

Network Model

ผศ. ดร. อนันต์ ผลเพิ่ม

Asst. Prof. Anan Phonphoem, Ph.D.

anan@cpe.ku.ac.th

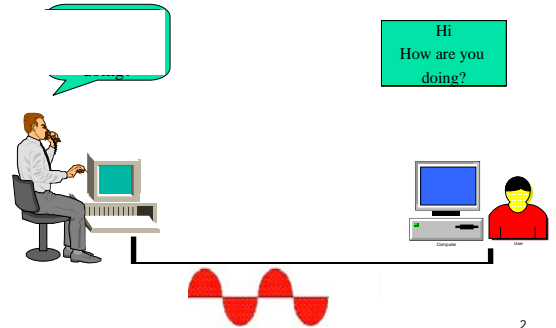
<http://www.cpe.ku.ac.th/~anan>

Computer Engineering Department

Kasetsart University, Bangkok, Thailand

1

Data Communication



2

How can it happen?

- A lot of work since user inputs data until the data is transmitted.
- Should each application program take care all tasks?
 - NO

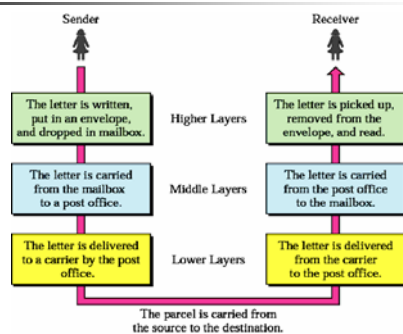
3

Computer Communication Model

- Modularity
- Well-defined interfaces
- Well-defined functions and protocol

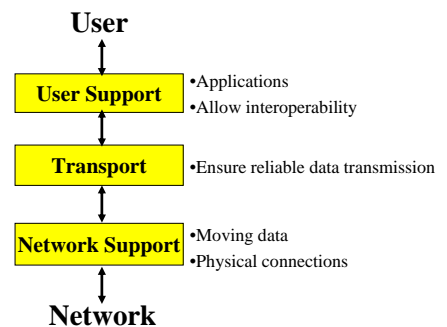
4

Transmit a letter



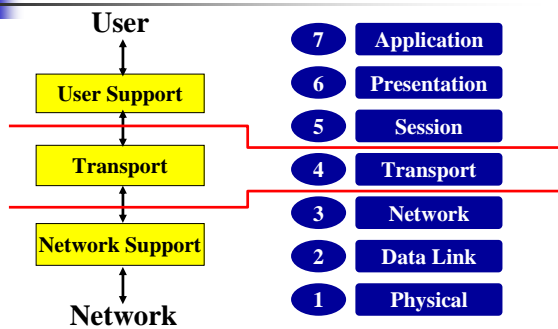
5

Layered Architecture



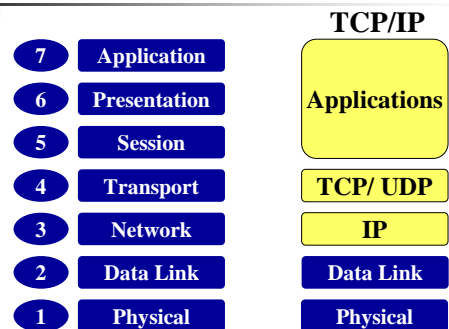
6

Open Systems Interconnection (OSI) Model



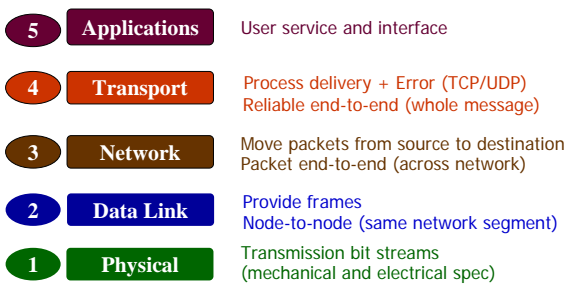
7

OSI model “It’s just a model”



8

TCP/IP Protocol Suite (Internet Model)



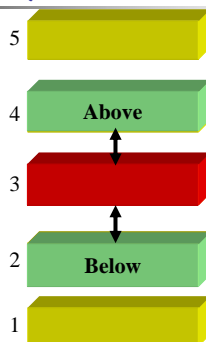
9

Layering Concept

1. Interfaces between layers (Physical)
2. Peer-to-Peer process (Logical)

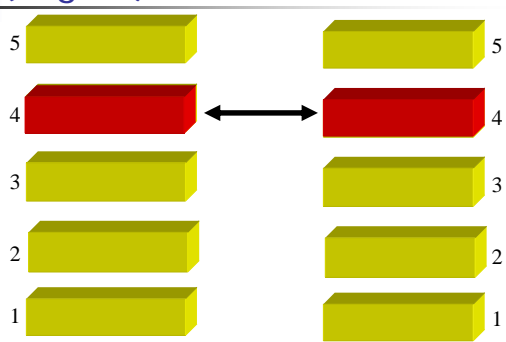
10

1. Interfaces between layers (Physical)



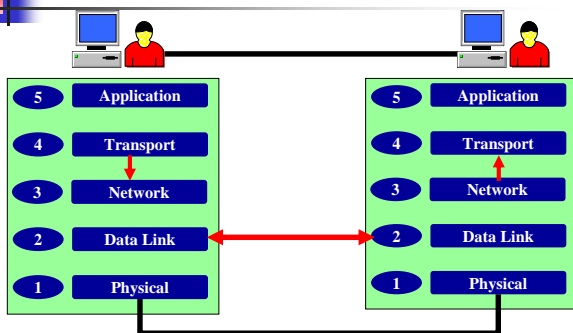
11

2. Peer-to-Peer process (Logical)



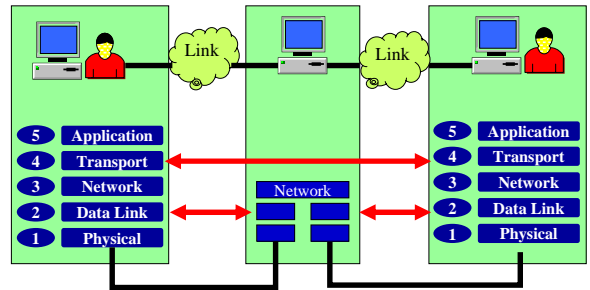
12

Direct connection



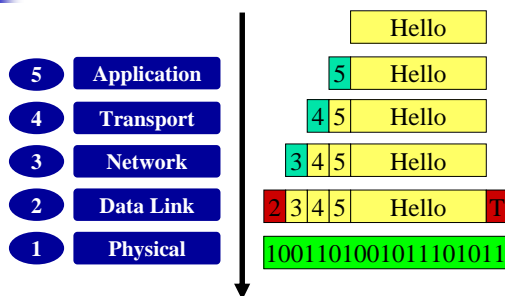
13

Connection via intermediate nodes



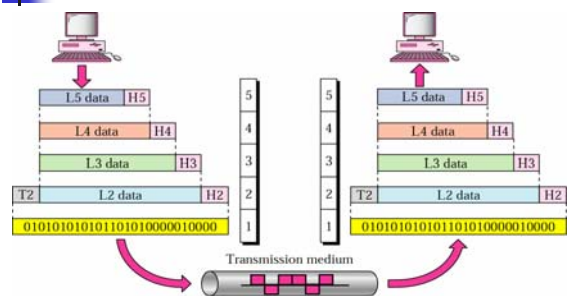
14

Data Flow in a station



15

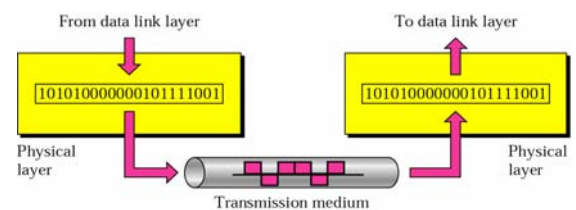
Data Flow



16

OSI Model and data flow

Physical Layer



Transmitting individual bits from one node to the next.

17

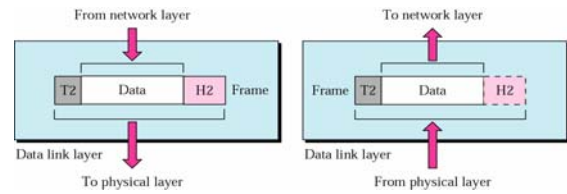
18

1. Physical Layer

- Physical characteristics of interface
- Stream of Bits (e.g., 001010100100)
- Line config. (e.g., point-to-point)
- Topology (e.g., bus, star)
- Transmission mode (e.g., half-duplex)

19

Data Link Layer



Transmitting frames from one node to the next.

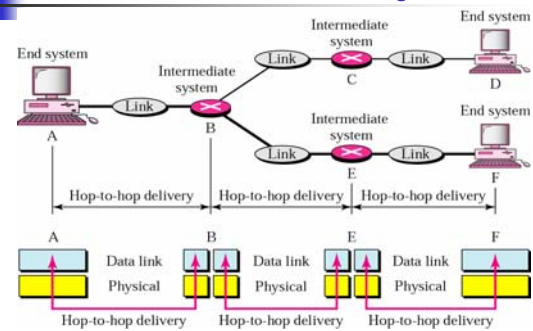
20

2. Data Link Layer

- Physical addressing
- Access control
- Error control
- Node-to-Node delivery** (same network)

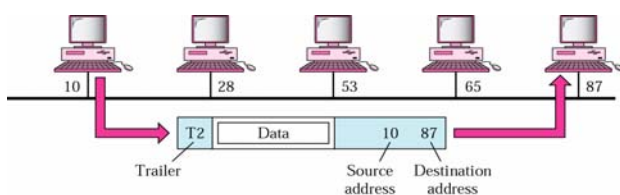
21

Node-to-node delivery



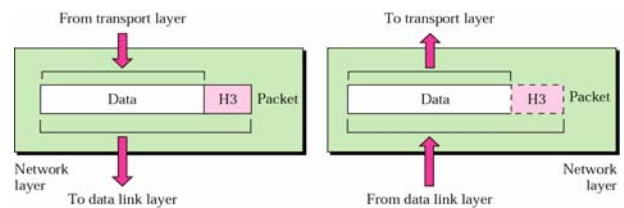
22

2. Data Link Layer Example



23

3. Network Layer



Delivery of packets from the source to the final destination

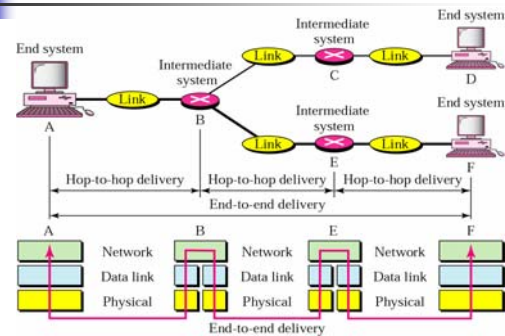
24

3. Network Layer

- Logical Address
(e.g., IP address: 158.108.33.66)
- Routing (router, gateway)

25

Source-to-destination delivery

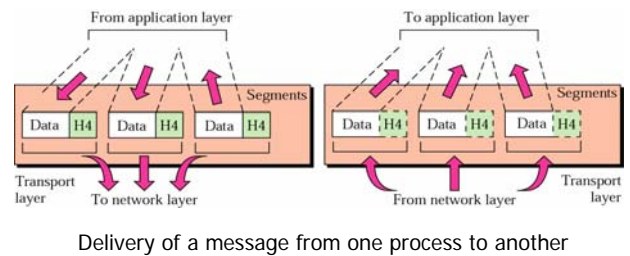


26

3. Network Layer Example

27

4. Transport Layer



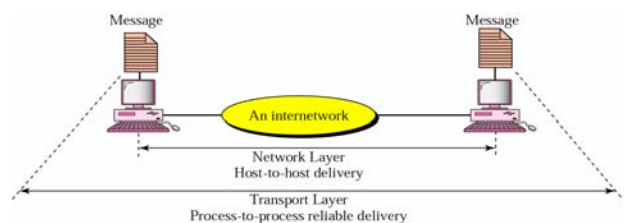
28

4. Transport Layer

- Service-point addressing (port number)
- Segmentation and assembly
- Flow and error control
- End-to-end delivery (across network)

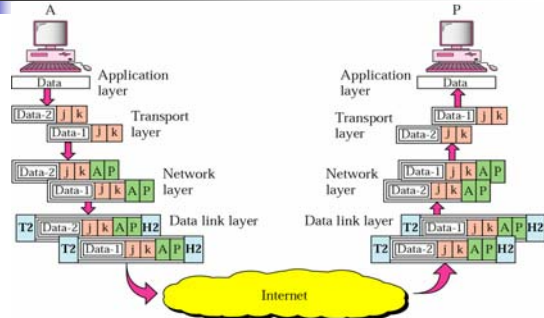
29

Process-to-process delivery



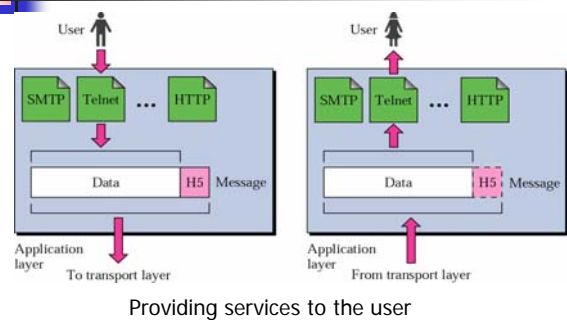
30

Process-to-process delivery



31

5. Application Layer



32

5. Application Layer

- User interfaces
- Service supports (e.g., mail, FTP)

33

TCP/IP Protocol Suite (Internet Model)

- | | | |
|---|---------------------|---|
| 5 | Applications | User service and interface |
| 4 | Transport | Process delivery + Error (TCP/UDP)
Reliable end-to-end (whole message) |
| 3 | Network | Move packets from source to destination
Packet end-to-end (across network) |
| 2 | Data Link | Provide frames
Node-to-node (same network segment) |
| 1 | Physical | Transmission bit streams
(mechanical and electrical spec) |

34

OSI Model

- | | | |
|---|---------------------|-------------------------------------|
| 7 | Application | User service |
| 6 | Presentation | Translate format, encrypt |
| 5 | Session | Session manage, checkpoints |
| 4 | Transport | Reliable end-to-end (whole message) |
| 3 | Network | Packet end-to-end (across network) |
| 2 | Data Link | Node-to-node (same network segment) |
| 1 | Physical | Physical |

35