

Chapter 2

Network Models

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LAYERED TASKS

- Sender, Receiver, and Carrier

- Hierarchy

ក្រសាយការប្រព័ន្ធបានលាង

ក្រសាយ 2



តុលា

ក្រសាយដែលបានរាយ
យកទៅ



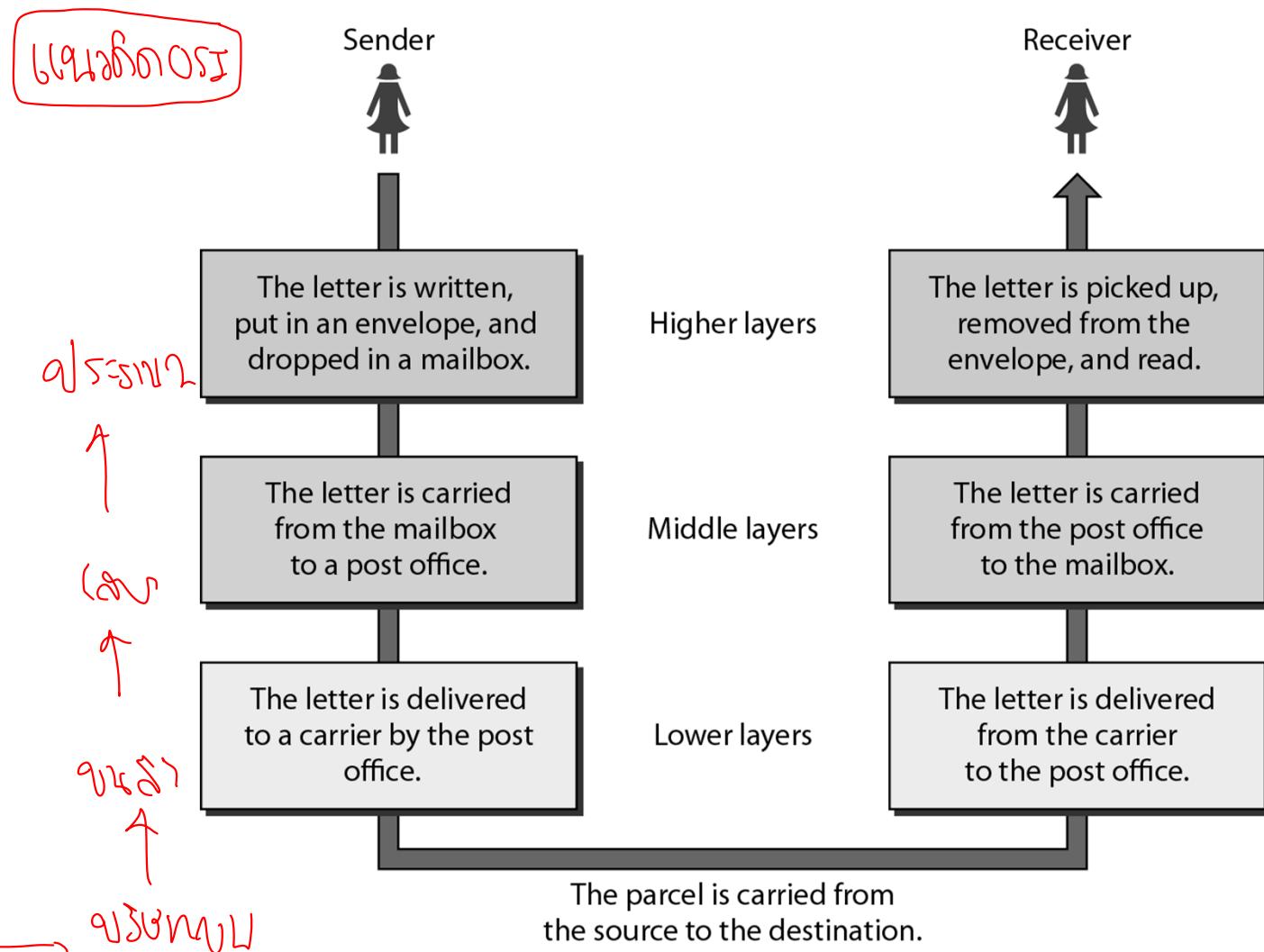
ពិភេស

ការអំពេញការងារ



ប្រជុំការ

Wherever



THE OSI MODEL

- History
 - Layered Architecture
 - Peer-to-Peer Process
 - Encapsulation

၁၀

Service តើ ឬជាកំសាន់ការប្រើប្រាស់រាល់រាត្រាណកំមើនទិន្នន័យដែលប្រព័ន្ធដឹងស្មានអារម្មណ៍

၃၆၁။ protocol ထုတေသနများ၏လုပ်ချက်၊ အိမ်ခြေခံ
နေဂြာက်စွာဘုရားစွာအားလုံး၏လုပ်ချက်၊ အိမ်ခြေခံ
လုပ်ချက်

→ దిఱక లోవర్ ఆప్లికేషన్ లో డాటా టెంప్లా క్రిచ్ = డిజిటల్ లైన్స్ ఫోర్మాట్
డైటా ప్రోకోల్ (Protocol) లో లోవర్ క్రిచ్ లో డాటా లింక్

OSI Model

- History

- 1970 → ISO (International Organization for Standard)

- จัดตั้งคณะกรรมการพิจารณา architecture ที่เป็นกลางเพื่อกำหนดการเชื่อมต่อระหว่างคอมพิวเตอร์ และอุปกรณ์ต่างๆ

- 1984 → released in ISO 7498 document

- OSI (Open System Interconnection) → 7 layers

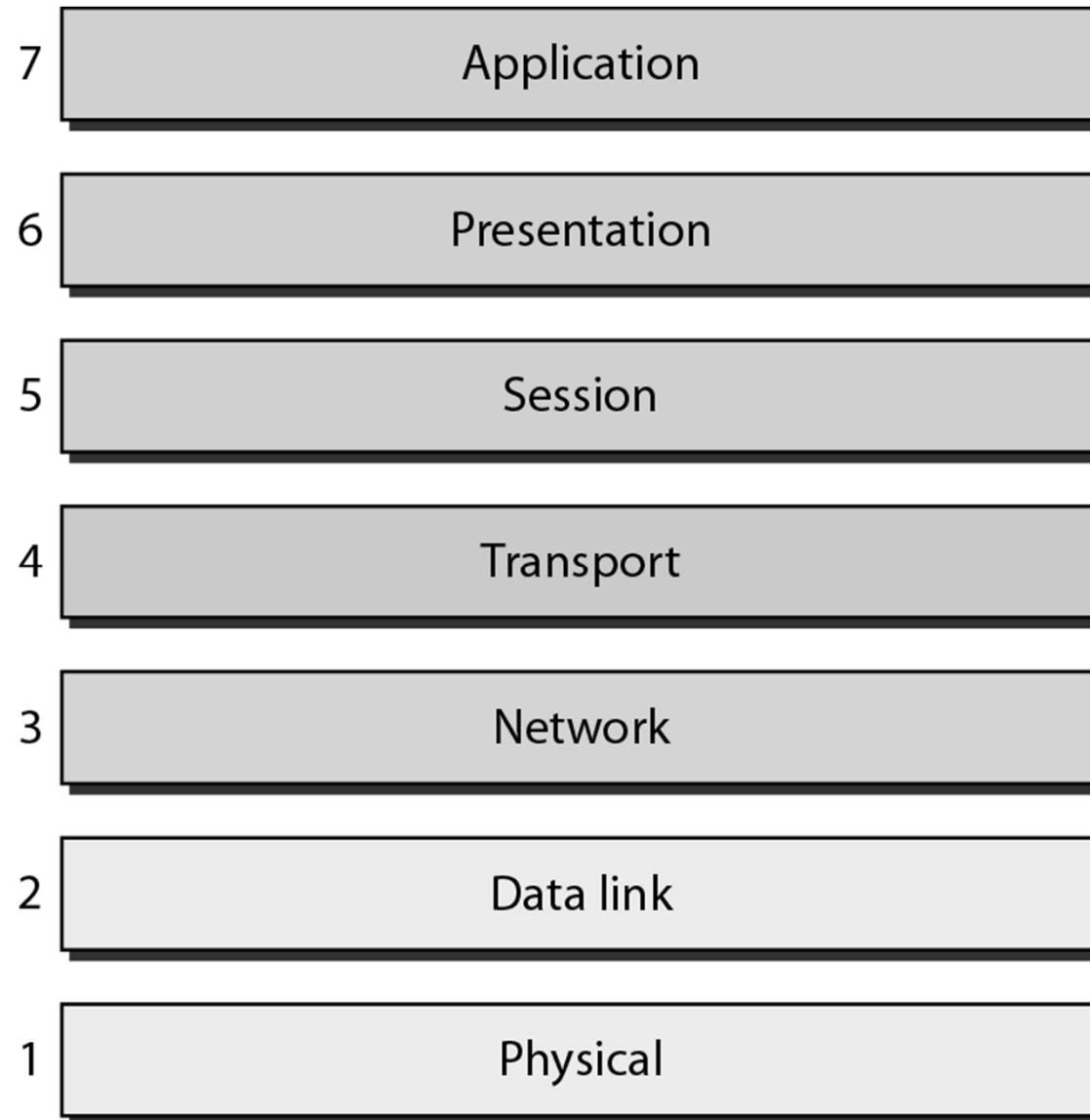
- Objectives

- Compatibility ความเข้ากันได้ของอุปกรณ์ต่างผู้ผลิตกัน

- Flexibility มีความยืดหยุ่นต่อการเปลี่ยนแปลง เช่น การพัฒนาของเทคโนโลยี

↳ เส้นทางดูด 1 ปี จึงจะรู้ว่าจะต้องอะไร whoever

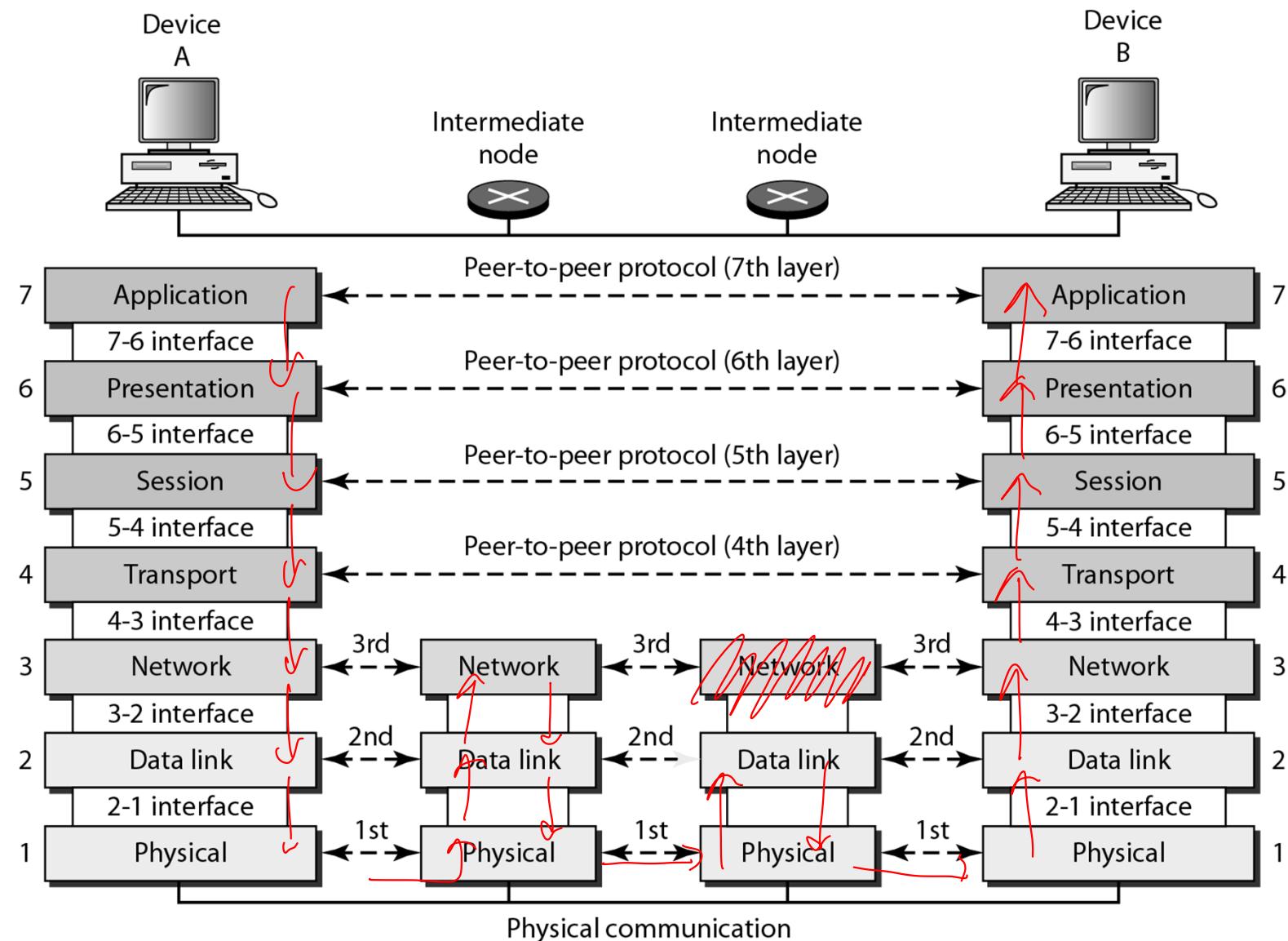
Layered Architecture



2msnigas=uislayer

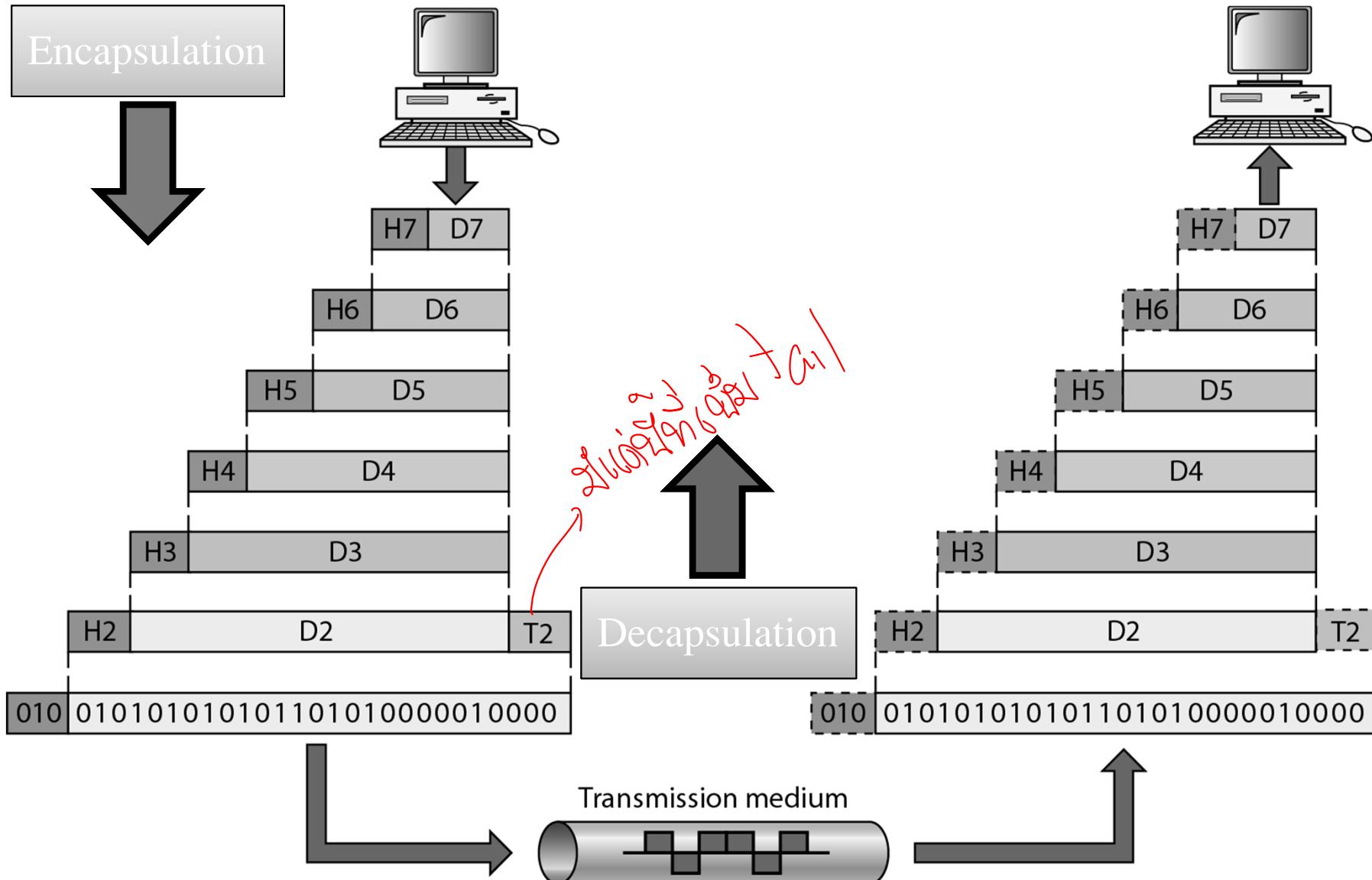
Seven layers of the OSI model (Fig. 2.2)

Model was OSI 1984
top down button up



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

Encapsulation (پیغام‌گذاری)

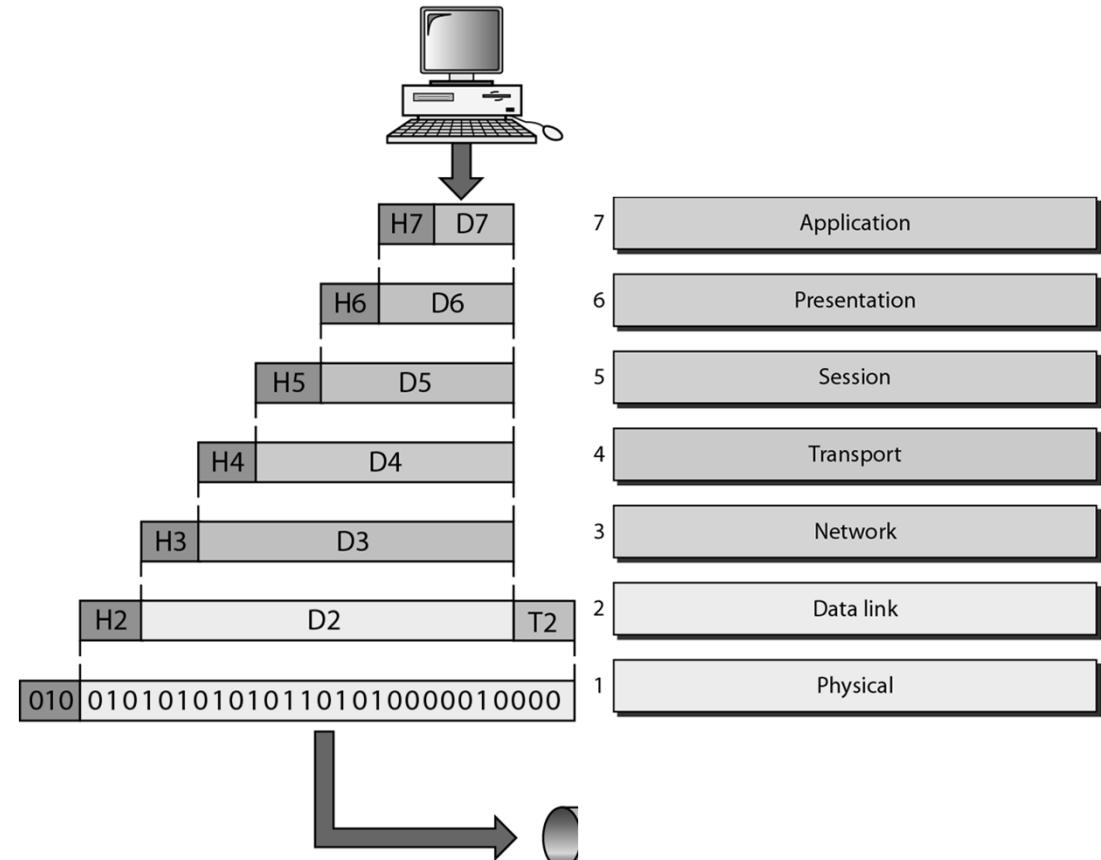


An exchange using the OSI model (Fig. 2.4)

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

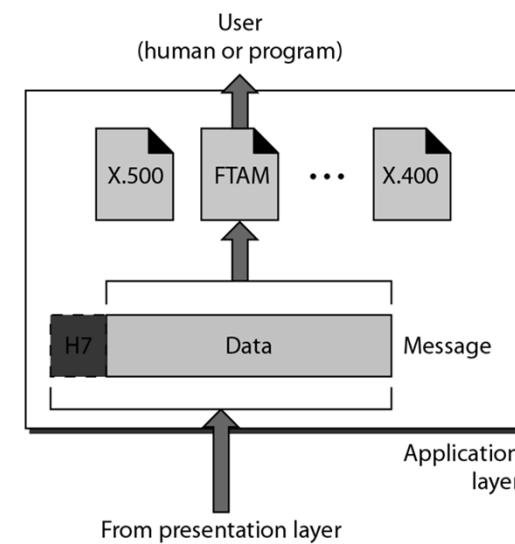
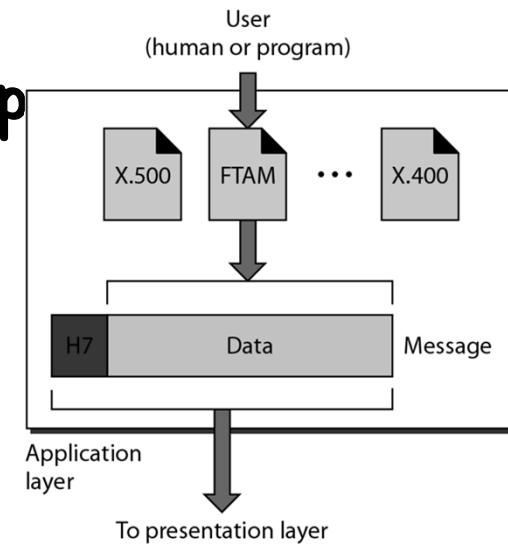
LAYERS IN THE OSI MODEL

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



⑦ Application layer

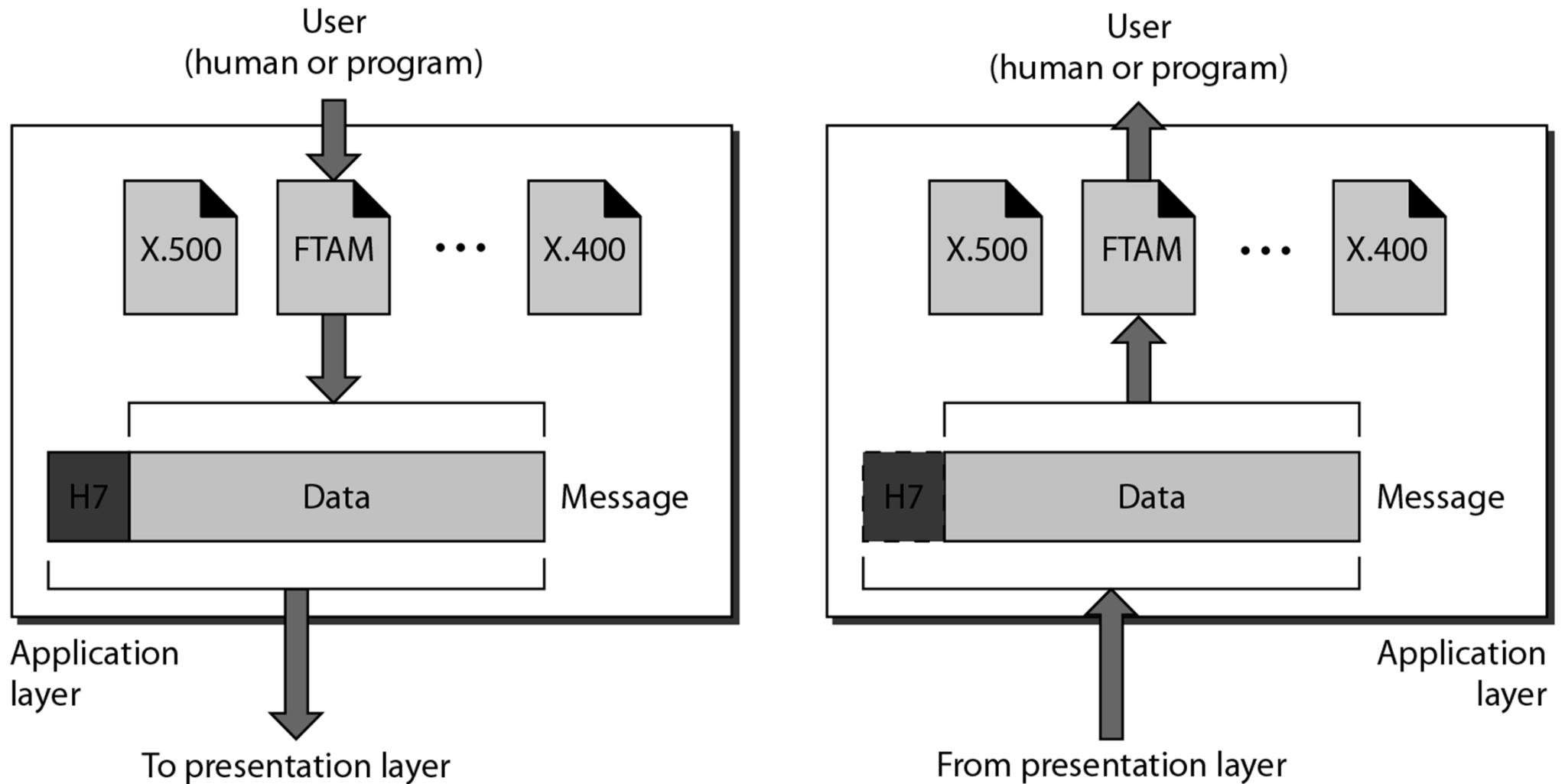
- Responsibility
 - providing services to the user
 - User interface (Software app)
 - No header or trailer
- Services
 - Network Virtual Terminal
 - File transfer, access, and management (FTAM)
 - Mail service
 - Accessing WWW



Layer 7 (Application Layer)

ສາທິລະນະທີ່ໃດຕ່ອະນະລາຍງົບ (user) ກົມ application ອັນດີຈະຢູ່ນາໂລວັງ ແລ້ວ Web Browser (HTTP),
FTP, Telnet ເປັນຕົ້ນ ສຸດເລື້ອມນັກຕໍ່ application ອັນດີຈະຢູ່ net work ອັນດີ

Application layer (Fig. 2.14)



⑥

Presentation layer

Responsibility

જાળ ફોર્માટ \leftrightarrow અફોર્માટ
(હિન્દી લિંગ) (અંગ્રેજી લિંગ)

પ્રોટોકોલ સેટિંગ્સ કરવાની પણ વિધું
, ડાટા લિંગ કરવાની પણ વિધું,
ચેયરમ્નીંગ

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

Services

બનાતું હોય ASCII નિર્માણ કરું એવું કરું જે કે આપણે

માનવીએ

- Translation of data format - જે કોઈ રીતે રીતે કોઈ રીતે કરી શકી નથી

- Ex. ASCII \rightarrow non ASCII system

માનવીએ

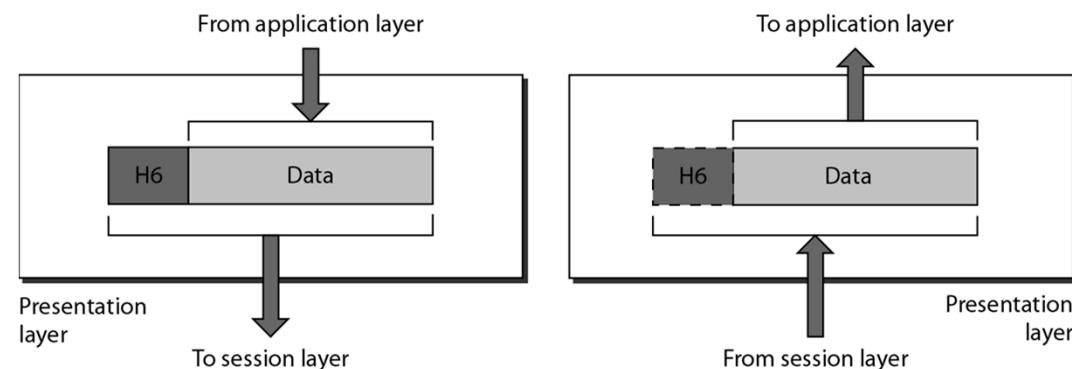
- Encryption (privacy & security)

- For sensitive information: login-password, credit card, bank account, personal information

માનવીએ

- Compression

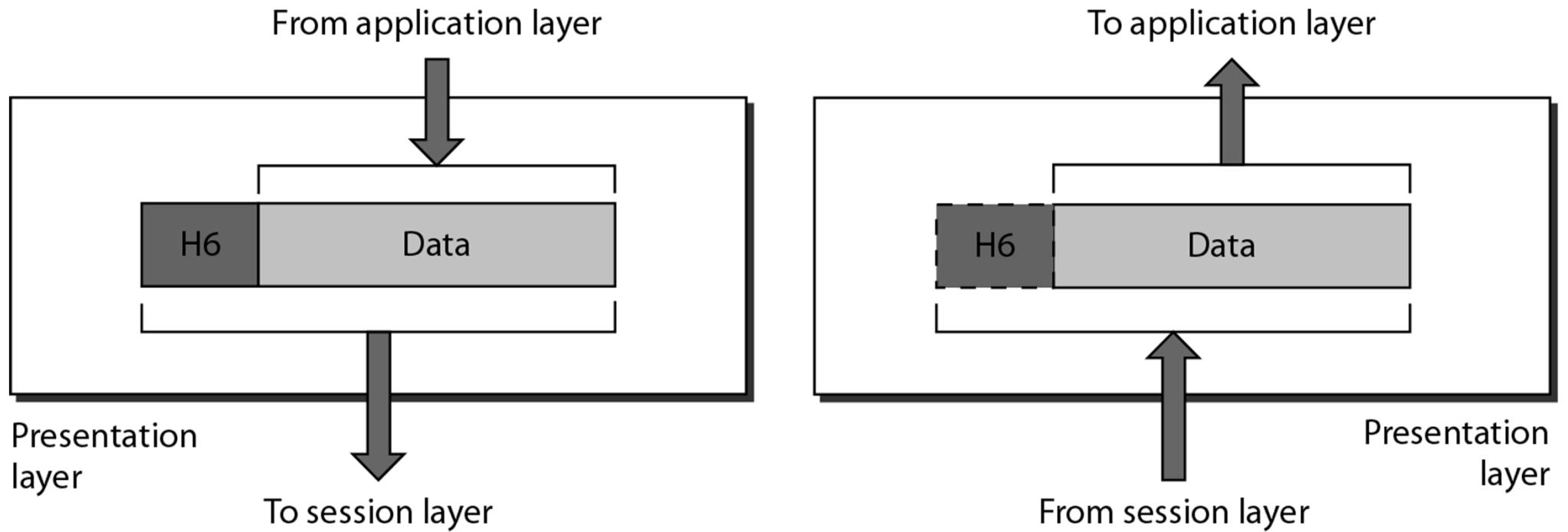
- Ex. Zip, Gif, JPEG



Layer 6 (Presentation Layer)

- ↳ ការបង្កើតរូបរាង (សម្រាប់ប្រើប្រាស់) structure, format, coding នៃទូទាត់ខ្លួនរបស់ app ទាន់ប្រព័ន្ធដែលត្រូវបានបង្កើត (កាត់ 2 ពីរអាមេរិក =)
- ↳ ផ្អែកទូទាត់ខ្លួន encode ទៅខ្លួន (កាត់ form) \rightarrow Layer 6 នៅក្នុង reformat ទៅកាន់កាត់ 2 (កាត់ប្រព័ន្ធ)

Presentation layer (Fig. 2.13)



⑤

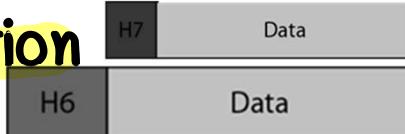
Session layer

ດែបចុងការផ្តល់នគរណ៍ទូរសព្ទ host
↓ simplex , duplex
ក្នុងការផ្តល់នគរណ៍ កំណត់ជានាមីល់ "session"

- Responsibility

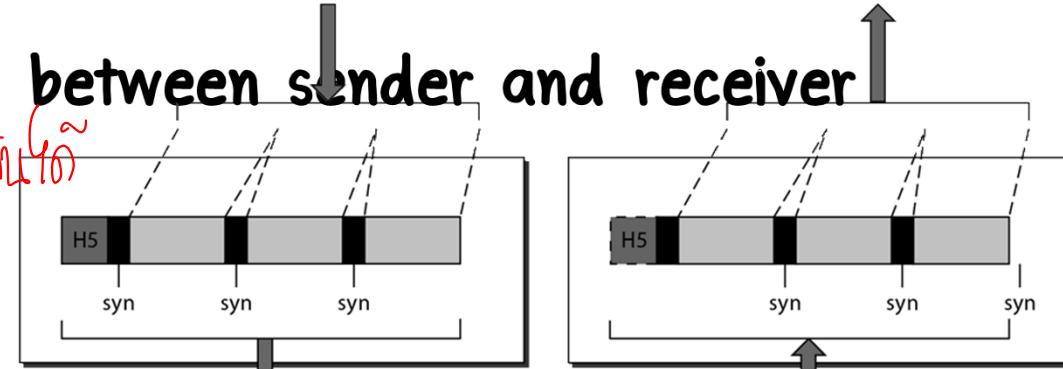
— dialog control and synchronization

គ្រប់គ្រង data ដោយការផ្តល់នគរណ៍



— 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 *និង data នឹងប្រហែល*

— Adding checkpoints (synchronization points) in the message stream

Layer 5 (Session Layer)

ສໍາຜົນໄດ້ໃຫຍ່ຂອງ session ເພື່ອສ້າງຂາຍໜັນຮັບ ກັບ ປະເທດ

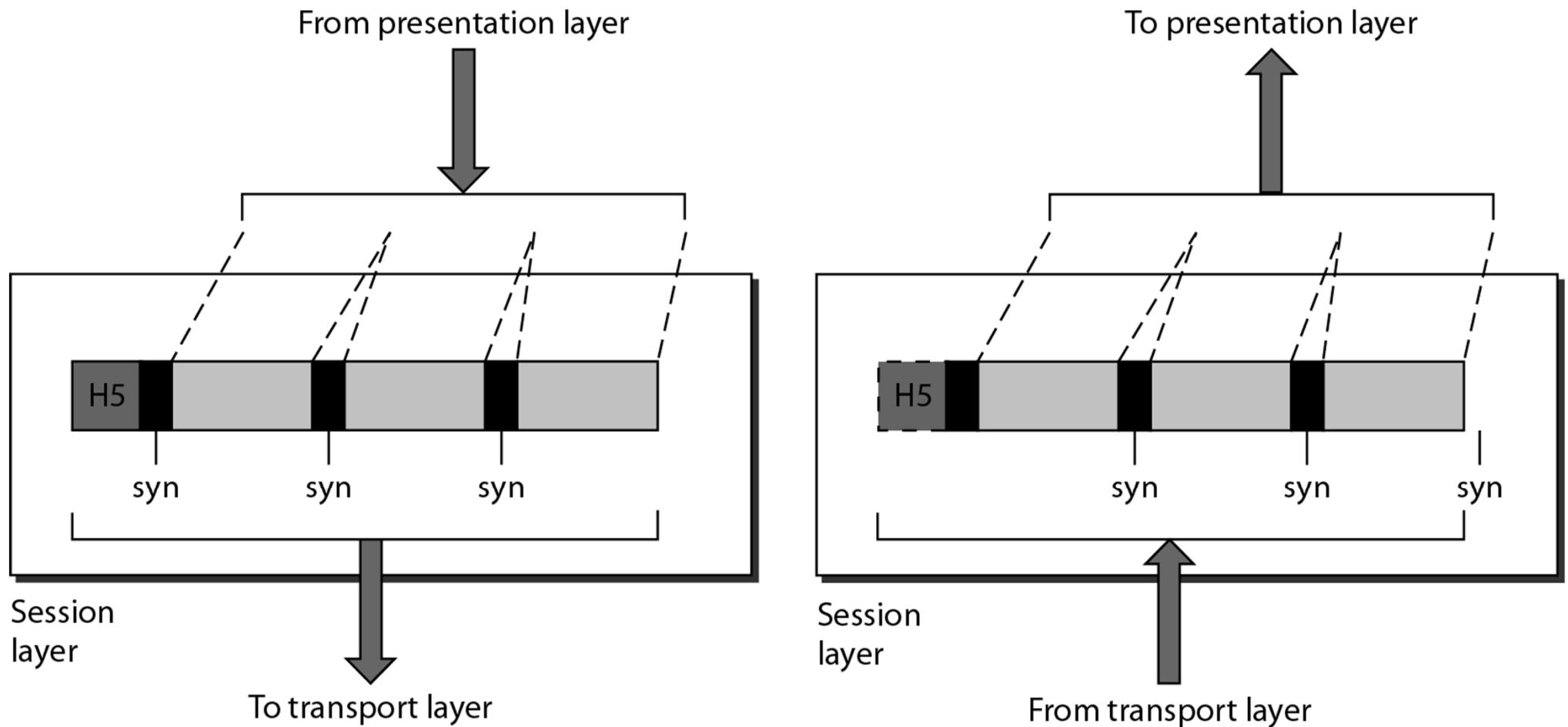
↪ ດີວຸນມານີ້ສ້າງຕົວ ອົບເກົດ

ອື່ນຍະລາຍ application ດັ່ງນີ້



ອື່ນຍະລາຍໂຄງການ session ຂັ້ນໄດ້ໃຫຍ່ port ຢື່ສອນໄມ້

Session layer (Fig. 2.12)



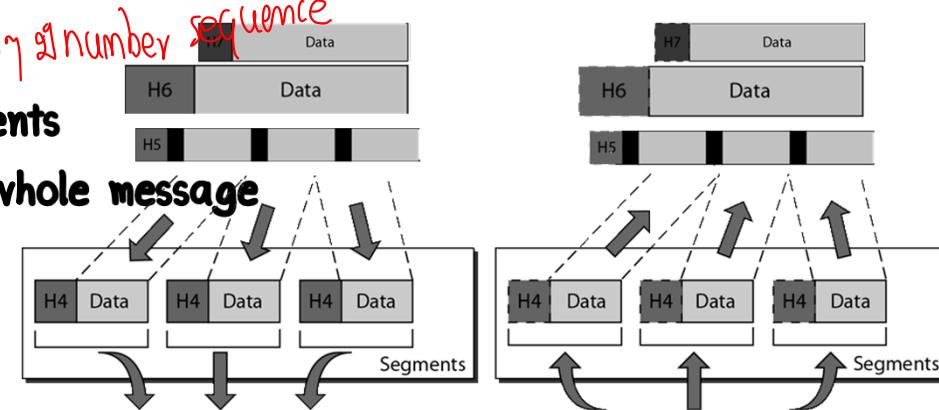
(4)

Transport layer

ສູນປະກາດວ່າສົດໆໄລຍະອາໄຫະ

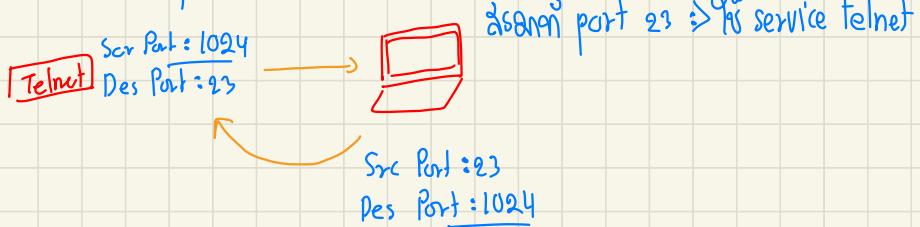
- Responsibility
 - delivery of a message from one process to another
 - Guarantee whole message delivery : From source to final destination
- Service
 - Service-point addressing: Port address (16 bits: 0 - 65,535 ports)
 - Each application is assigned a specific port address
 - Segmentation and Reassembly
 - 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

ອະນຸມັດໂຄນ້າຢືນຢັນເວັນໄວ → ຂົບportໃໝ່ເພີ້ມກາລົດຕົວໃຈໃນອາໄຫະ



Layer 4 (Transport Layer)

- ↳ ការប្រព័ន្ធឌីជីថទិនអំពី upper layer មានវិសាវិកសាខា network service និង application ទៅអាជីវកម្ម។
សំគាល់ (end to end connection) មានលើវិសាវិកសាខា port number ដូចតែងនៃលេខភាព layer 4 ដែលមិនមែន protocol 2 នៃ TCP , UDP
- ↳ layer 4 ទៅអាជីវកម្មអំពី service មានលើវិសាច់ port នេះ (សំគាល់) នៅលើវិសាច់លើវិសាច់លើវិសាច់ = random port number ដែលមិនមែនលេខភាពសំគាល់ទេ ដែលមិនមែនលេខភាពសំគាល់ទេ



↳ និង protocol នៃ layer 4

↳ Transmission Control Protocol (TCP)

↳ ផ្តល់នូវលើខ្លួនការសំណង់ app នៃបរាបាណនាមឈប់បញ្ជីបញ្ជី (segment)

↳ សំគាល់ connection ក្នុងការងារដែលត្រូវបានរៀបចំឡើង (connection-oriented)

↳ មិន sequence number ដើម្បីតាមលក្ខណៈបញ្ជីបញ្ជីឡើង

↳ និង Flow control តាមការងារដែលបានបញ្ជីបញ្ជីឡើង

↳ និង error recovery → ទទួលឱ្យអ្នកបានការពារឡើង

→ សំគាល់=សំគាល់ឡើង✓

↳ និង segmentation រាយការដែលបានបញ្ជីបញ្ជីឡើង layer 3 (សំគាល់ sequence number)

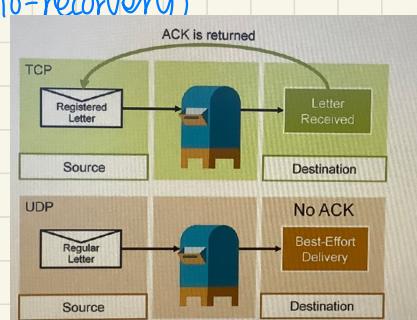
↳ User Datagram Protocol (UDP)

↳ មិនសំគាល់ connection ក្នុង (connectionless)

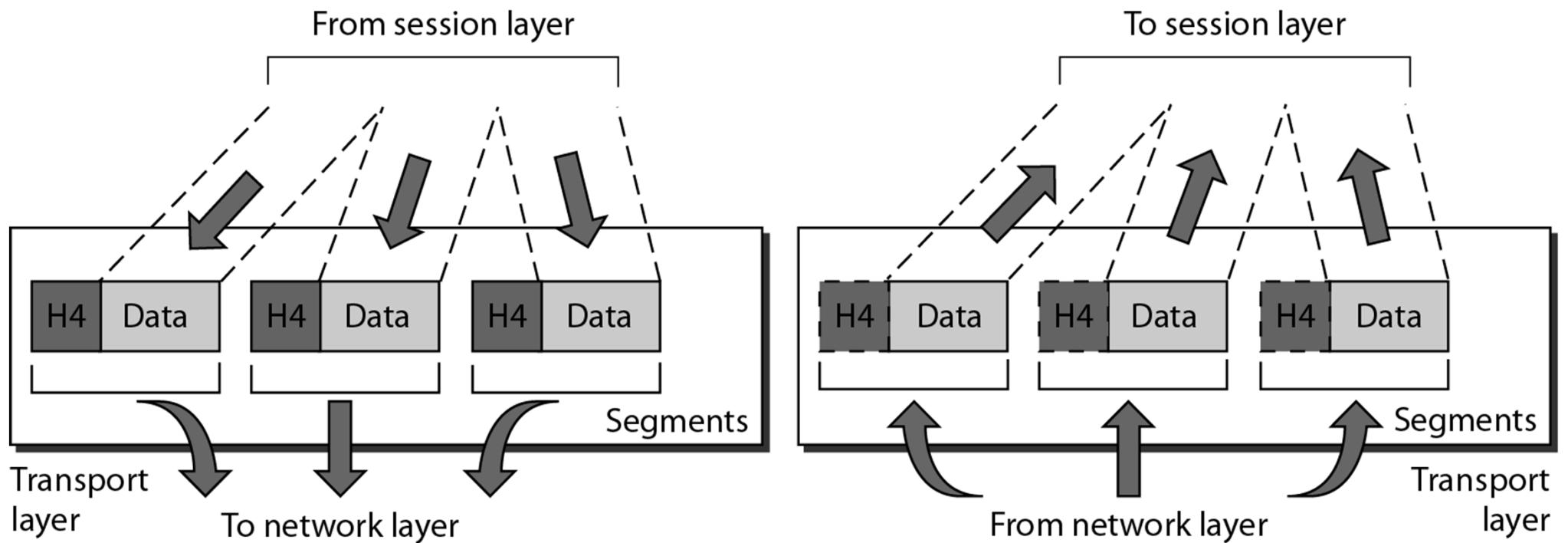
↳ មិនសំគាល់ទៅសំគាល់ឡើងឡើង (no-recovery)

↳ និងនៅក្នុង TCP

↳ និងនៅ Video នូវ សំគាល់ឡើង



Transport layer (Fig. 2.10)



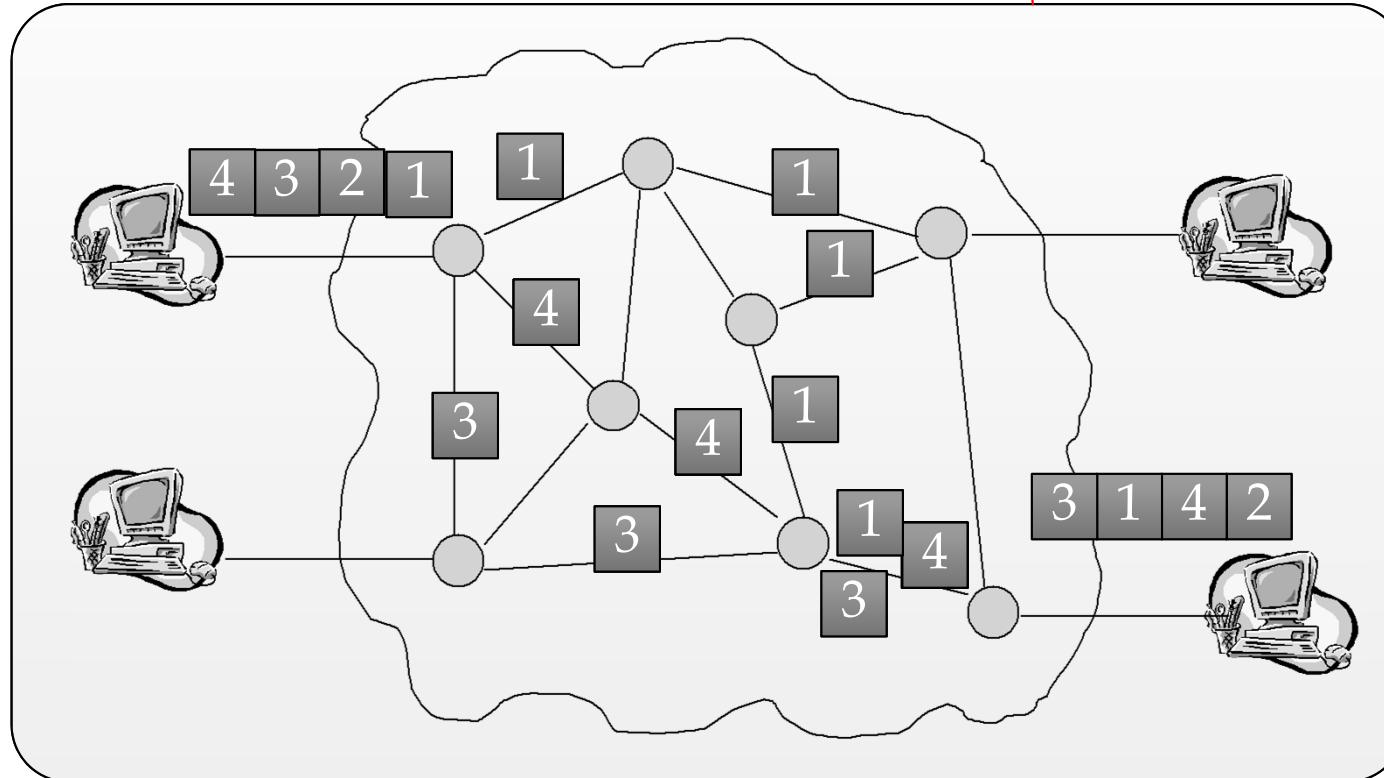
Transport layer

- Connection Control

គ្រប់គ្រល់ពាណិជ្ជកម្ម

- Connectionless

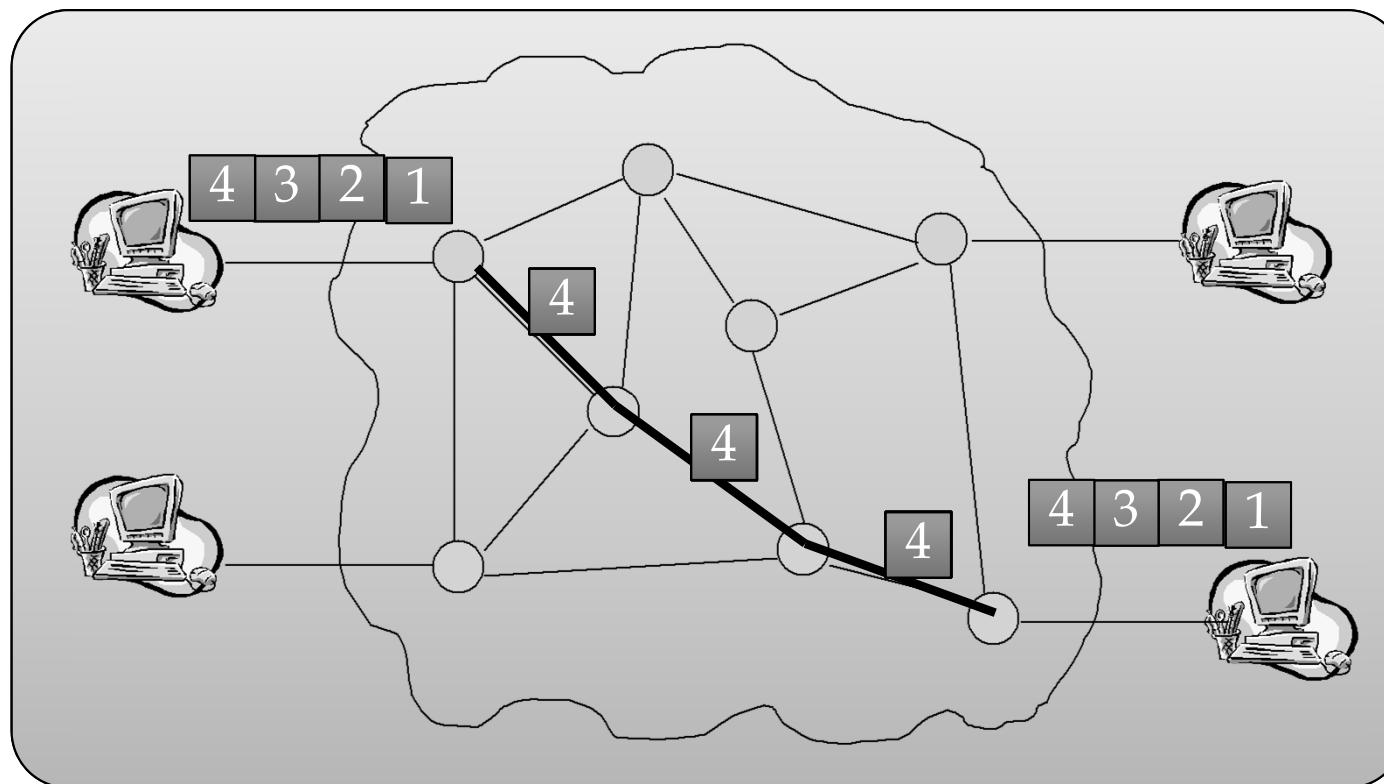
យកមកលាងវិញ — transport layer នេះត្រូវបង្កើតឡើង



Transport layer

- Connection Control
 - Connection-oriented

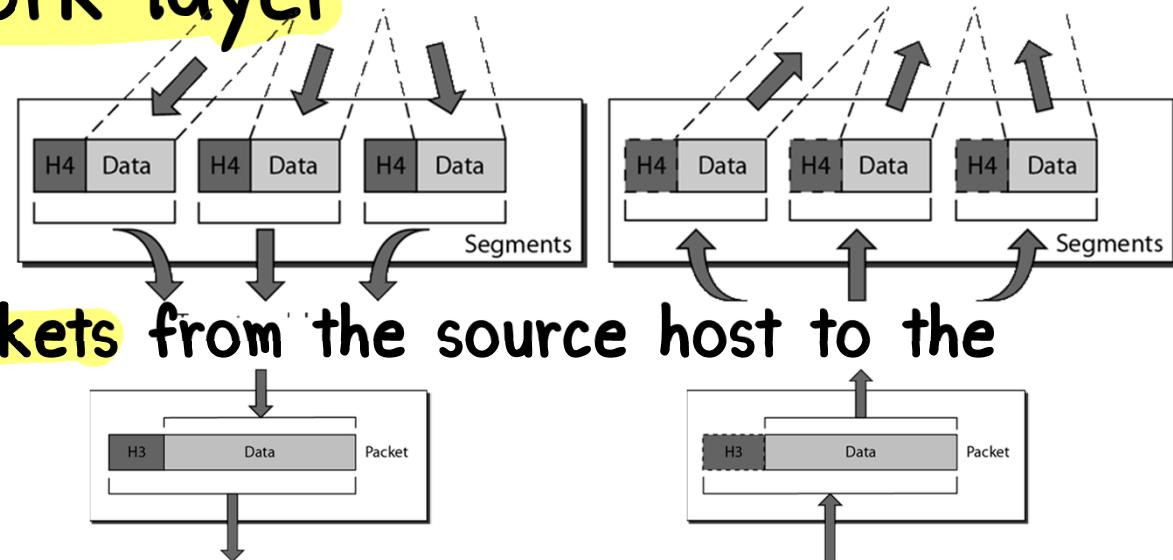
ເຕັມເນື່ອມານຸ່າ — ສະບັບສິນ



(3)

Network layer

QoS packet



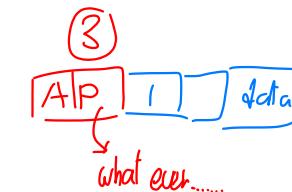
- Responsibility

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

- Guarantee packet delivery

- Service

Հայագիրություն



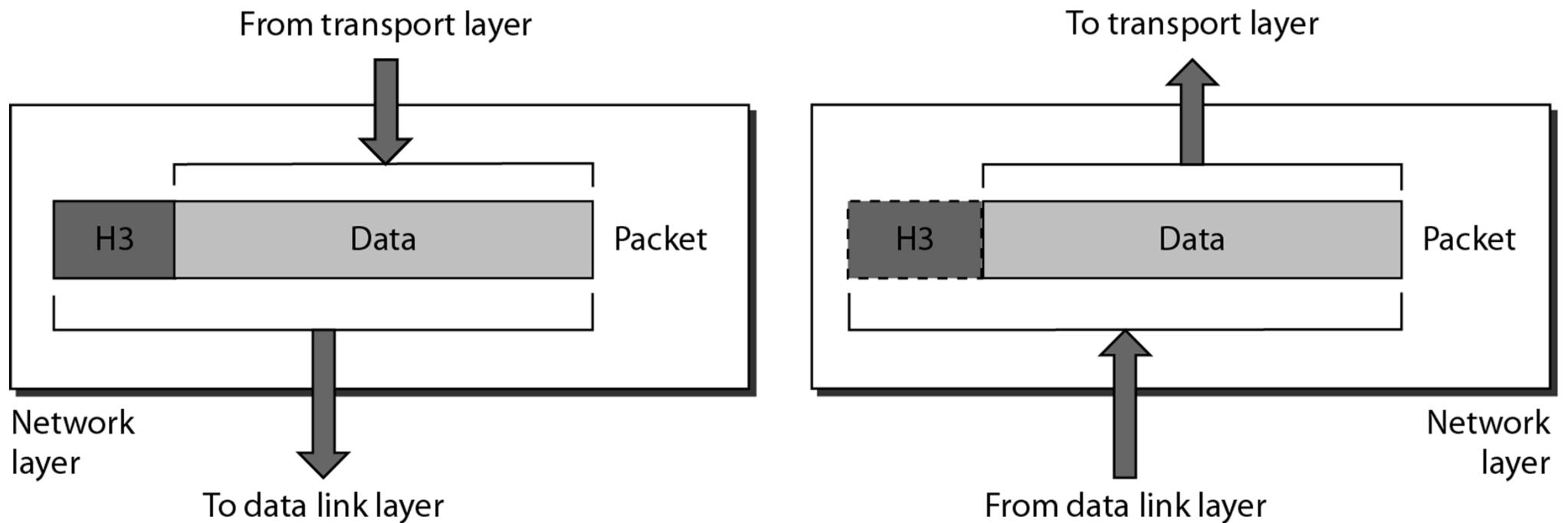
- Logical (Network) address (header): IP address

- Routing packets through internetworking device

- Router || Gateway

Layer 3 (Network Layer)

Network layer (Fig. 2.8)



ເຊື້ອໂລດຍິ່ງຂະໜາດ physical layer ແລະ ສັນນູມຂະໜາດ data link layer

② Data link layer

ຈົດຕັ້ງຂໍາຕະຫວັດ , ແກ້ໄຂ error

- 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

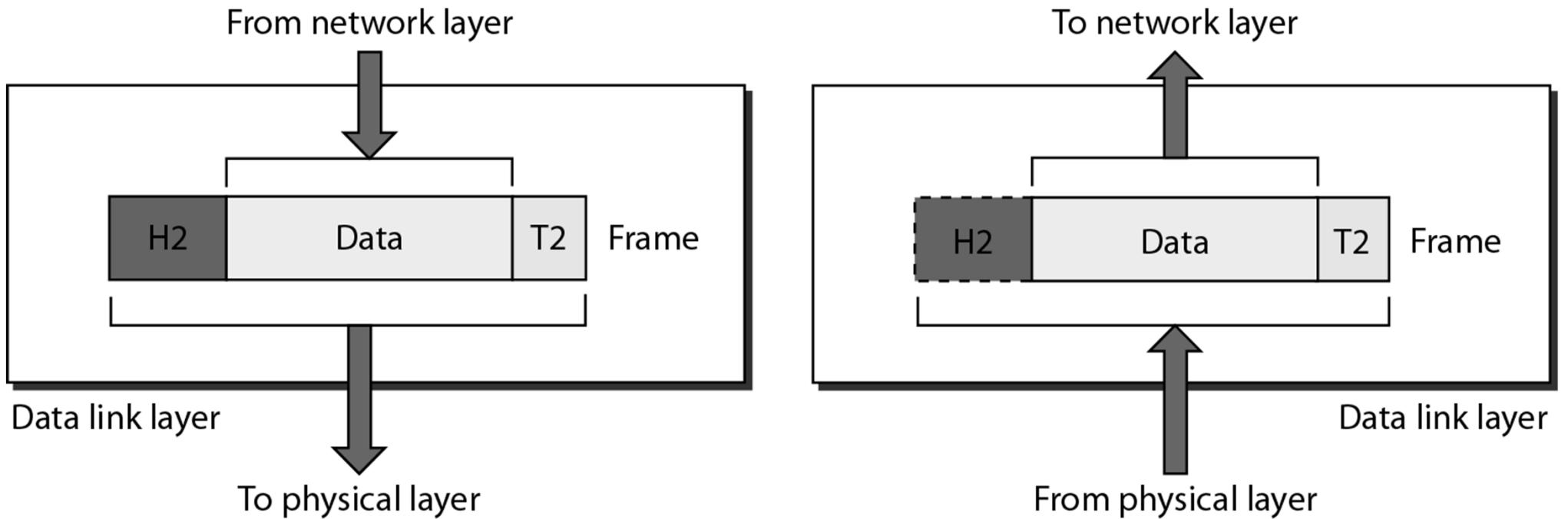
- Framing (adding header & trailer)
ຈົດຕັ້ງຂໍ້ມູນໃນຂະໜາດ Frame
ຈົບປະກັບຂັ້ນດີ່ນ node
- Physical addressing (MAC address: 12 digit hexadecimal (e.g. 080BFOAFDC09))
 - Same sender network : source & destination address
 - Outside sender network address : source & connecting devices (bridge, router, gateway)
ຕົກທຳມາດໄລ
ຕົກເປັນທີ່ຈະ node
- Flow control: frame acknowledgement, inform buffer size, etc.
- Error control: error detection and error correction
ຈົບເຈັດ ໂດຍ ໄກສ້າ, ຂໍາລັດລວ...
- Access control: checking accessibility (ex. Multipoint connection)
ເຂົ້າມີຢູ່ຢືນຢັນ ໃນ network ເພື່ອກັນ ຈົດຕັ້ງສົດໃນຂະໜາດ

ກົດຕັ້ງເພື່ອກັບດຸຈສັນດັບຮັບຈົບເຈັດ ໃນ “CSMA/CD”

Layer 2 (Data-Link Layer)

- ↳ កំណត់តាមប្រព័ន្ធបរិច្ឆេទសម្រាប់ផ្លូវ physical network និង physical address (MAC address) ដើម្បីនៅក្នុងសែរបានសម្រេចដោយការសម្រេចបញ្ជីអីមួយលើការសម្រេចបញ្ជីអីមួយលើការសម្រេចបញ្ជីអីមួយ
 - ↳ ជួយតាមតាមប្រព័ន្ធឌីឡូវर៉ែន layer ទី 2 “ frame ”
 - ↳ ឧប្បម្ព layer 2 ដោយពេញ LAN , WAN
 - ↳ LAN ចំពោះមានពេញ 2 sublayer
 - ↳ Logical Link Control (LLC)
 - ↳ ធ្វើដំឡើង layer ទី 2 ដូចខាងក្រោម ក្រឡែង - សំណើអីមួយ
 - ↳ layer ទី 2 មានប្រព័ន្ធដែលចូលរួមជាមួយគ្នា និងការសម្រេចបញ្ជីអីមួយ ដូច LLC ឬ IEEE 802.1Q ឬ IEEE 802.11
 - ↳ MAC Address
 - ↳ ធ្វើដំឡើង layer ទី 1 ដូចខាងក្រោម ក្រឡែង - សំណើអីមួយ
 - ↳ ដែលមានការសម្រេចបញ្ជីអីមួយ ក្រឡែងនៃគ្មានឱ្យ “ frame check sequence (FCS) ”
 - ↳ ដែលរាយការនៃសម្រាប់ផ្លូវ ដើម្បីកែតែបញ្ជីអីមួយ ក្នុងការបញ្ចូល
 - ↳ ហើយ “ CSMA/CD ”
 - ↳ ក្នុងការបញ្ចូលនៃការបញ្ចូលនៃសម្រាប់ផ្លូវ ethernet
 - ↳ ដែលមានការបញ្ចូល មិនបានសម្រេចបញ្ជីអីមួយ (jam - signal) ដើម្បីបញ្ជូនឈាមការបញ្ចូល នៅក្នុងការបញ្ចូលនៃការបញ្ចូល

Data link layer (Fig. 2.6)



①

Physical layer

(សំណើលក់ដោយ layer ដីមេដៃរក្សា “បិត” 010110101 ...)

- 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)

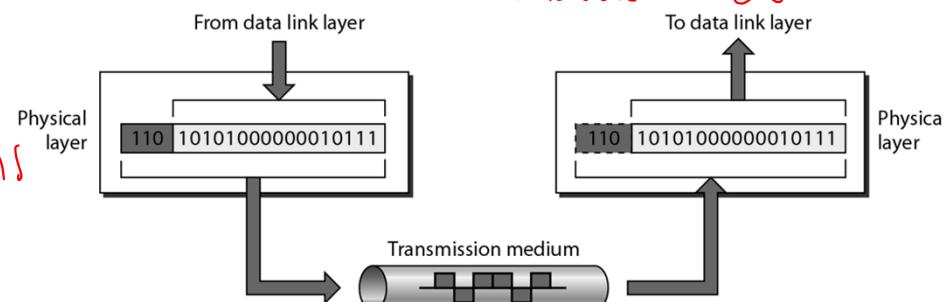
- Data rate — រៀងរាល់ទឹនតាមពីរ (bit/s)

- Bit synchronization — ការចូលរួមរាយពីរពីរ សង្គមពីរ

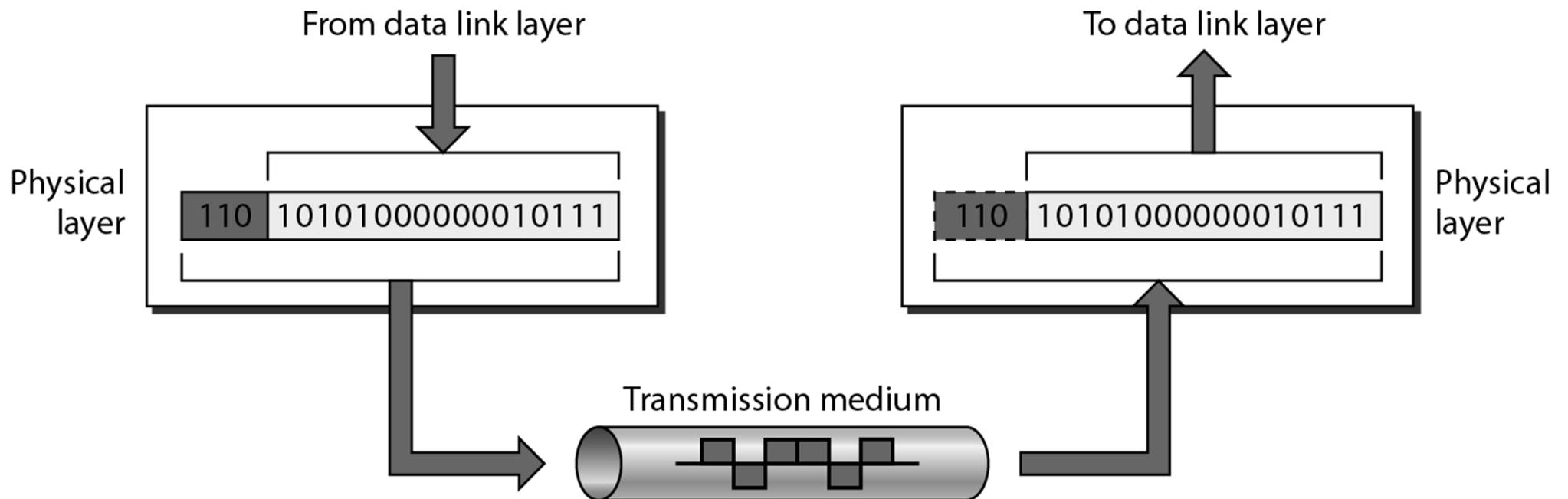
- Line configuration & Topology

- Transmission mode (Simplex, Half-duplex, Full-duplex)

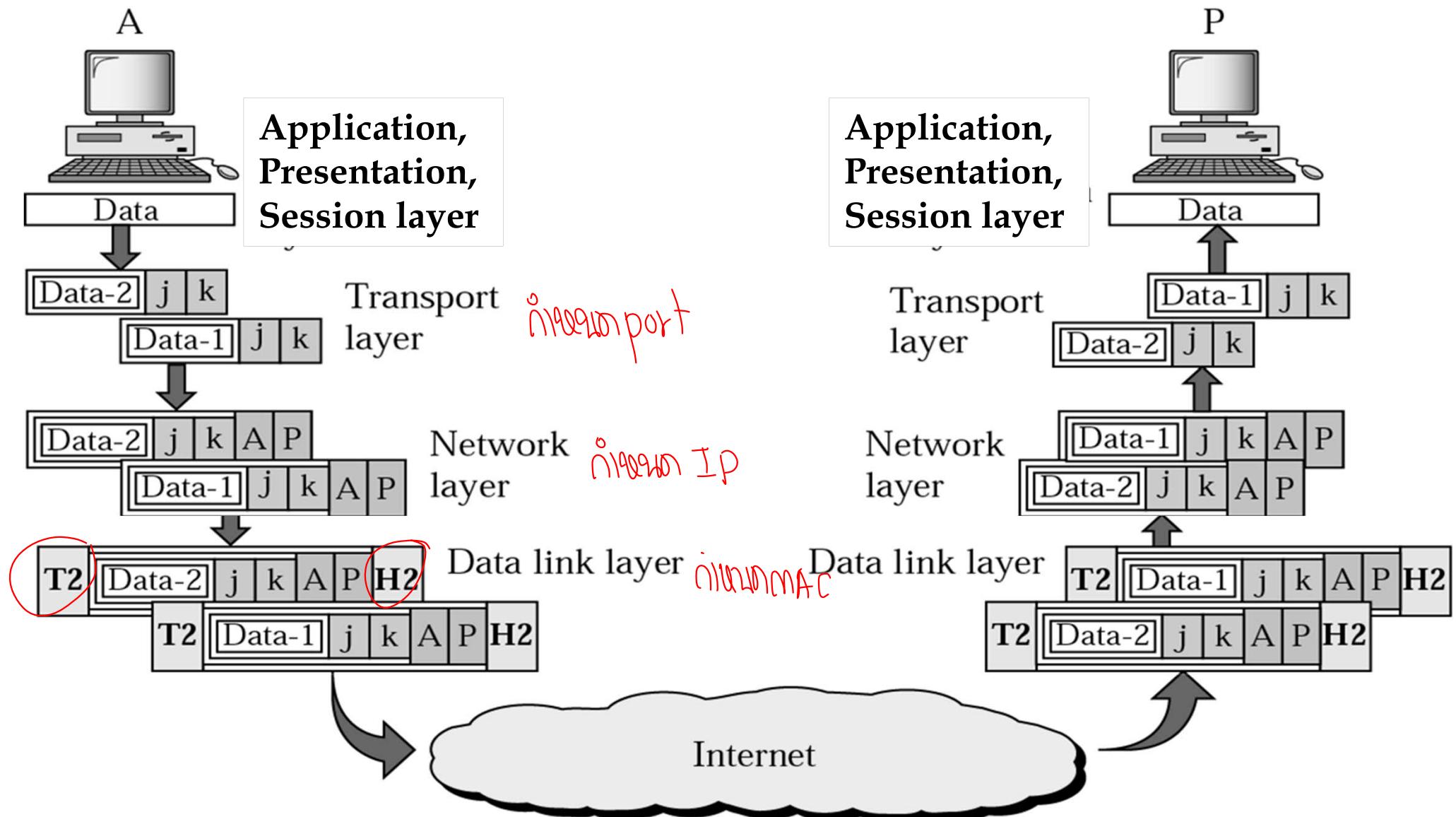
កំណត់របៀបប្រើប្រាស់សម្រាប់ការប្រើប្រាស់ កំណត់របៀបប្រើប្រាស់ការសំឡែង
Bus ring star



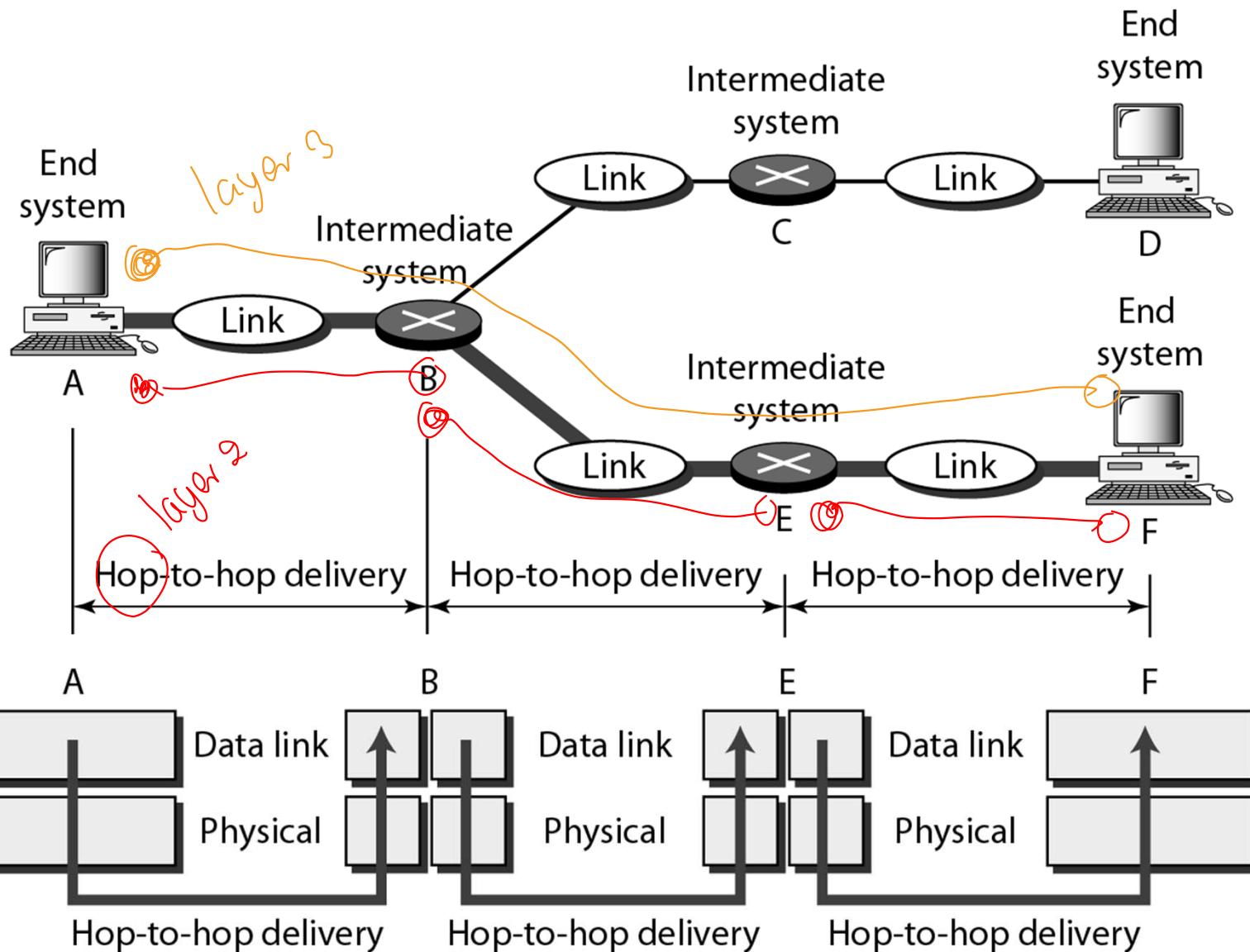
Physical layer (Fig. 2.5)



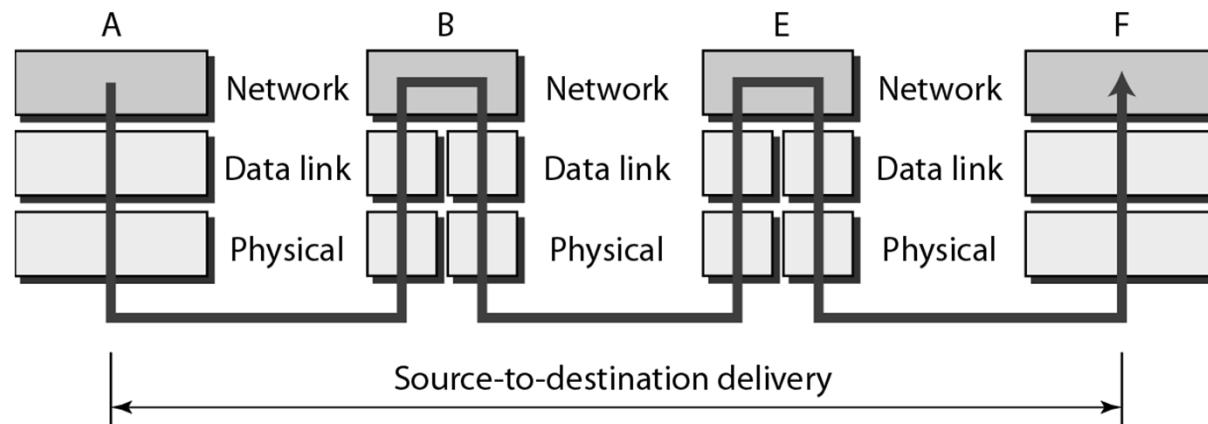
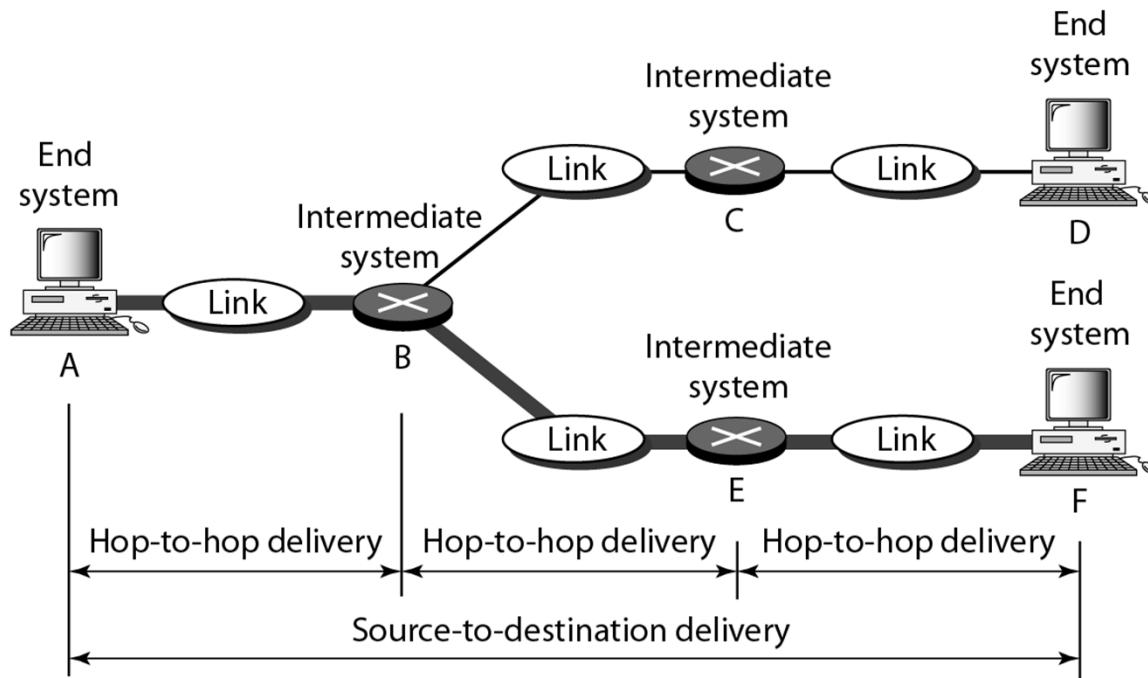
Transport and Network Layer Example



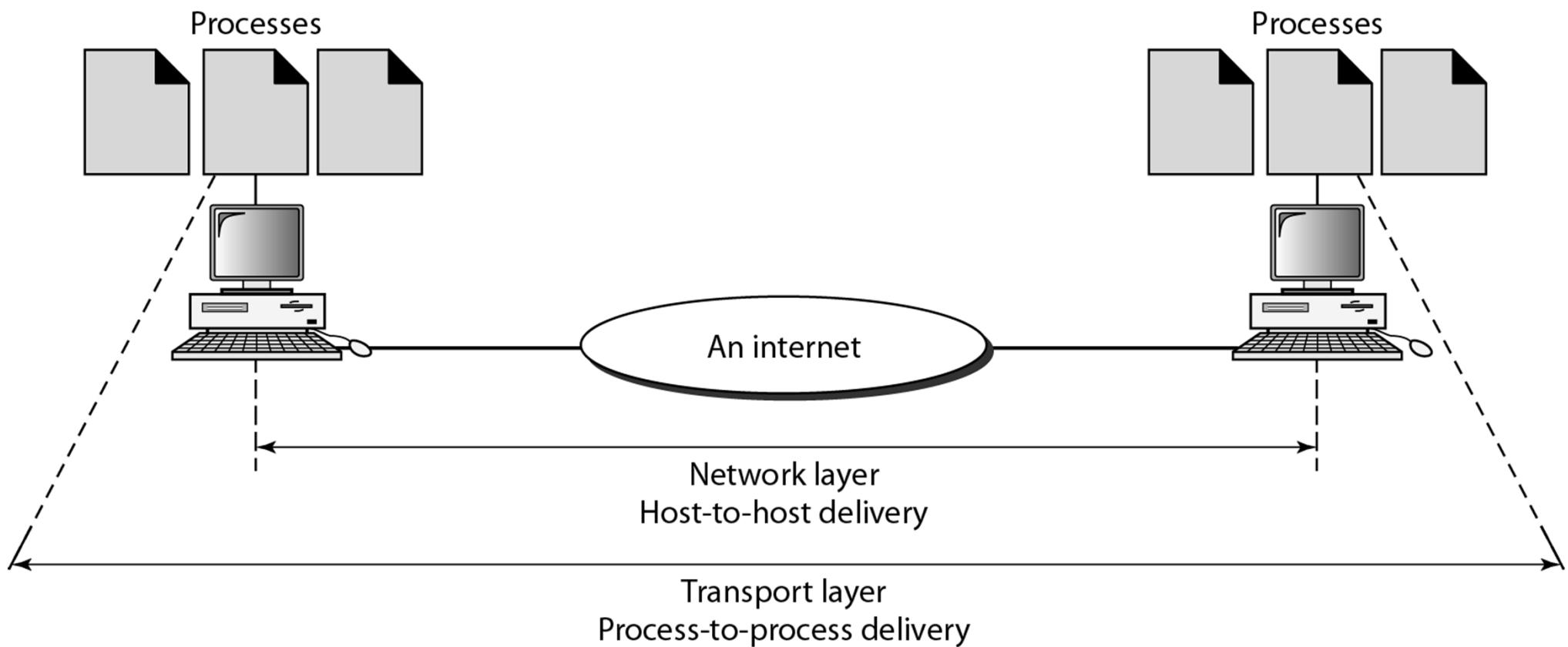
Hop-to-hop delivery (Fig. 2.7)



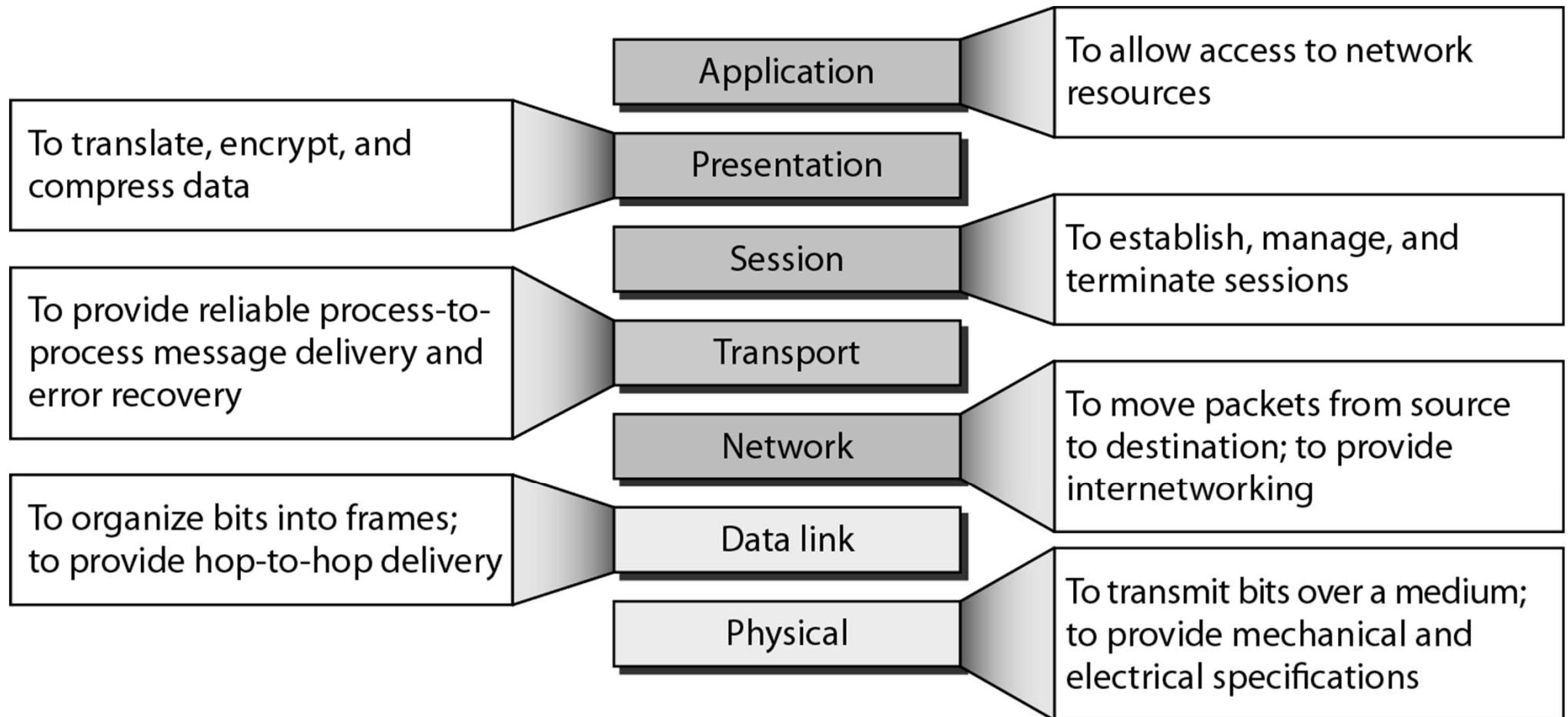
Source-to-destination delivery (Fig. 2.9)



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



Summary of layers (Fig. 2.15)

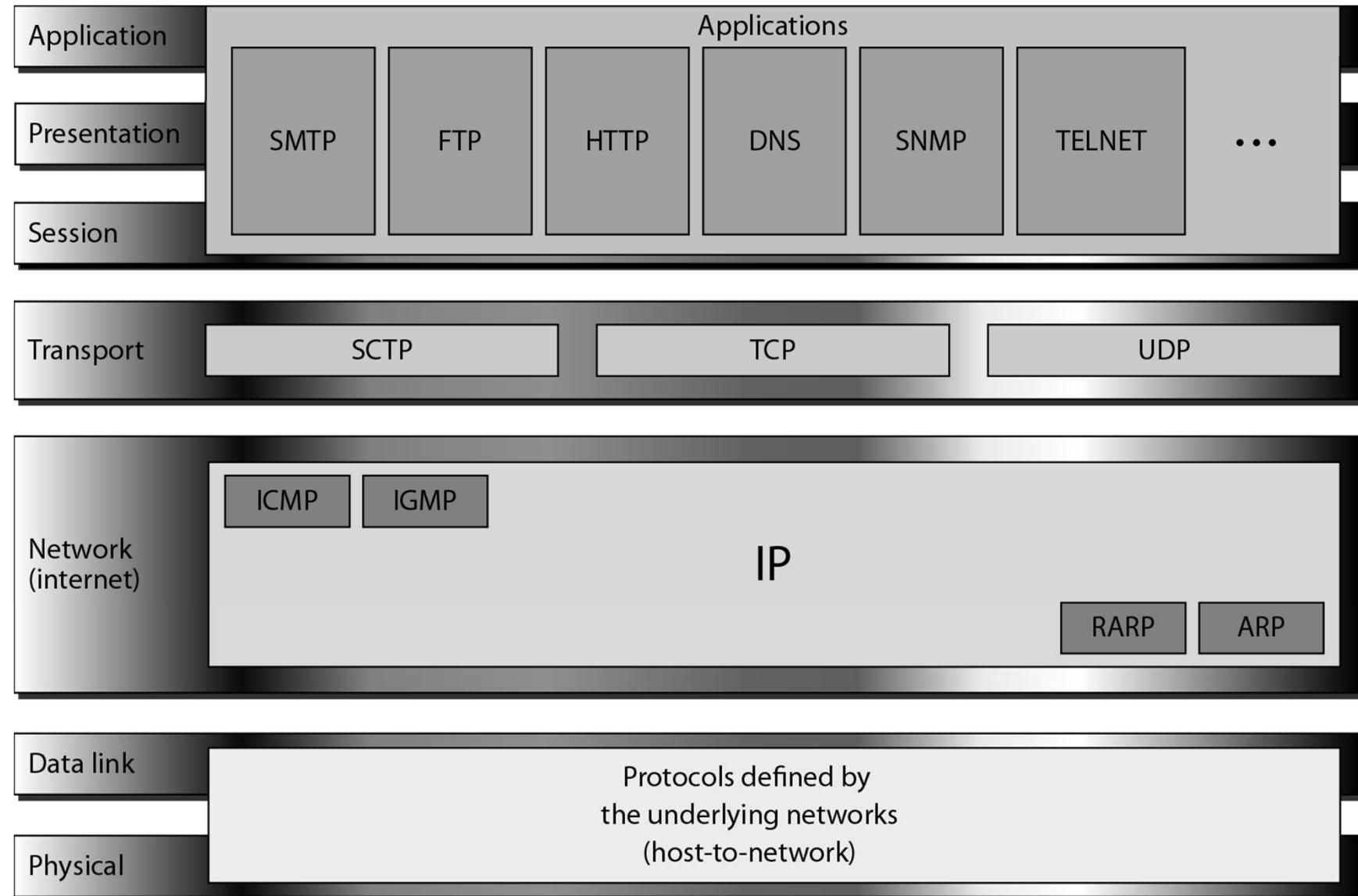


TCP/IP PROTOCOL SUITE

సిపిఎప్పు క్లోవర్స్‌ప్రోటోకాల్స్

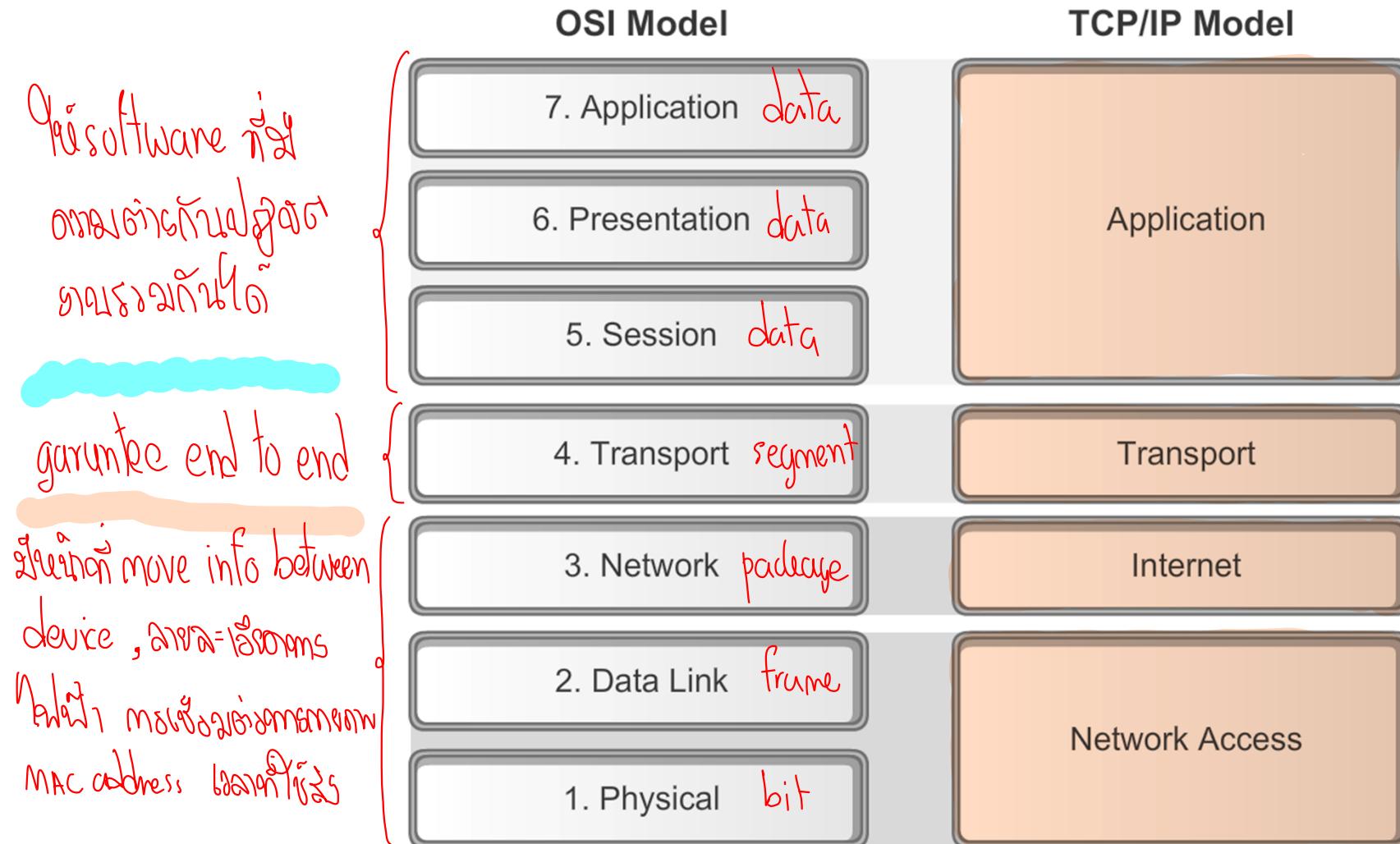
- Physical and Data Link Layers
- Network Layer
- Transport Layer
- Application Layer

TCP/IP and OSI model (Fig. 2.16)



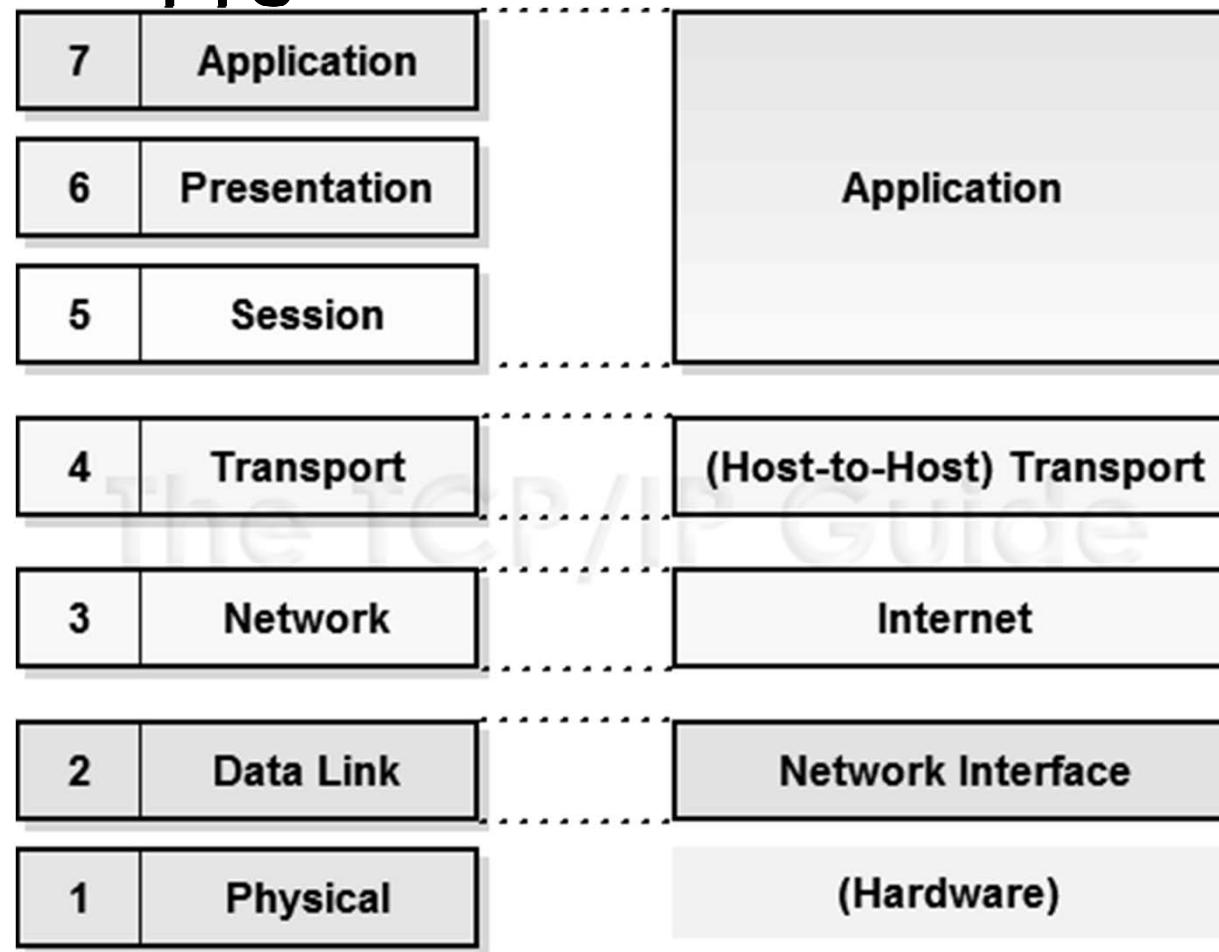
Comparison of OSI and TCP/IP

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



Comparison of OSI and TCP/IP

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



OSI Model

TCP/IP Model

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

OSI 2000 (OSI 2000)
TCP 2000 (TCP 2000)