The OSI Model

- Open Systems Interconnection (OSI).
- Developed by the International Organization for Standardization (ISO).
- Model for understanding and developing computer-to-computer communication architecture that is flexible, robust and interoperable.
- It is not a protocol.
- Developed in the 1980s.
- Divides network architecture into seven layers.

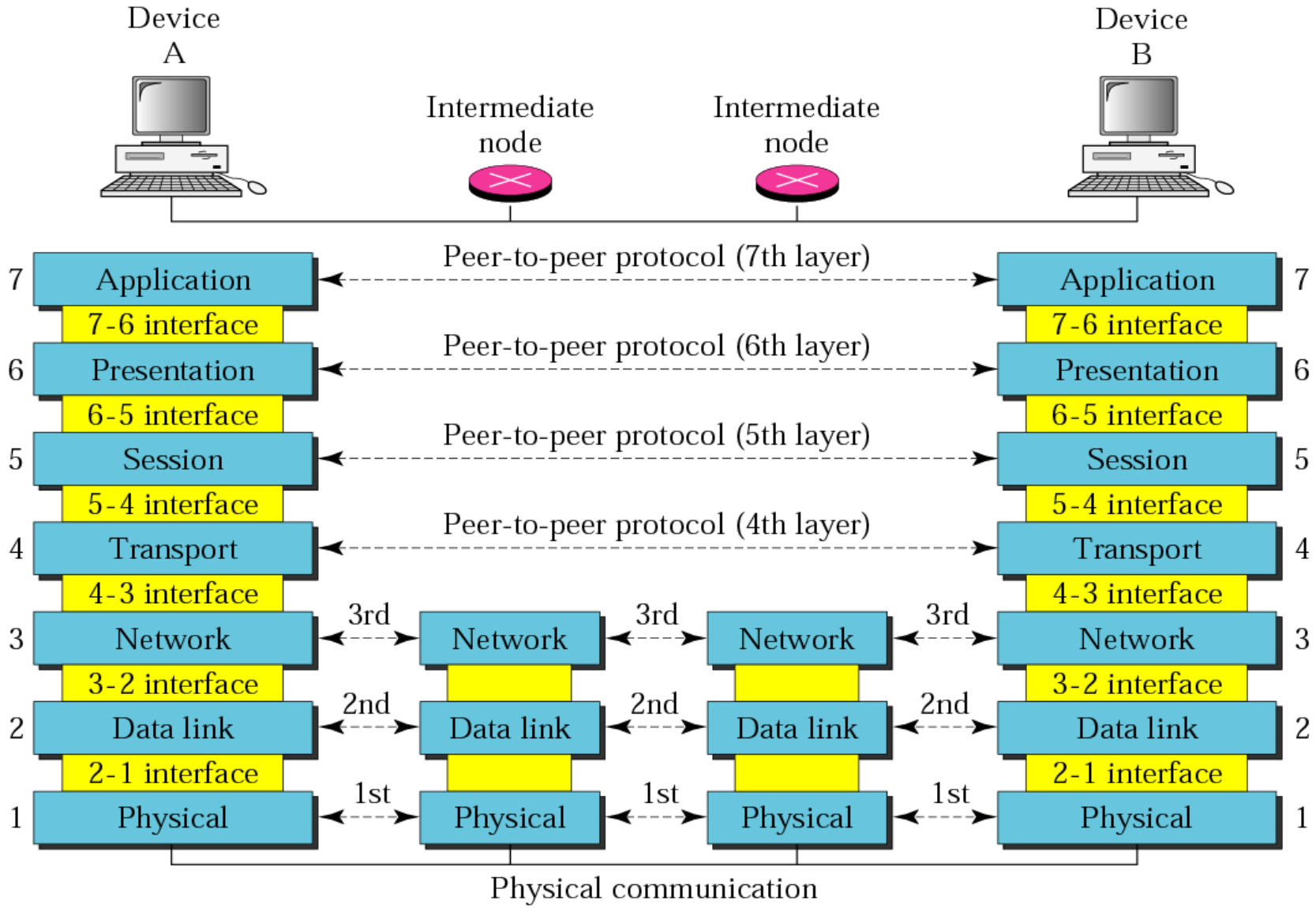
OSI cont.

- Each layer performs a subset of the required communication functions
- Each layer relies on the next lower layer to perform more primitive functions
- Each layer provides services to the next higher layer
- Changes in one layer should not require changes in other layers
- Layer 1,2,3 are the network support layer, deals with the physical aspects of moving data from one device to another.
- Layer 5,6,7 are the user support layer, allow the interoperability among unrelated software.
- Layer 4 ensures that what the lower layer have transmitted is in a form that the upper layers can use.

OSI layer

- Application layer
- Presentation layer
- Session layer
- Transport layer
- Network layer
- Data Link layer
- Physical layer

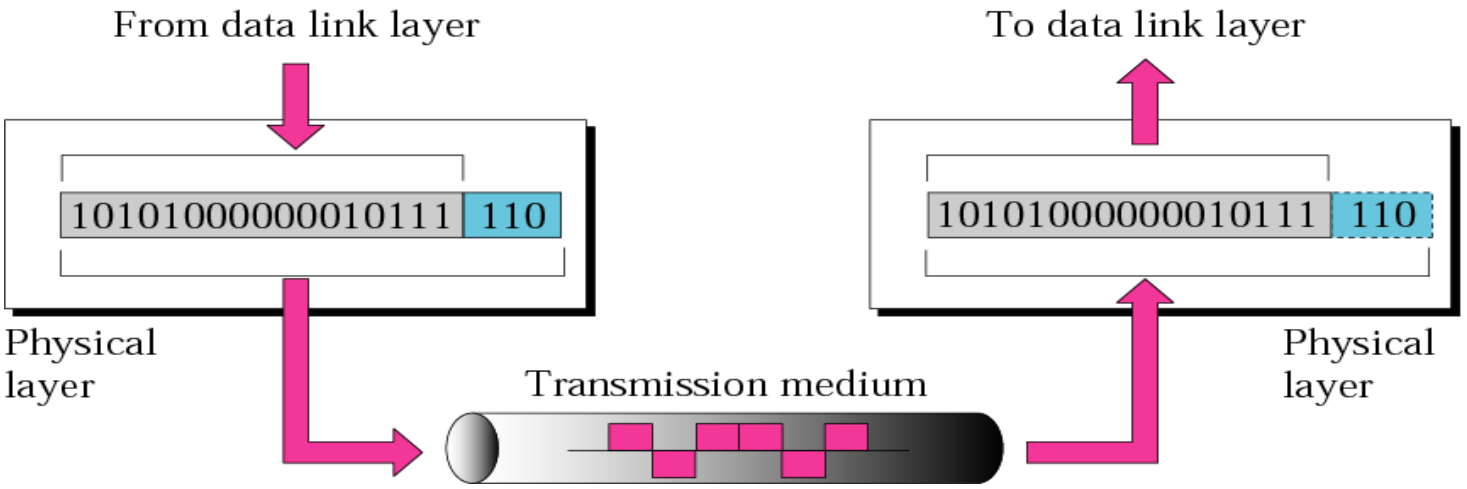
OSI layer


Device A
Device B
Intermediate node
Intermediate node
Peer-to-peer protocol (7th layer)
Peer-to-peer protocol (6th layer)
Peer-to-peer protocol (5th layer)
Peer-to-peer protocol (4th layer)
7 Application
7-6 interface
6 Presentation
6-5 interface
5 Session
5-4 interface
4 Transport
4-3 interface
3 Network
3-2 interface
2 Data link
2-1 interface
1 Physical
3rd
2nd
1st
Physical communication

Layer 1: Physical Layer

- Responsible of:
  - Transmitting individual bits from one to the next.
  - Physical characteristics of interface and media.
  - Representation of bits: a stream of bit(0s,1s),
  - Data rate.
  - Synchronize of bits
  - Line configuration
  - Physical topology
  - Transmission mode

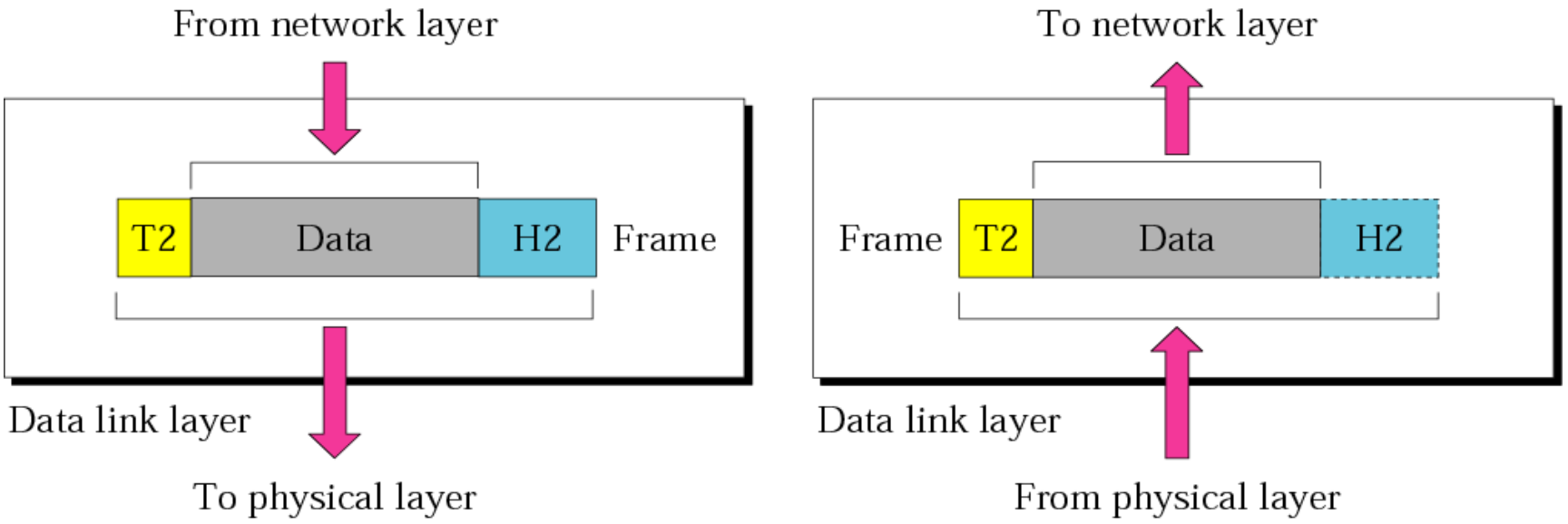
Physical Layer cont.



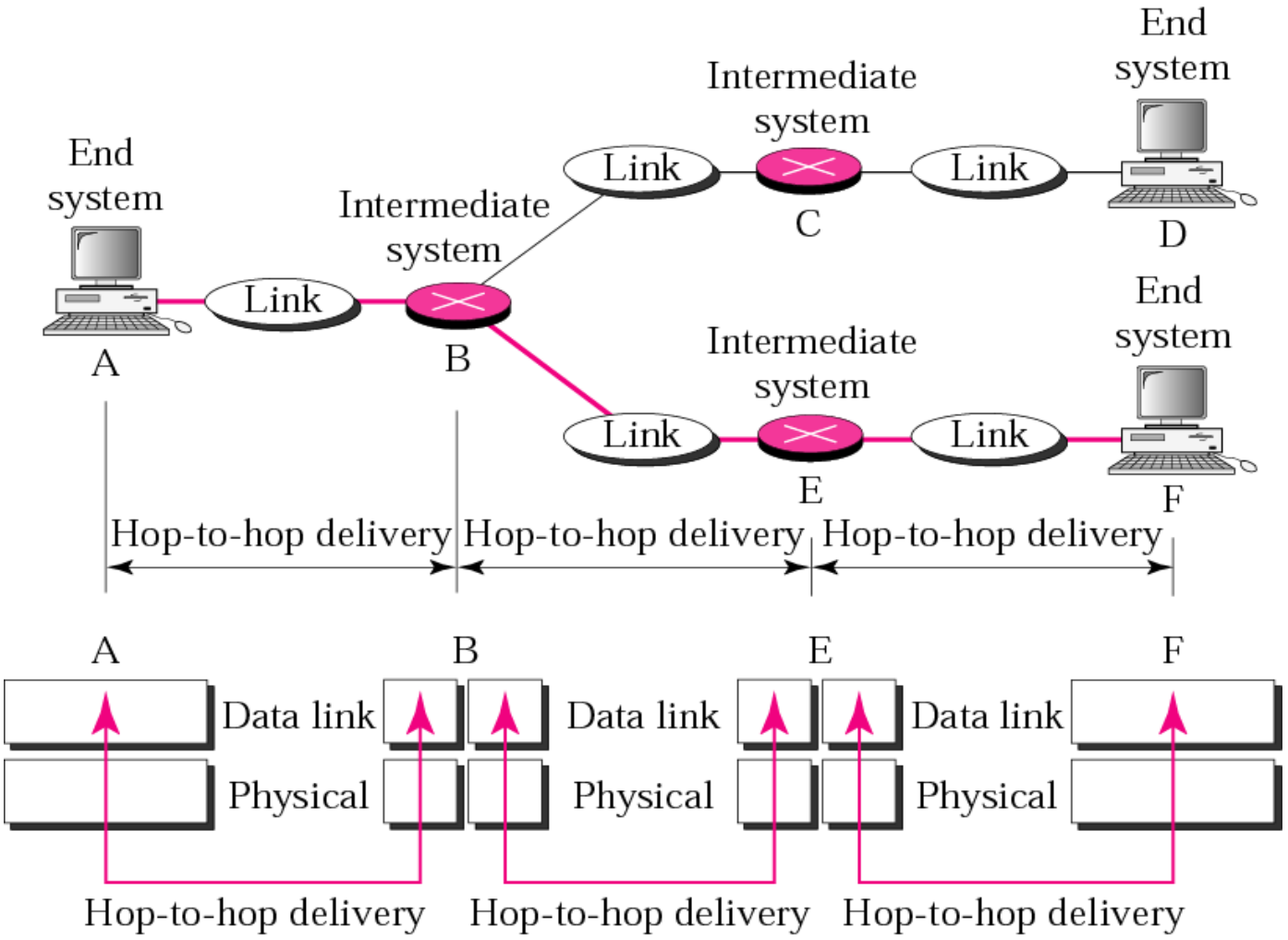
Layer 2: Data Link layer

- Responsible of:
  - Moving frames from one hop (node) to the next.
  - Framing: divided the stream of bits received from the network layer manageable data units called frames.
  - Physical address (MAC address).
  - Flow control.
  - Error control: added trailer to the end of frame.
  - Access control.
  - Hop to hop delivery

Data Link layer cont.



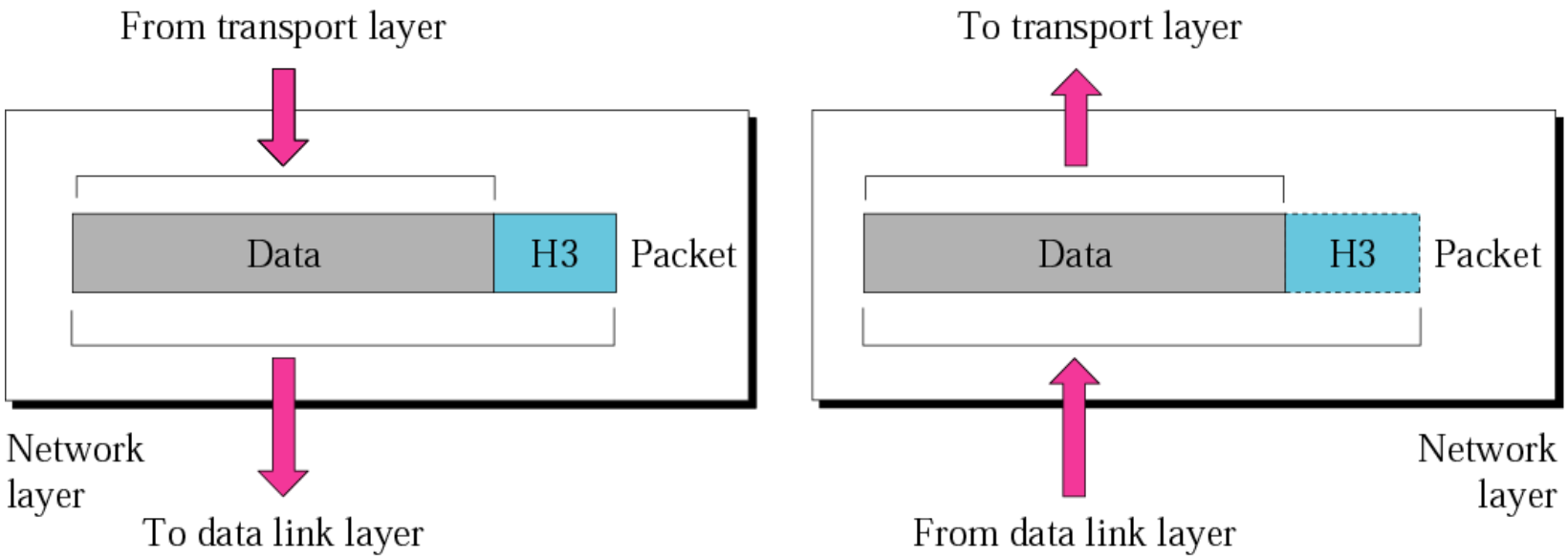
Hop-to-Hop delivery



Layer 3: Network Layer

- The network layer is responsible:
  - The delivery of individual packets from the original source to the final destination .
  - Logical addressing: if the packet passes the network boundary we need another addressing system to help (source to destination) connection.
  - Routing : route or switch the packet to final destination.
  - Source-to-destination delivery (End-to-End).

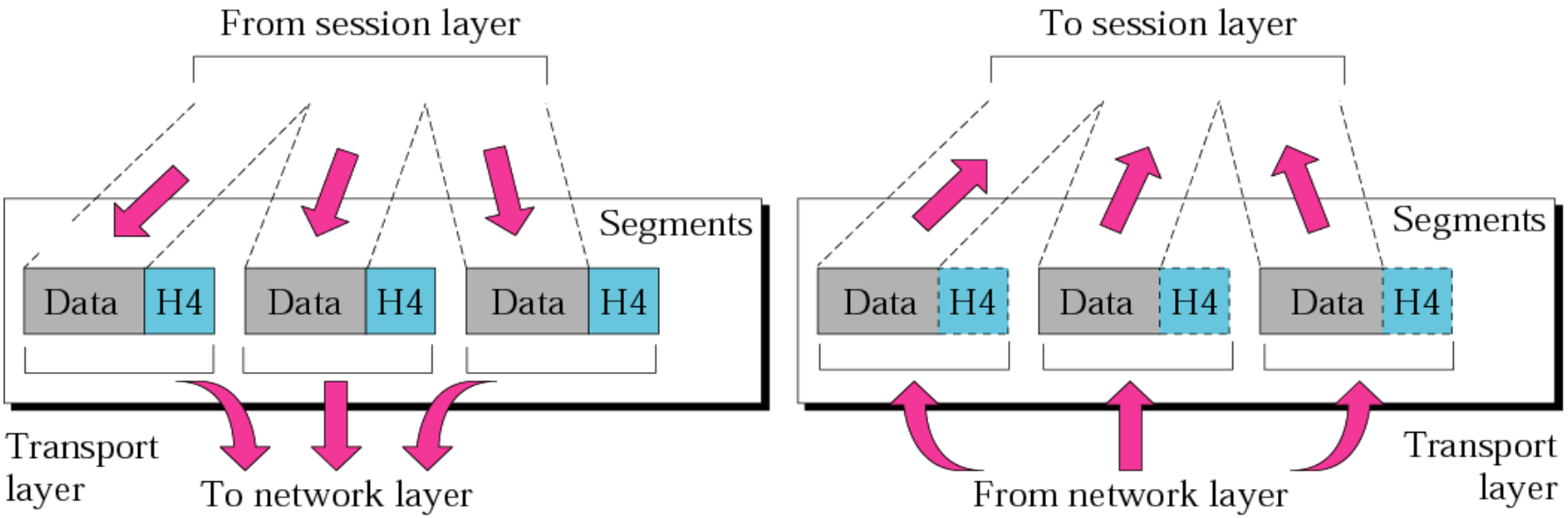
Network Layer cont.



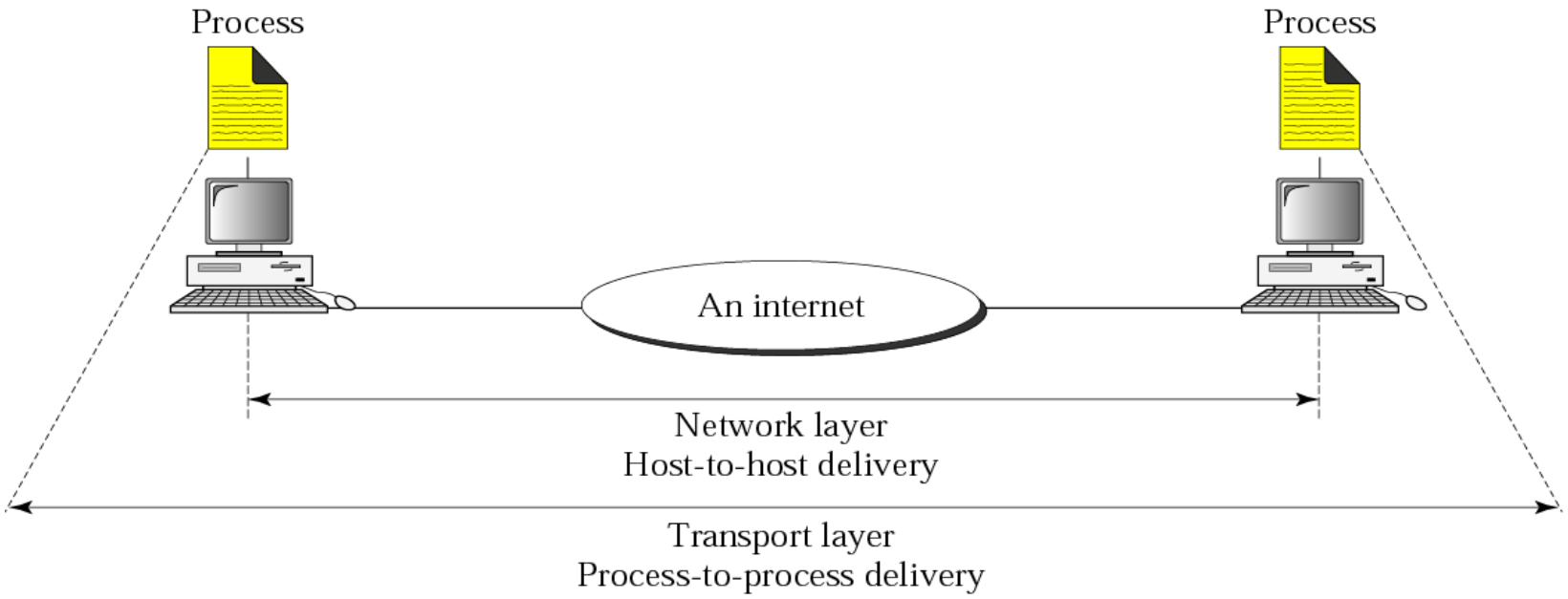
Layer 4: Transport Layer

- The transport layer is responsible for:
  - **Service point or Port addressing**
  - **Segmentation and reassembly** : a message is divided into transmittable segments each segment containing a sequence no.
  - **Connection Control**: connection oriented or connectionless.
  - **Flow control**
  - **Error control**

Transport Layer cont.



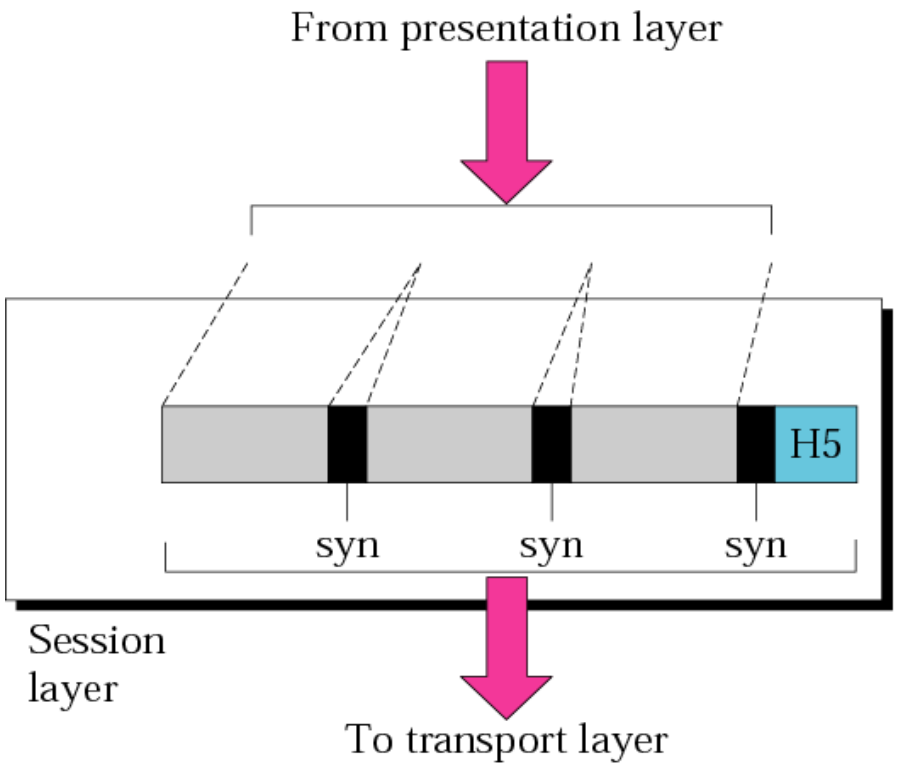
Reliable process-to-process delivery of a message

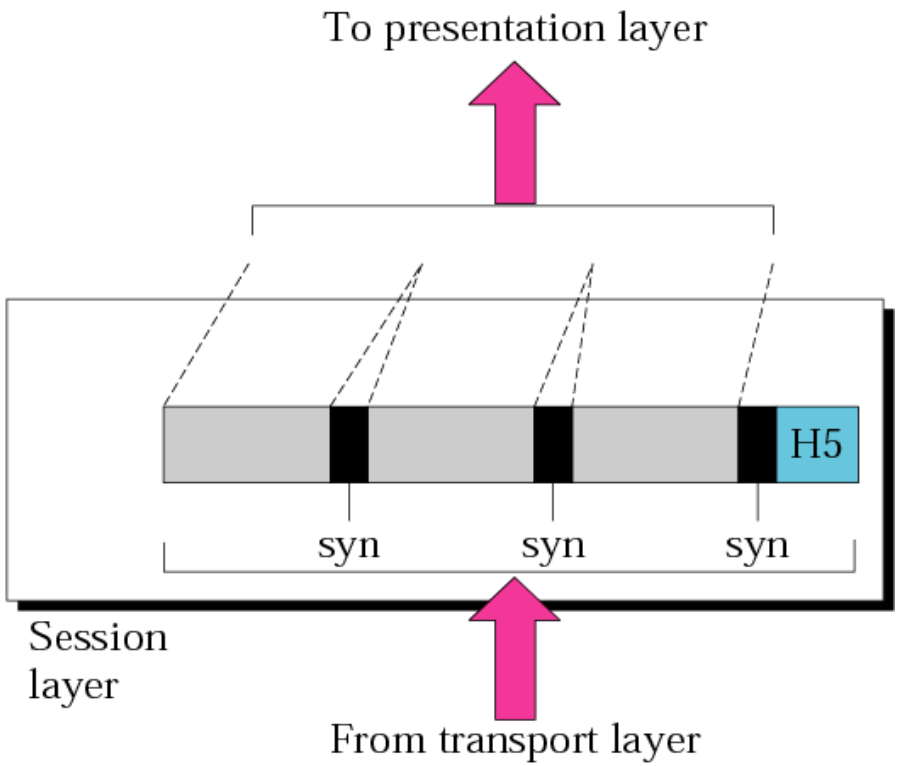


Layer 5: Session Layer

- Dialog control: design to establish, maintain, and synchronize the interaction between communicating systems.
- Synchronization: it allows a process to add checkpoints or synchronization points to a data stream.

Session Layer cont.

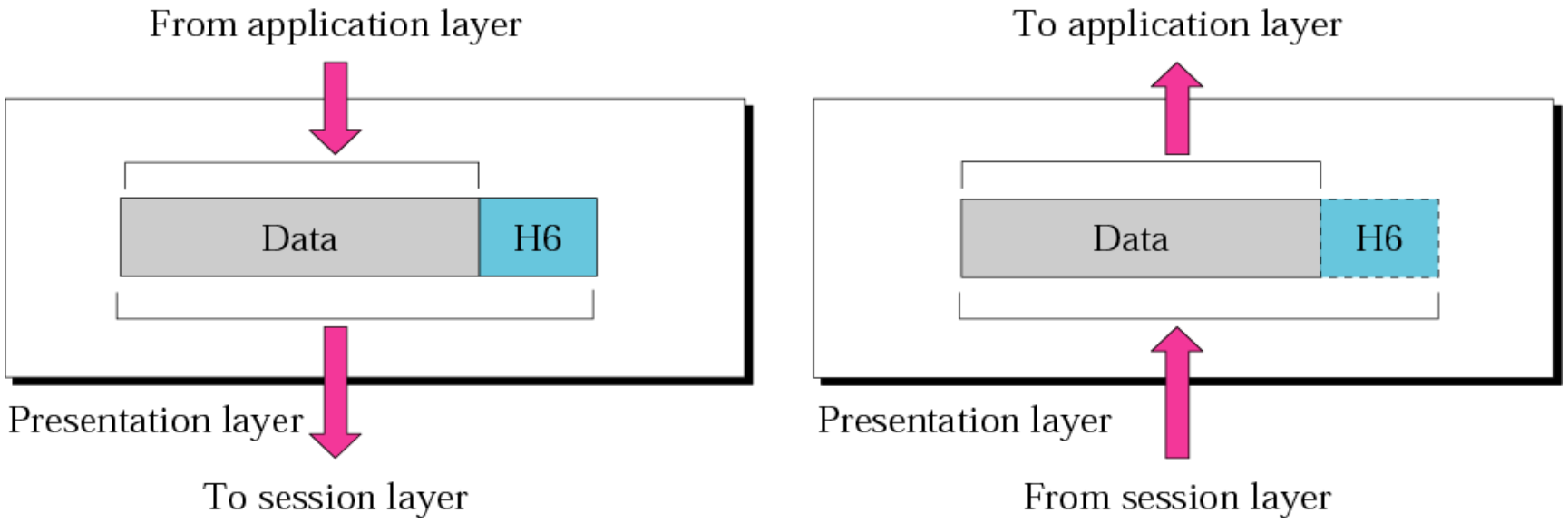




Layer 6 :Presentation Layer

- Design to the handle the syntax and semantic of the information exchanged between 2 systems.
- And design for data translation, encryption, decryption, and compression.

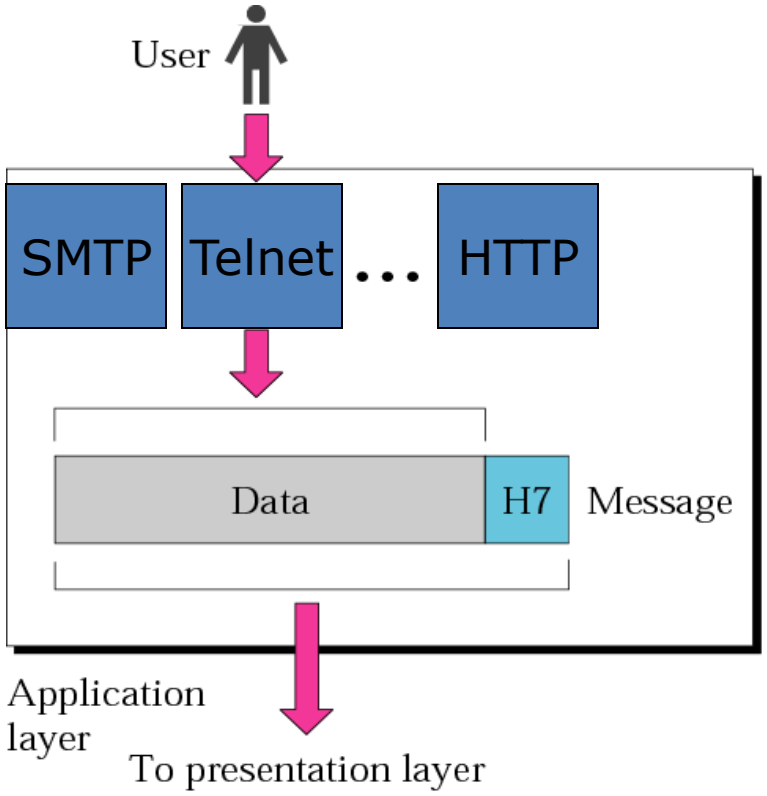
Presentation Layer cont.

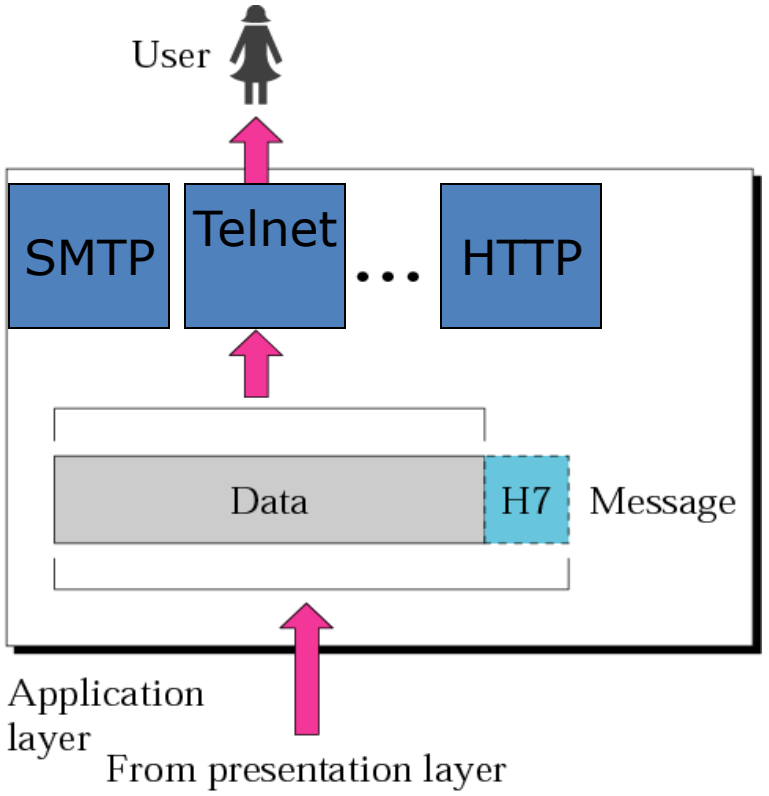


Layer 7: Application Layer

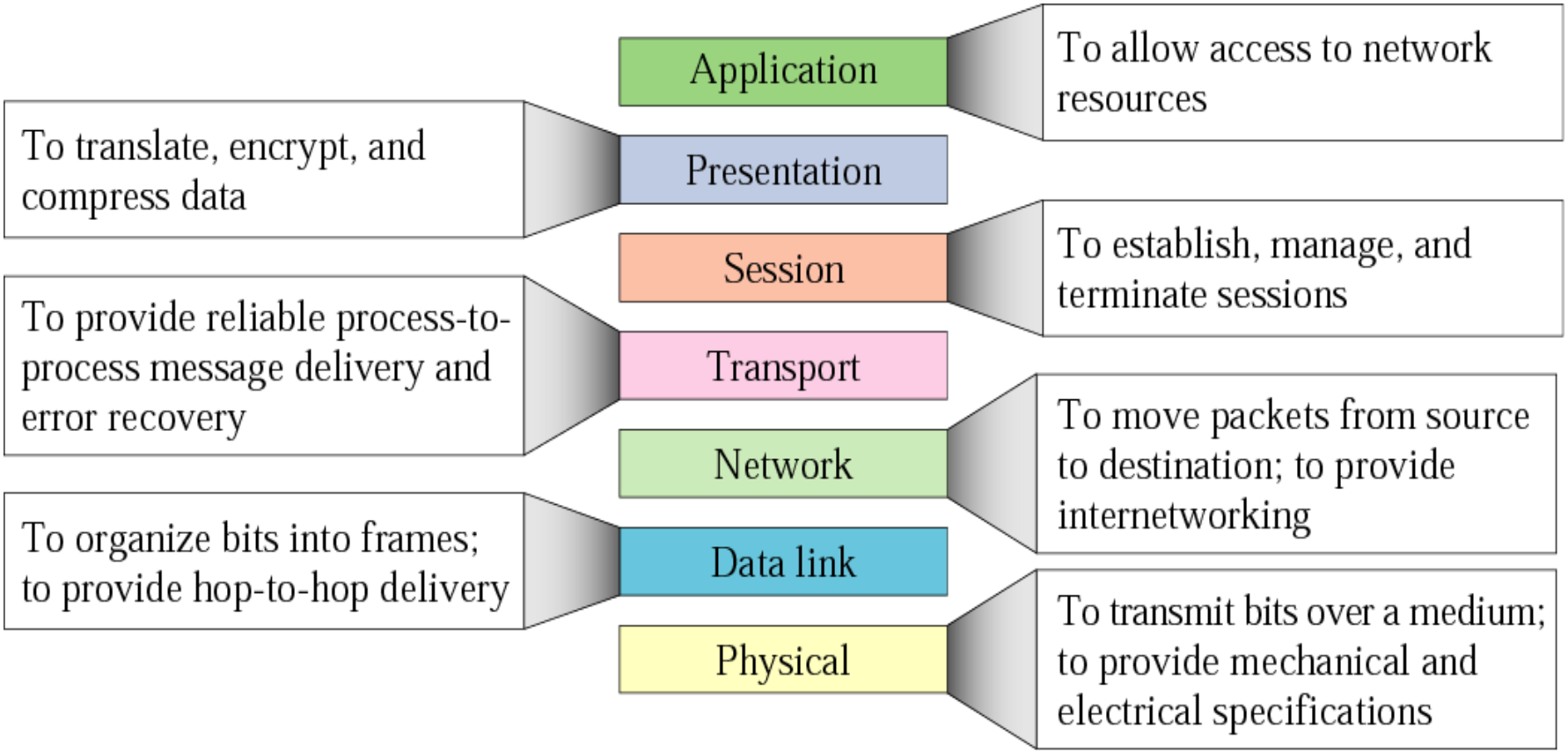
- The application layer is responsible for providing services to the user.
- Mail services
- File transfer, access and management
- Remote log-in or network virtual terminal
- Accessing the World Wide Web
- Directory service

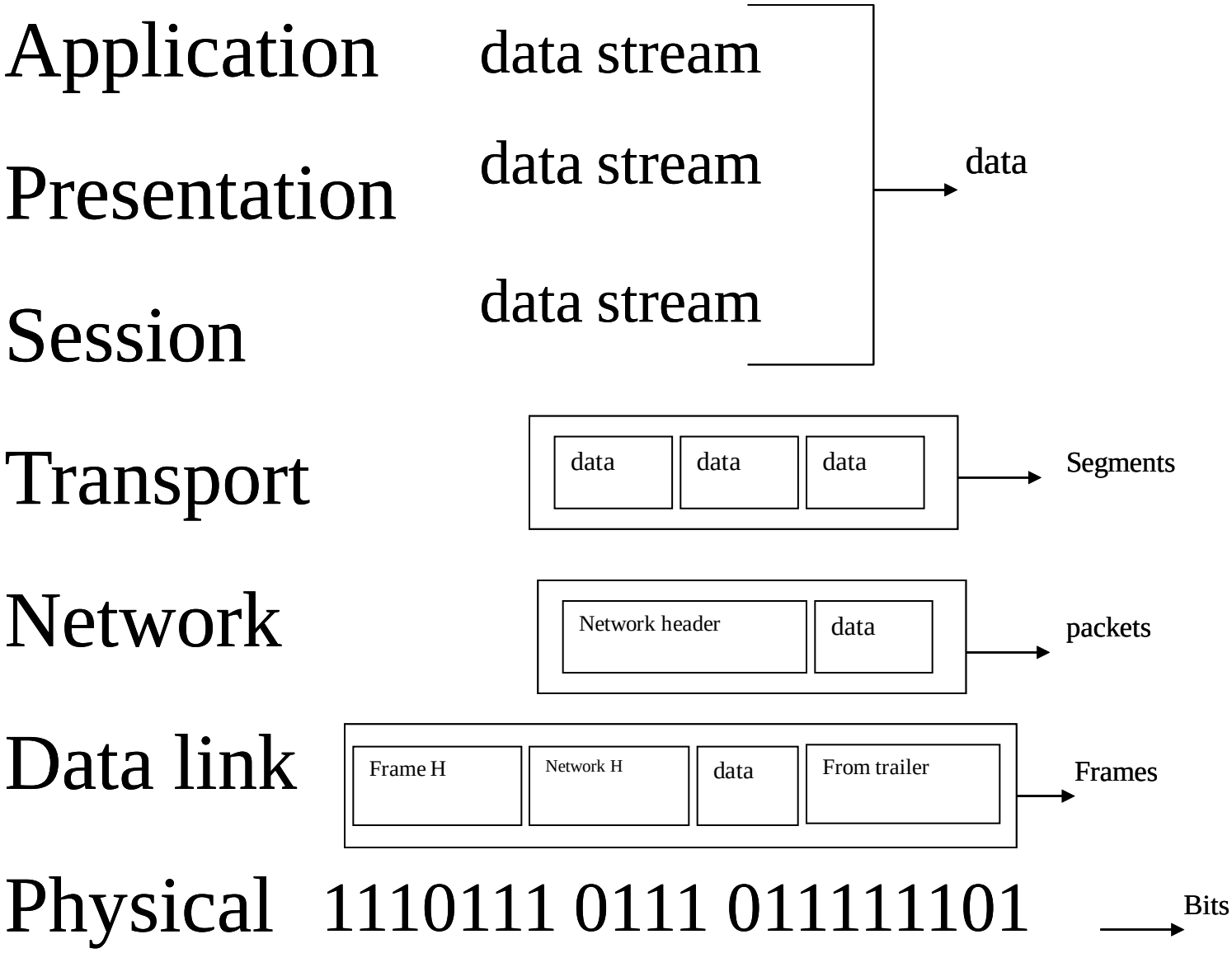
Application Layer cont.





Summary


Application
To allow access to network resources
Presentation
To translate, encrypt, and compress data
Session
To establish, manage, and terminate sessions
Transport
To provide reliable process-to-process message delivery and error recovery
Network
To move packets from source to destination; to provide internetworking
Data link
To organize bits into frames; to provide hop-to-hop delivery
Physical
To transmit bits over a medium; to provide mechanical and electrical specifications


Application
Presentation
Session
data stream
data stream
data stream
data
Transport
data
data
data
Segments
Network
Network header
data
packets
Data link
Frame H
Network H
data
From trailer
Frames
Physical
1110111 0111 011111101
Bits

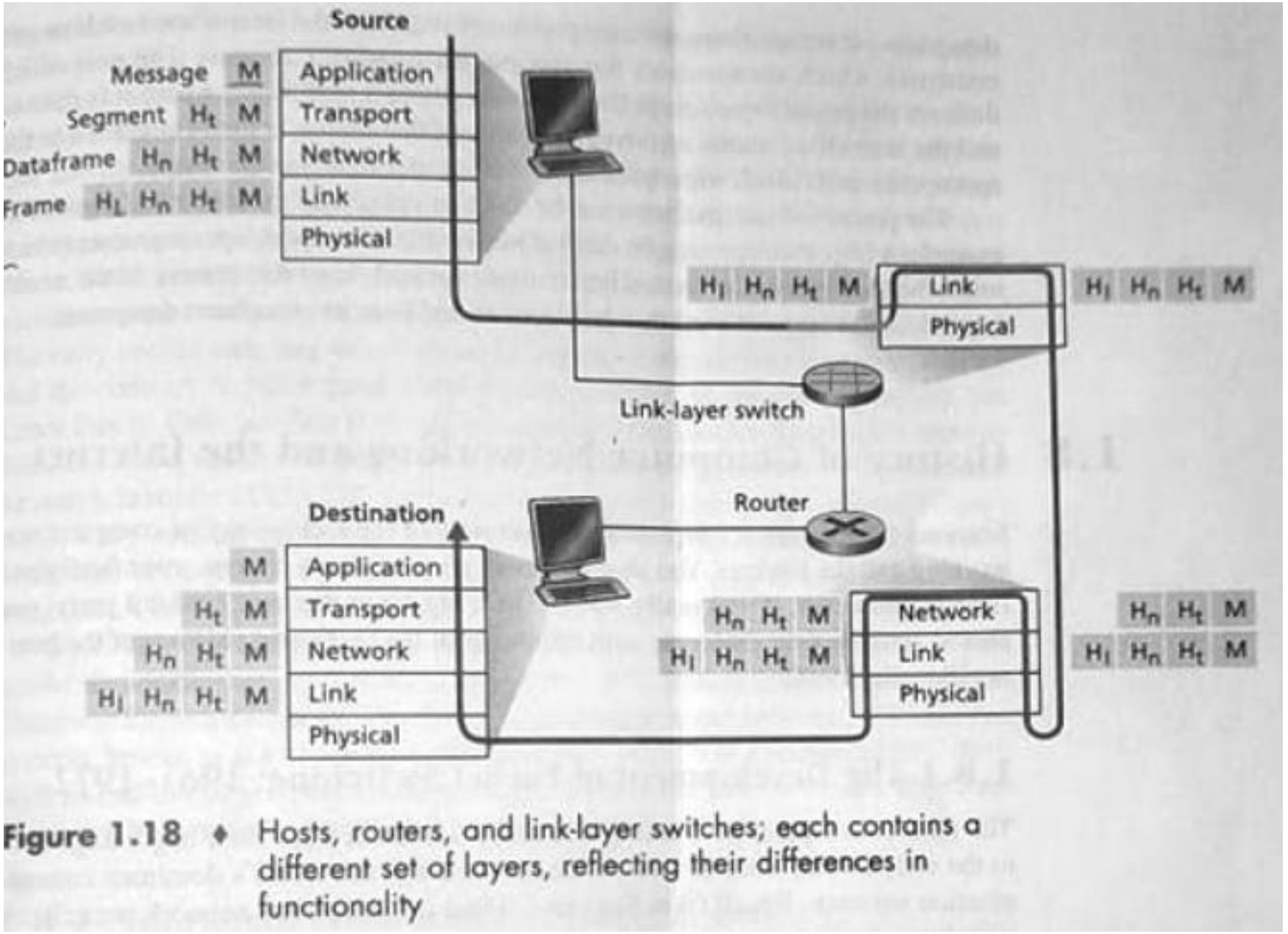


Figure 1.18 ♦ Hosts, routers, and link-layer switches; each contains a different set of layers, reflecting their differences in functionality

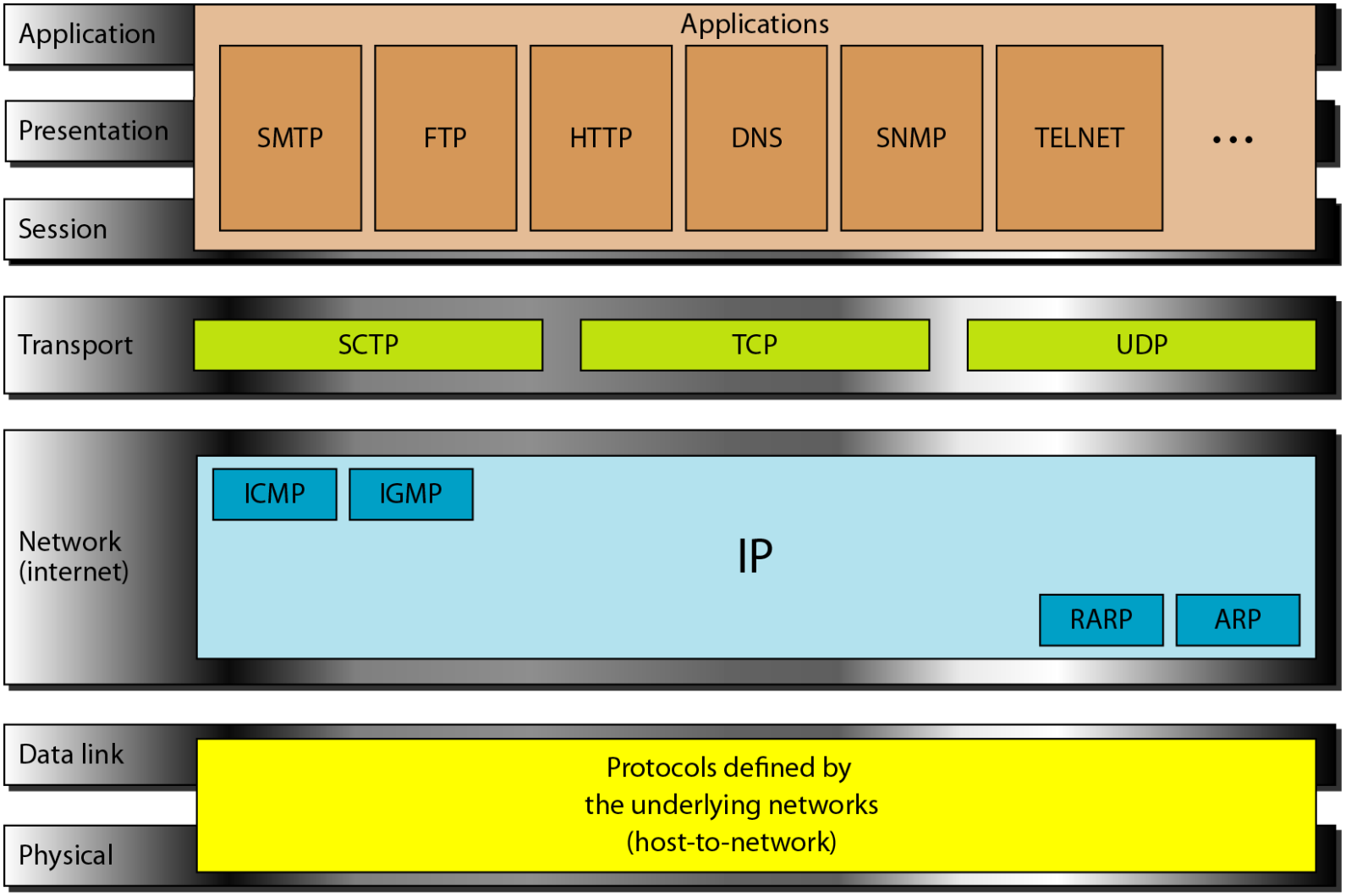
TCP/IP Protocol Suite

- **The TCP/IP protocol suite is a hierarchical protocol , made of five layers:**
  - **Physical layer**
  - **Data link layer**
  - **Network layer**
  - **Transport layer**
  - **Application layer.**

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.

TCP/IP and OSI model



ADDRESSING

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