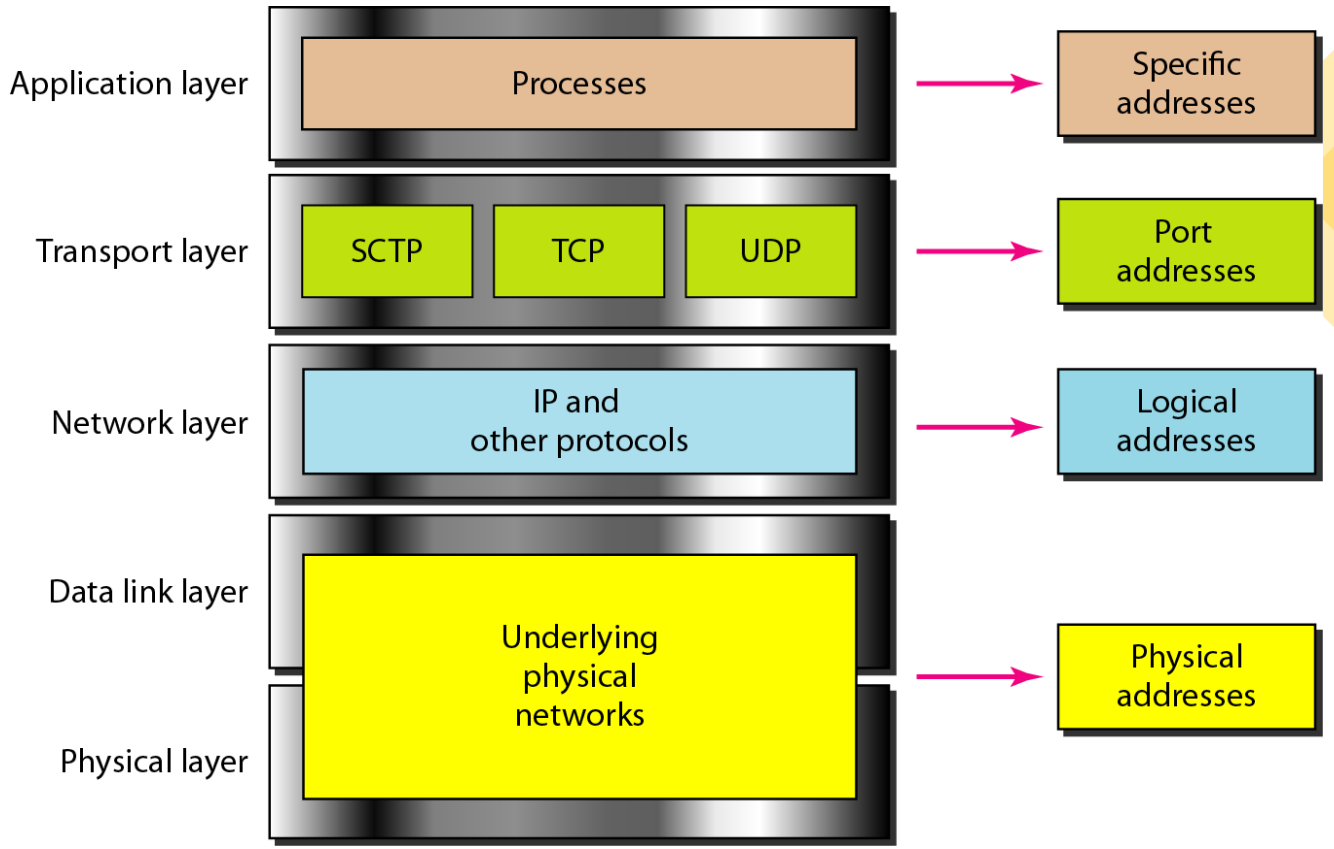

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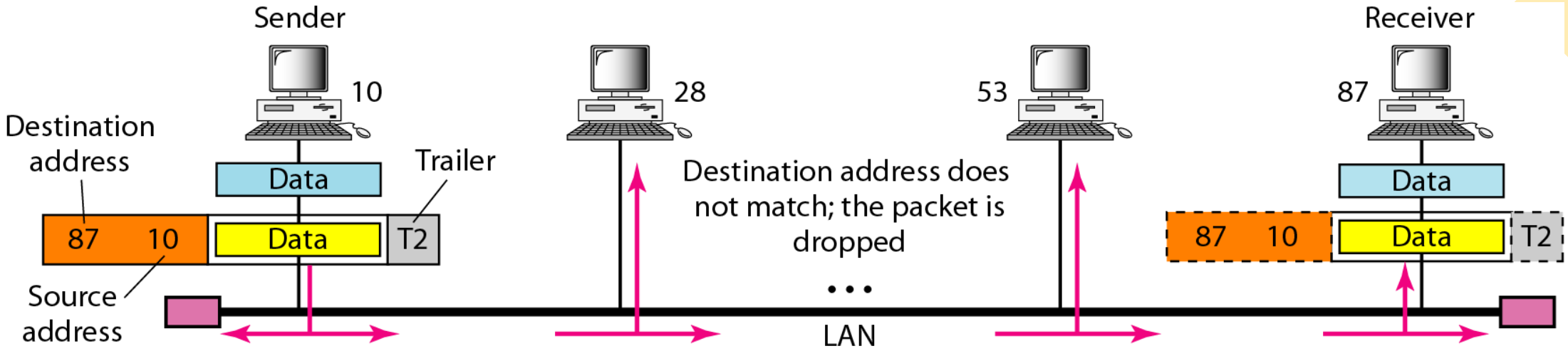

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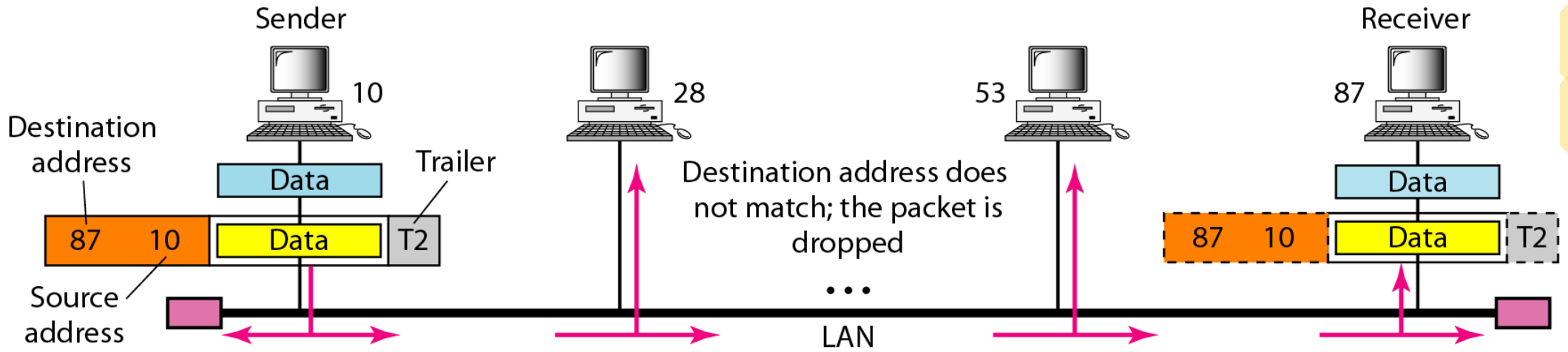
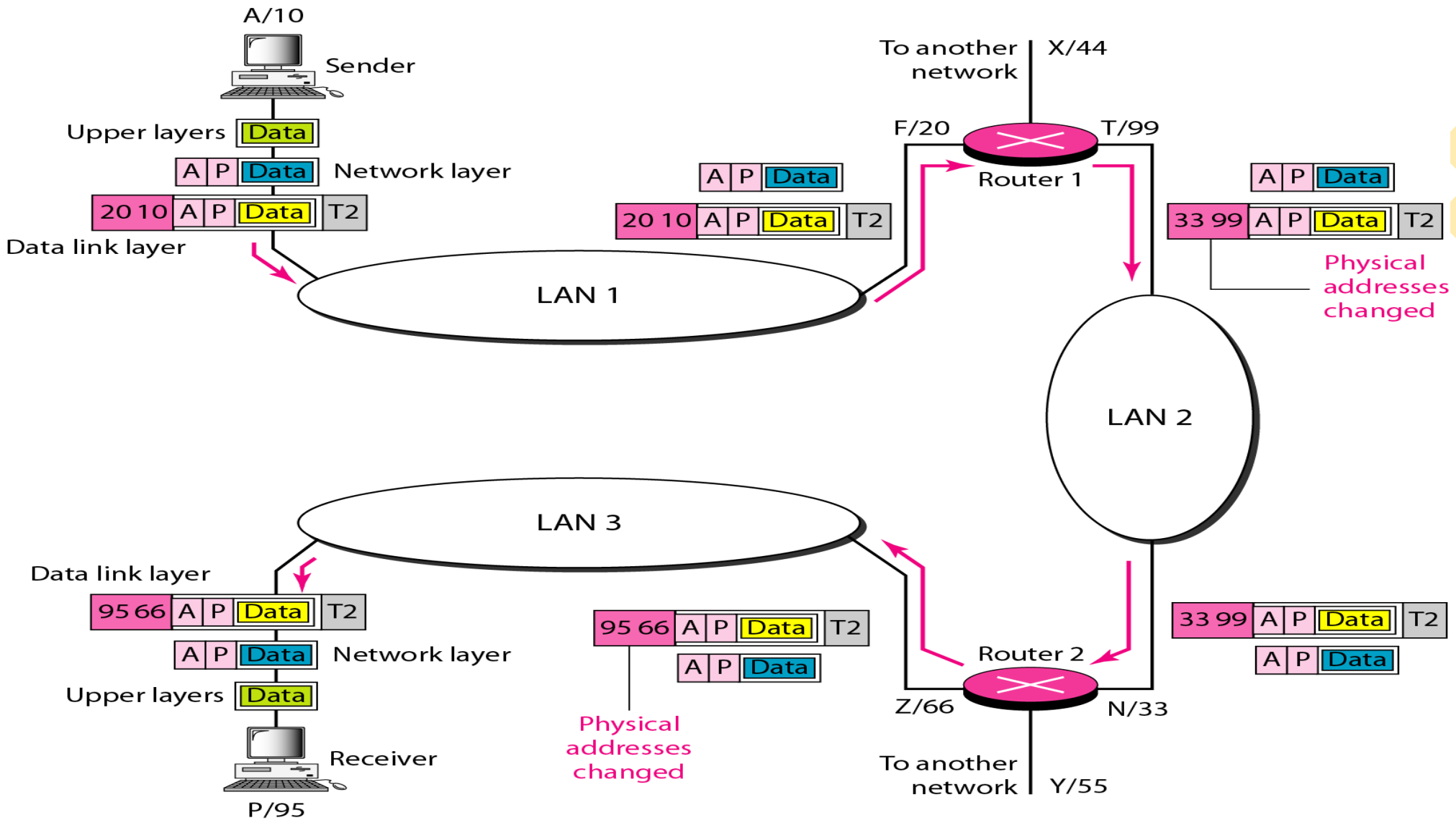


07:01:02:01:2C:4B

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

2. TCP/IP Protocol Suite



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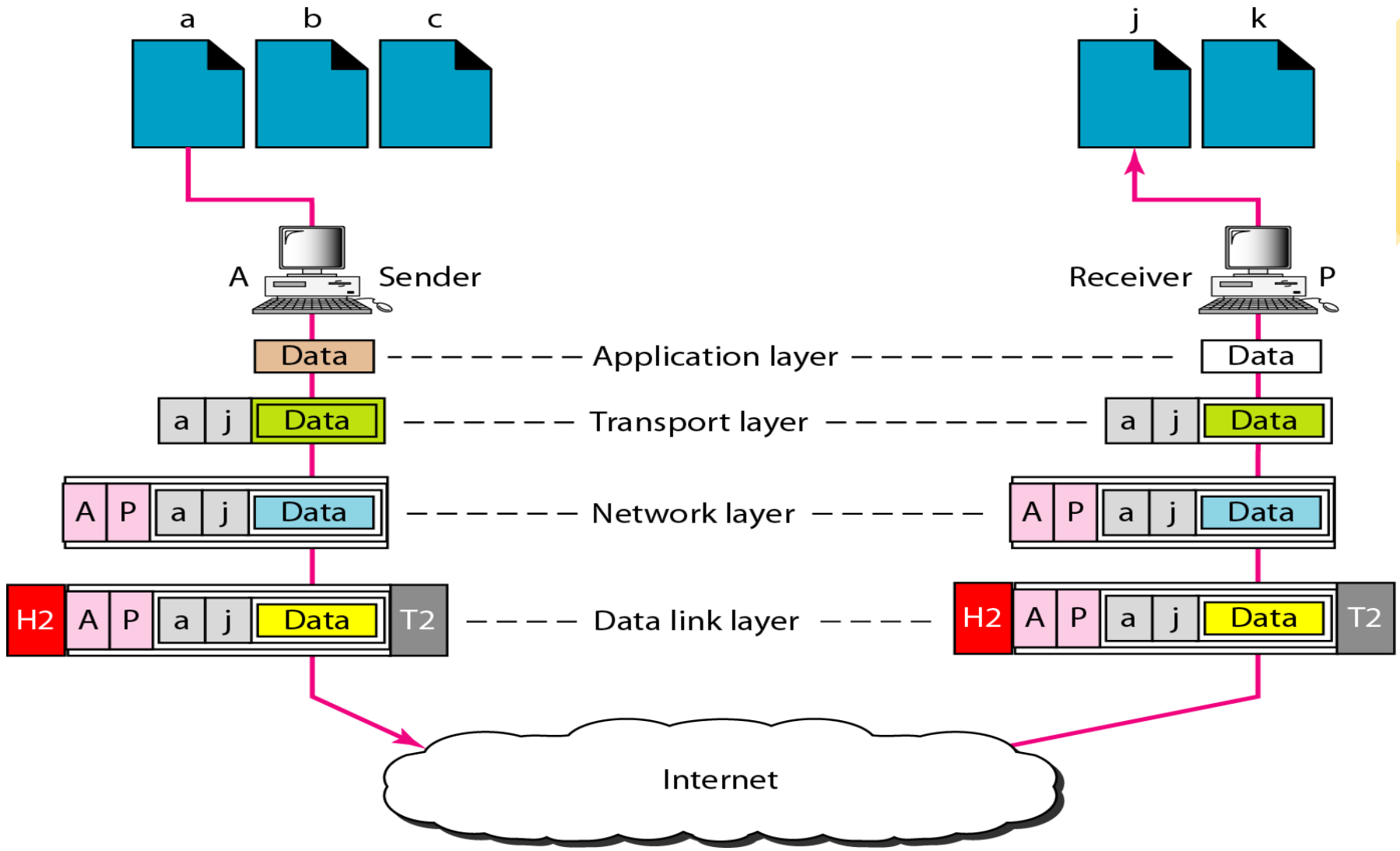
The physical addresses will change from hop to hop, but the logical addresses usually remain the same.



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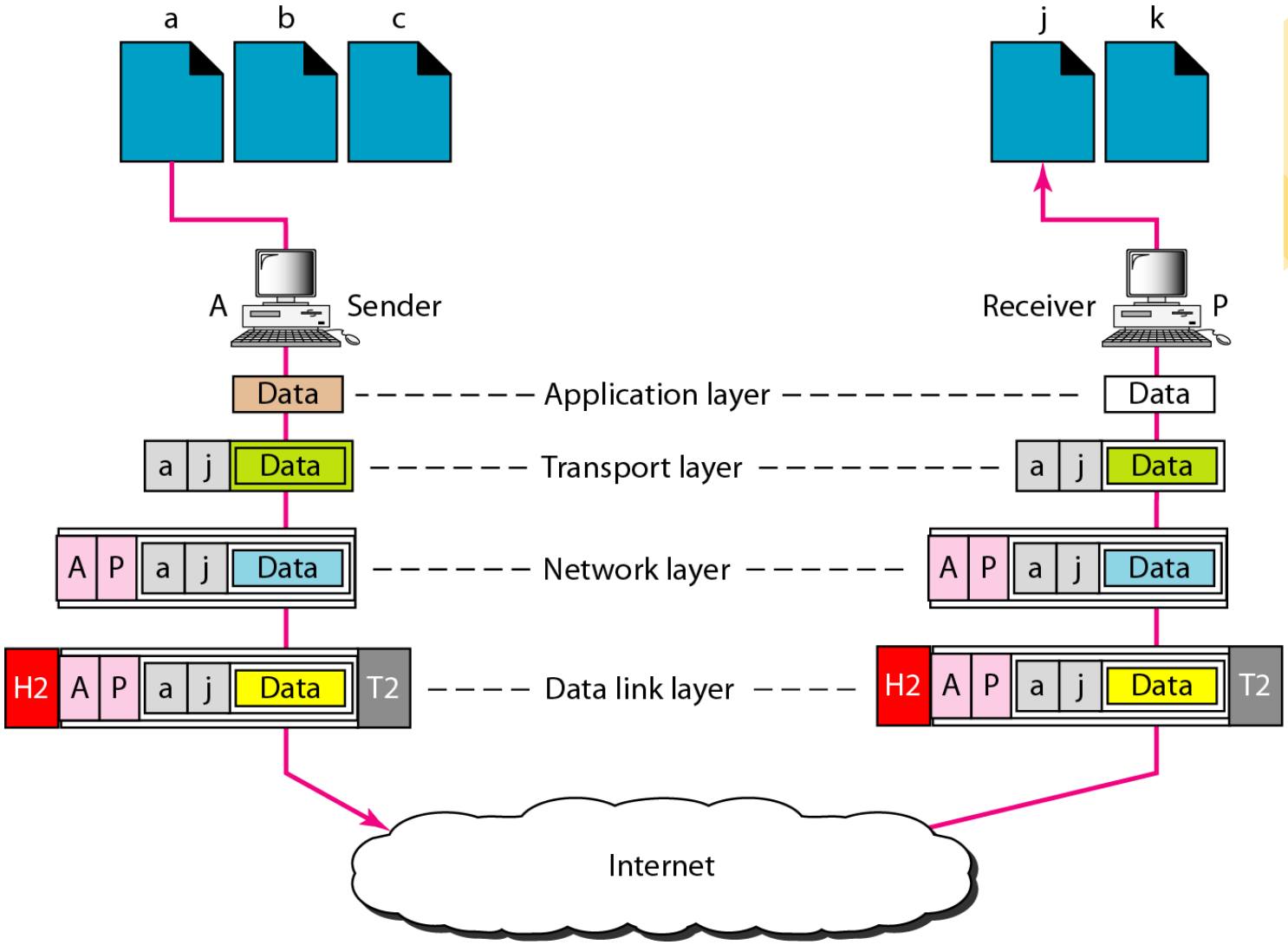
A 16-bit port address represented as one single number.

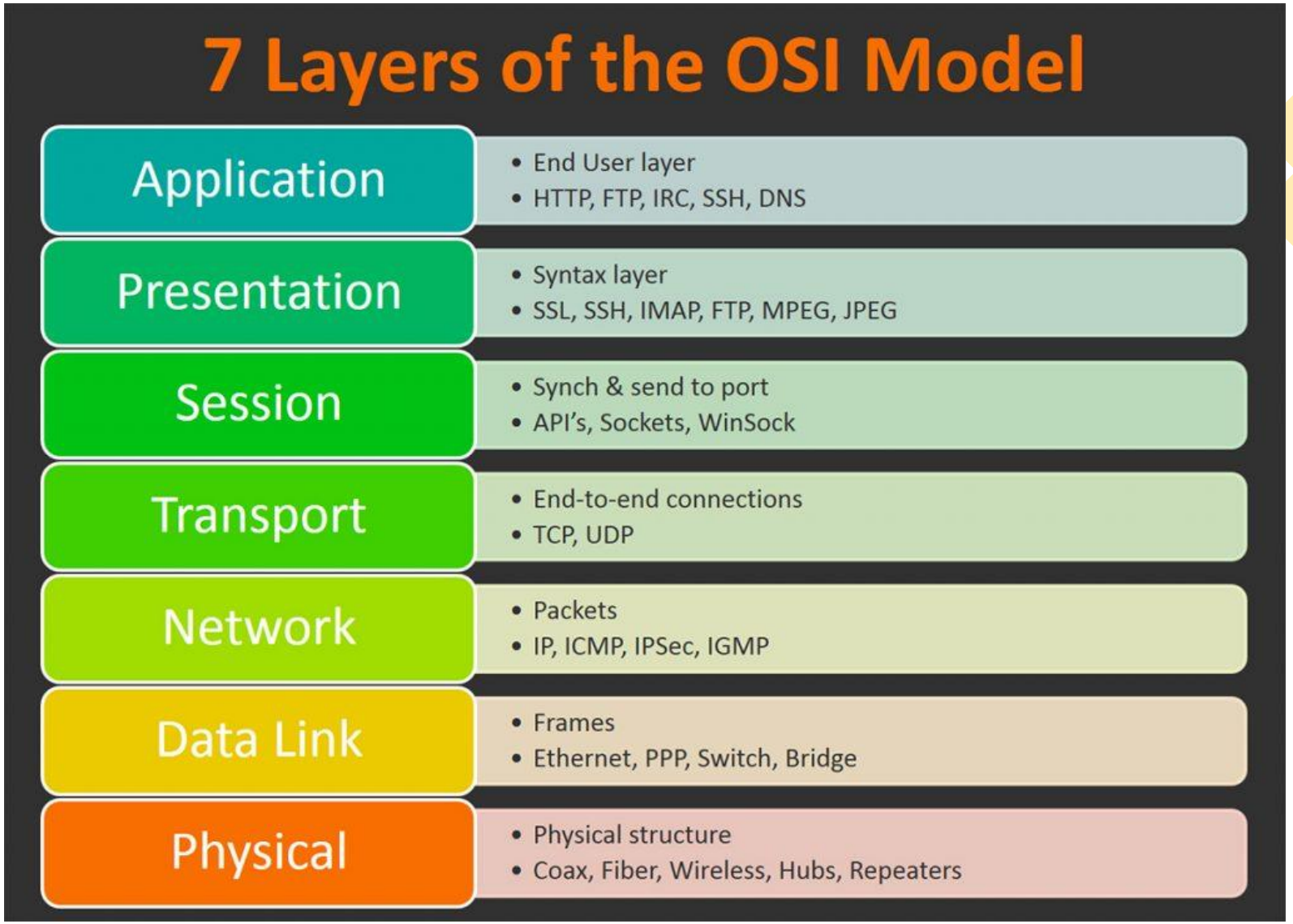


3. OSI vs TCP/IP

TCP/IP vs OSI Model

TCP/IP Model	OSI Model
TCP IP stands for Transmission Control Protocol/Internet Protocol.	OSI stands for Open System Interconnection.
DARPA developed the TCP IP model in the 1960s, and ARPANET (Advanced Research Project Agency Network) was adopted as a standard in 1983.	OSI was first created in 1983 and adopted by ISO (International Standard Organization) as an international standard in 1984.
The TCP IP model has 4 layers.	The OSI model has 7 layers.
The TCP/IP model is a simplified version of the OSI model. It has four layers instead of seven and combines some of the functionality of the OSI model layers.	OSI model is a more elaborated model where each layer has separate functionality. Unlike the TCP IP model, It does not combine any layers.
The TCP/IP model is more geared towards networking hardware and software used on the Internet.	OSI model is more general and can be applied to any type of network.
The Network Access layer in the TCP/IP model is equivalent to the OSI model's Data Link and Physical layers.	OSI model has separate Physical and Data Link Layers.
The Internet layer in the TCP/IP model corresponds to the Network layer in the OSI model.	The Network layer in the OSI model corresponds to the Internet layer in the TCP/IP model.
The Transport Layer in the TCP/IP model equates to the Transport layer in the OSI model.	The Transport Layer in the OSI model equates to the Transport layer in the TCP/IP model.
The Application layer in the TCP/IP model is equivalent to the OSI model's application, Presentation, and Session layers.	OSI model has separate Application, Presentation, and Session layers.
The TCP/IP model (4 layers) has fewer layers than the OSI model (7 layers) and follows a horizontal approach.	The OSI model (7 layers) has more layers than the TCP/IP model (4 layers) and follows the Vertical approach.

3. Layers and Protocols



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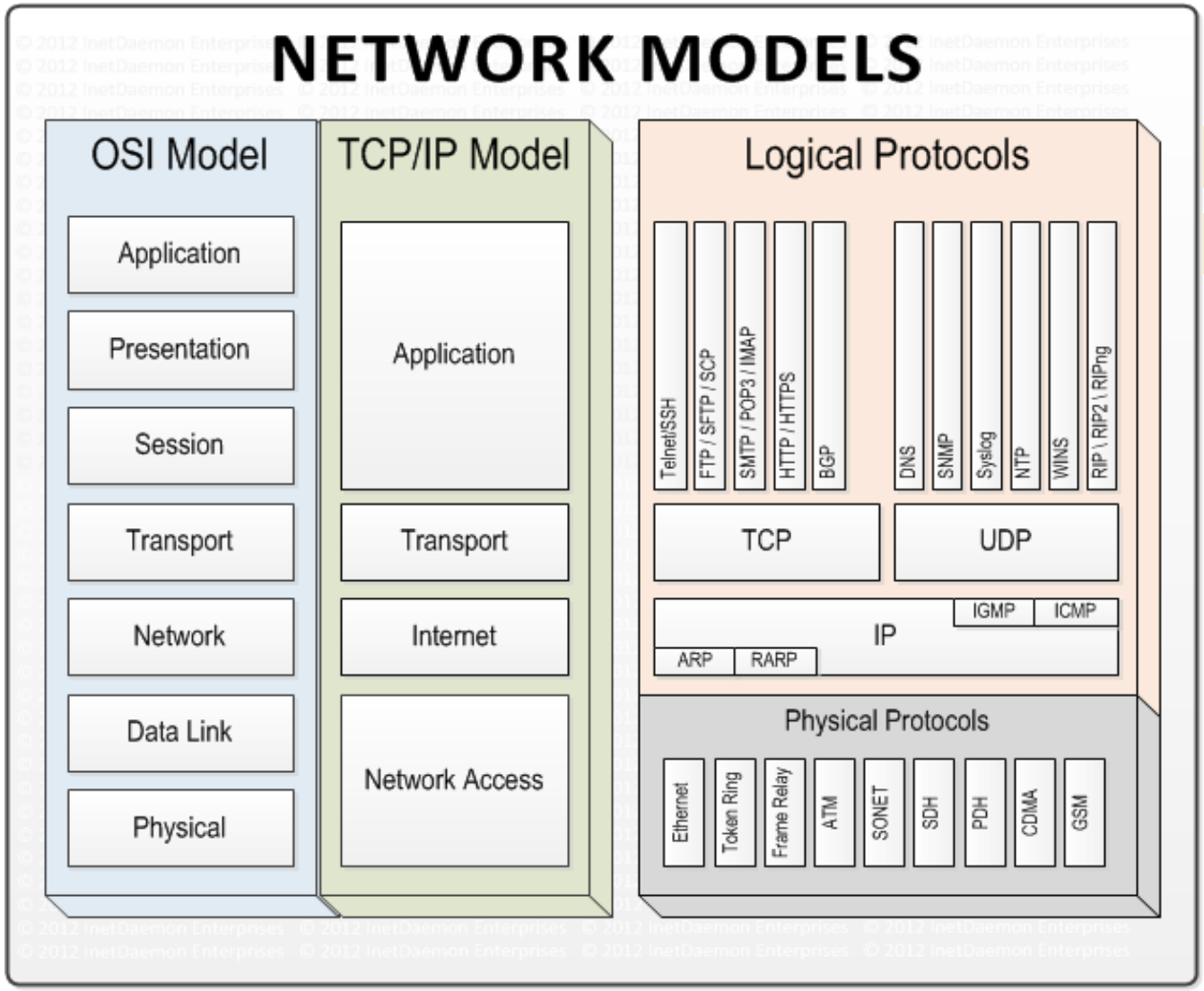

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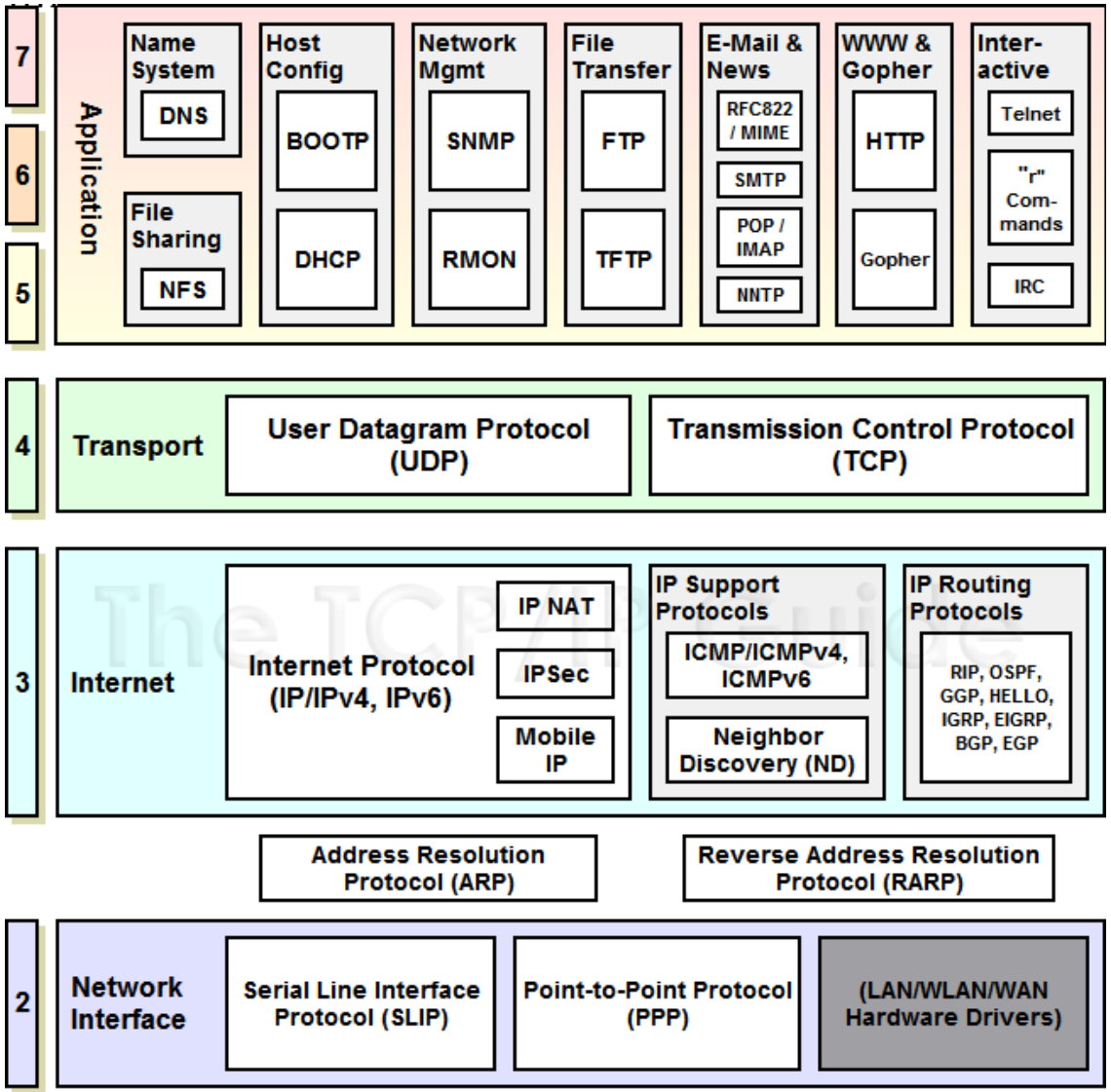
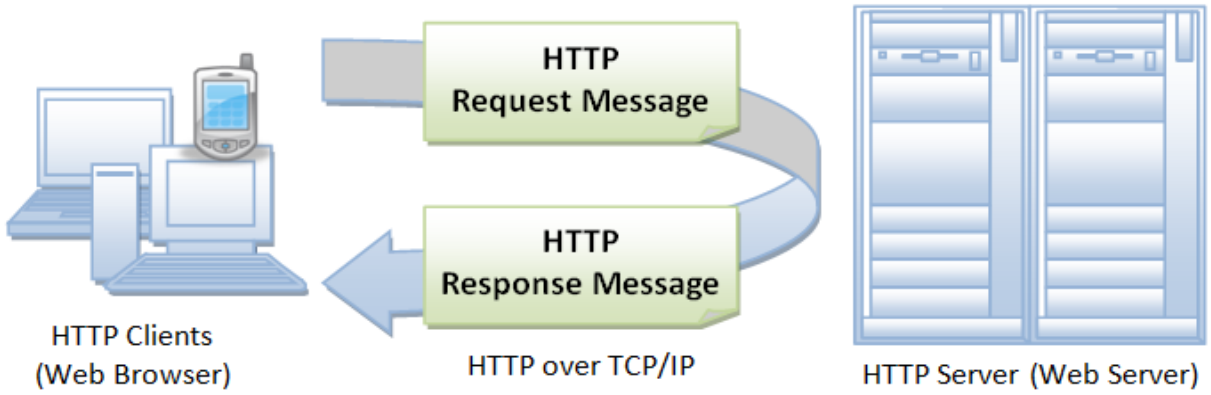
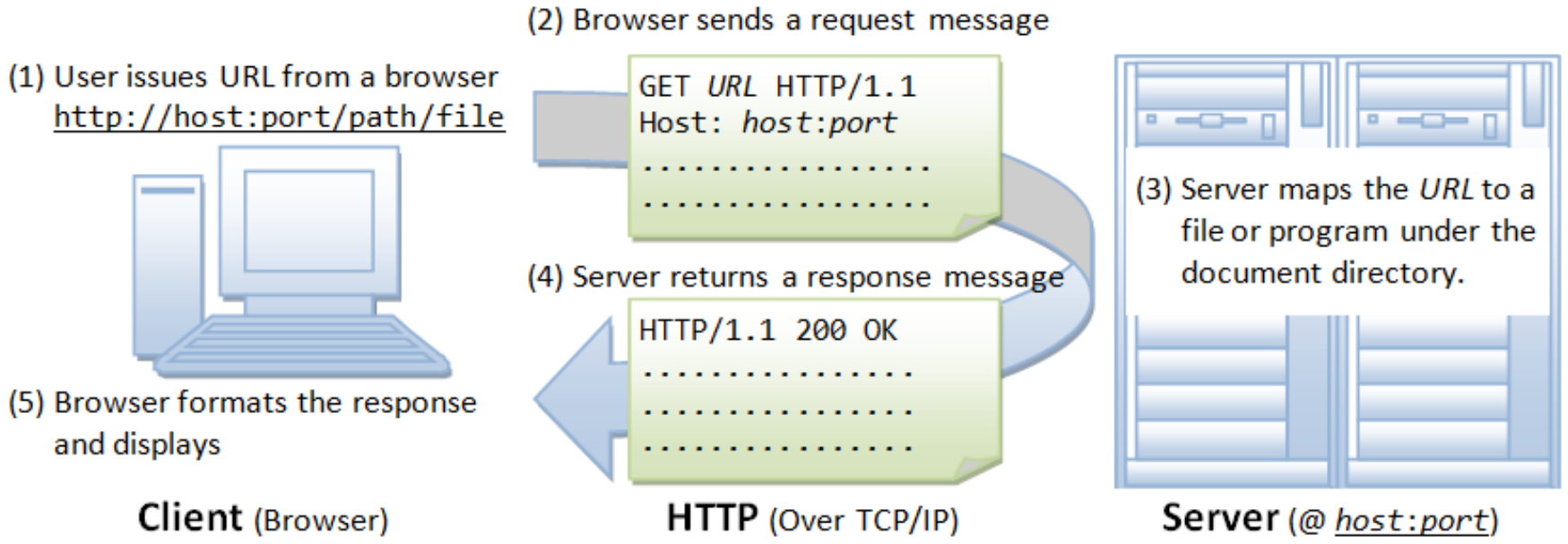


4. Example

HTTP: Hyper Text Transfer Protocol





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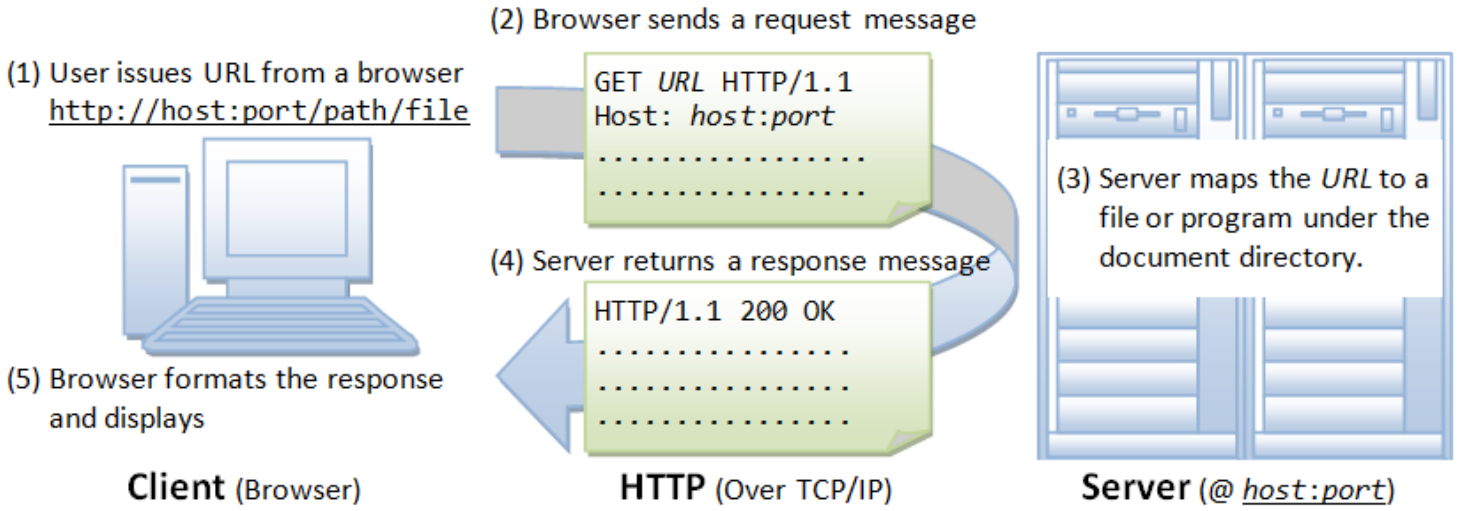
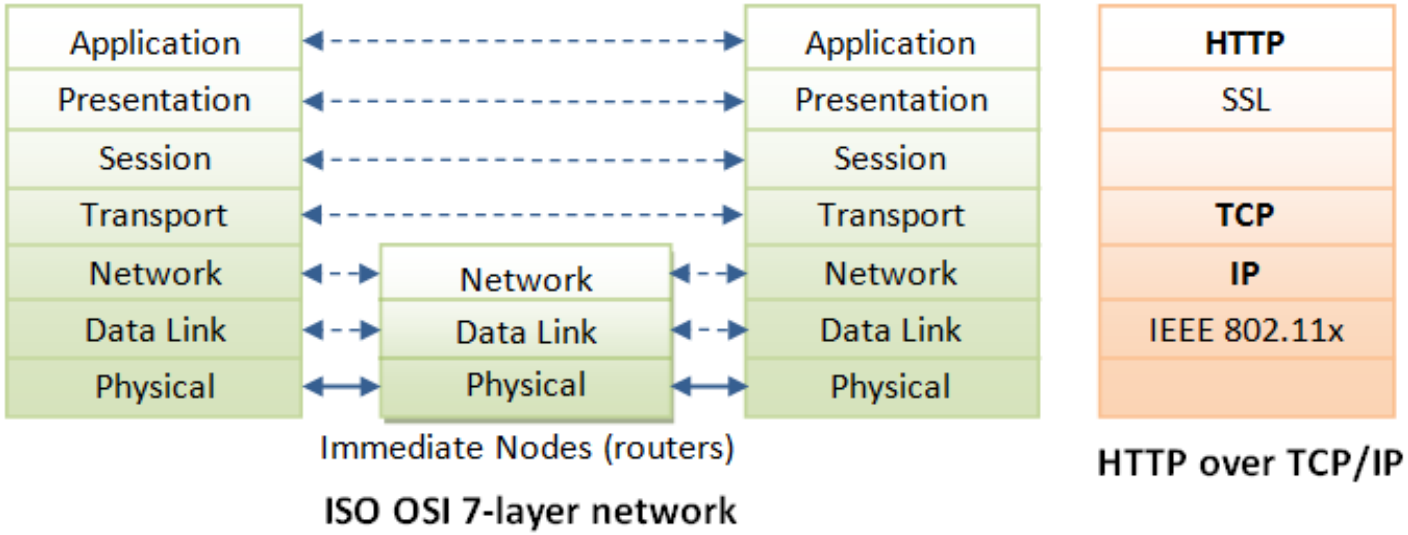
TCP: Transmision Control Protocol

IP : Internet Protocol

IEEE 802.11x: Wireless





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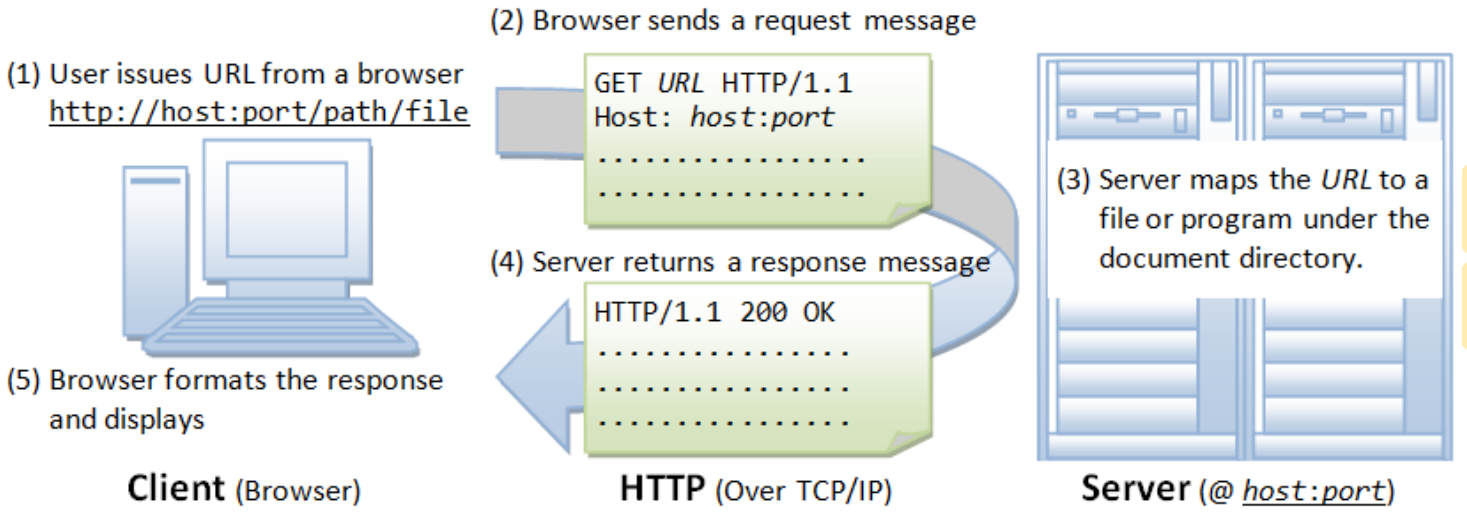

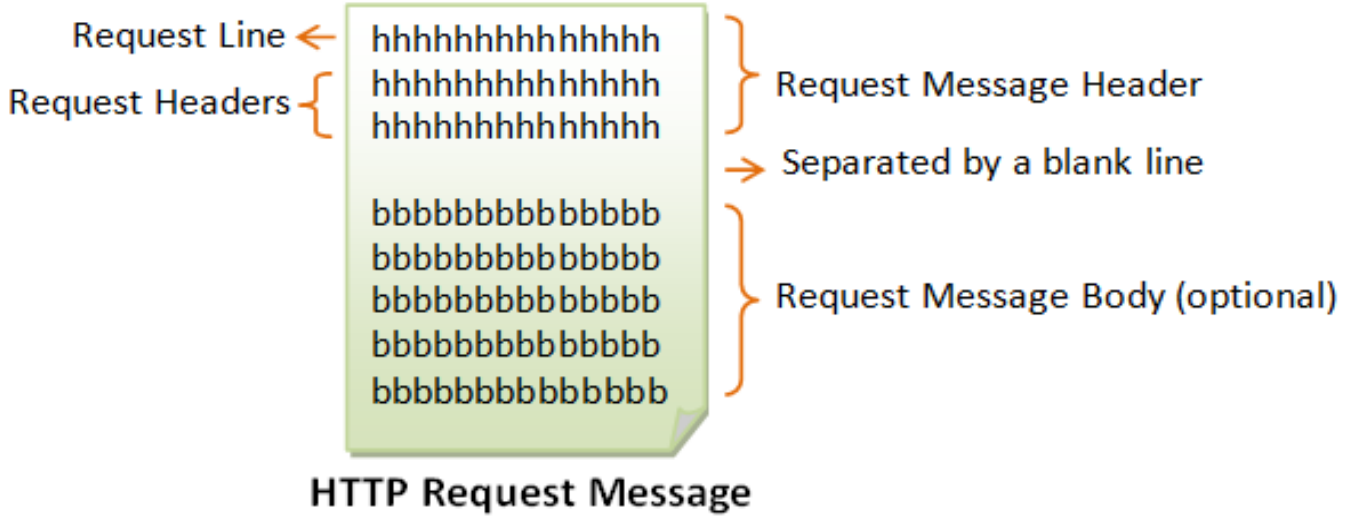

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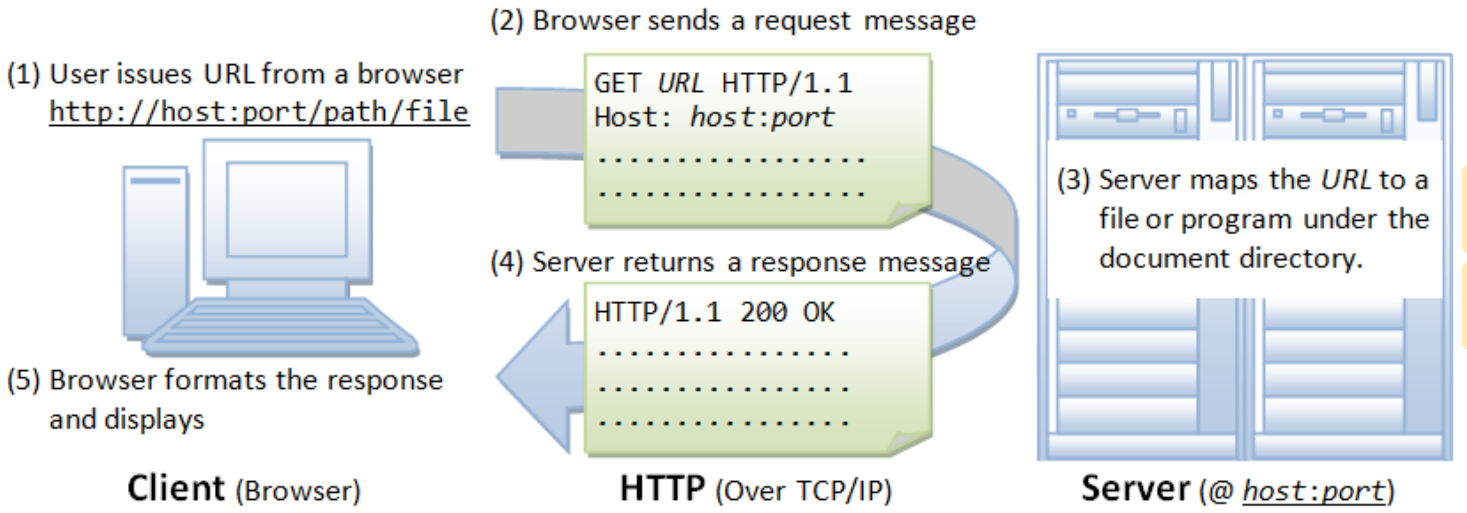

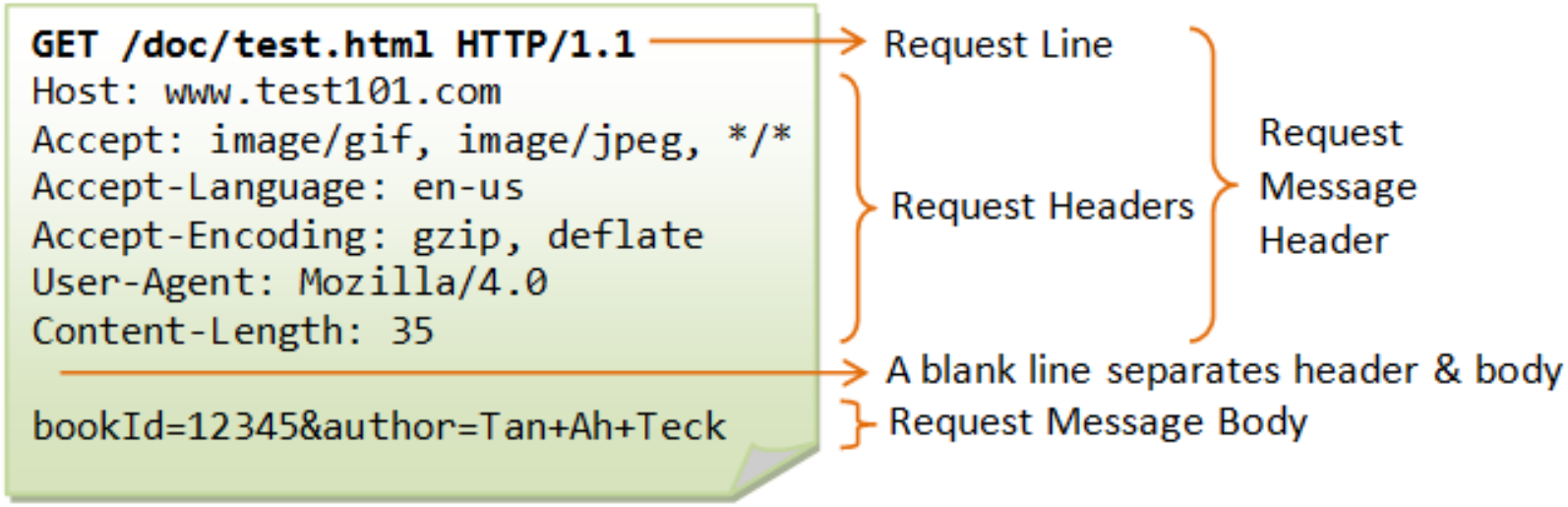

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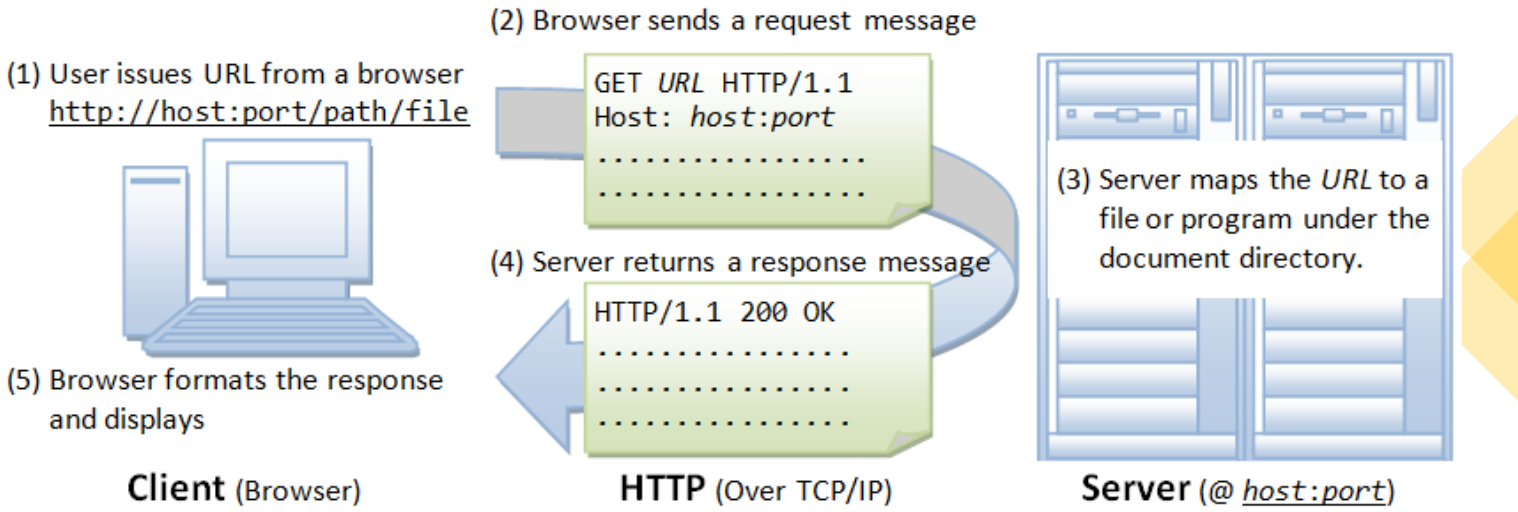

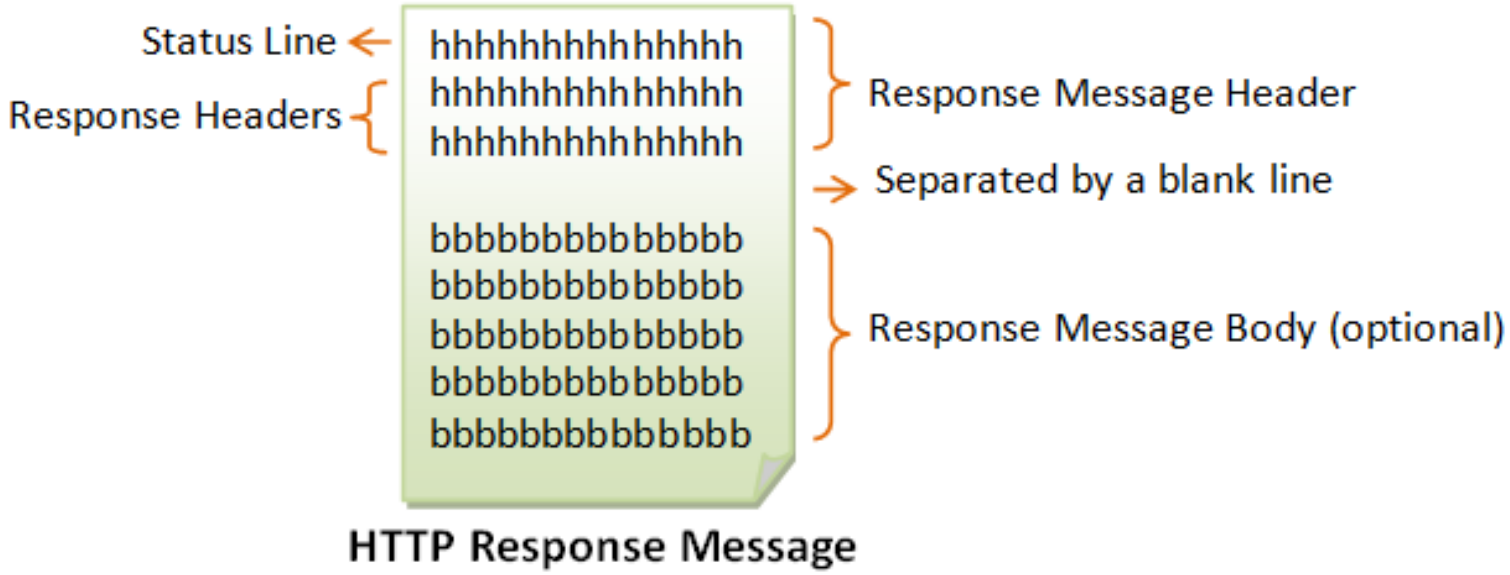

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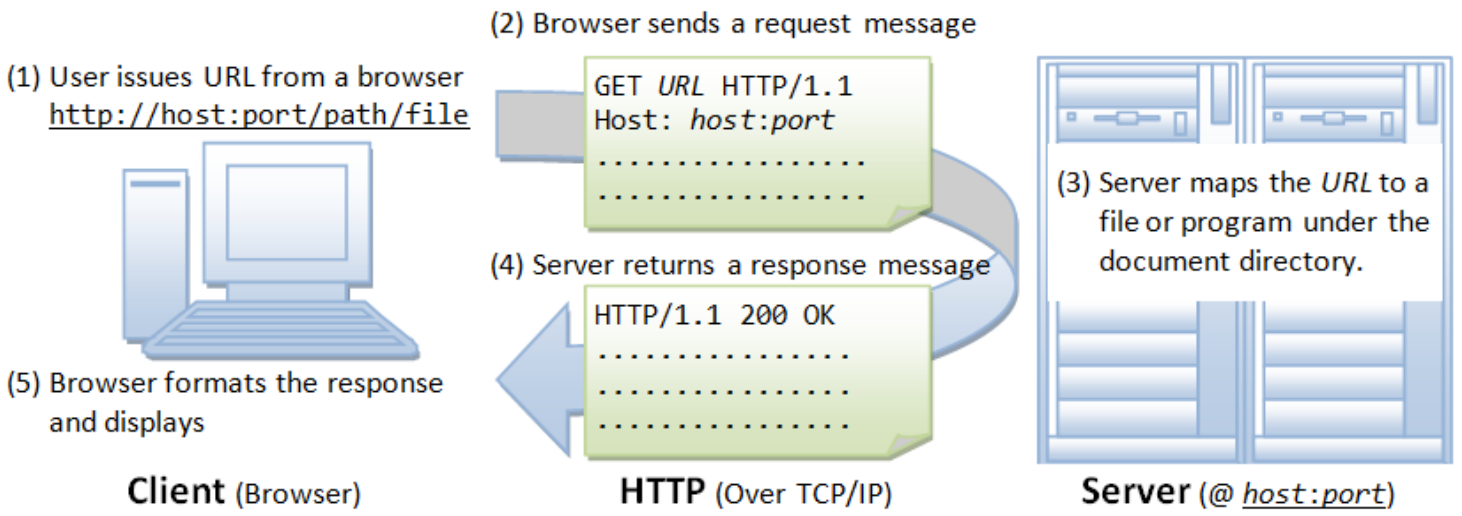

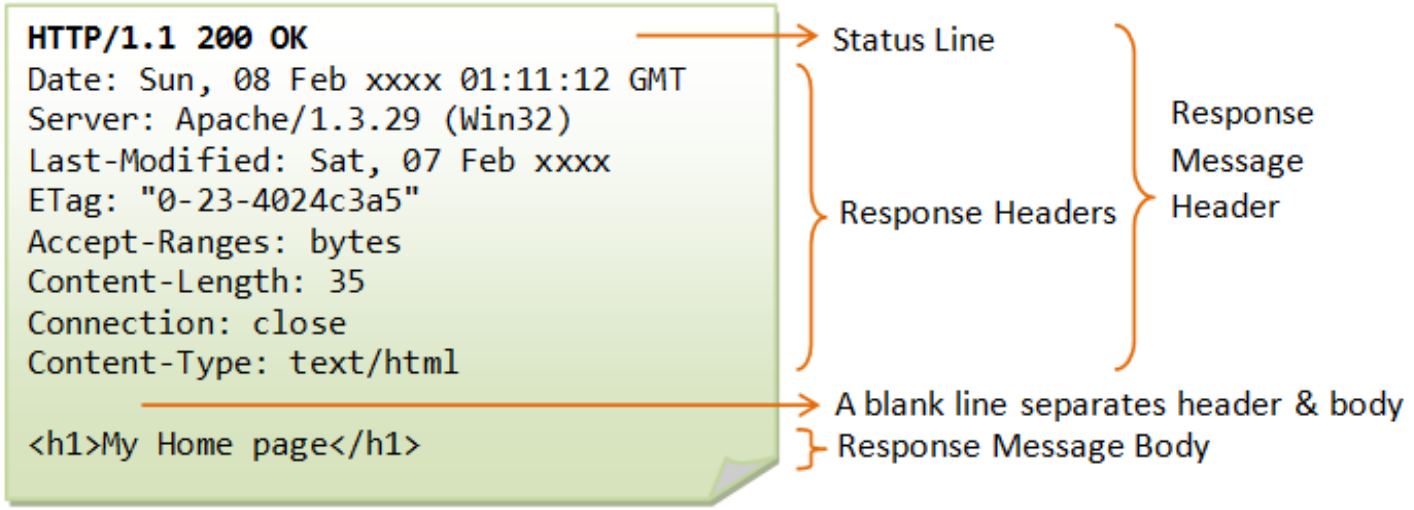

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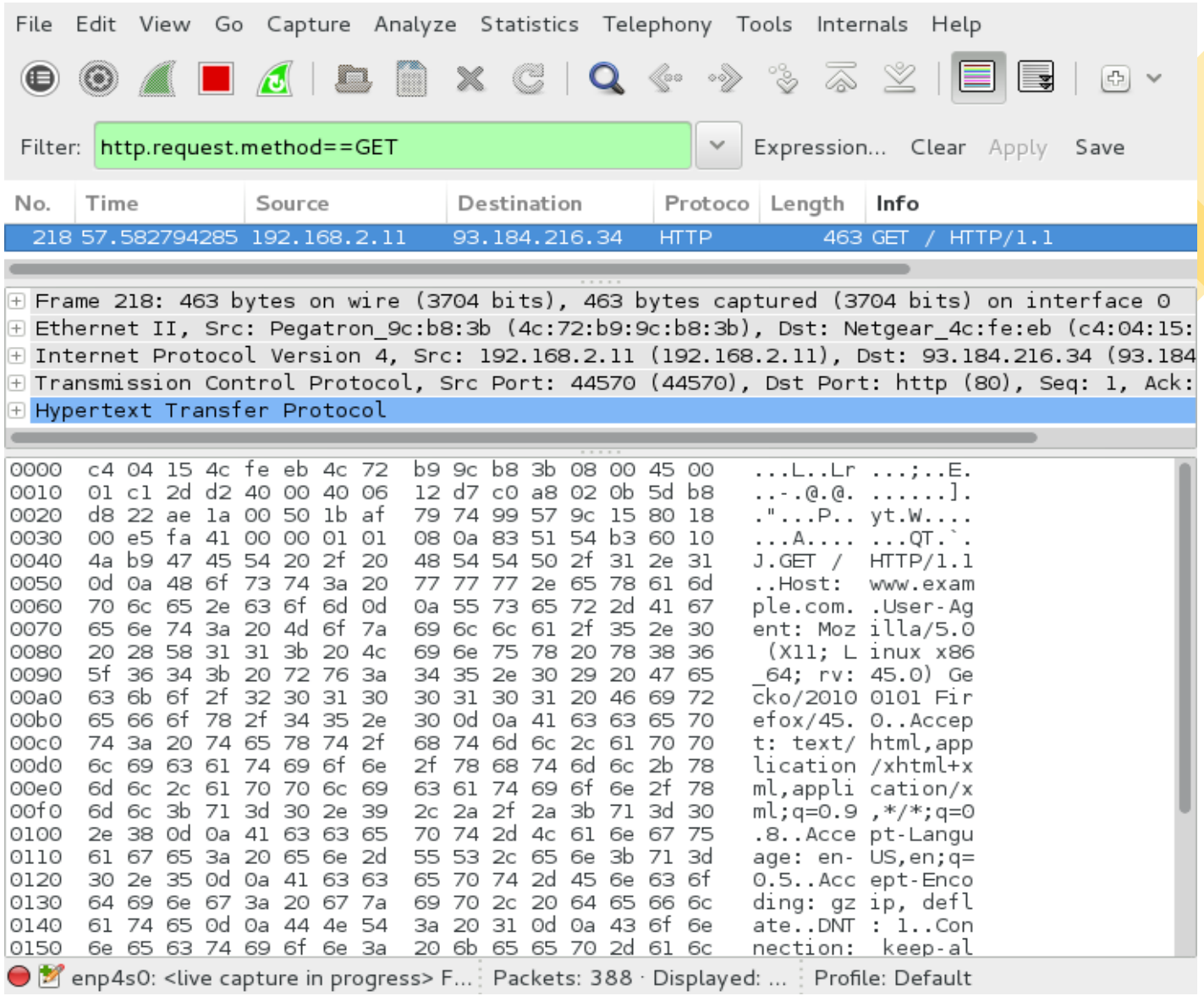
Wireshark screen shot for some http request



Reference

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- https://www3.ntu.edu.sg/home/ehchua/programming/webprogramming/http_basics.html

Thank You