Protocols

"Set of Rules Governing Communication"

"set of rules that makes the communication both possible and efficient"

Protocols

- **Protocols defines:**
  - What is Communicated?
  - How, it is Communicated?
  - When, it is Communicated?

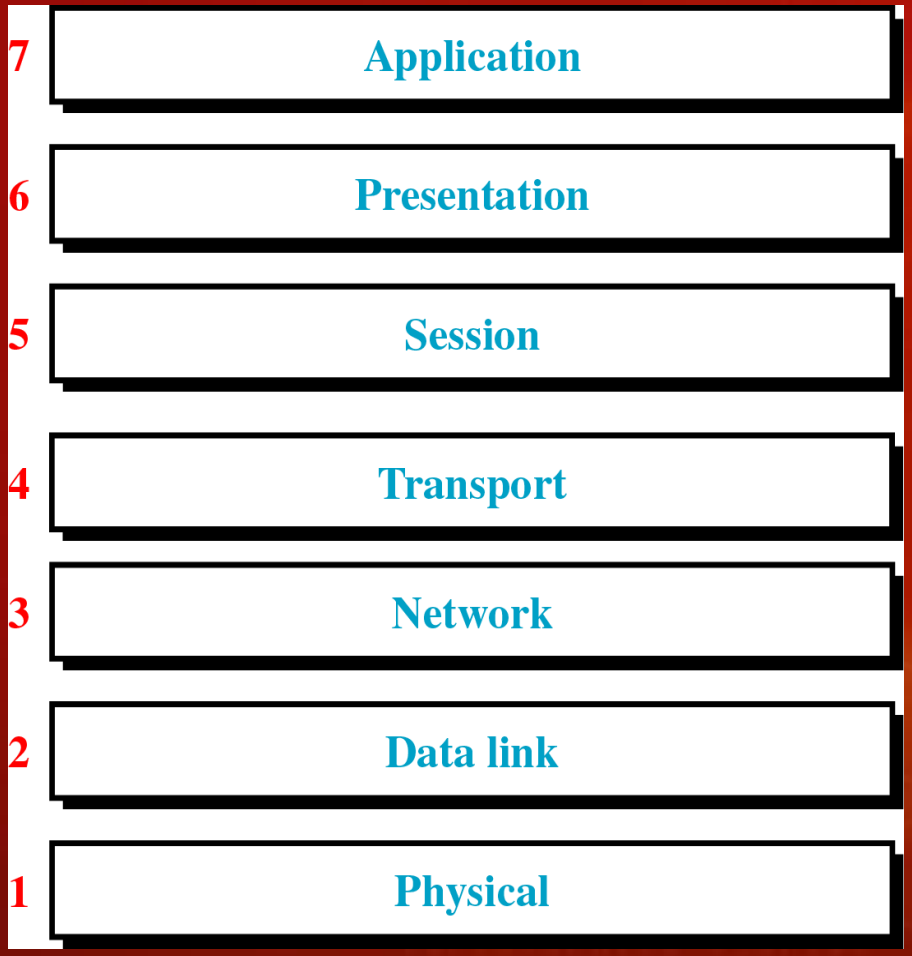
Protocols

- **Elements of a Protocol:**
  - –Syntax
    - –Structure or format of data
  - –Semantics
    - –What does it mean.
  - –Timing
    - –When it is communicating

The OSI Model

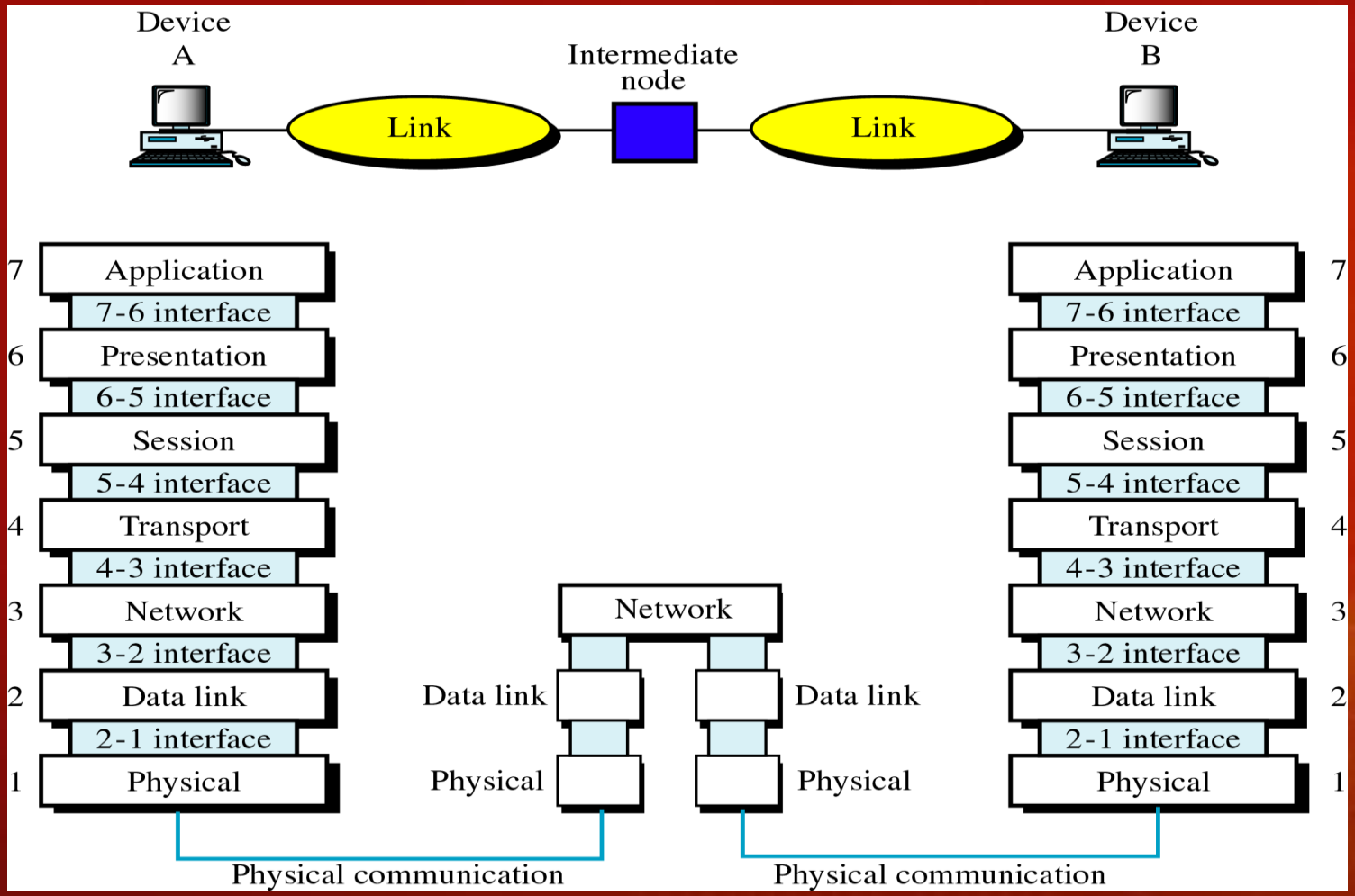
A layered framework for the design of network systems that allows communication across all types of computer systems regardless of their underlying architecture

OSI Layers



Please Do not Touch Steve's Pet Alligator

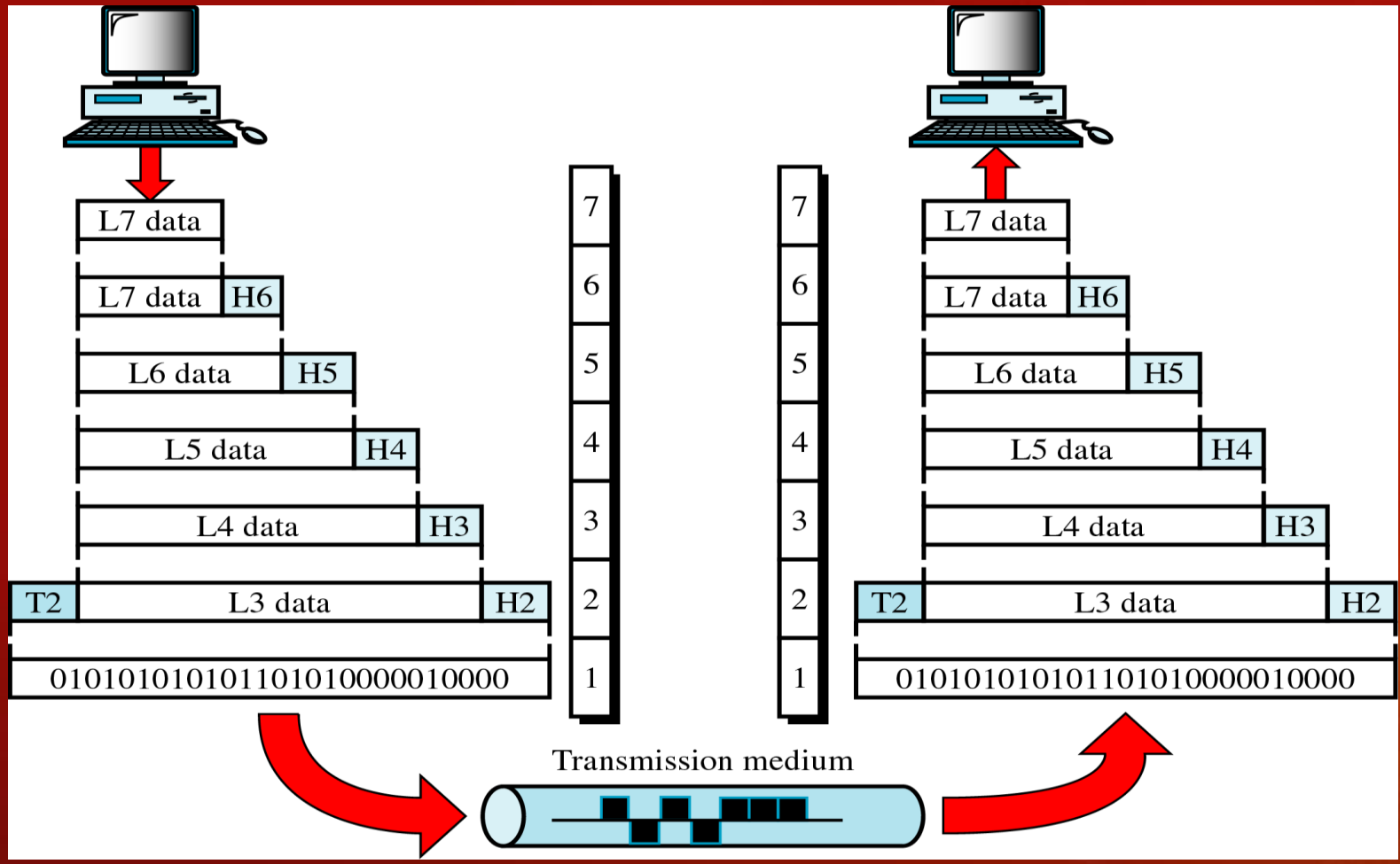
The OSI Model



Organization of Layers

- Network Support Layers
  - Layers 1,2,3
- User Support Layers
  - Layers 5,6,7

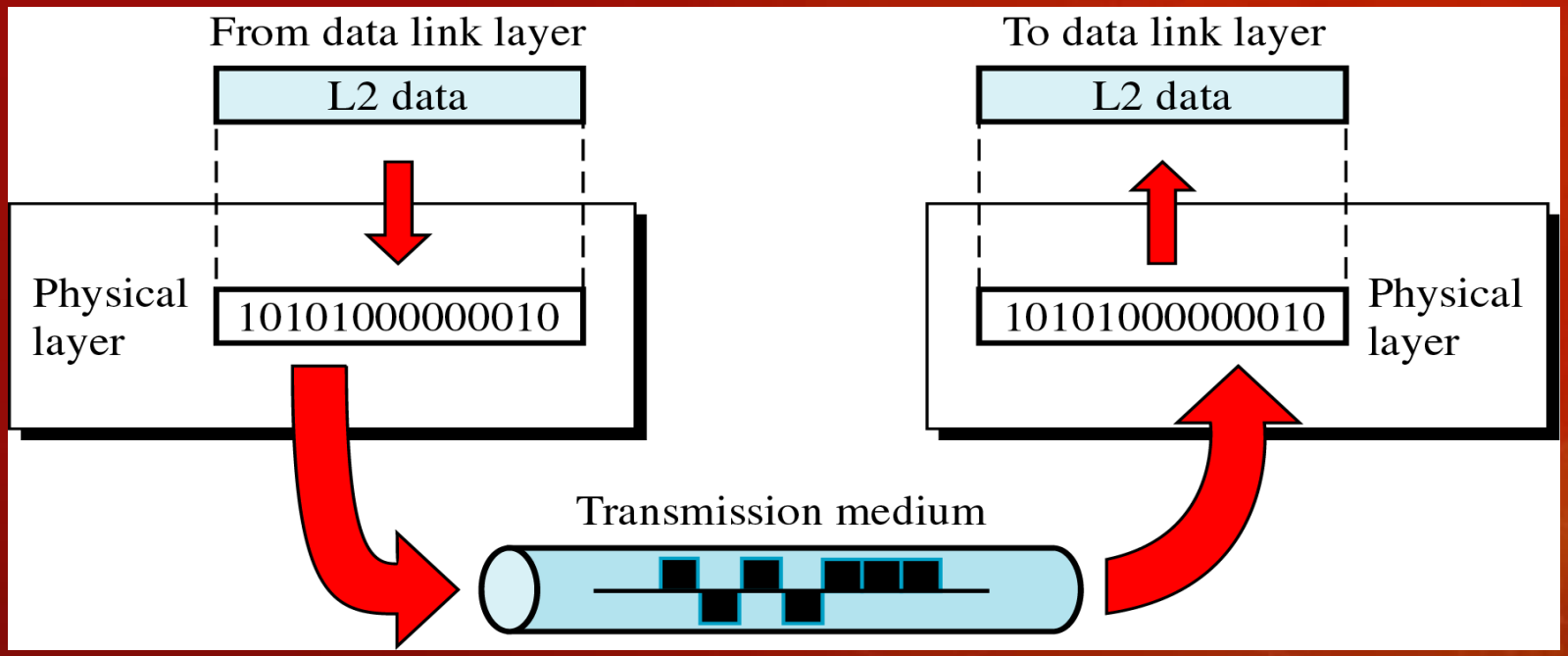
Exchange using the OSI Model



Physical Layer

- Transmits the digital bit stream over the transmission medium.
- Defines the electrical and mechanical specifications of the connection (i.e. cable and connectors).

Physical Layer



Physical Layer Functions

- Physical Characteristics of Interface and Media
- Representation of Bits/ Encoding
- Data Rate/ Transmission Rate
- Synchronization of Bits

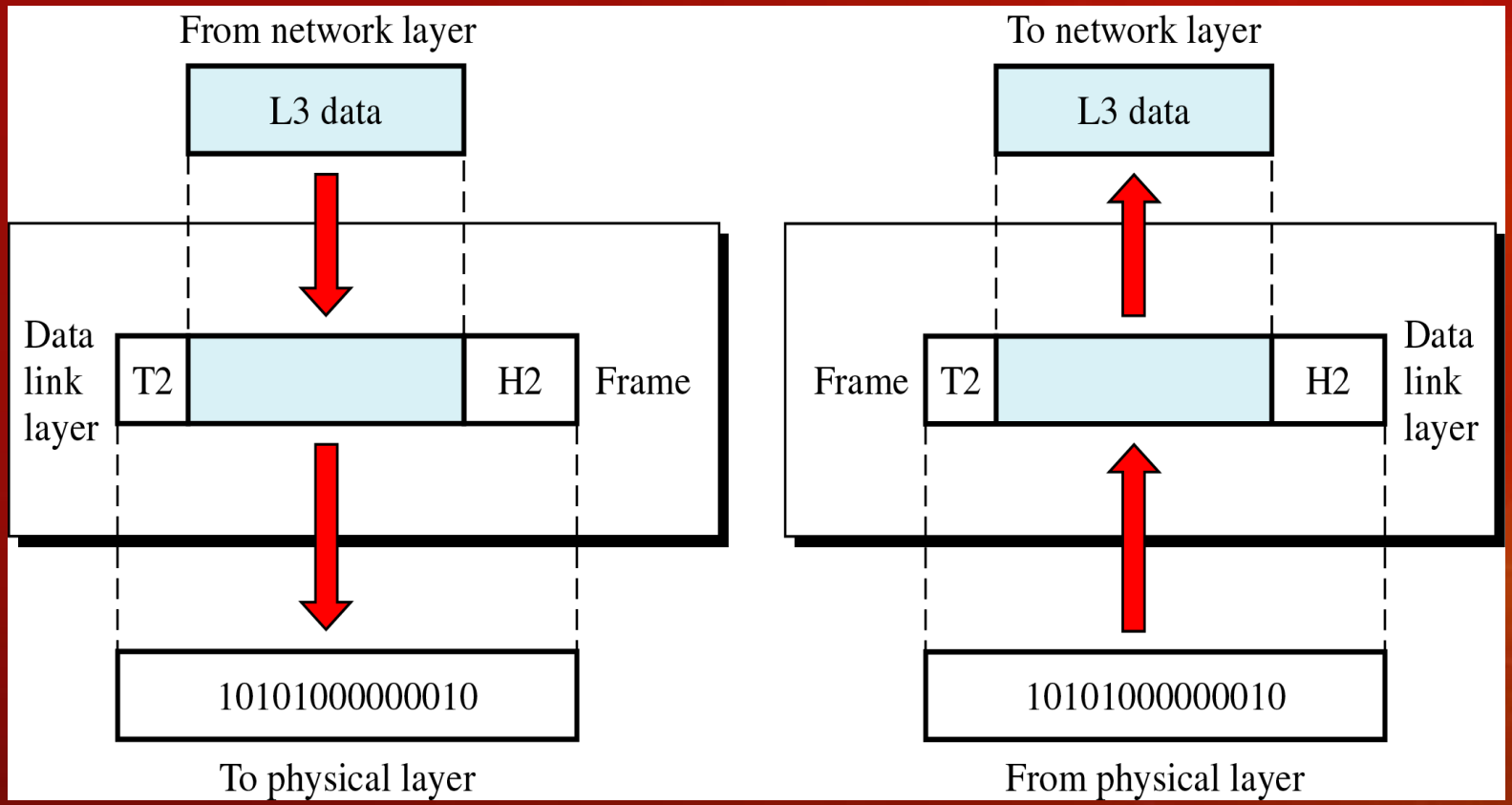
Physical Layer Functions

- Line Configuration
- Physical Topology
- Transmission Mode

Data Link Layer

- Responsible for Node-To-Node Delivery
- Makes Physical Layer error free to the upper layers

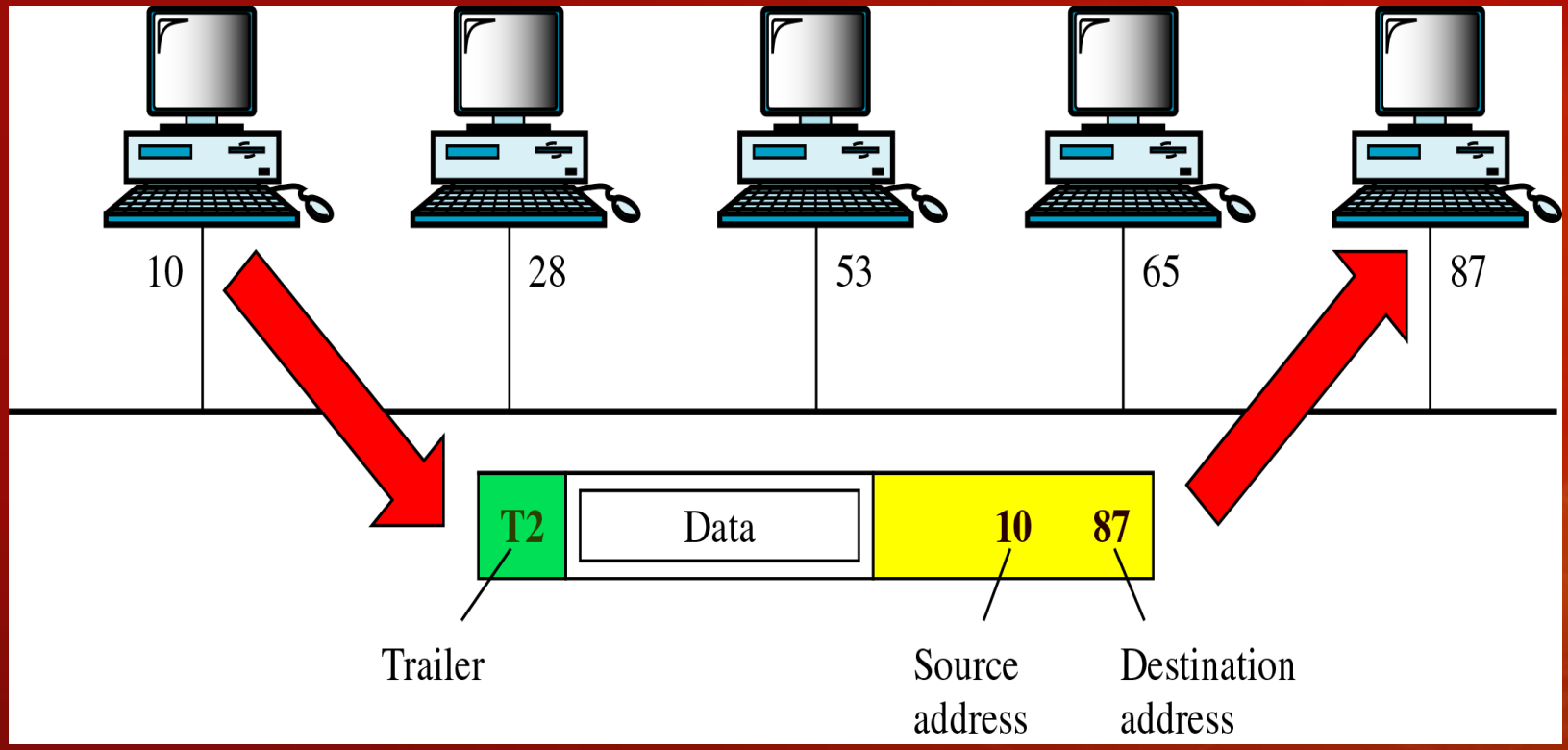
Data Link Layer



Data Link Layer Functions

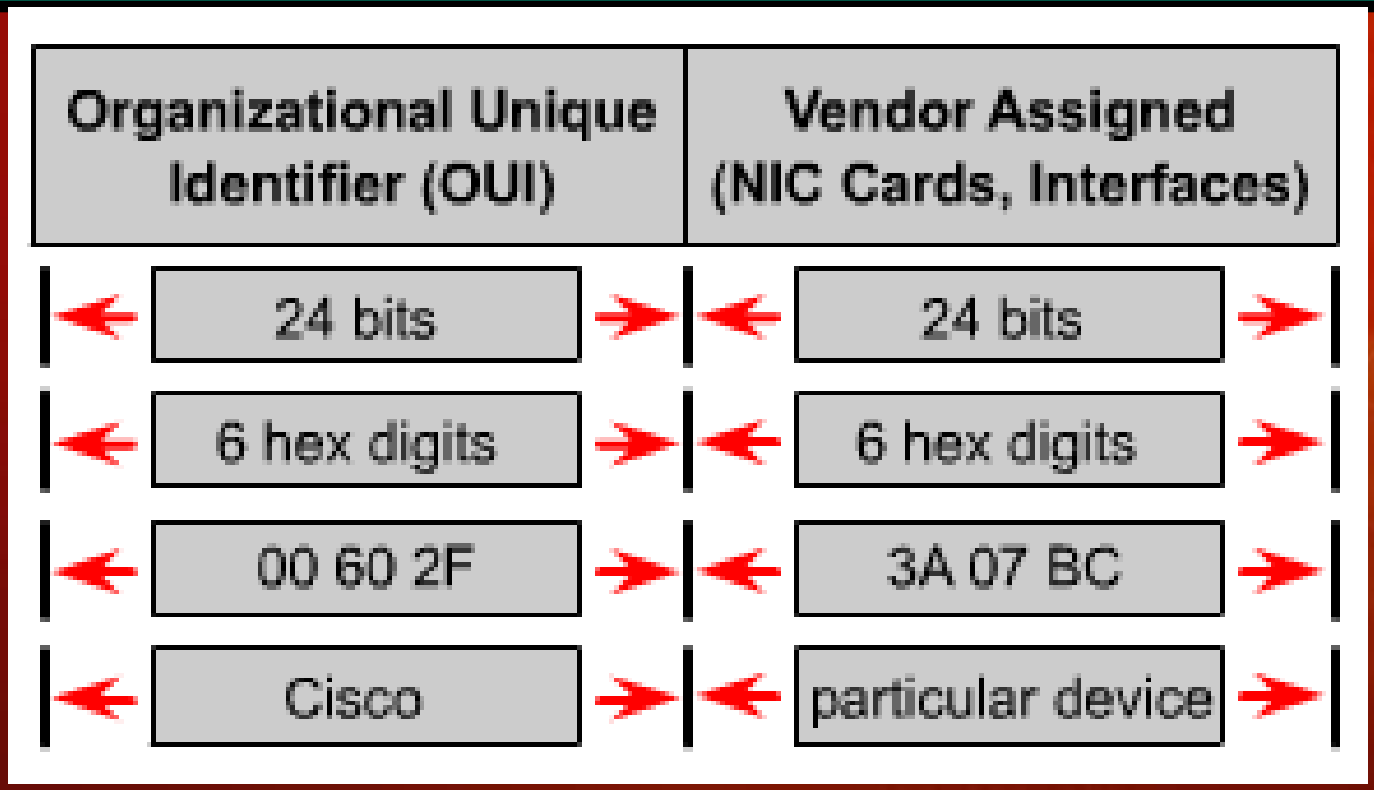
- Framing
- Physical Addressing
- Flow Control
- Error Control
- Access Control

Data Link Layer Example



MAC Address

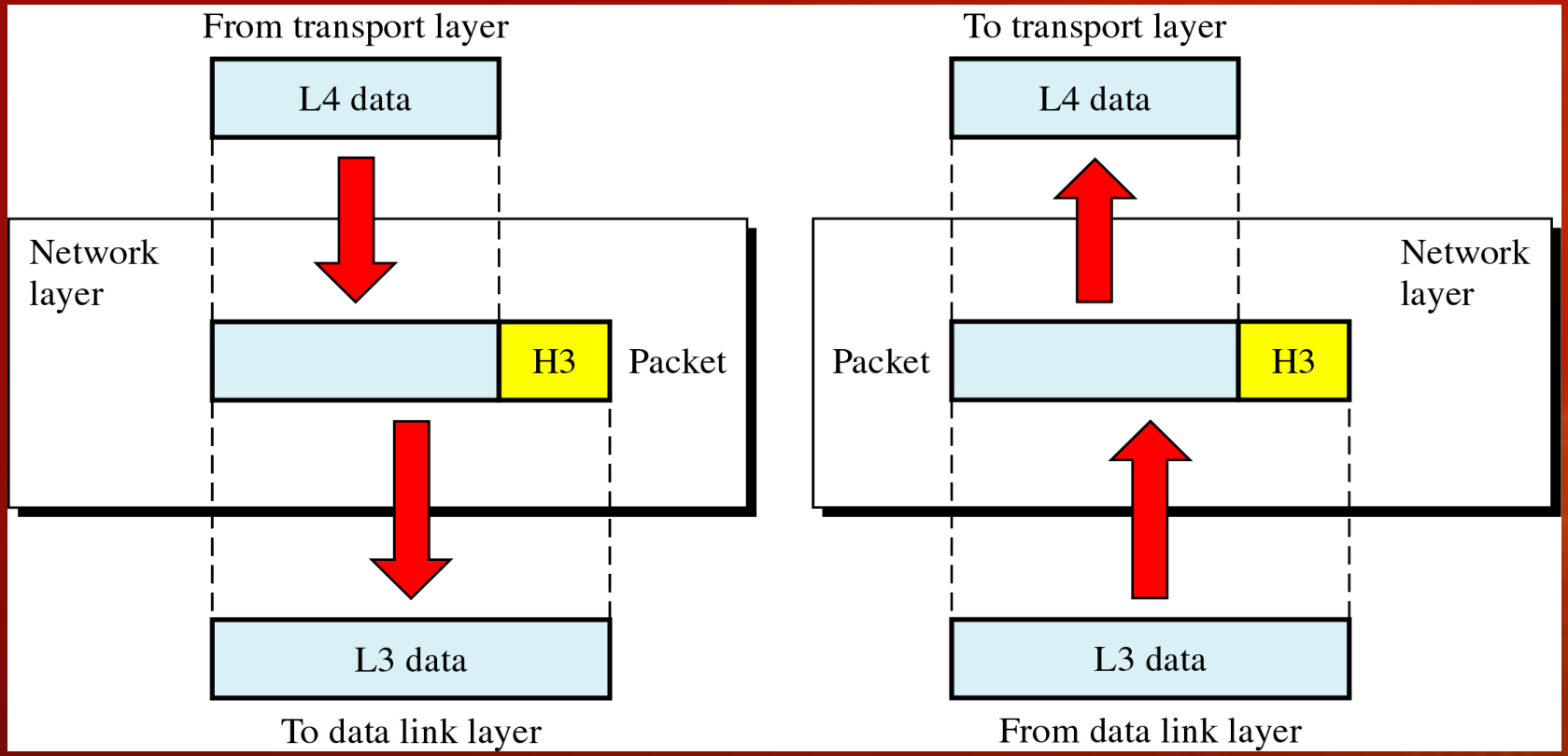
MAC address is 48 bits in length and expressed as twelve hexadecimal digits.MAC addresses are sometimes referred to as burned-in addresses (BIA) because they are burned into read-only memory (ROM) and are copied into random-access memory (RAM) when the NIC initializes.



Network Layer

- Responsible for Source-to-Destination delivery
- Network Layer ensures that each packet gets from its point of origin to its final destination

Network Layer



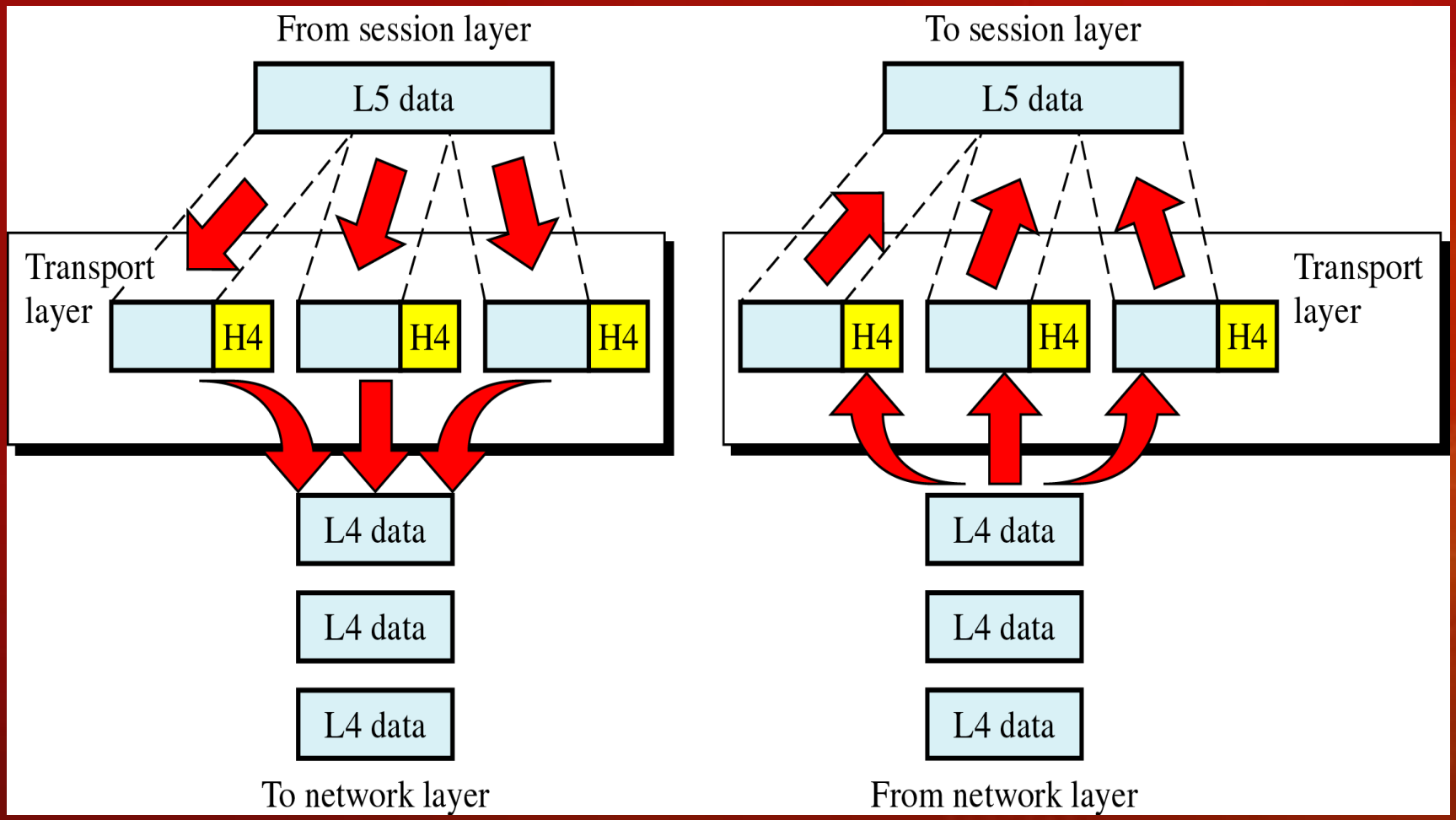
Network Layer Functions

- Logical Addressing
- Routing

Transport Layer

- Responsible for Source-to-Destination delivery of Entire Message
- Transport Layer ensures that whole message arrives at the destination intact

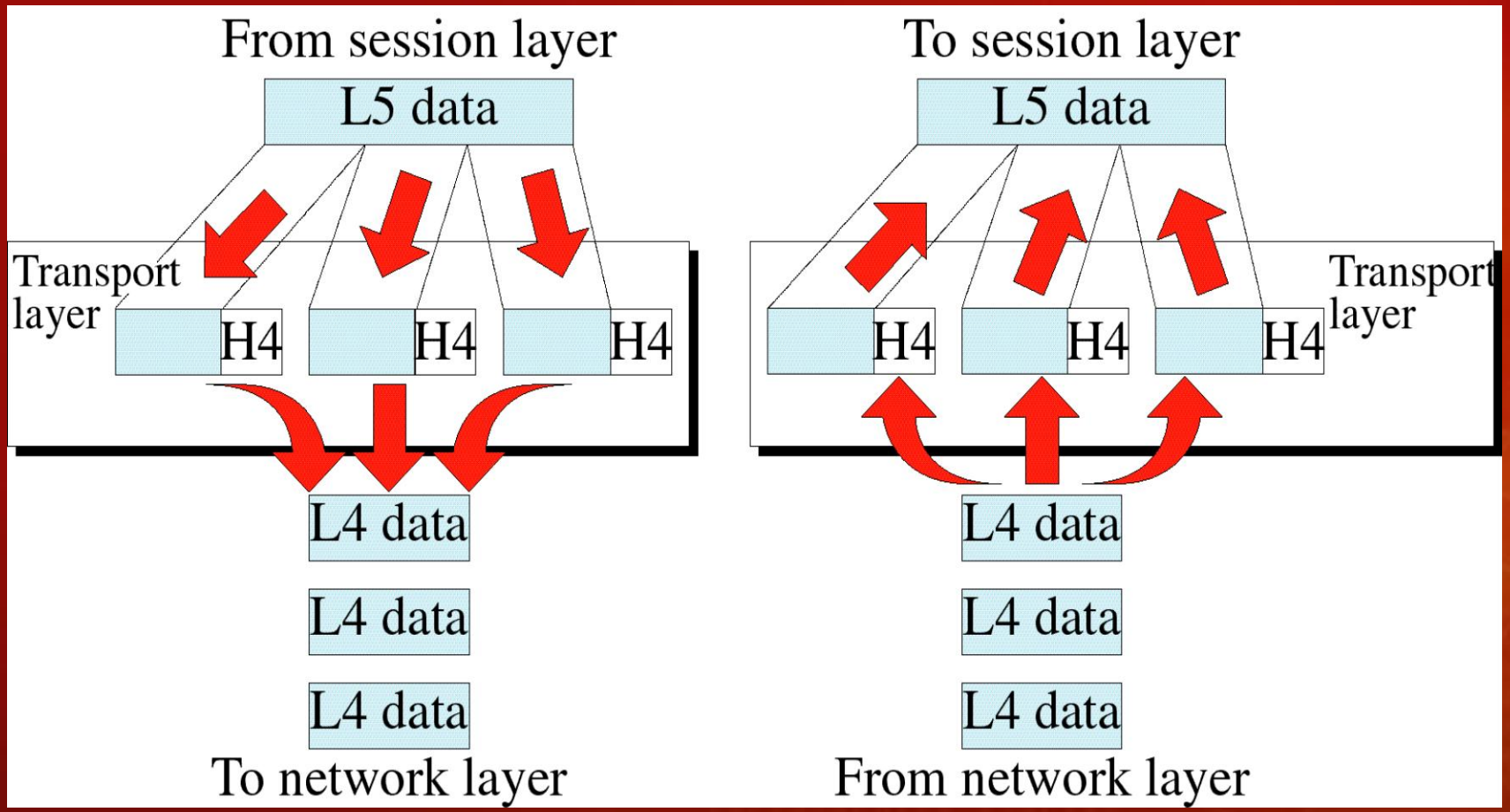
Transport Layer



Functions of Transport Layer

- Service Point Addressing
- Segmentation and Reassembly
- Connection Control
- Flow Control
- Error Control

Transport Layer Example



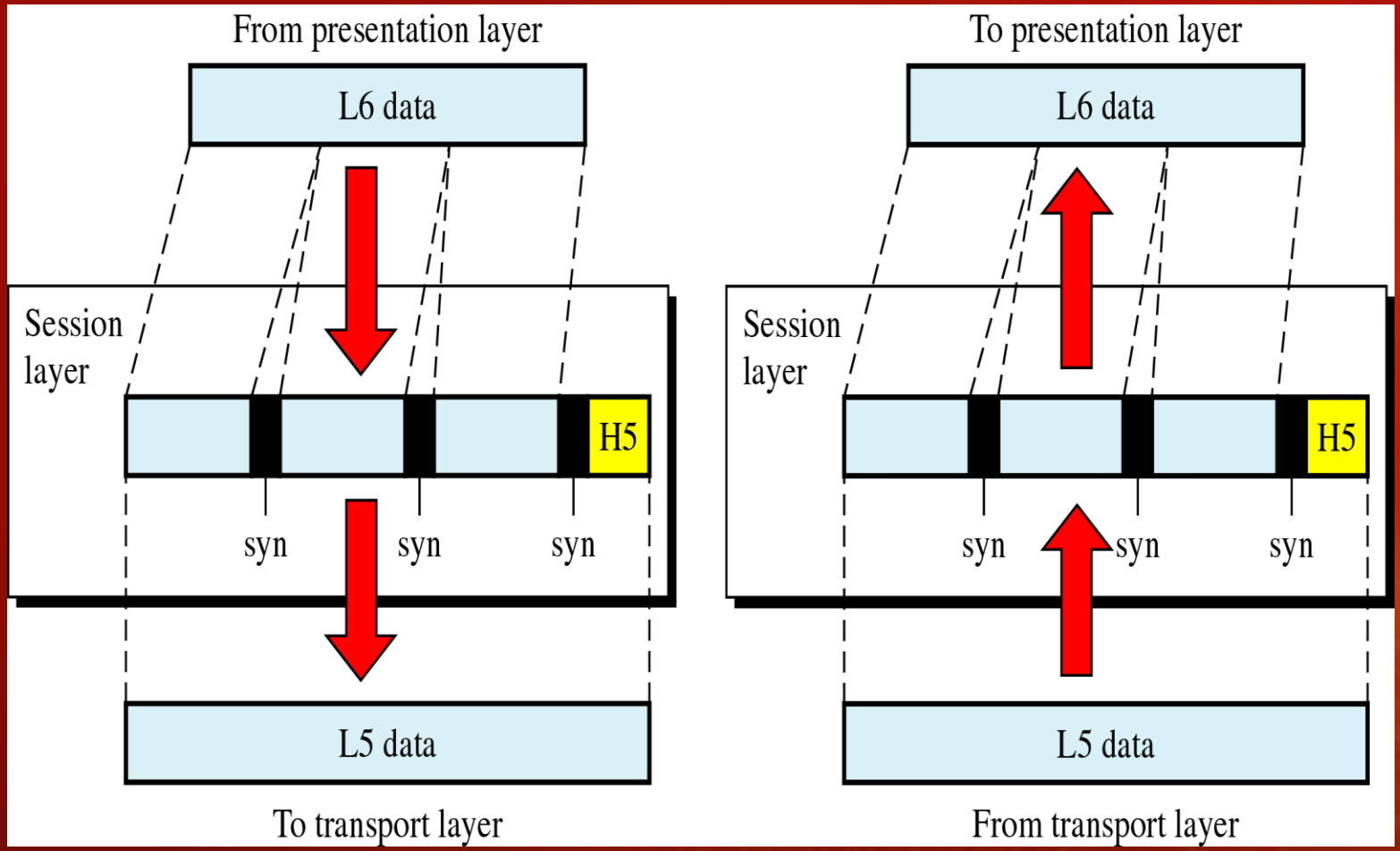
Session Layer

- Session layer is the Network Dialog Controller
- Establishes, Maintains, and Synchronizes the interaction between communicating systems

Functions of Session Layer

- Dialog Control
- Synchronization

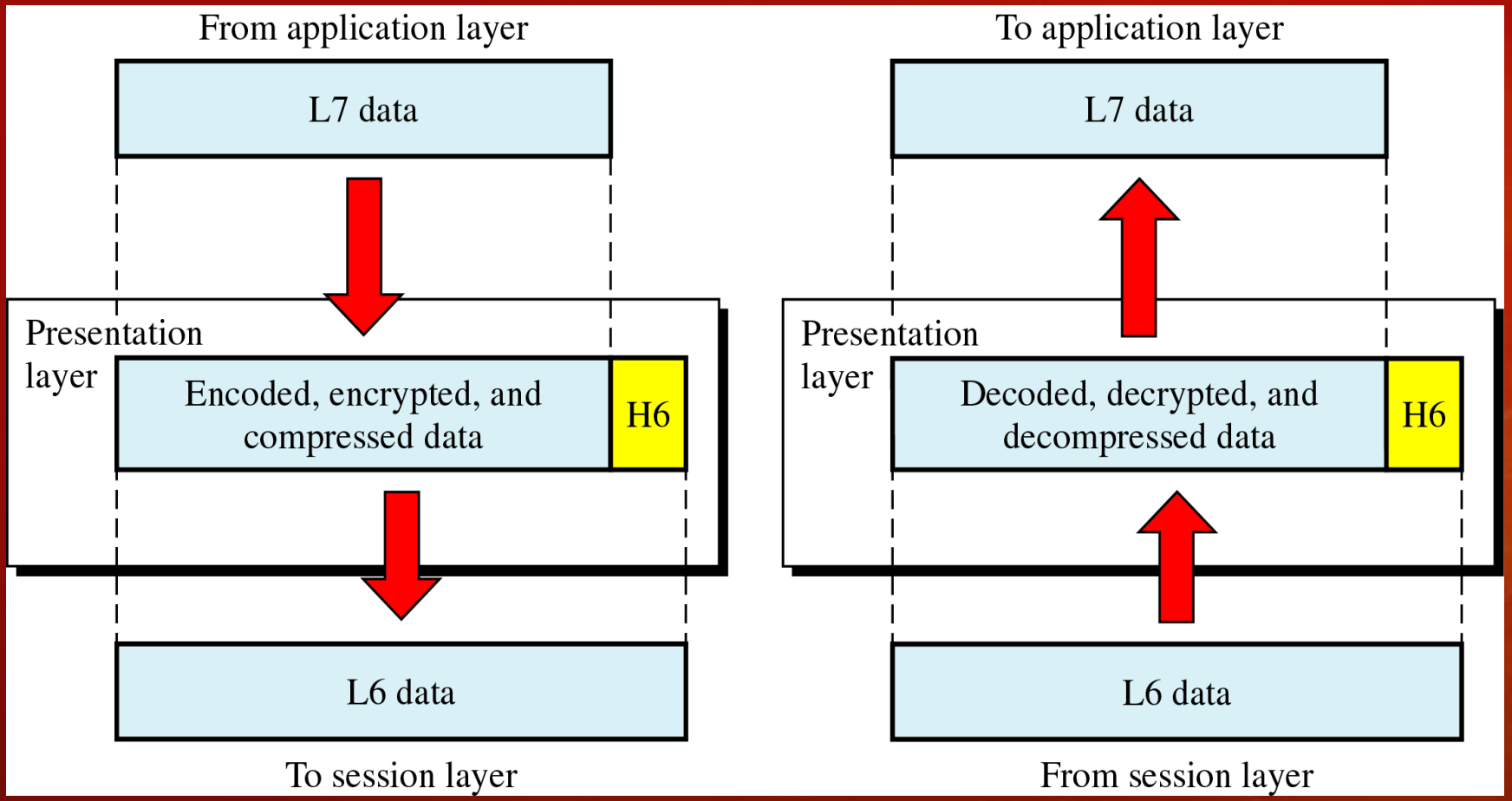
Session Layer



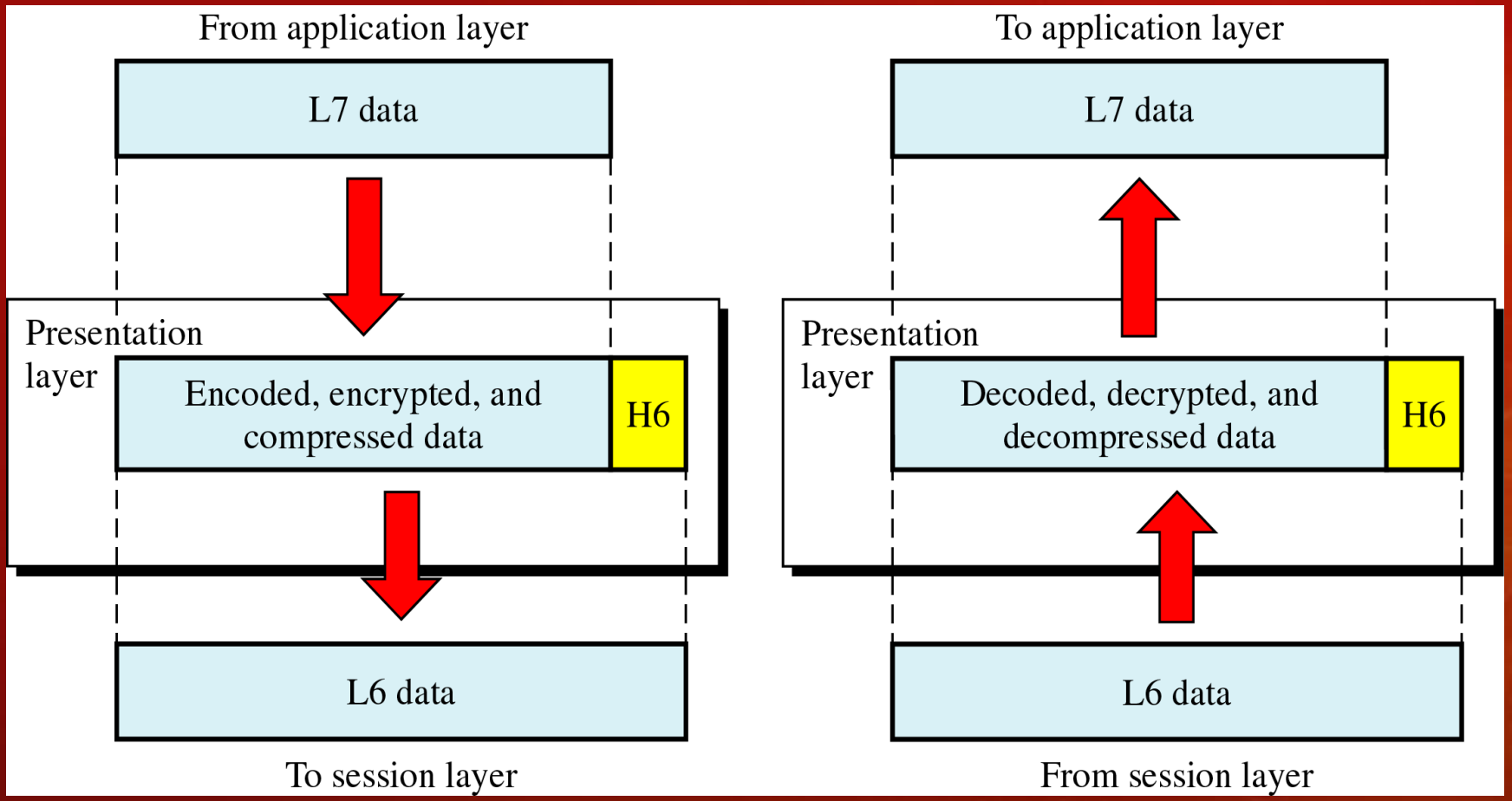
Presentation Layer

- Presentation layer is concerned with Syntax and Semantics of info exchange between two systems

Presentation Layer



Presentation Layer



Functions of Presentation Layer

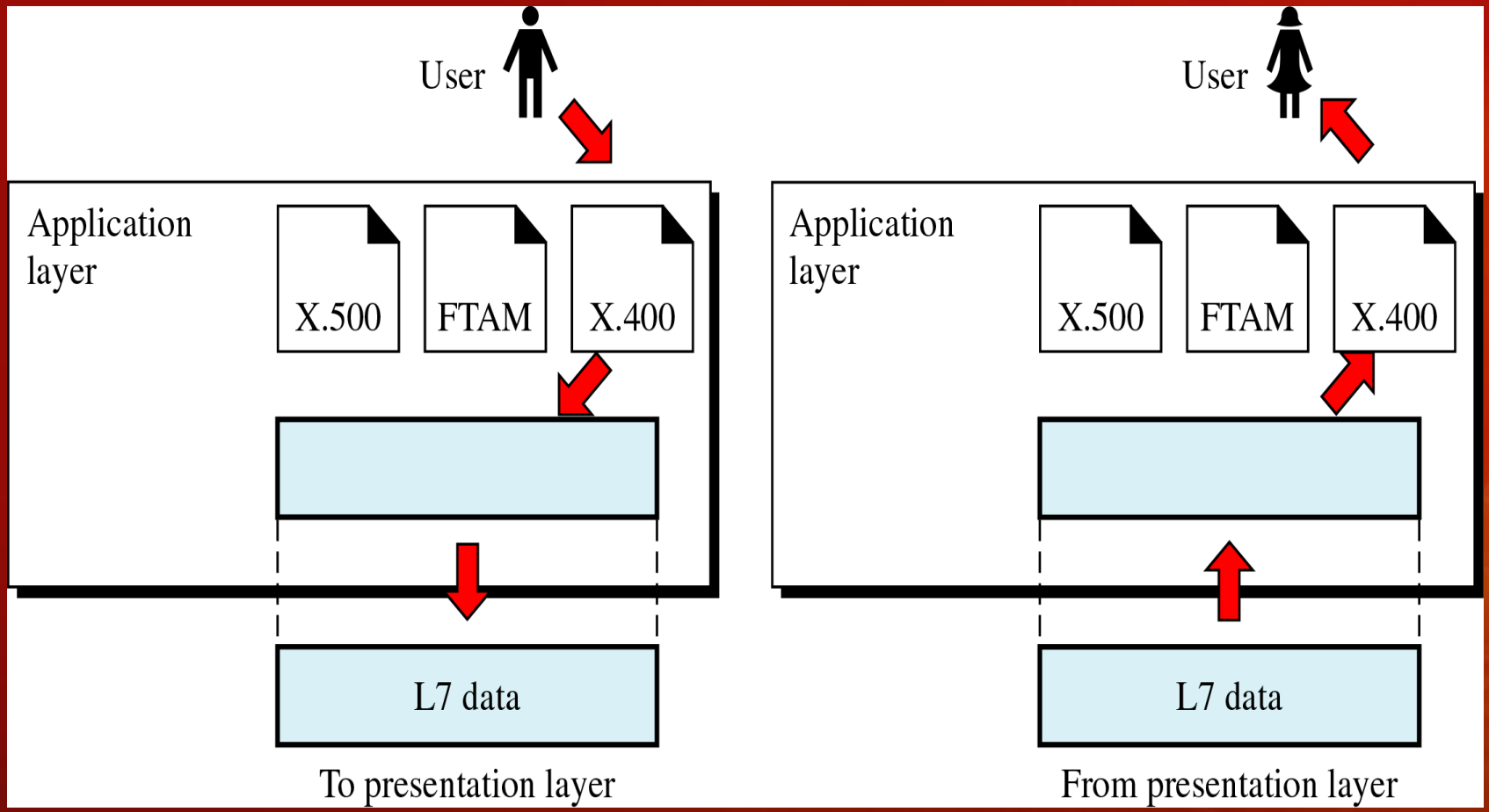
- Translation
- Encryption
- Compression

Application Layer

- Enables the user either human or software to access the network

- It provides user interface and support for the services such as
  - Electronic mail
  - Remote File access and Transfer
  - Shared Database Management

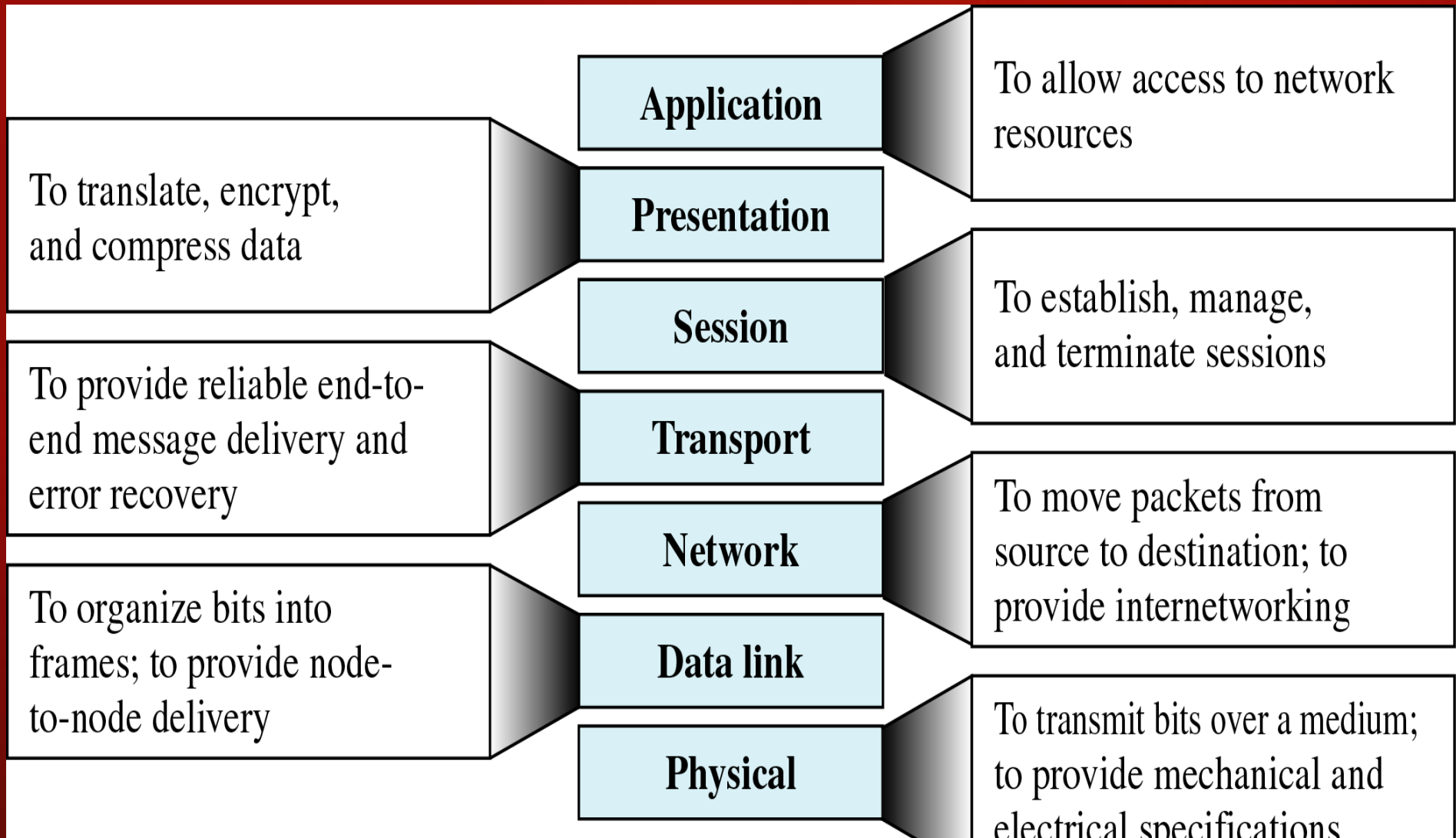
Application Layer



Application Layer Functions

- Network Virtual Terminal
- File Transfer, Access & Management (FTAM)
- Mail Services
- Directory Services

Summary of Layer Functions



OSI Layers

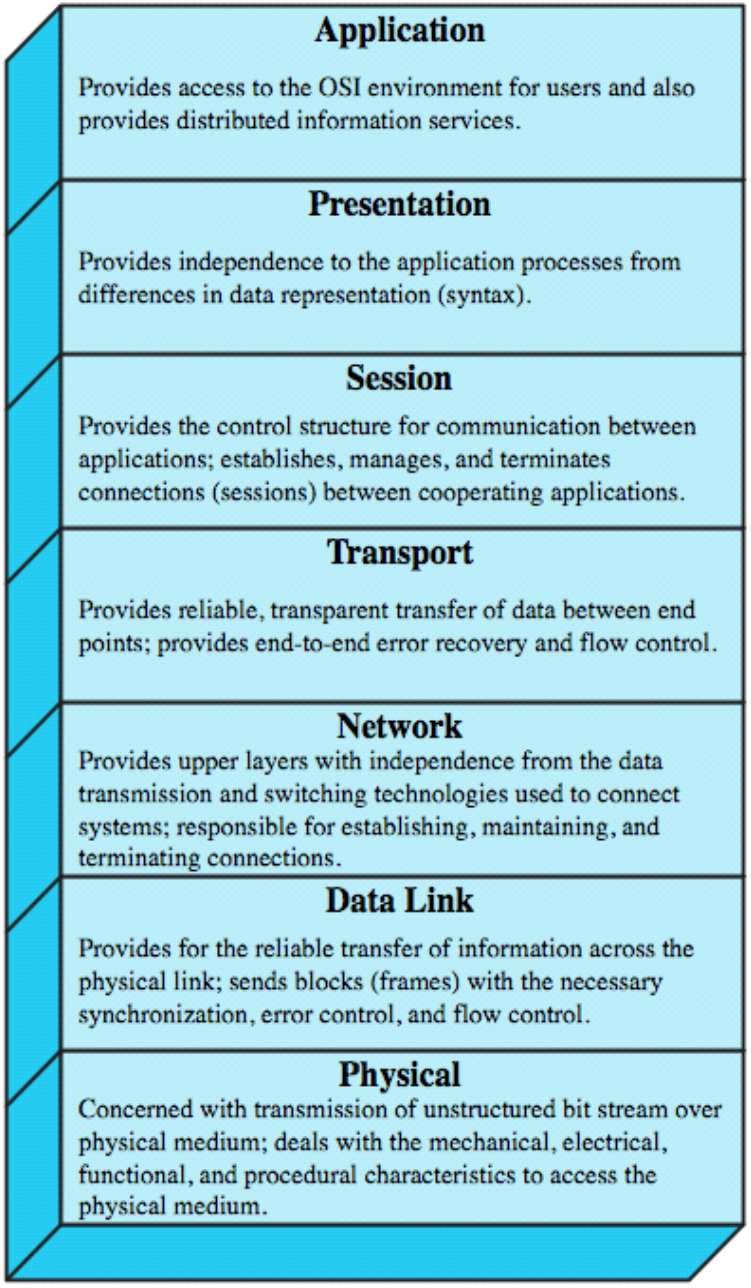


Figure 2.6 The OSI Layers

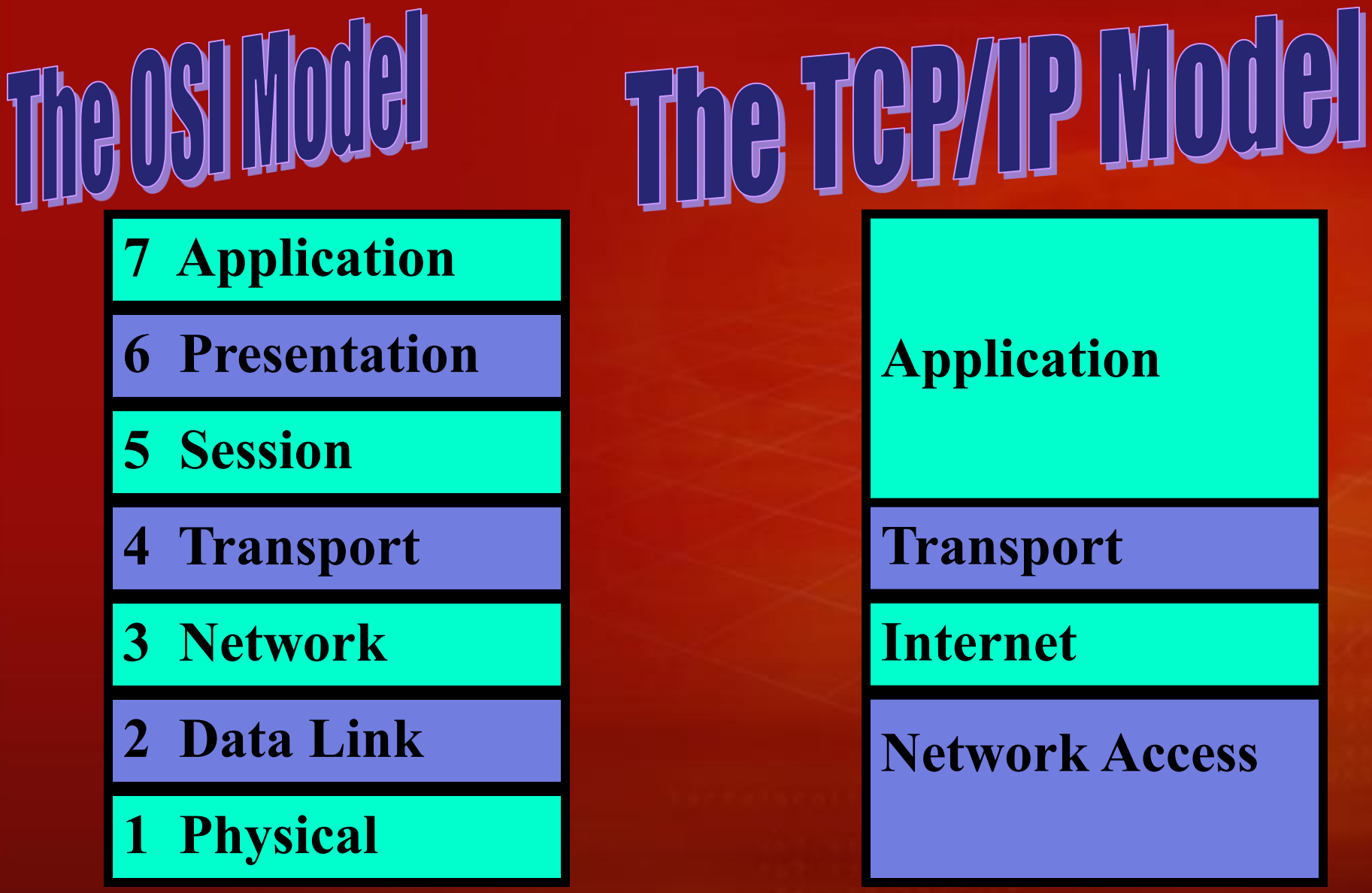
TCP/IP Protocol Suite

- Transmission Control Protocol / Internetworking Protocol
- Developed Prior to OSI Model
- Widely used in the Internet Today

Layers in TCP/IP Protocol Suite

1. Network Access
2. Network
3. Transport
4. Application

Don't Confuse the Models



TCP

Transmission Control Protocol (TCP) is a connection-oriented Layer 4 protocol that provides reliable full-duplex data transmission.

TCP is part of the TCP/IP protocol stack. In a connection-oriented environment, a connection is established between both ends before the transfer of information can begin.
TCP is responsible for breaking messages into segments, reassembling them at the destination station, resending anything that is not received, and reassembling messages from the segments.TCP supplies a virtual circuit between end-user applications.

The protocols that use TCP include:

- FTP (File Transfer Protocol)
- HTTP (Hypertext Transfer Protocol)
- SMTP (Simple Mail Transfer Protocol)
- Telnet

UDP

User Datagram Protocol (UDP) is the connectionless transport protocol in the TCP/IP protocol stack.

UDP is a simple protocol that exchanges datagrams, without acknowledgments or guaranteed delivery. Error processing and retransmission must be handled by higher layer protocols.

UDP uses no windowing or acknowledgments so reliability, if needed, is provided by application layer protocols. UDP is designed for applications that do not need to put sequences of segments together.

The protocols that use UDP include:

- TFTP (Trivial File Transfer Protocol)
- SNMP (Simple Network Management Protocol)
- DHCP (Dynamic Host Control Protocol)
- DNS (Domain Name System)