

Chapter 2

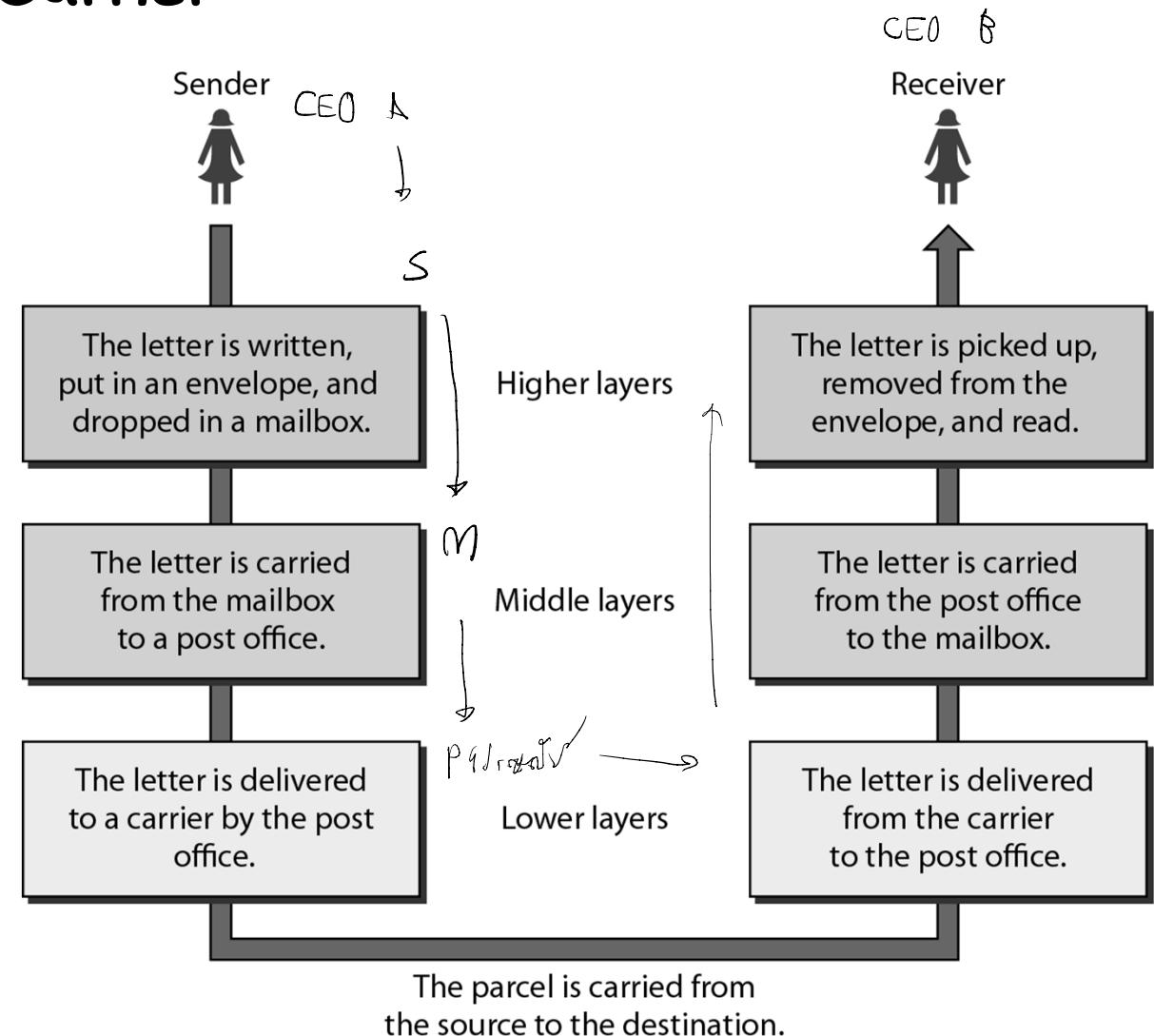
Network Models

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LAYERED TASKS

- Sender, Receiver, and Carrier
- Hierarchy



THE OSI MODEL

- History
- Layered Architecture
- Peer-to-Peer Processes
- Encapsulation

OSI Model

- History

- 1970 → ISO (International Organization for Standardization)

- จัดตั้งคณะกรรมการพิจารณา architecture ที่เป็นกลางเพื่อกำหนดการเชื่อมต่อระหว่างคอมพิวเตอร์ และอุปกรณ์ต่างๆ

- 1984 → released in ISO 7498 document

- OSI (Open System Interconnection) → 7 layers

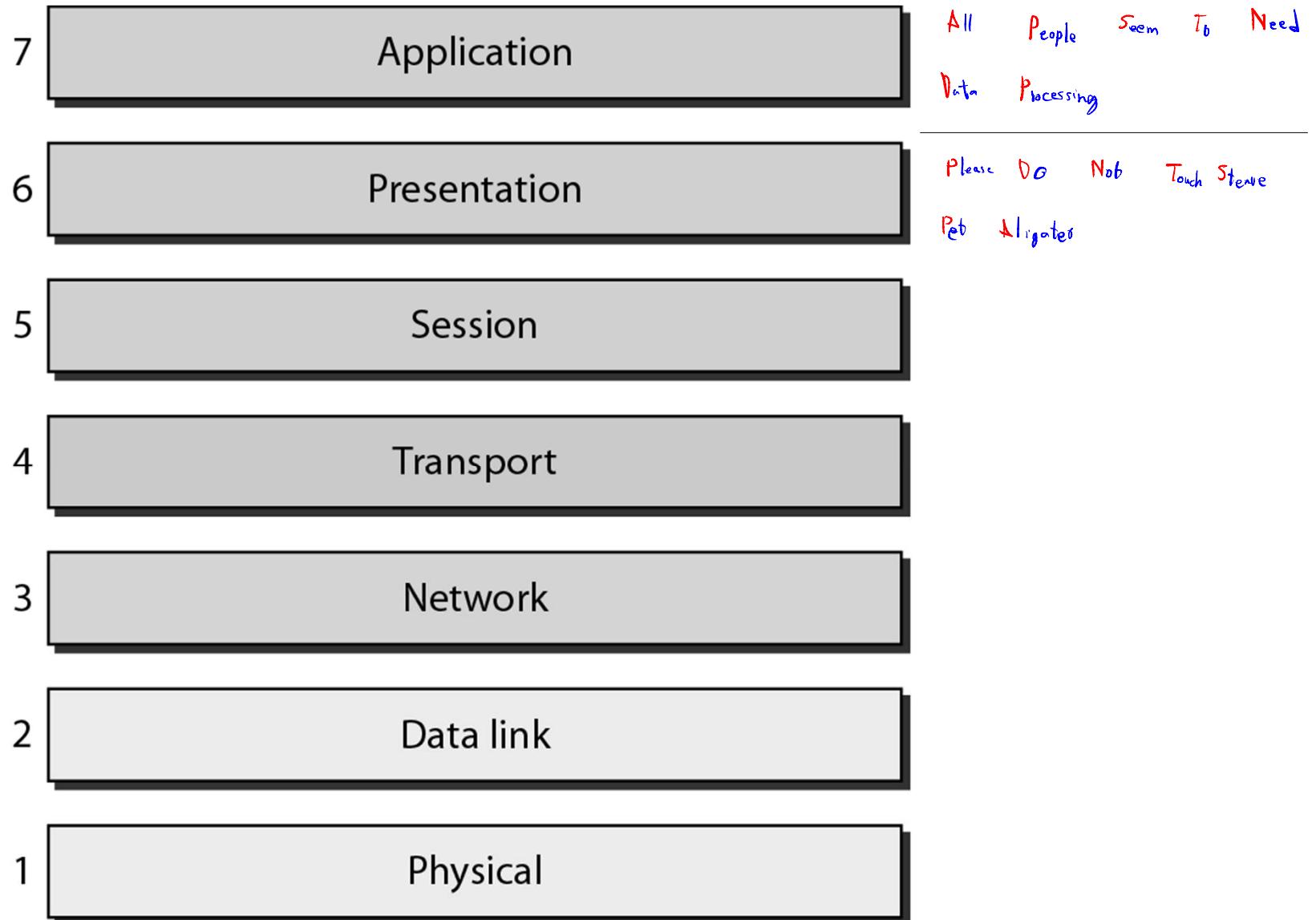
- Objectives

- Compatibility ความเข้ากันได้ของอุปกรณ์ต่างผู้ผลิตกัน

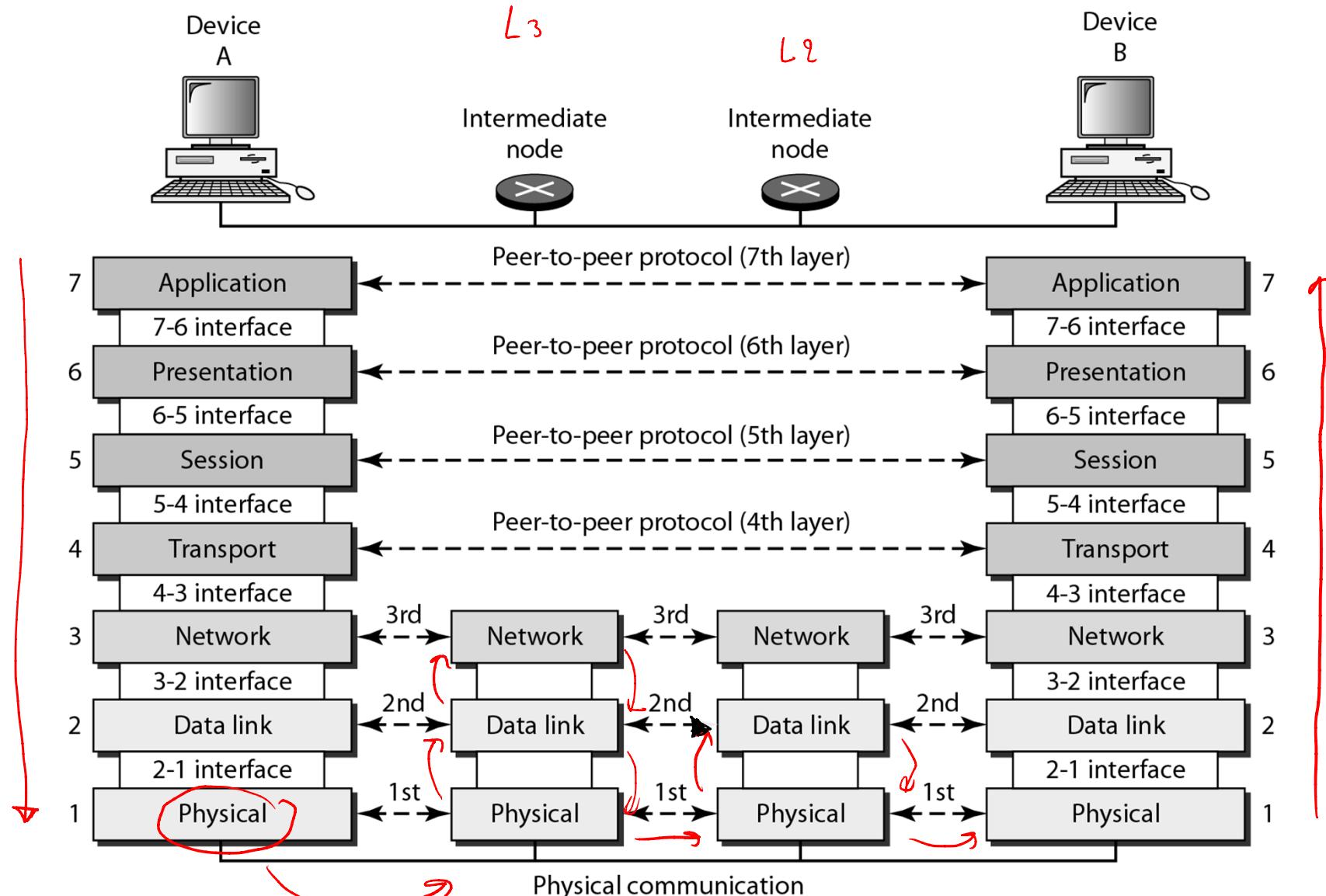
- Flexibility มีความยืดหยุ่นต่อการเปลี่ยนแปลง เช่น การพัฒนาของเทคโนโลยี

Please Do Not Throw
Sausage Pizza Away

Layered Architecture



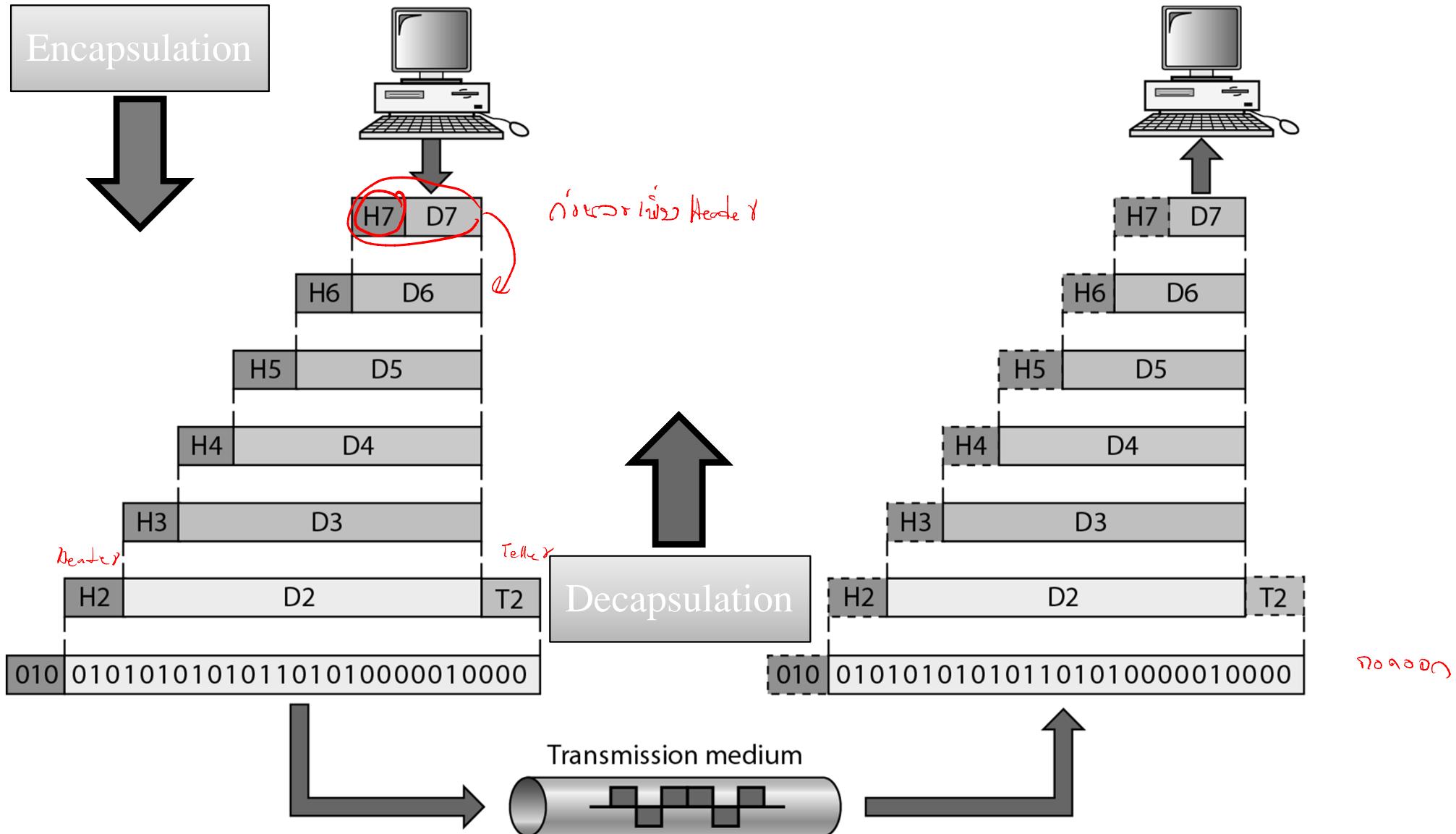
Peer-to-Peer Processes



The interaction between layers in the OSI model (Fig. 2.3)

Encapsulation

پرسامنیوں کی

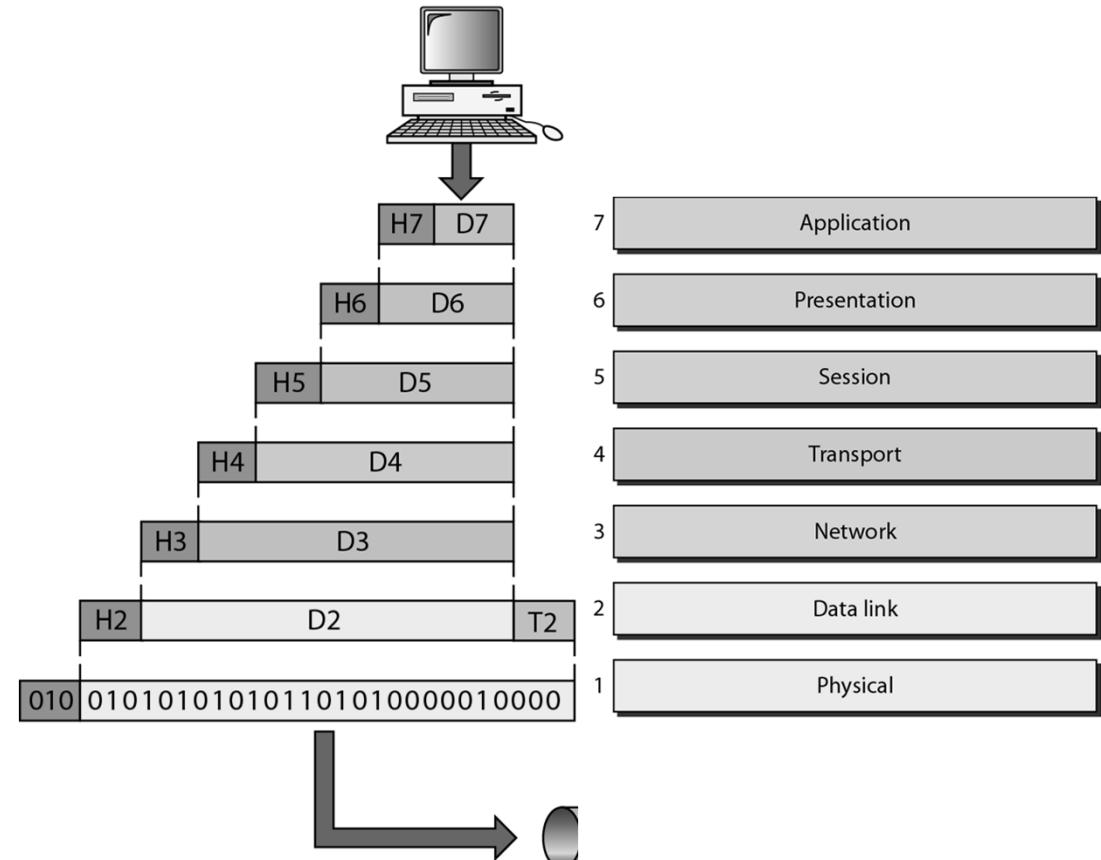


An exchange using the OSI model (Fig. 2.4)

B. A. Forouzan, Data Communications and Networking, 4th edition, McGRAW-HILL

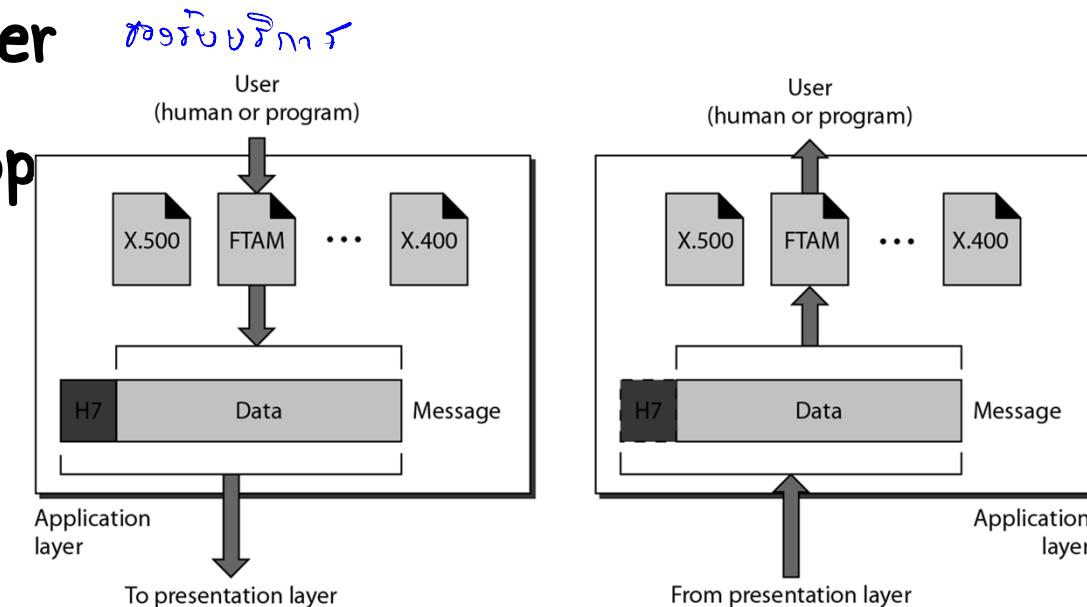
LAYERS IN THE OSI MODEL

- Physical Layer
- Data Link Layer
- Network Layer
- Transport Layer
- Session Layer
- Presentation Layer
- Application Layer
- Summary of Layers

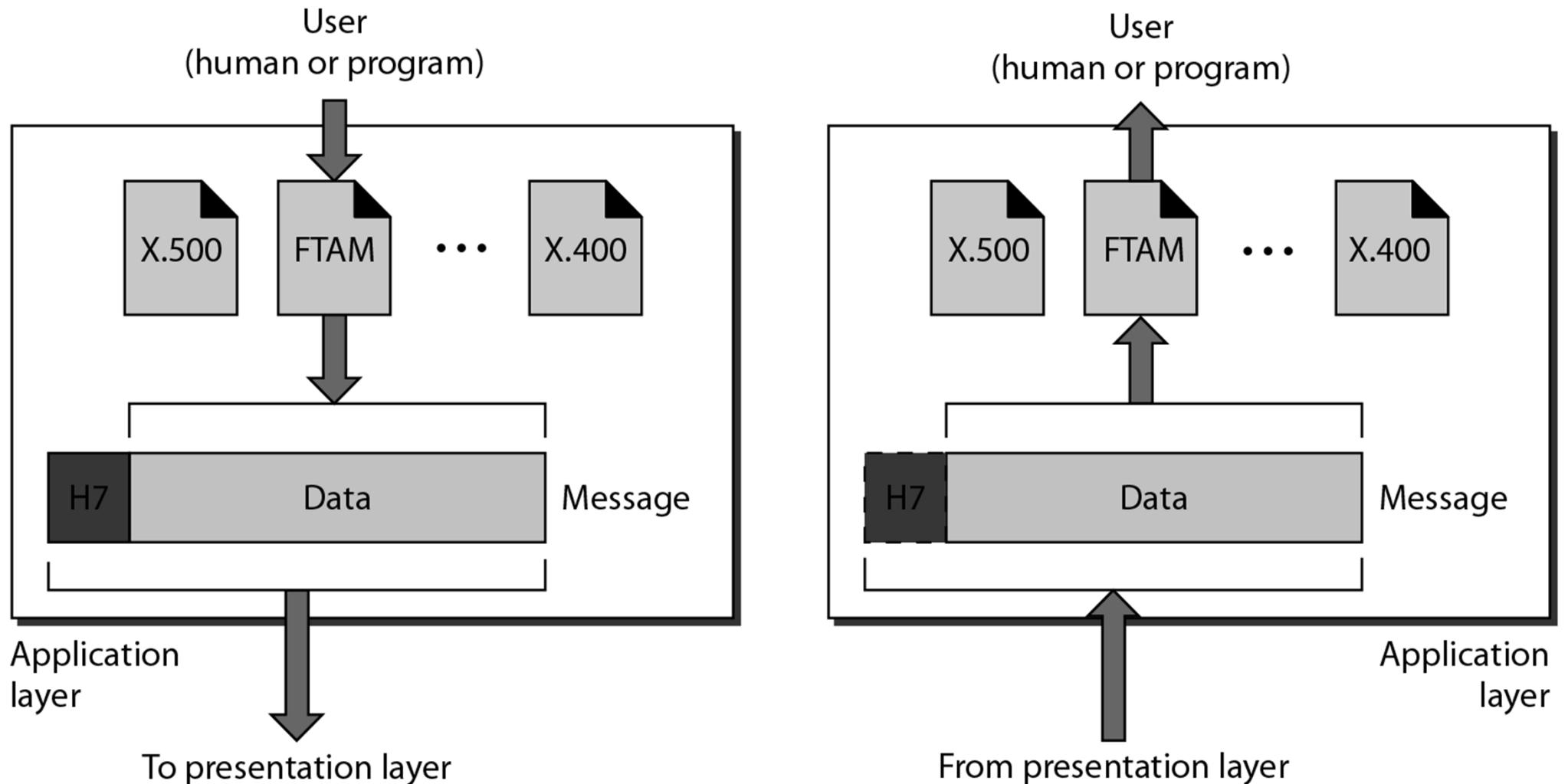


Application layer

- Responsibility
 - providing services to the user
 - User interface (Software app)
 - No header or trailer
- Services
 - Network Virtual Terminal
 - File transfer, access, and management (FTAM)
 - Mail service
 - Accessing WWW



Application layer (Fig. 2.14)

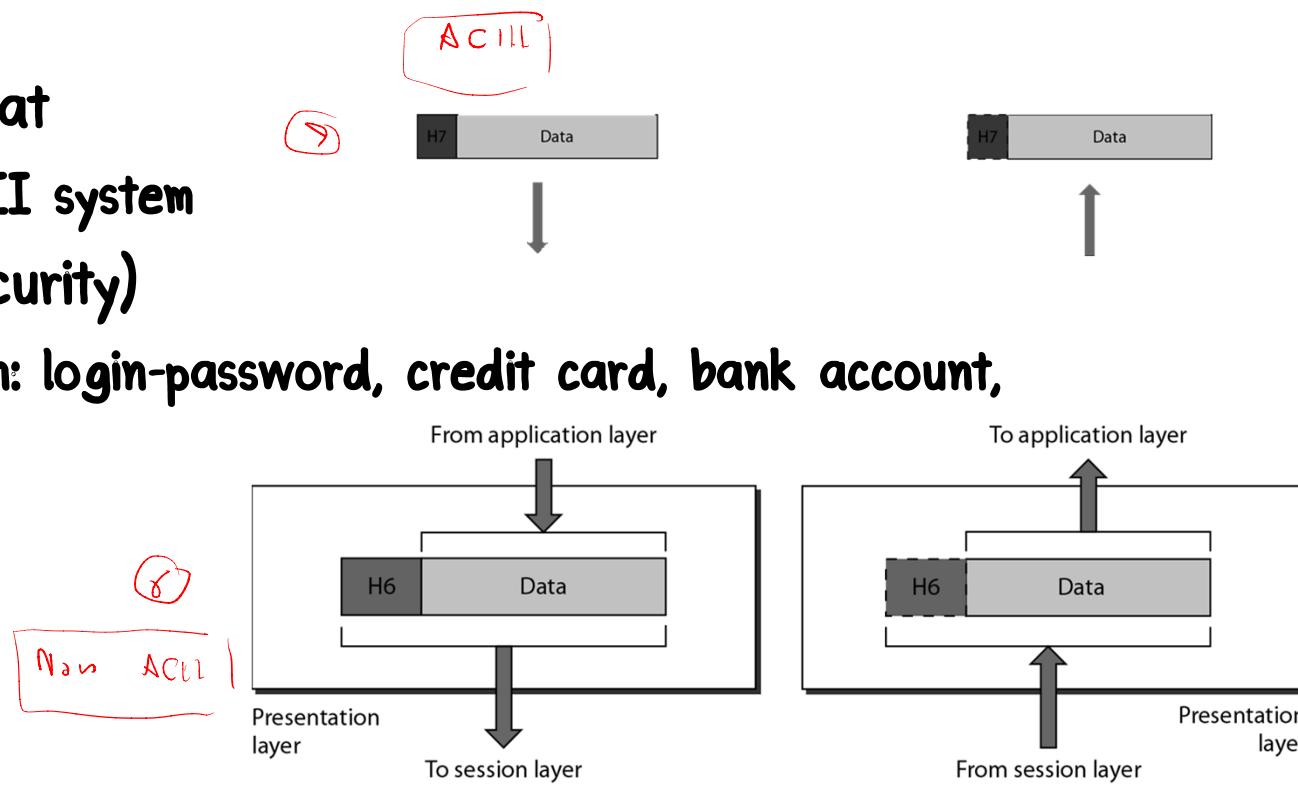


Presentation layer

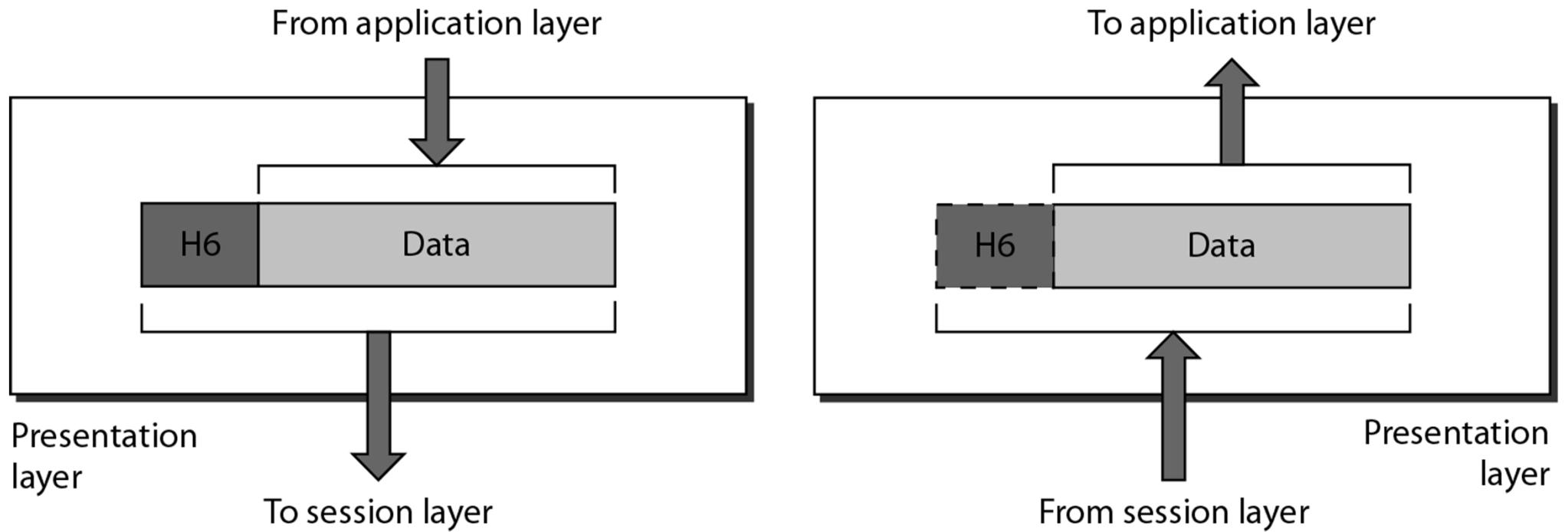
- **Responsibility** *ပုဂ္ဂန်ဆိုင်လုပ်ချက်*
 - translation, compression, and encryption
 - Manage syntax (format) and semantics (format understanding) of different data format between any two systems

- **Services**

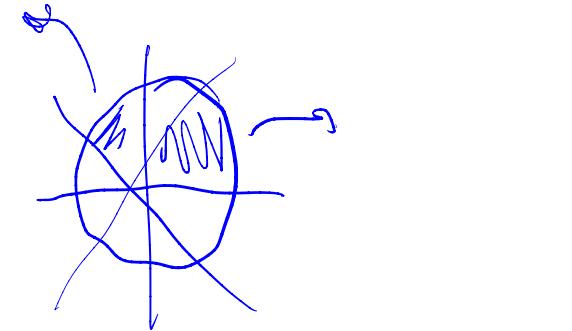
- Translation of data format
 - Ex. ASCII → non ASCII system
- Encryption (privacy & security)
 - For sensitive information: login-password, credit card, bank account, personal information
- Compression
 - Ex. Zip, Gif, JPEG



Presentation layer (Fig. 2.13)



Session layer



- **Responsibility**

- dialog control and synchronization

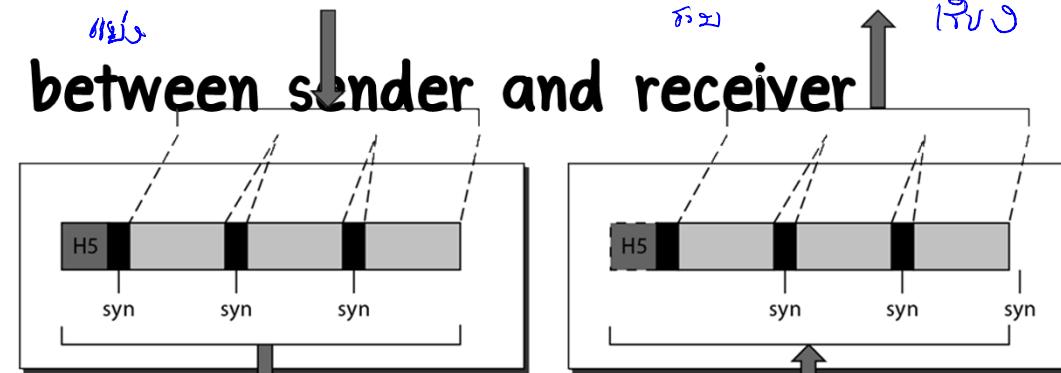


- Establish, manage, and terminate session

- Session = virtual communication between sender and receiver

- **Services**

- Dialog control

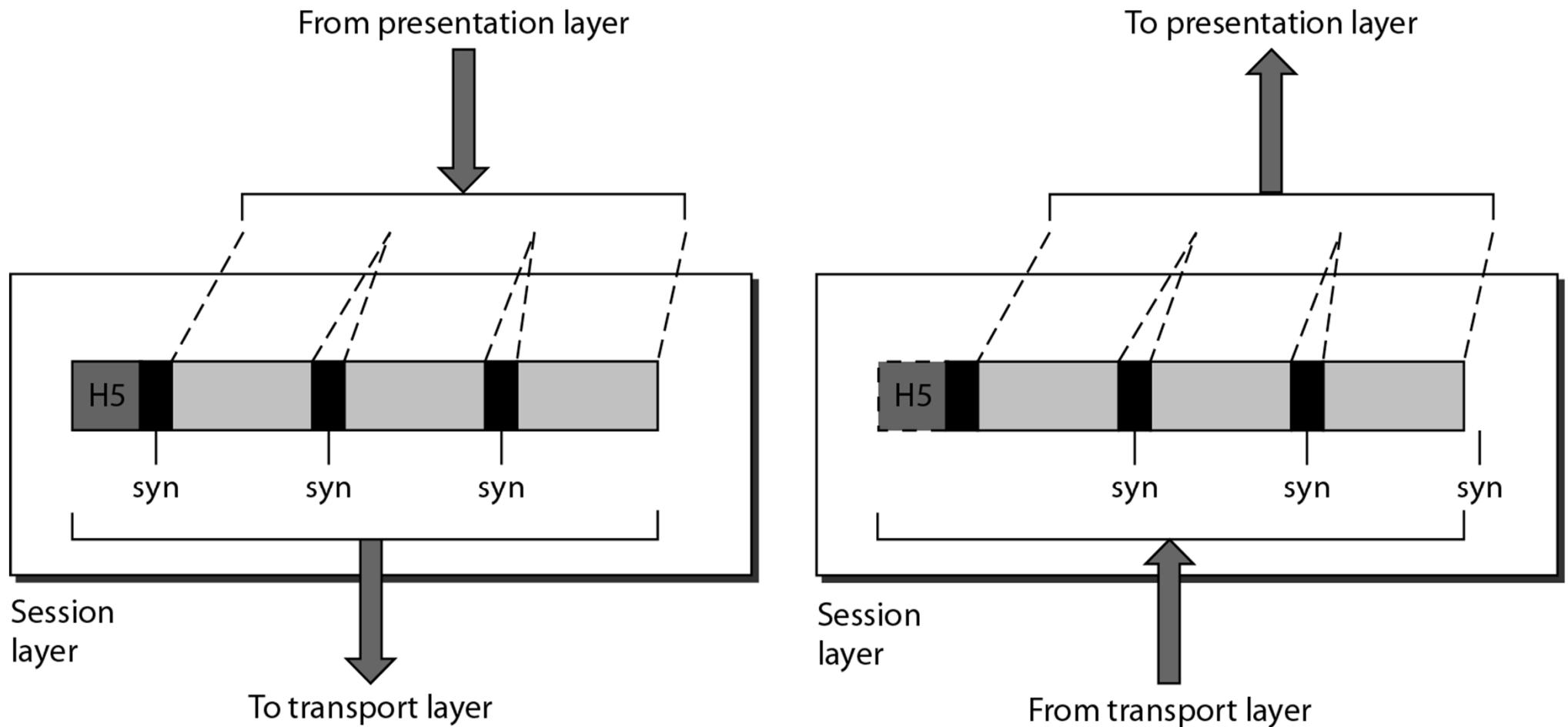


- Traffic control & direction control (Half duplex, Full duplex)

- Message synchronization

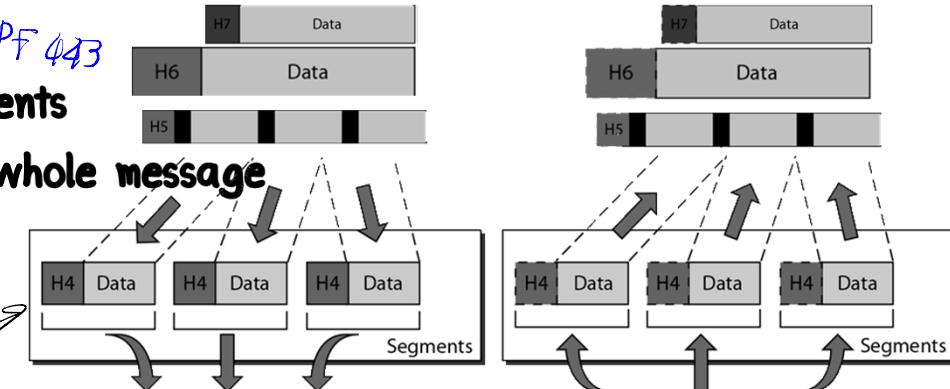
- Adding checkpoints (synchronization points) in the message stream

Session layer (Fig. 2.12)

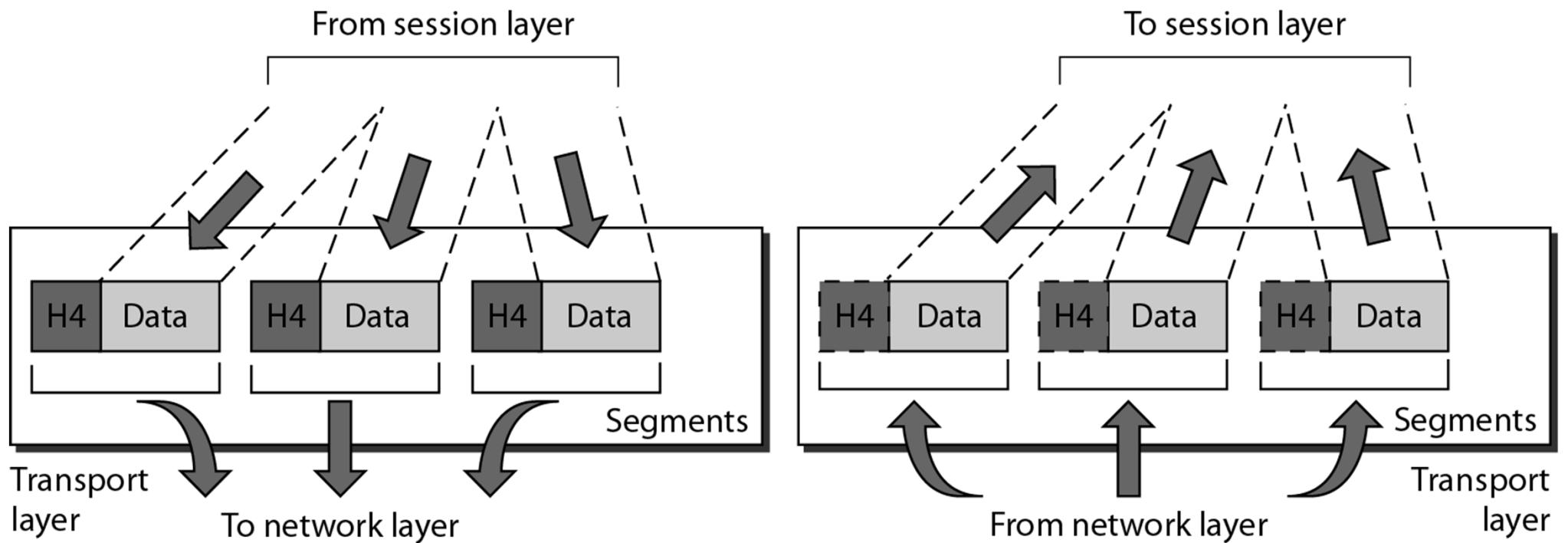


Transport layer

- Responsibility *task*
 - delivery of a message from one process to another
 - Guarantee whole message delivery : From source to final destination
- Service *functions*
 - Service-point addressing: Port address (16 bits: 0 - 65,535 ports) *KOP 3389*
 - Each application is assigned a specific port address
 - Segmentation and Reassembly *HTTP 80 HTTPF 443*
 - Source : segment L5 data into small segments
 - Destination : reassembly small segments into a whole message
 - Connection control
 - Connectionless
 - Connection-oriented
 - Error control : error detection and correction of the entire message
 - Flow control *flow control*



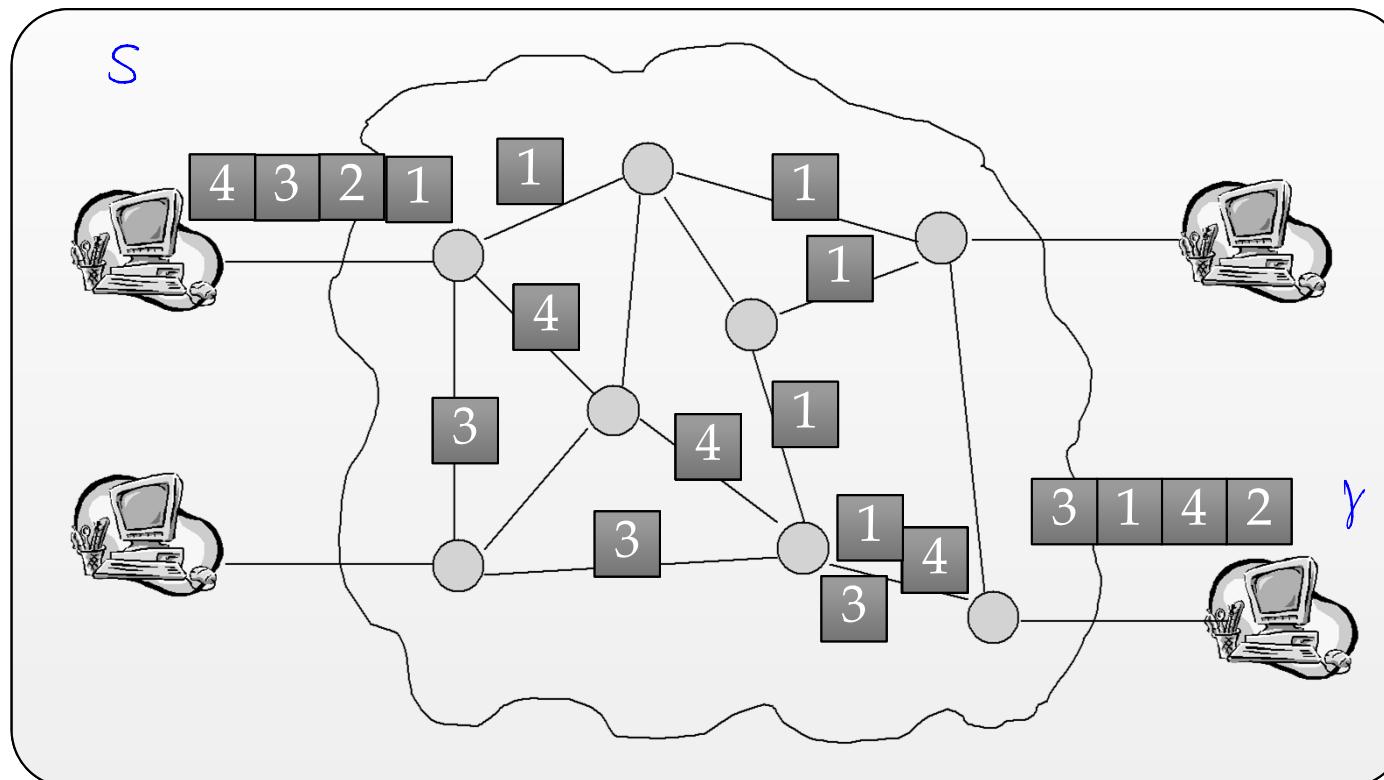
Transport layer (Fig. 2.10)



Transport layer

- Connection Control

- Connectionless *ନେଟ୍‌ଵୋର୍କ୍‌ରୁ ପାଇଁ ଯେତେବେଳେ*



Transport layer

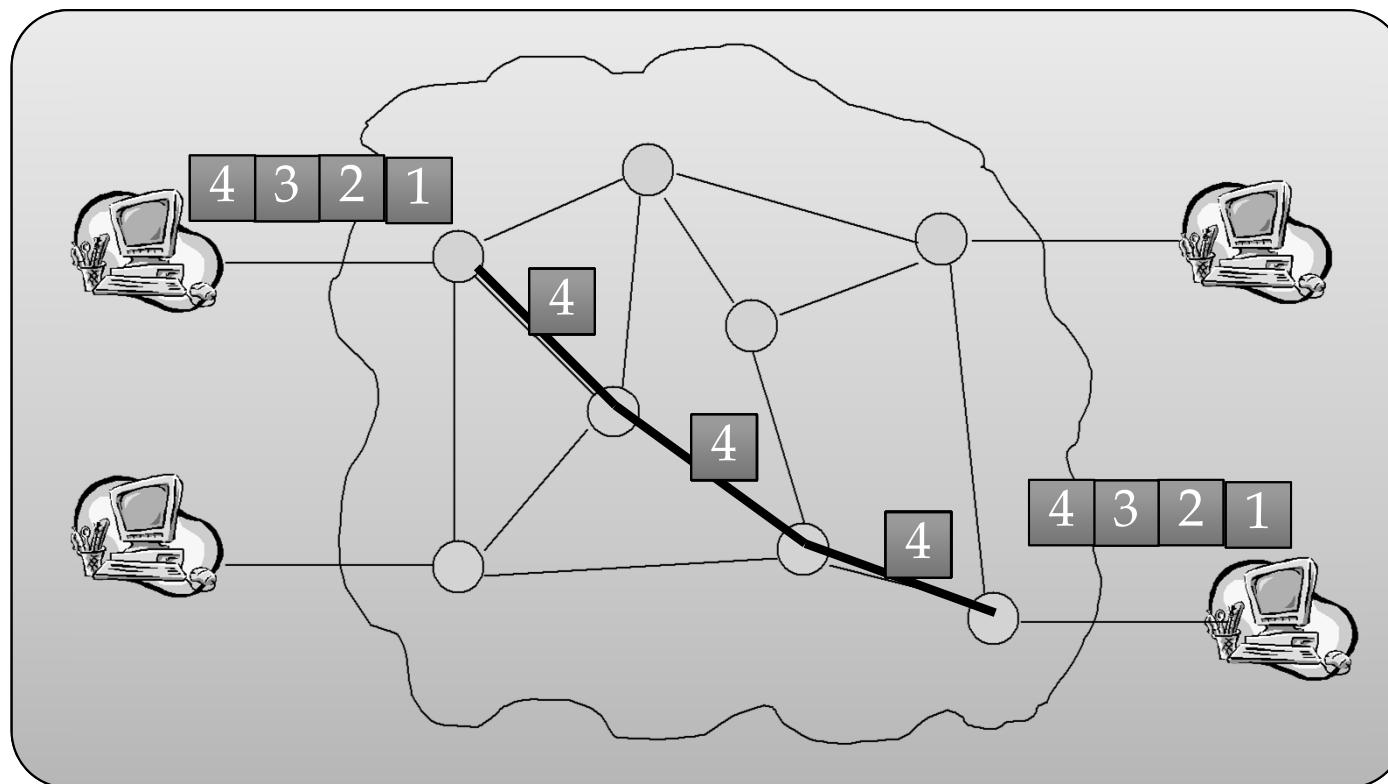
- Connection Control

- Connection-oriented

ສ່າງເຄືອຂະໜາດ
ກົມມາດີ

ກົດ - ດີວິຈິນ ດີ

ໂປຣ ແລ້ວ



Network layer

- Responsibility

- delivery of individual packets from the source host to the destination host

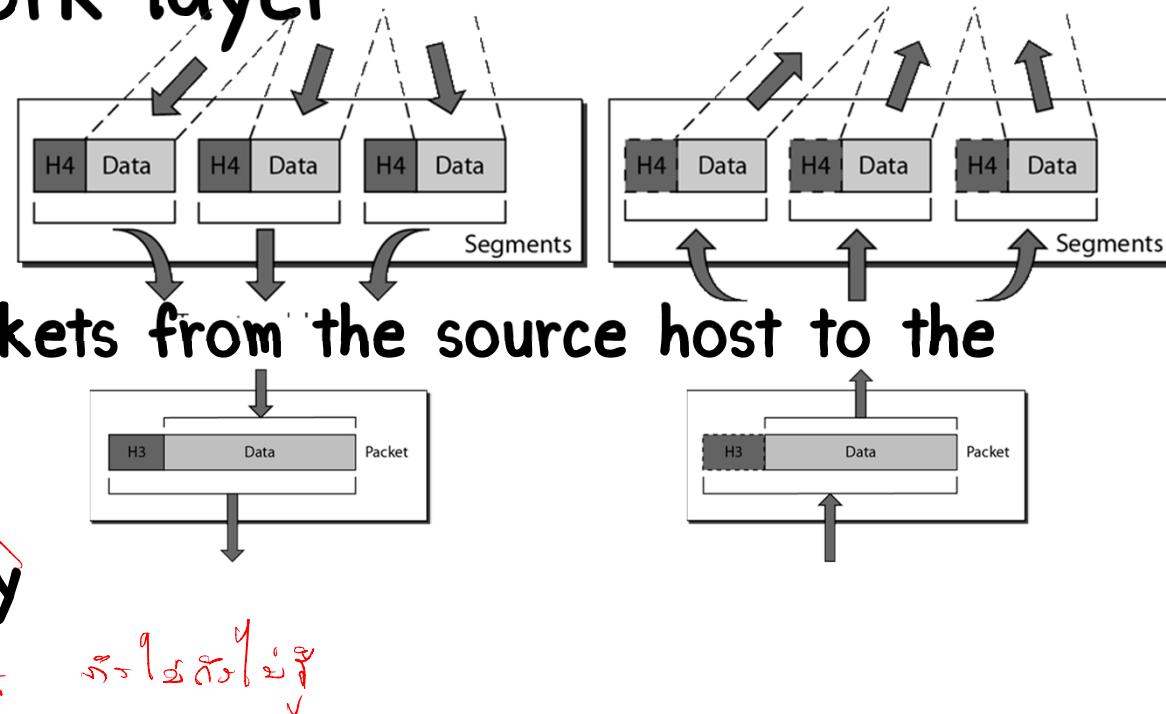
- Guarantee packet delivery

- Service

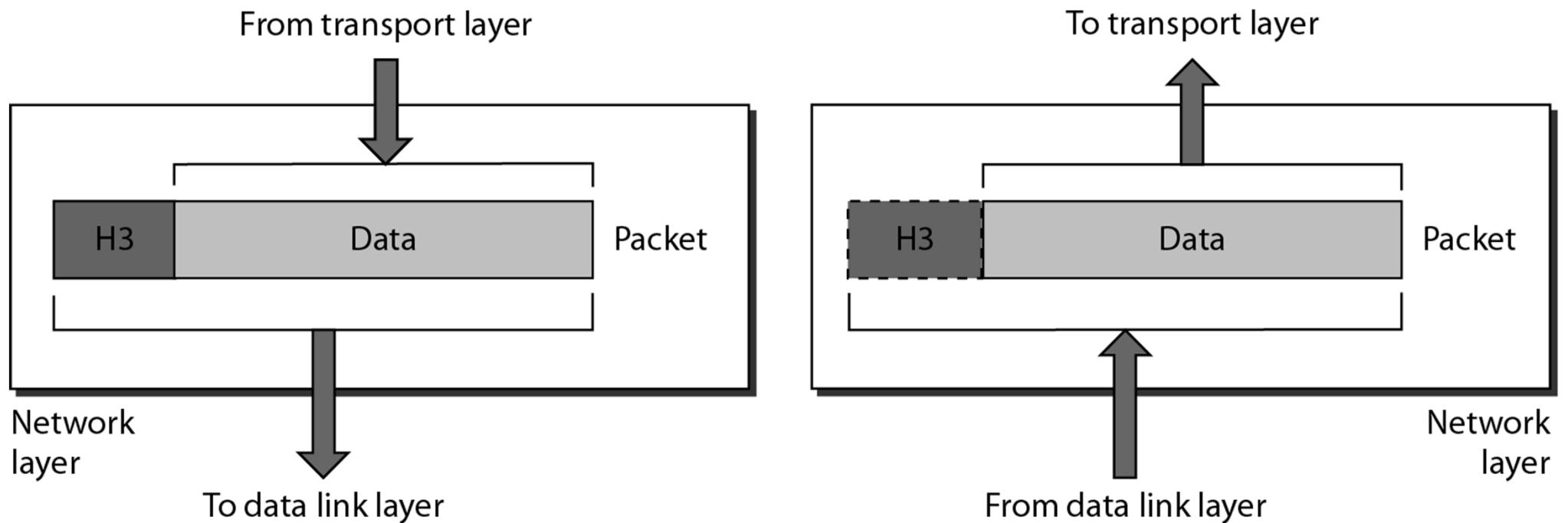
- Logical (Network) address (header): IP address

- Routing packets through internetworking device

- Router || Gateway



Network layer (Fig. 2.8)



Data link layer

- Responsibility

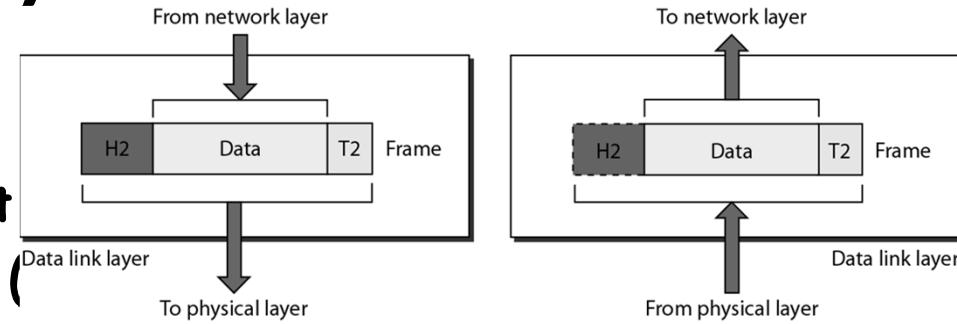
- moving frames from one hop (node) to the next
- Break L3 (Network) data into reasonable size (
- Guarantee Node-to-Node delivery (Frame Error Free)

- Service

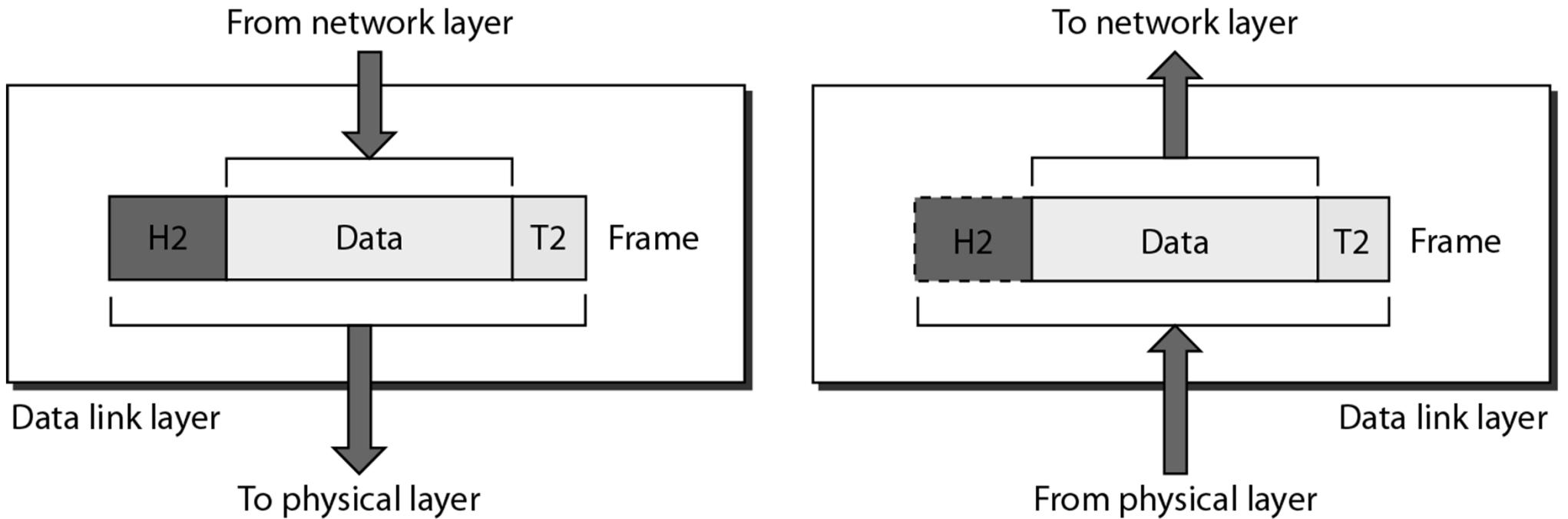
- Framing (adding header & trailer)
- Physical addressing (MAC address: 12 digit hexadecimal (e.g. 080BFOAFDC09))

- Same sender network : source & destination address
- Outside sender network : source & connecting devices (bridge, router, gateway)
address

- Flow control: frame acknowledgement, inform buffer size, etc.
- Error control: error detection and error correction
- Access control: checking accessibility (ex. Multipoint connection)

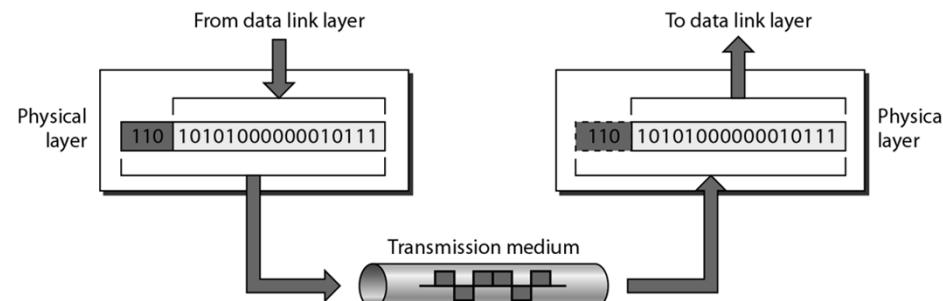


Data link layer (Fig. 2.6)

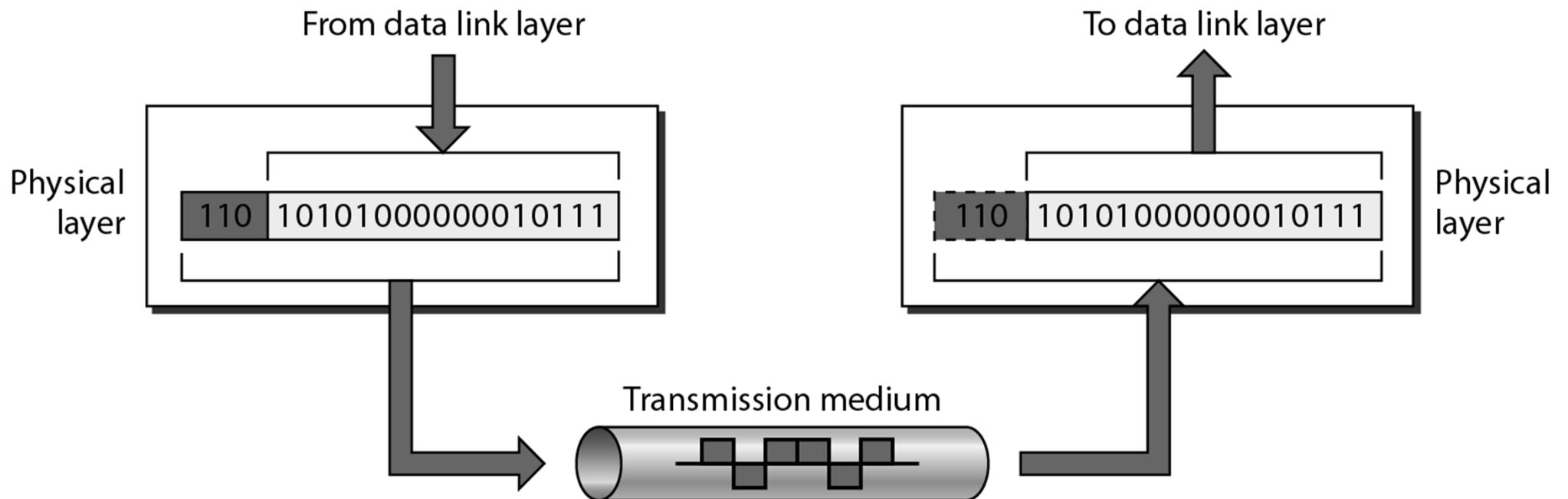


Physical layer

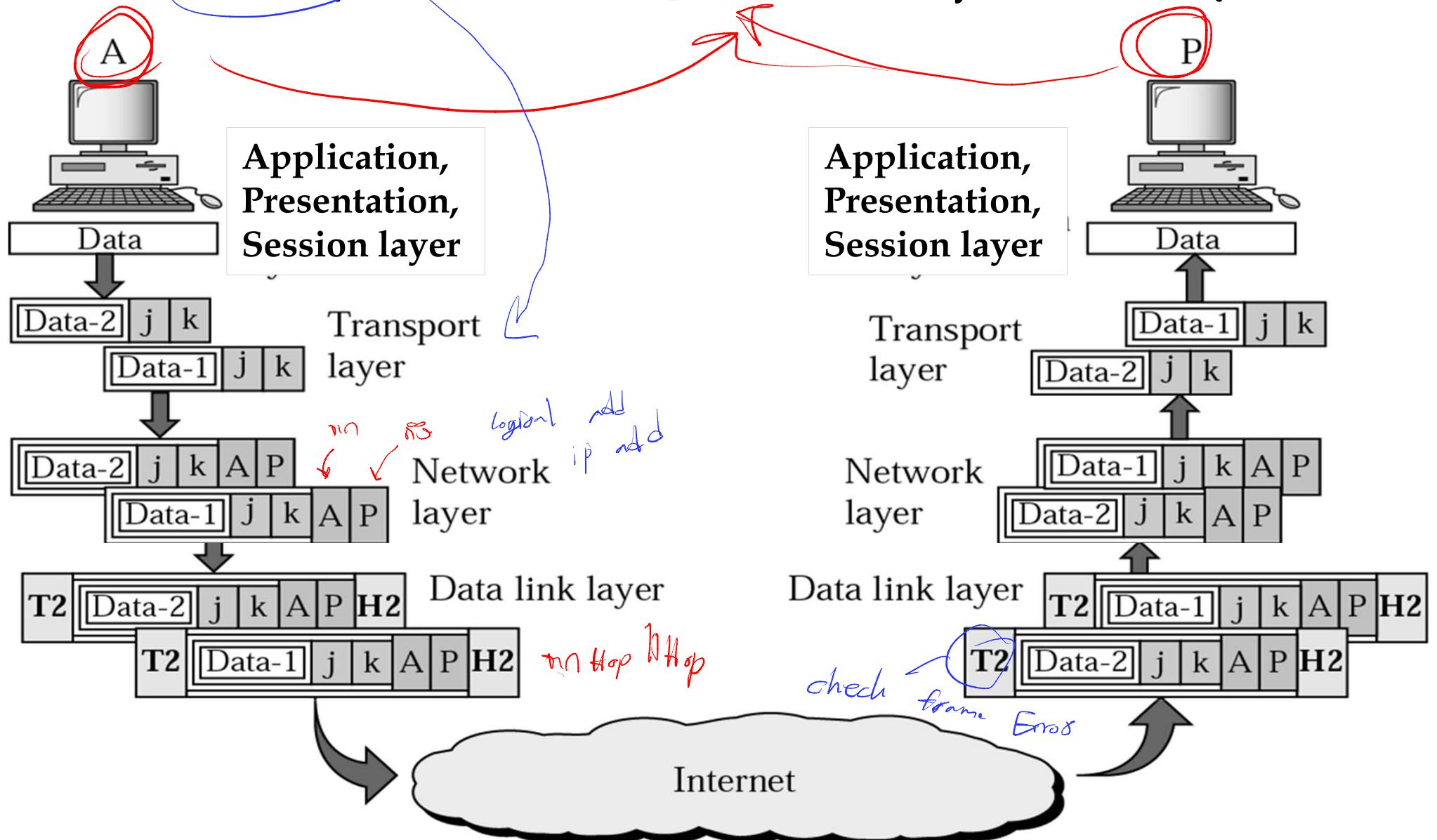
- Responsibility
 - movements of individual bits from one hop (node) to the next
 - Sending and receiving bitstream through physical medium
- Service
 - Physical characteristics of interface and medium
 - Representation of bits (encoding or modulation)
 - Data rate
 - Bit synchronization
 - Line configuration & Topology
 - Transmission mode (Simplex, Half-duplex, Full-duplex)



Physical layer (Fig. 2.5)

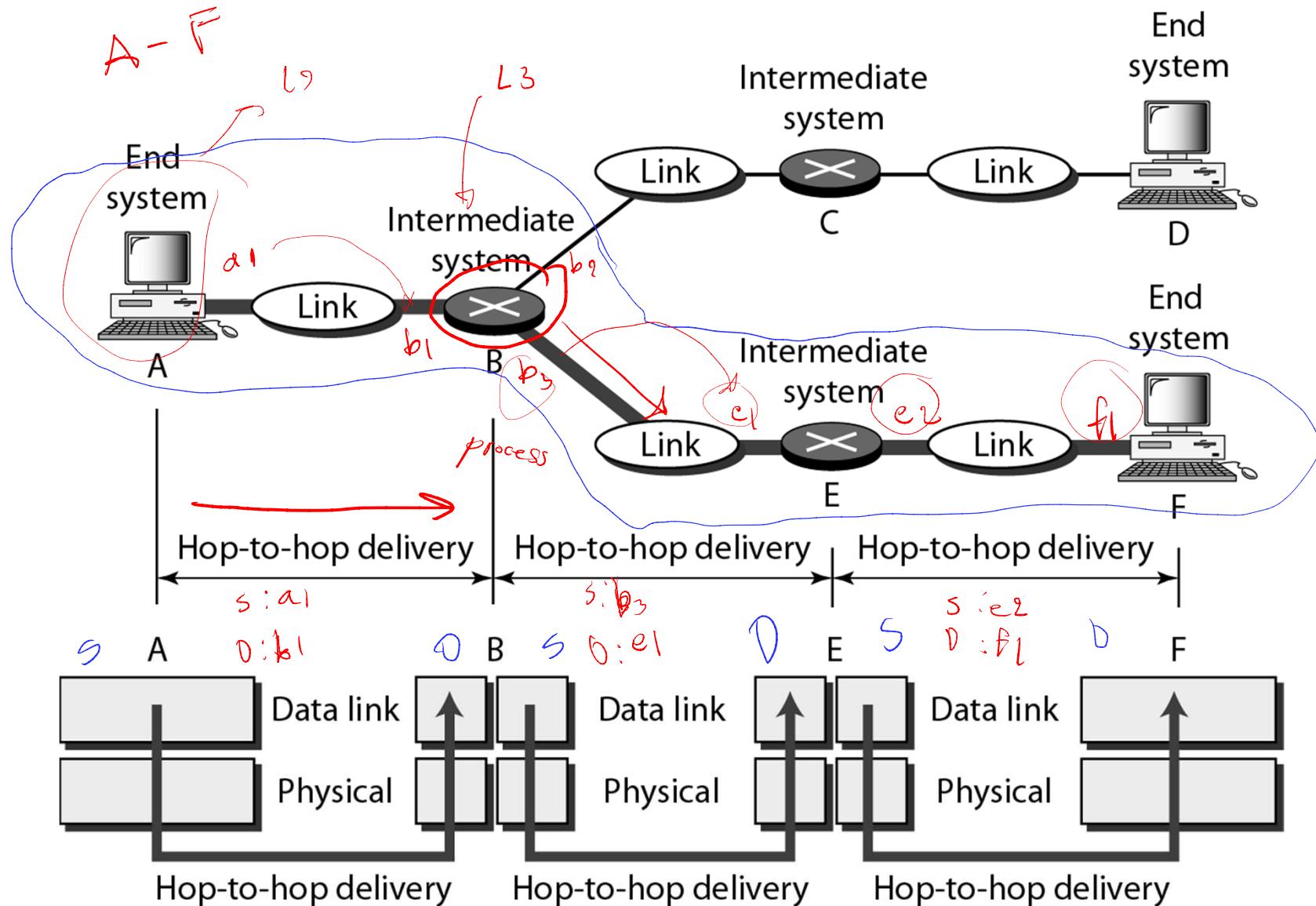


Transport and Network Layer Example

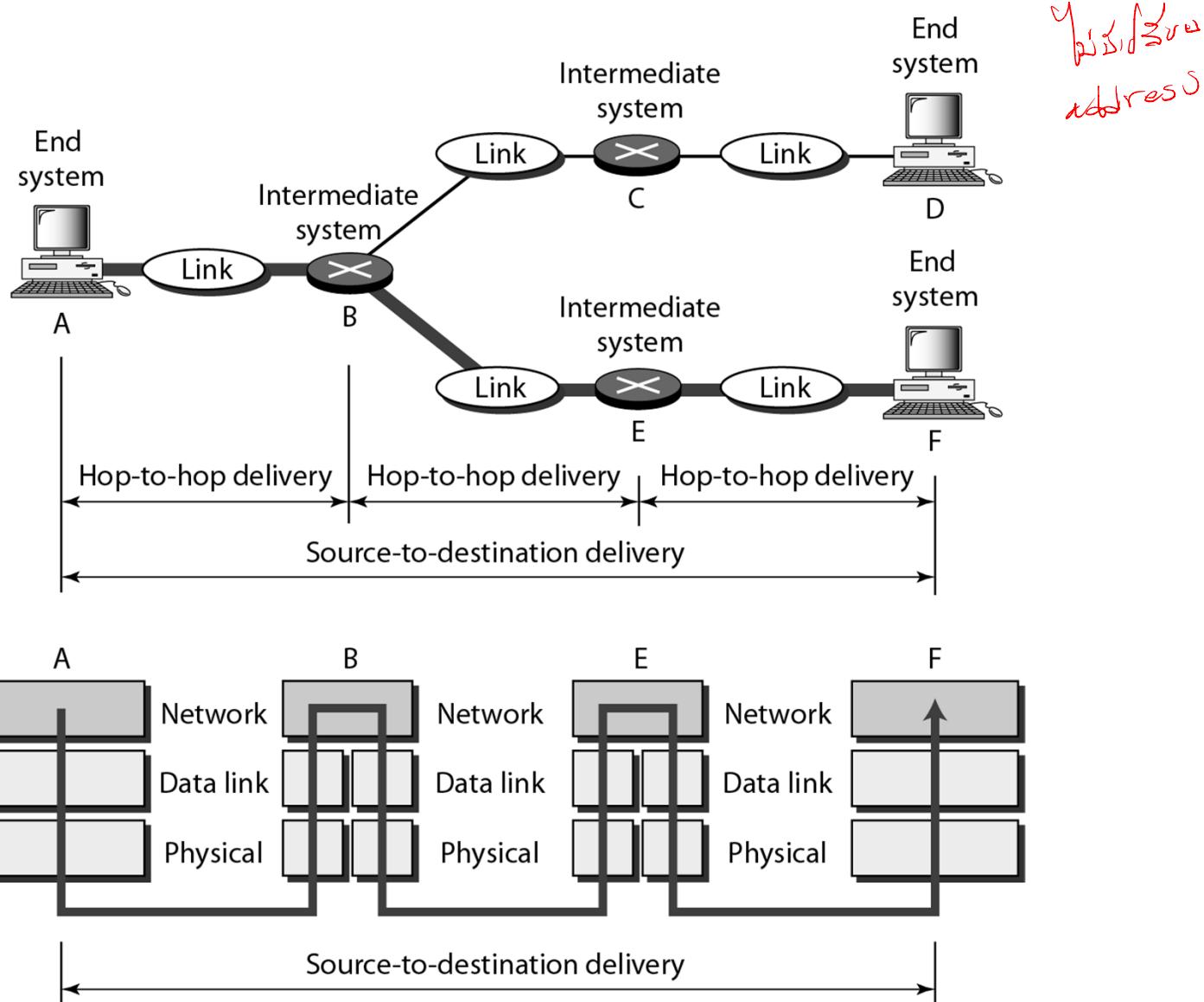


Hop-to-hop delivery (Fig. 2.7)

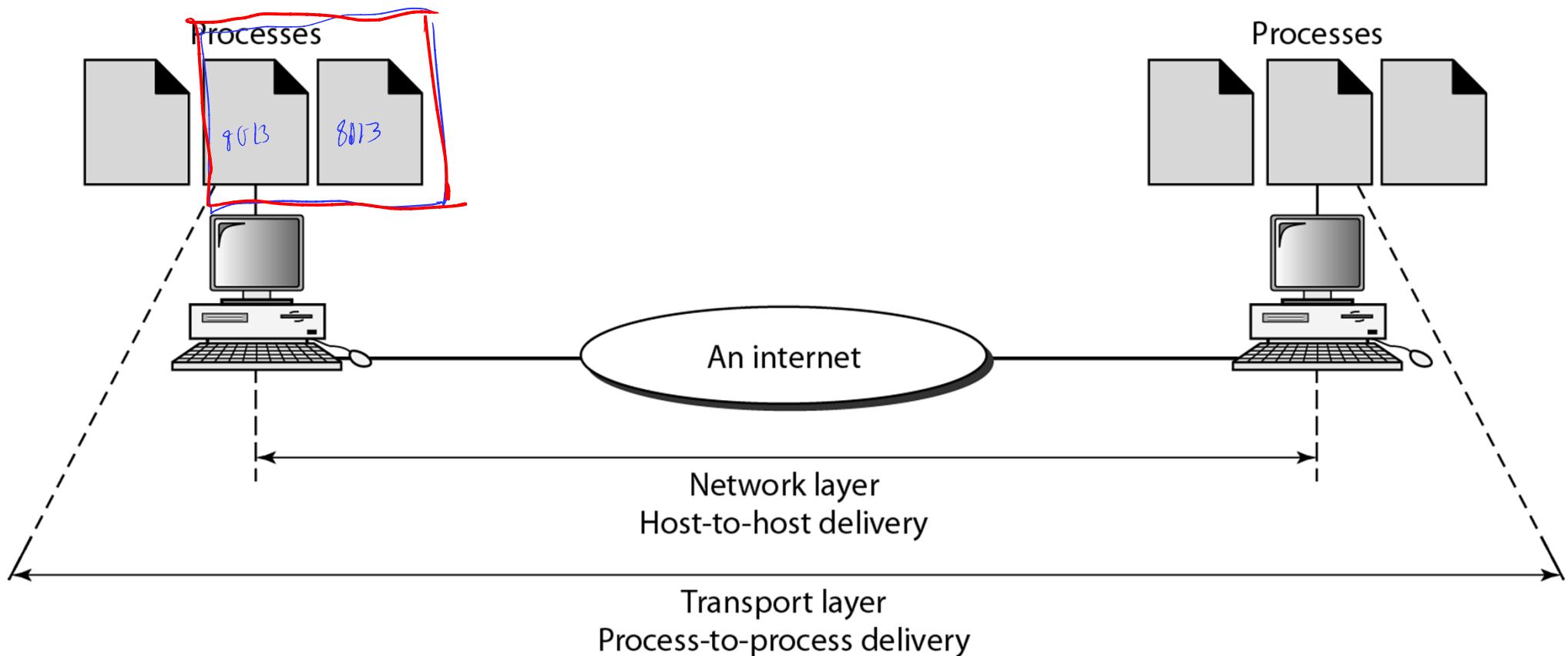
ຫົວໜ້າ (ໃນ)



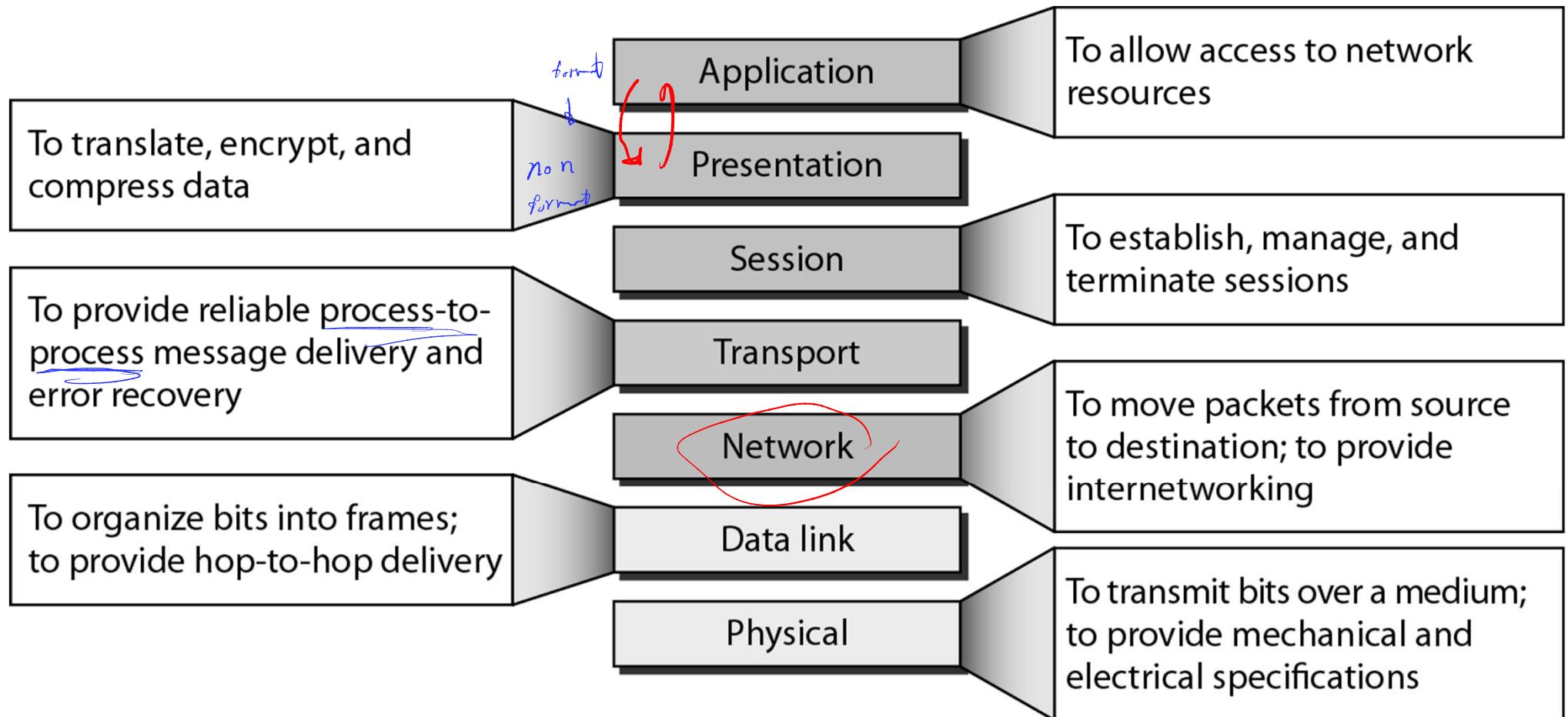
Source-to-destination delivery (Fig. 2.9)



Reliable process-to-process delivery of a message (Fig. 2.11)



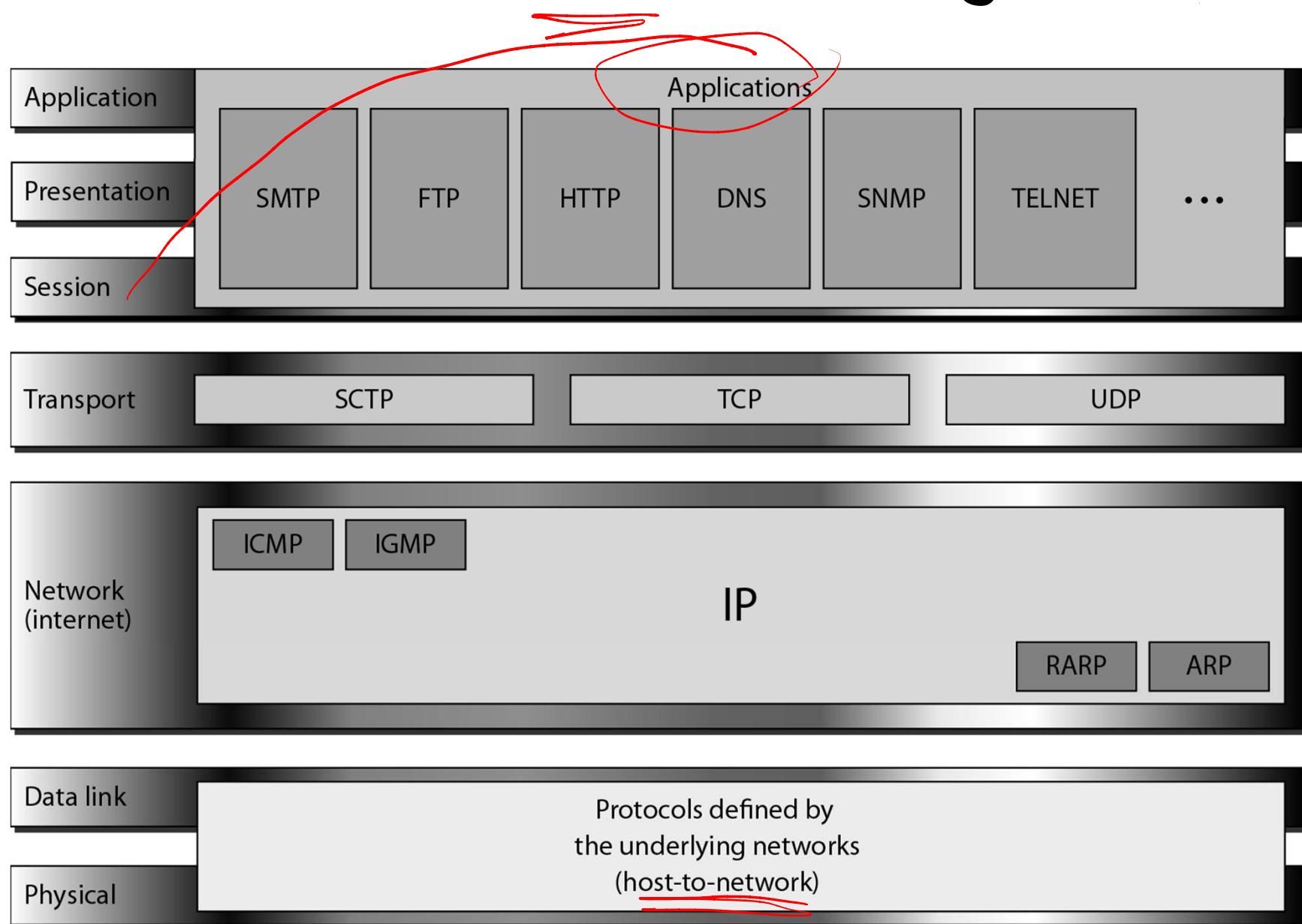
Summary of layers (Fig. 2.15)



~~TCP/IP~~ PROTOCOL SUITE

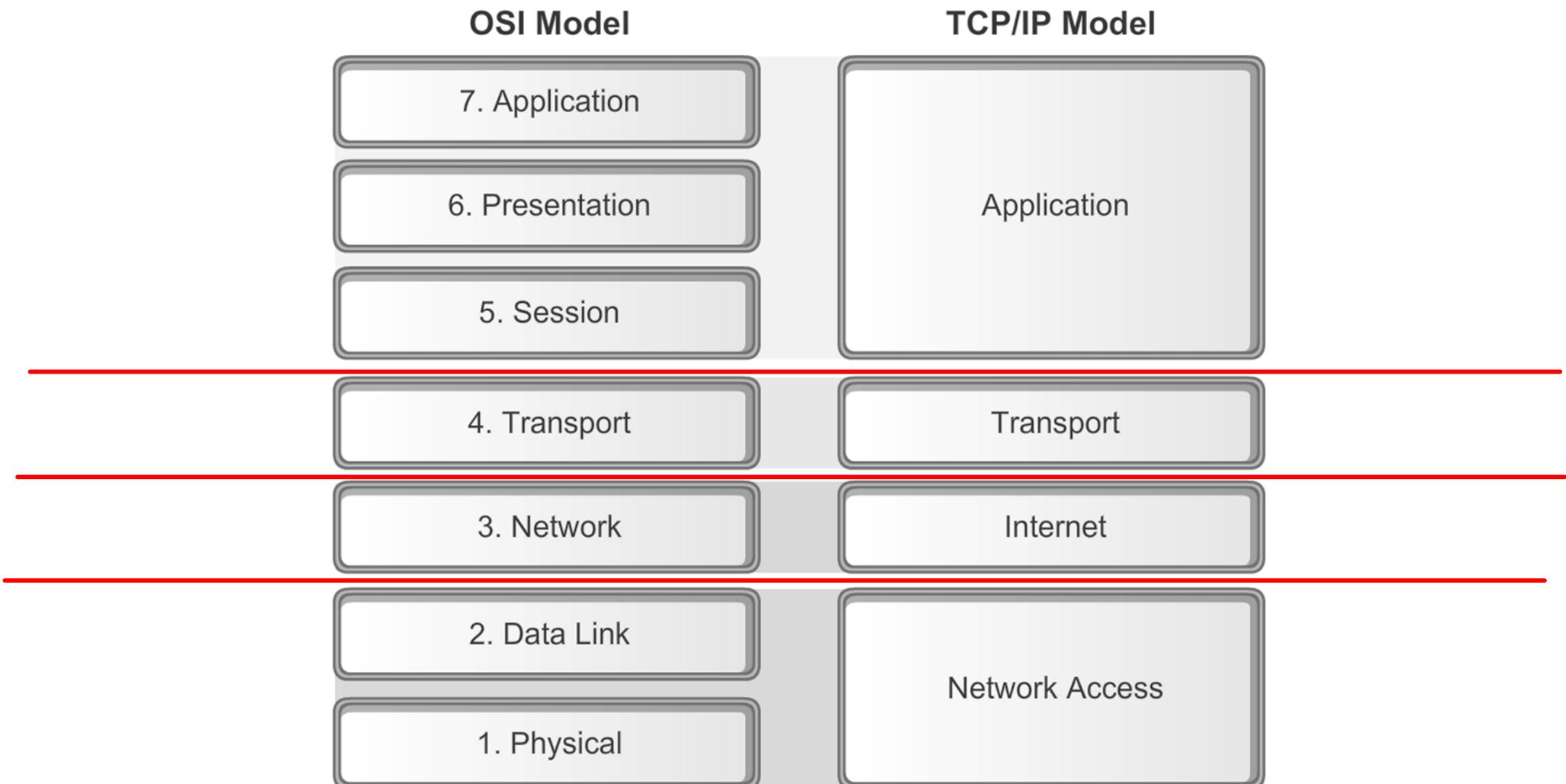
- Physical and Data Link Layers
- Network Layer
- Transport Layer
- Application Layer

TCP/IP and OSI model (Fig. 2.16)



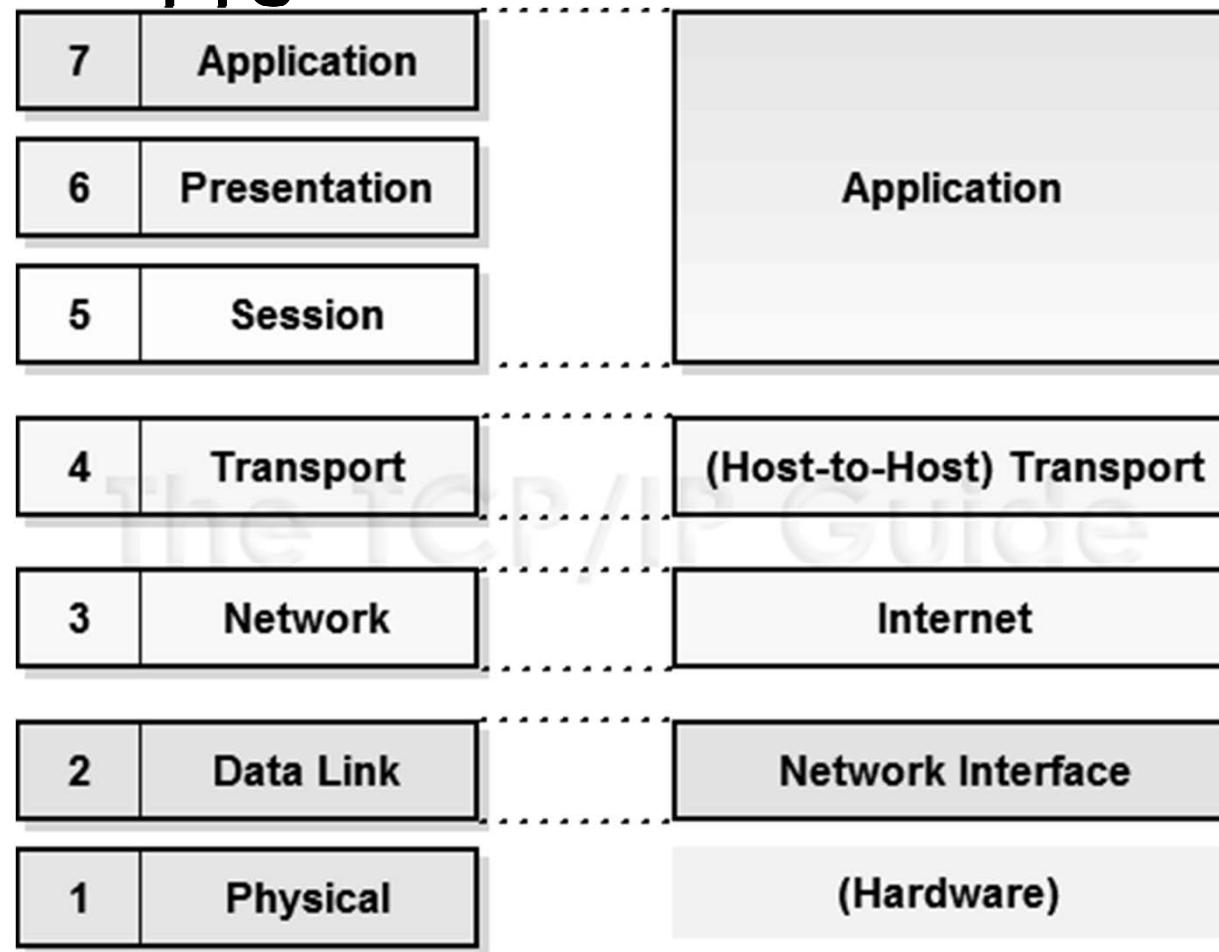
Comparison of OSI and TCP/IP

- <https://www.netacad.com/>



Comparison of OSI and TCP/IP

- <http://www.tcpipguide.com>



OSI model and TCP/IP protocol

ARPA: Advanced Research Projects Agency

DOD : Department Of Defense

OSI model

1970 (ISO, CCITT)

(International Organization of Standardization)

(Consultative Committee for International Telegraph and Telephony)

1983 (draft)

ITU-T (International Telecommunication Union- Telecommunication Standardization Sector)

1984 (release OSI)

1960 (ARPA in DOD)

1972 (draft)

1973 (release TCP/IP)

TCP/IP protocol