



SNS COLLEGE OF TECHNOLOGY



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COIMBATORE-641 035, TAMIL NADU**

DEPARTMENT OF COMPUTER APPLICATIONS

23CAT601 - DATA COMMUNICATION AND NETWORK

CLASS : I YEAR / I SEMESTER

UNIT I – DATA COMMUNICATION

TOPIC – OSI MODELS – FUNCTIONS OF OSI LAYERS



Protocol - OSI MODEL

- ✓ In data communication and networking, a protocol defines the rules that both the sender and receiver and all intermediate devices need to follow to be able to communicate effectively.
- ✓ When communication is simple, we may need only one simple protocol; when the communication is complex, we may need to divide the task between different layers, in which case we need a protocol at each layer, or protocol layering.
- ✓ International Organization for Standardization (ISO) is a multinational body dedicated to worldwide agreement on international standards.
- ✓ An ISO standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model. It was first introduced in the 1980s.



OSI Model

- ✓ OSI “ Open Systems Interconnection”.
- ✓ OSI model was first introduced in 1984 by the International Organization for Standardization (ISO).
- ✓ Outlines WHAT needs to be done to send data from one computer to another.
- ✓ Not HOW it should be done.
- ✓ Protocols stacks handle how data is prepared for transmittal (to be transmitted)
- ✓ In the OSI model, The specification needed are contained in 7 different layers that interact with each other.

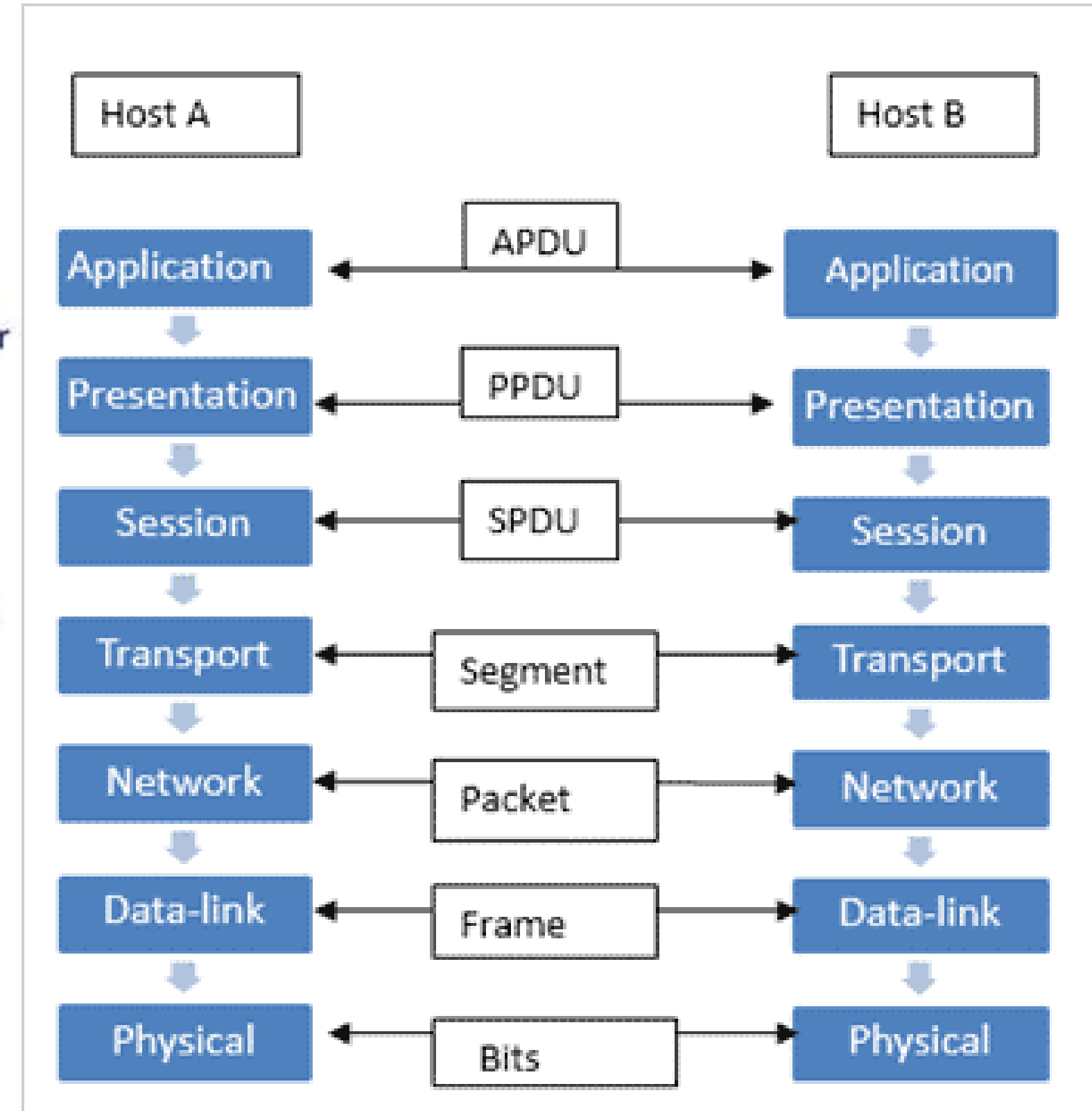
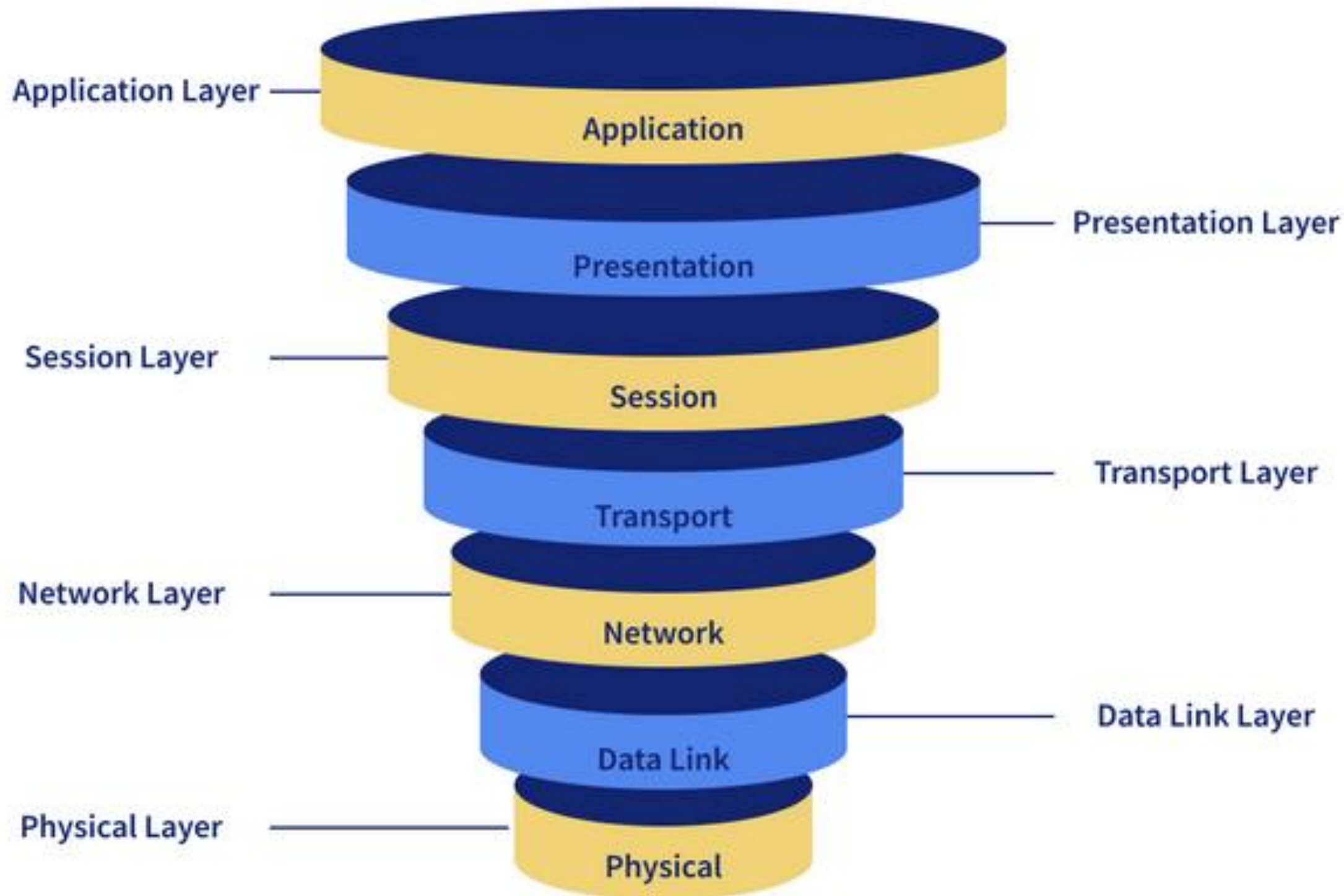


What is “THE OSI MODEL?”

- ✓ Commonly referred to as the OSI reference model.
- ✓ The OSI model is a theoretical blueprint that helps us understand how data gets from one user’s computer to another.
- ✓ It is also a model that helps develop standards so that all of our hardware and software talks nicely to each other.
- ✓ It aids standardization of networking technologies by providing an organized structure for hardware and software developers to follow, to insure their products are compatible with current and future technologies.



OSI Model





Physical Layer

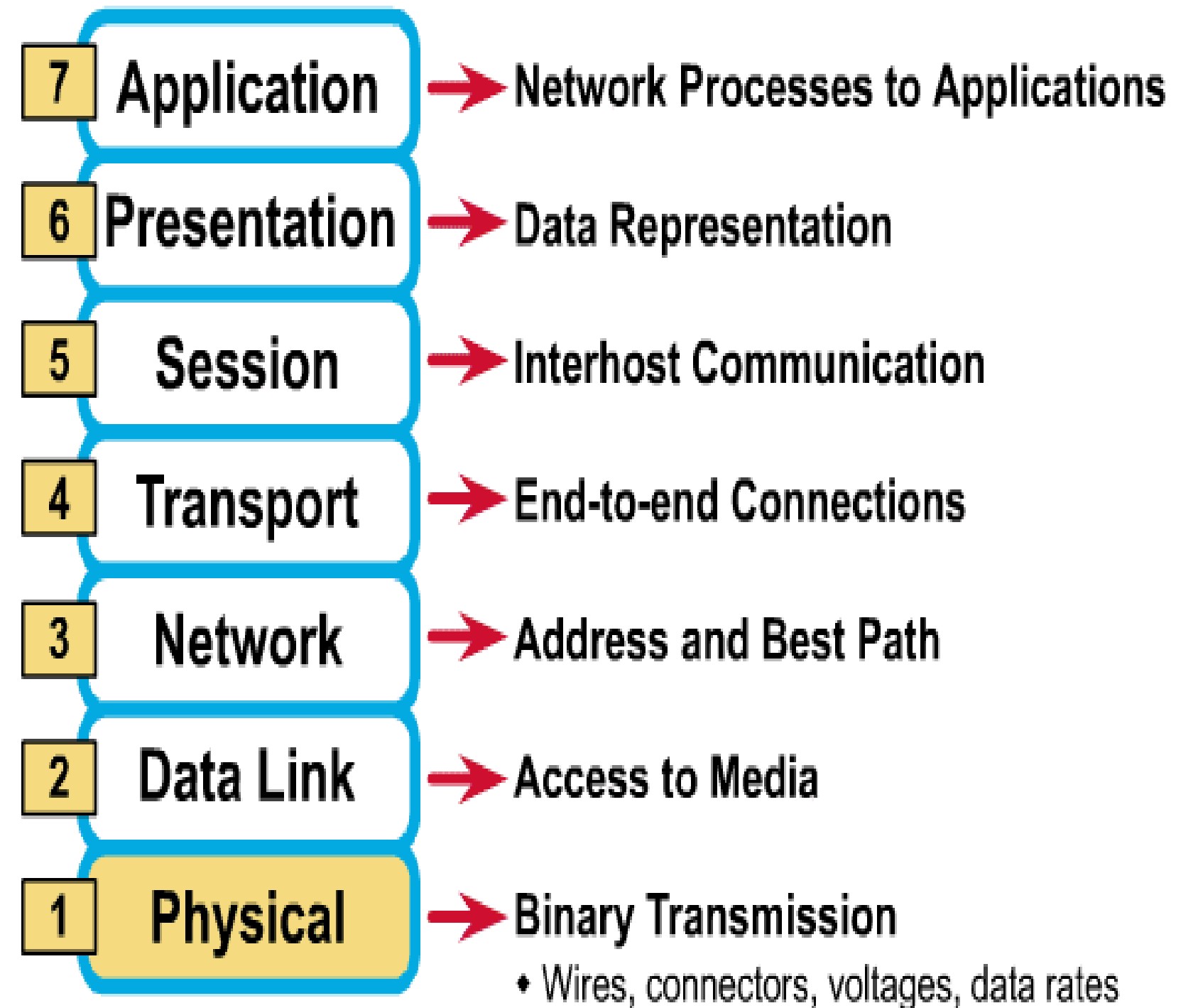
The physical layer coordinates the functions required to transmit a bit stream over a physical medium.

Determines the specs for all physical components

- ✓ Cabling
- ✓ Interconnect methods (topology / devices)
- ✓ Data encoding (bits to waves)
- ✓ Electrical properties
- ✓ Transmission mode

Examples:

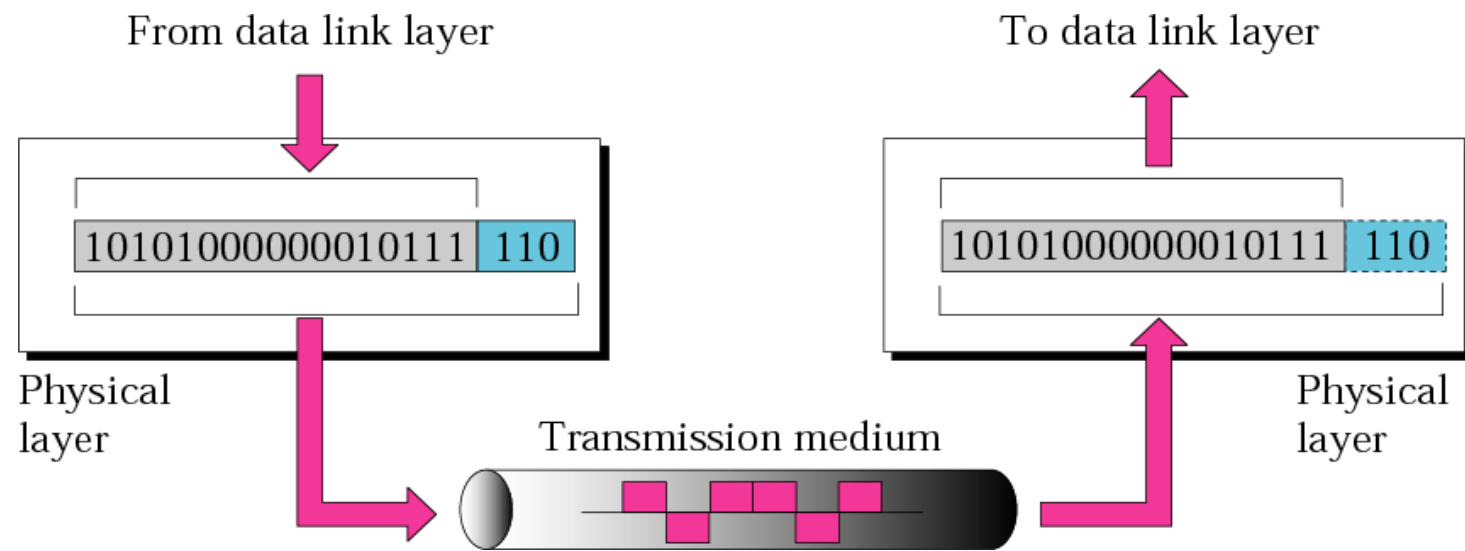
- ✓ Ethernet (IEEE 802.3), Token Ring (IEEE 802.5)
- ✓ Wireless (IEEE 802.11b)





Physical Layer

The physical layer coordinates the functions required to transmit a bit stream over a physical medium.



What are the Physical Layer components on my computer?

NIC

- ✓ Network Interface Card
- ✓ Has a unique 12 character Hexadecimal number permanently burned into it at the manufacturer.
- ✓ The number is the MAC Address/Physical address of a computer

Cabling

- ✓ Twister Pair
- ✓ Fiber Optic
- ✓ Coax Cable

The physical layer is responsible for the movement of individual bits from one hop (node) to the next.

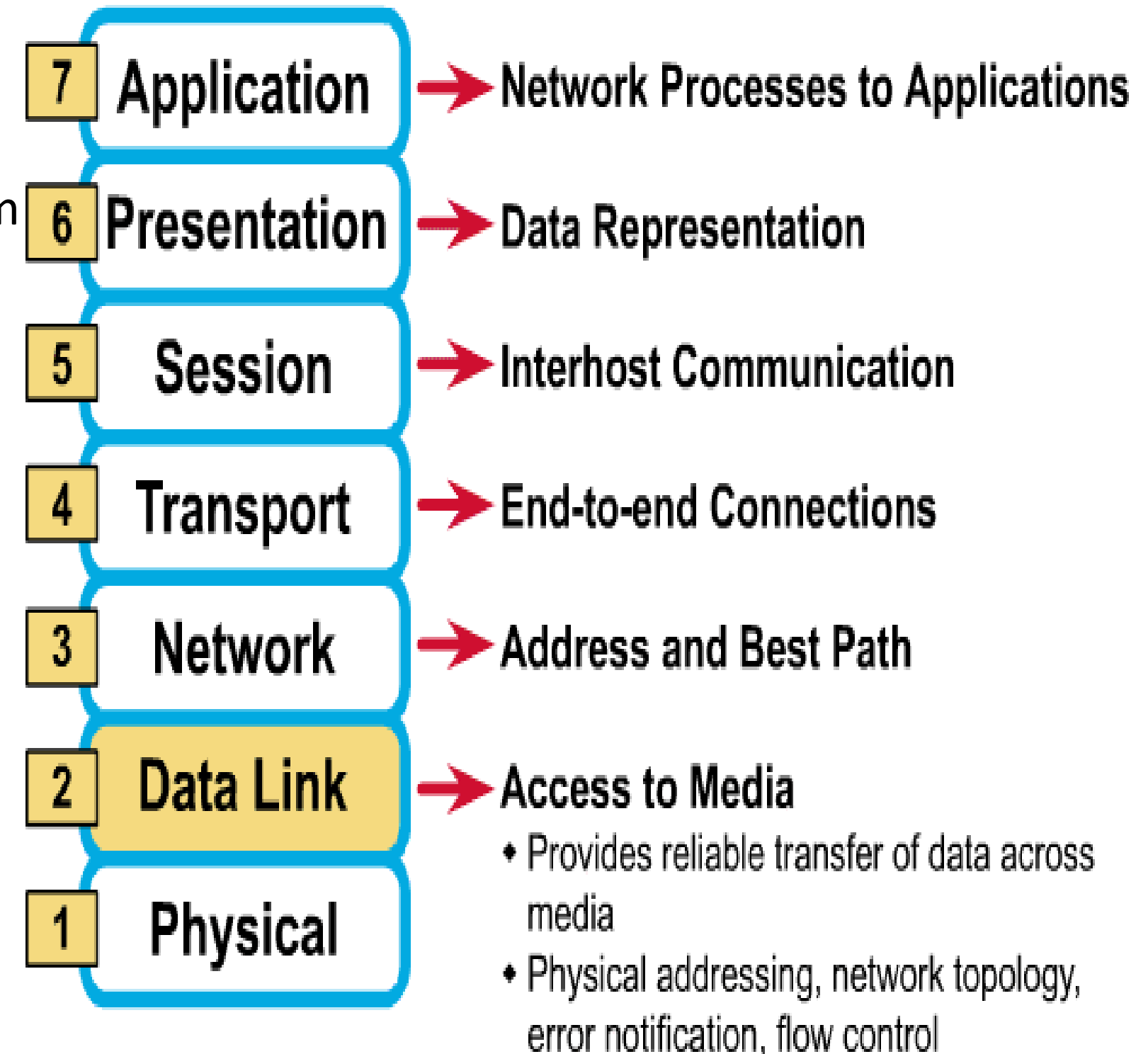


Data Link Layer

Places data and retrieves it from the physical layer and provides error detection capabilities

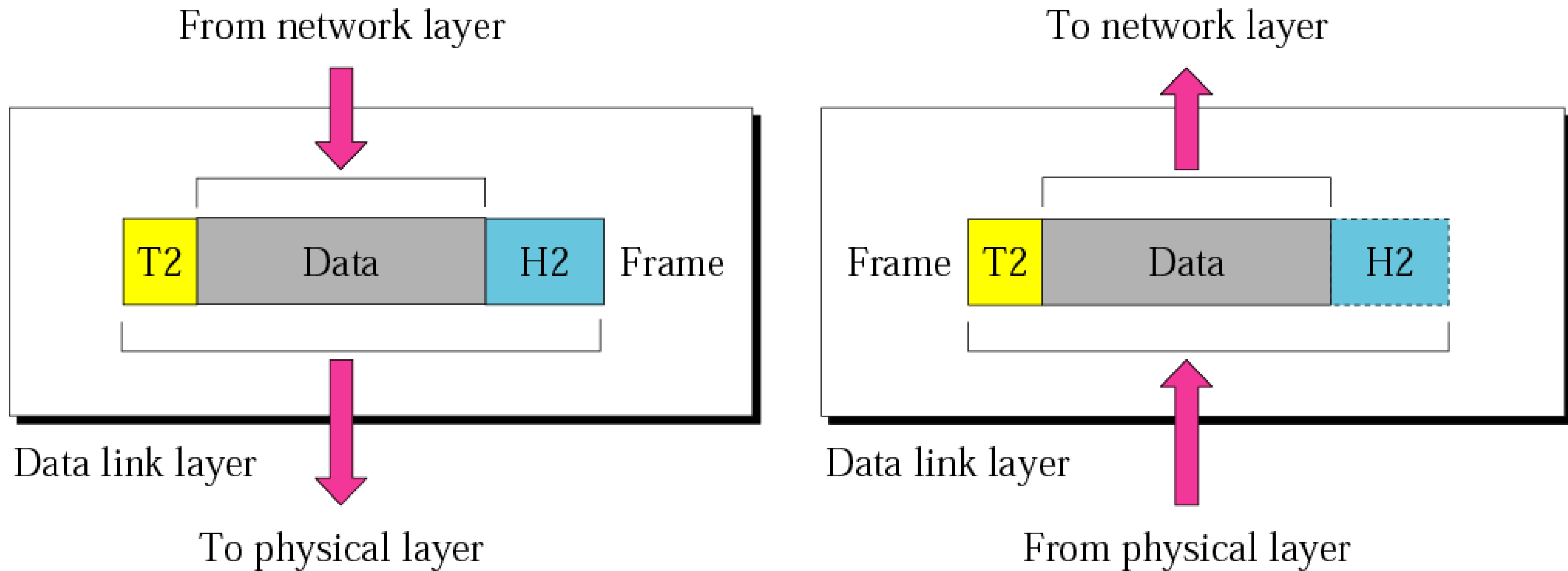
Framing—The data link layer divides the stream of bits received from the network layer into manageable data units called frames.

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





Data Link Layer

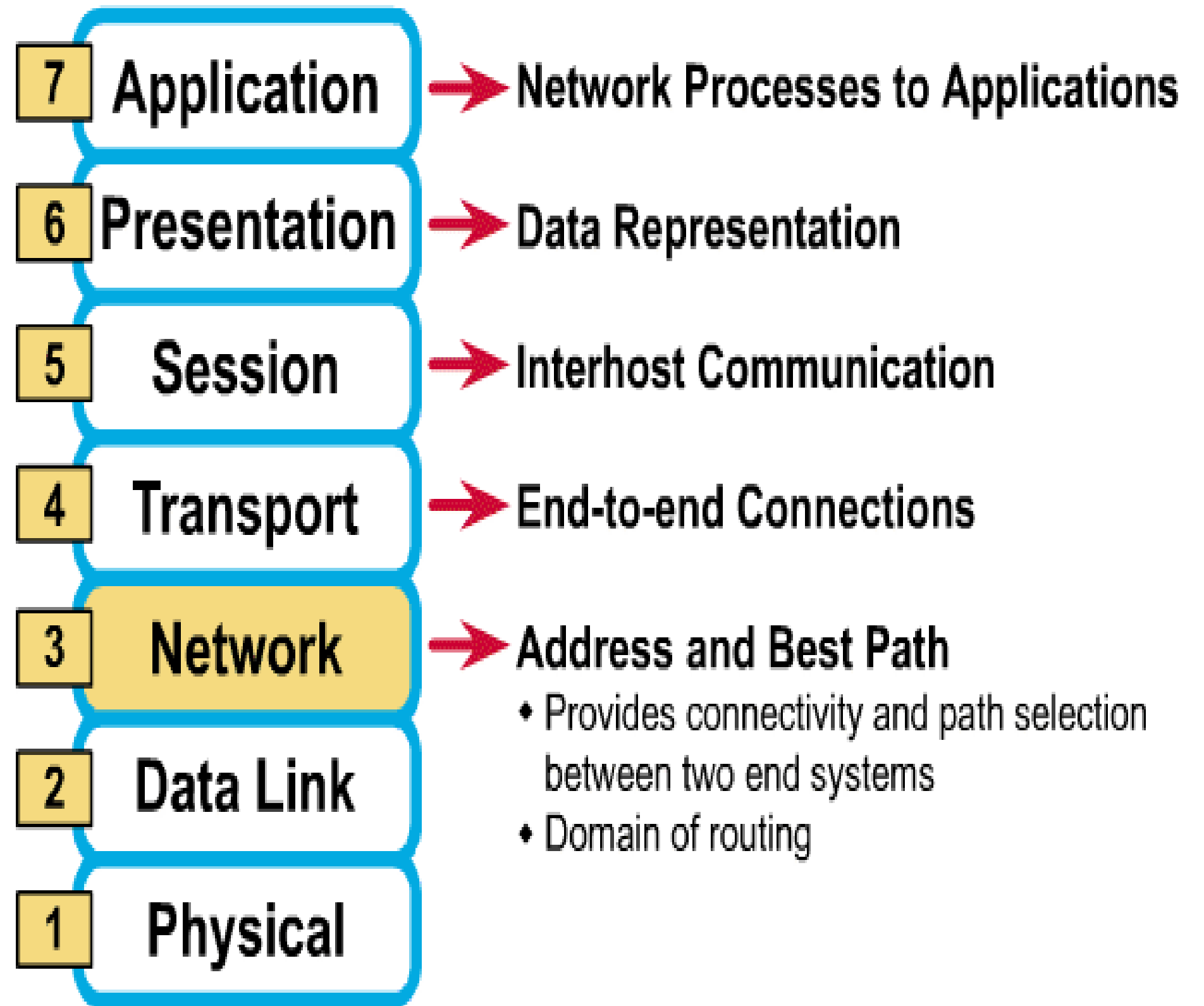


The data link layer is responsible for moving frames from one hop (node) to the next.



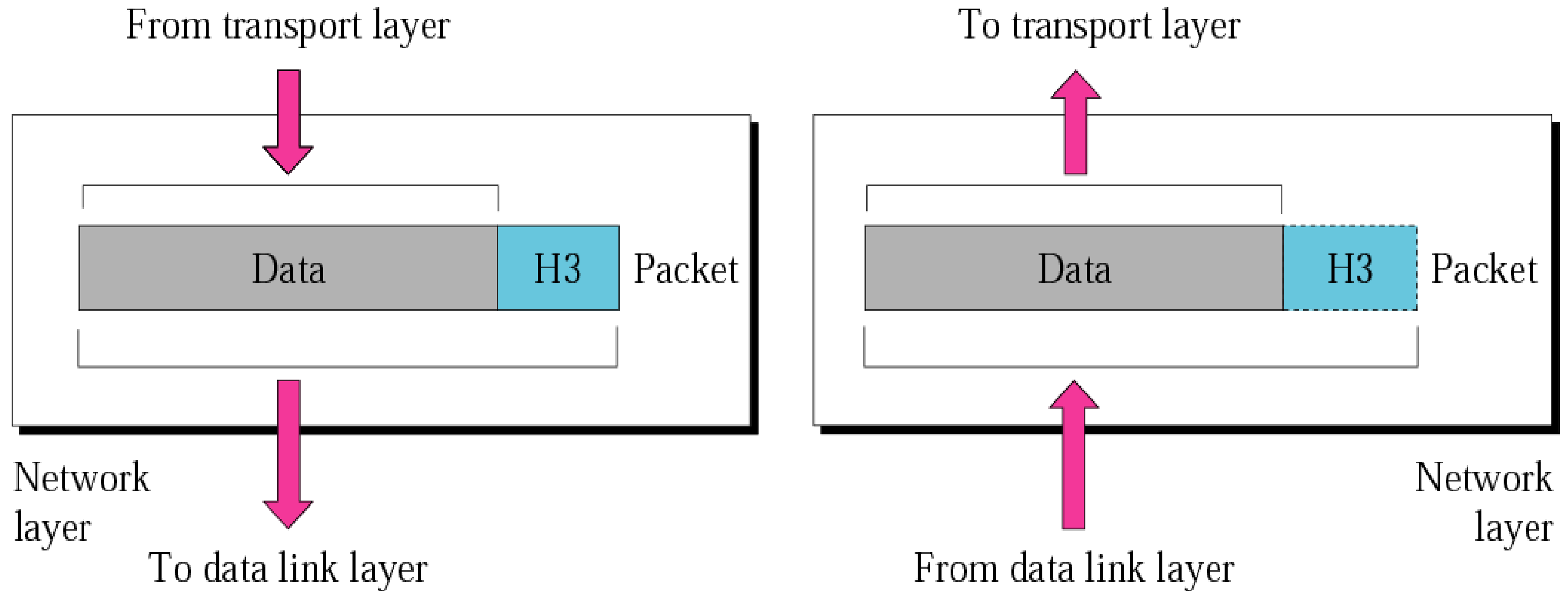
Network Layer

- ✓ The network layer is responsible for the source – to – destination delivery of a packet.
- ✓ Provides network-wide addressing and a mechanism to move packets between networks (routing).
- ✓ Responsibilities: Network addressing or Logical addressing Routing
- ✓ Example: IP from TCP/IP





Network Layer



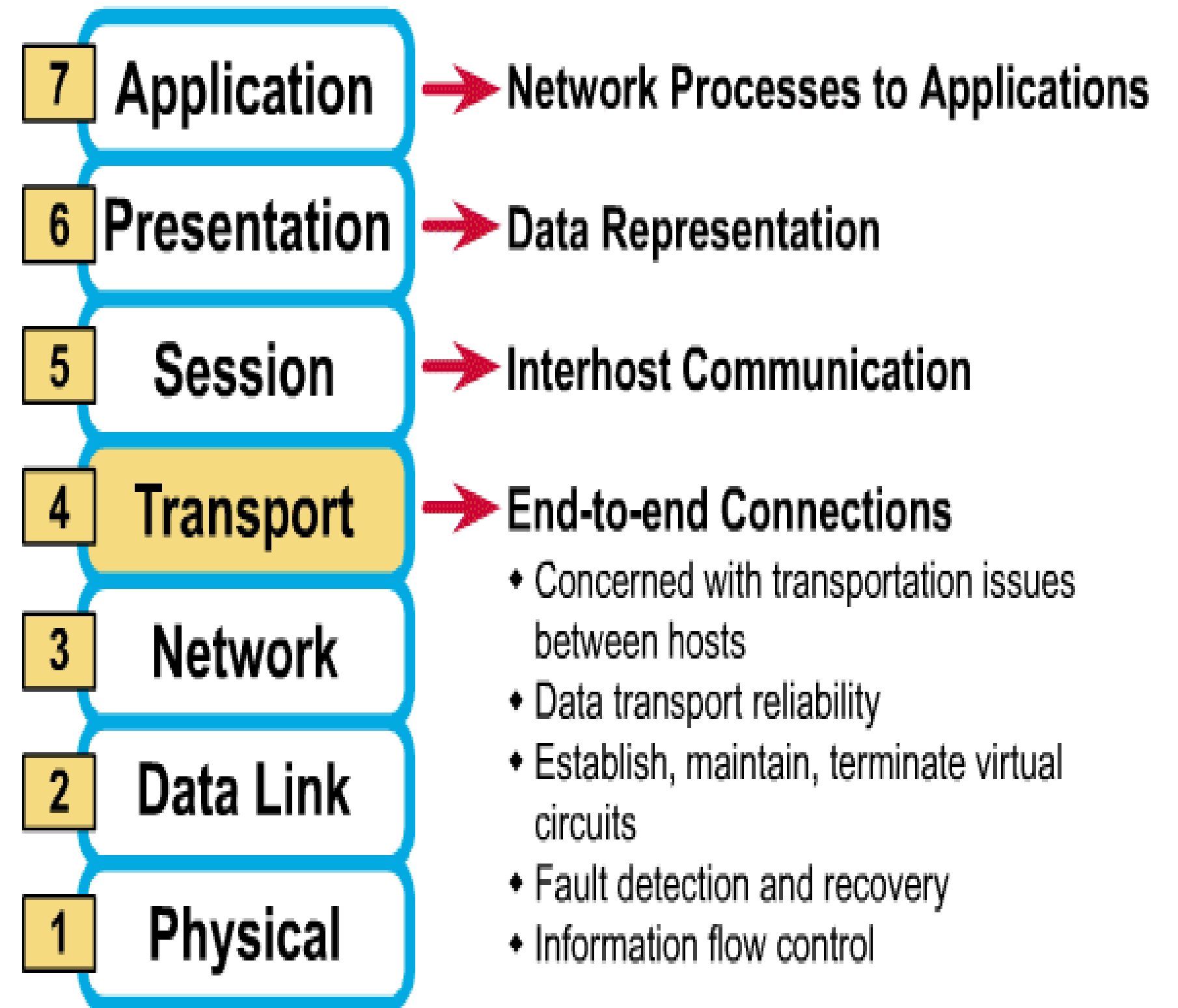
The network layer is responsible for the delivery of individual packets from the source host to the destination host.



Transport Layer

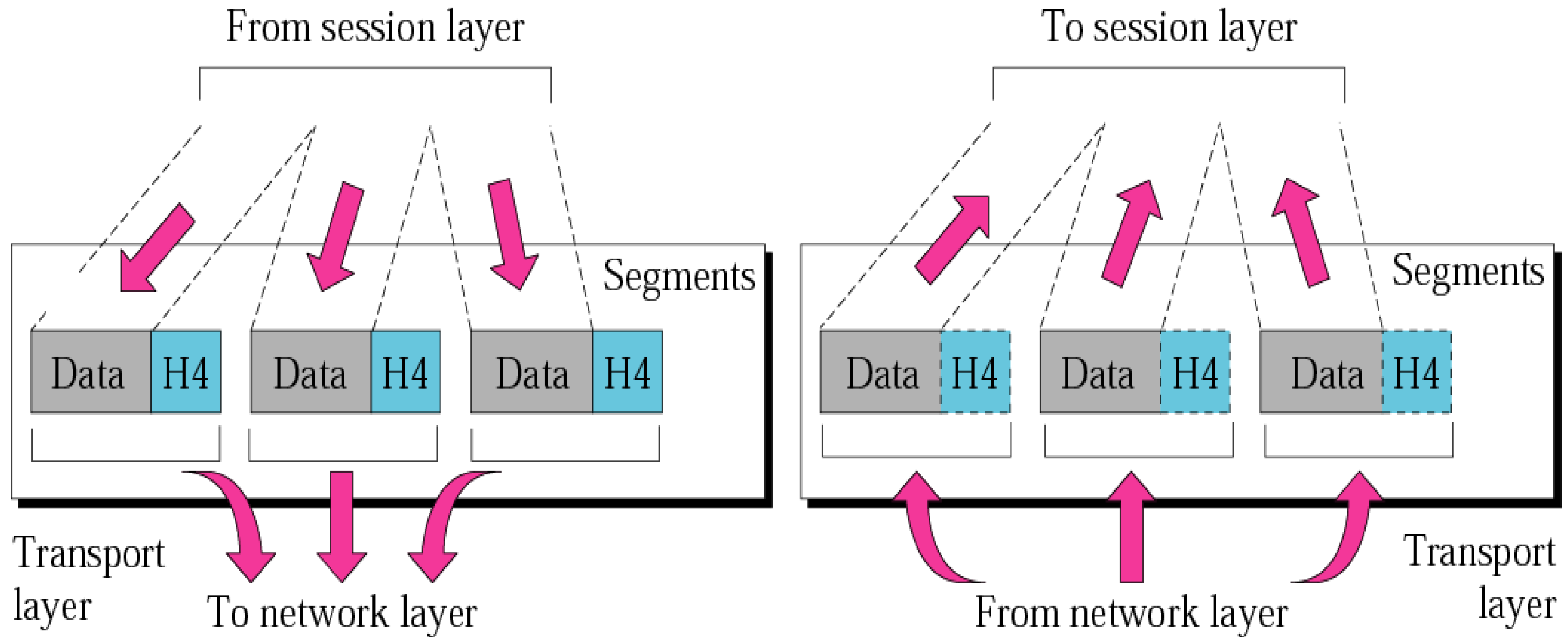
The transport layer is responsible for process-to-process delivery of the entire message

- Port Addressing
- Provides reliable data delivery
- It's the TCP in TCP/IP
- Receives info from upper layers and segments it into packets
- Can provide error detection and correction
- Segmentation and reassembly





Transport Layer

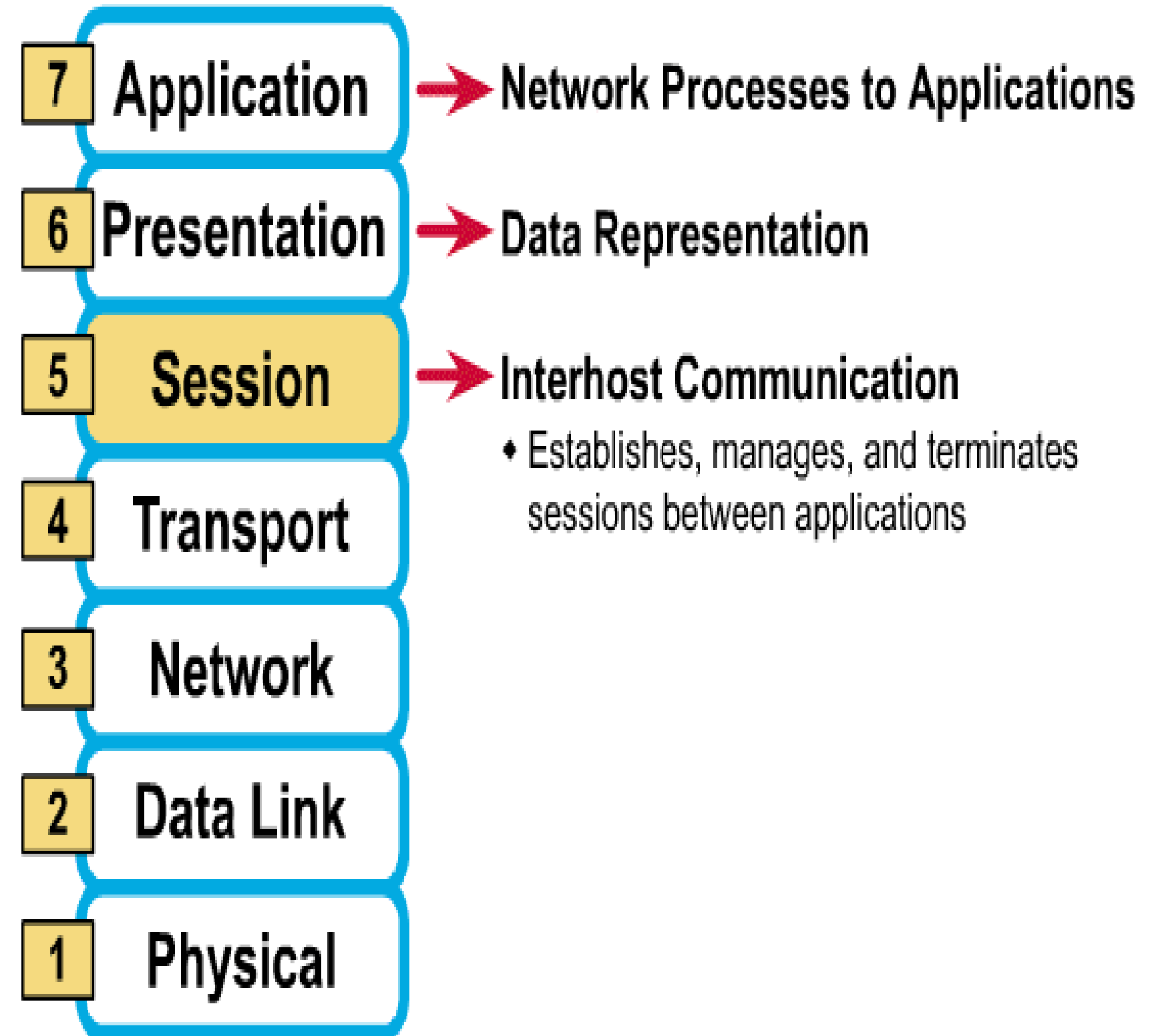


The transport layer is responsible for the delivery of a message from one process to another.



Session Layer

- ✓ The session layer is the network dialog controller.
- ✓ It establishes, maintains, and synchronizes the interaction among communicating systems
- ✓ Allows applications to maintain an ongoing session
Synchronization (Check Points) & Dialog Control
(Manages who's turn to transfer data)
- ✓ Where is it on my computer?
 - Workstation and Server Service (MS)
 - Windows Client for
 - NetWare (NetWare)

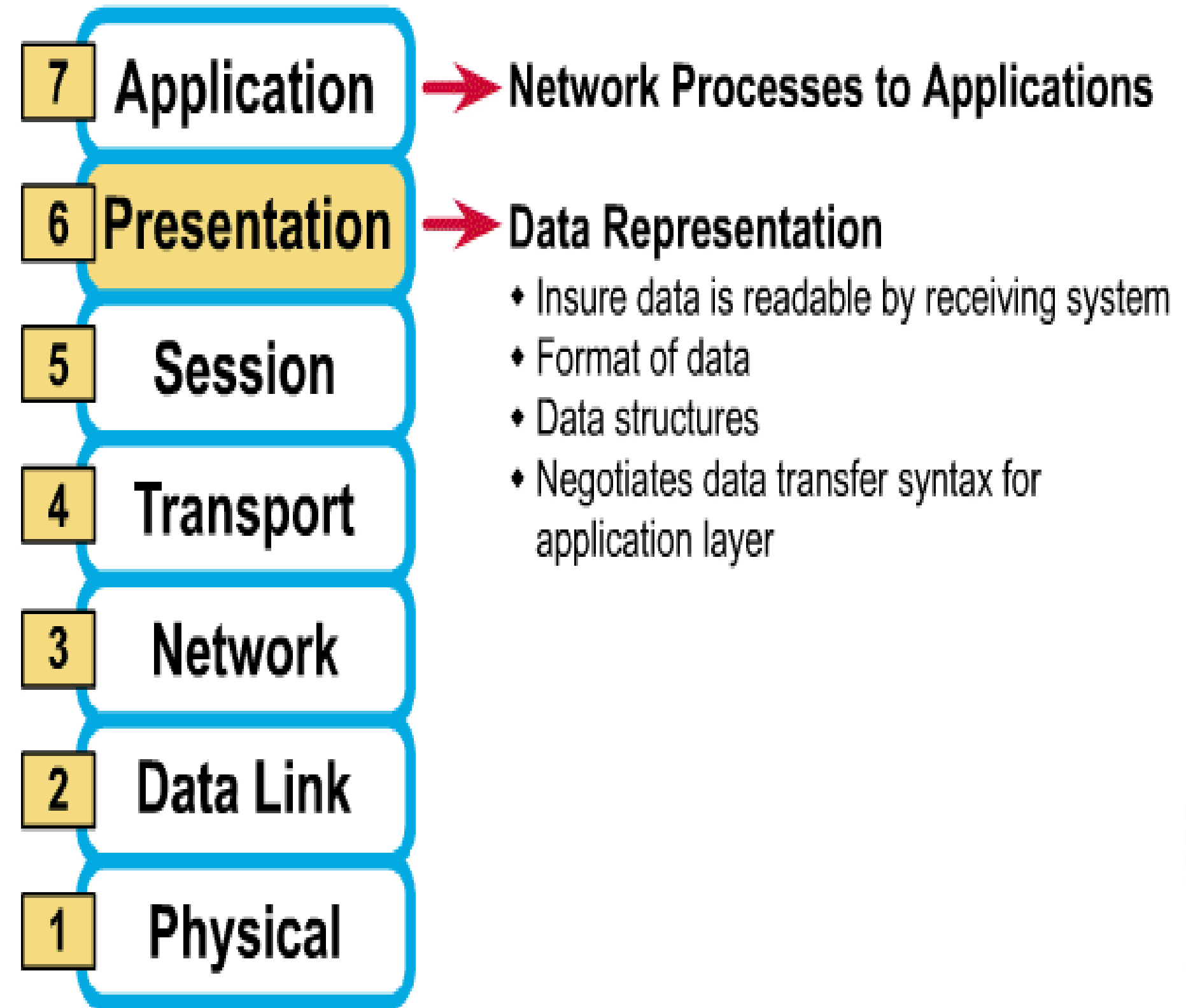




Presentation Layer

The presentation layer is concerned with the syntax and semantics of the information exchanged between two systems.

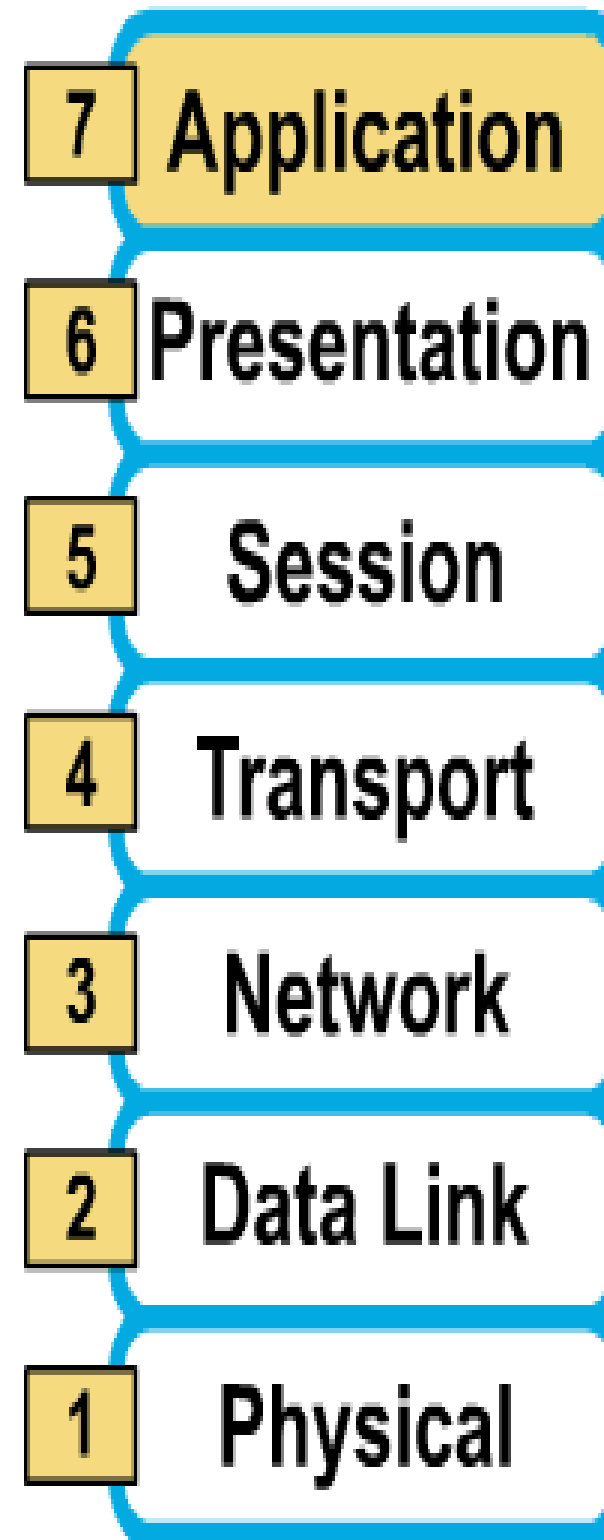
- Translation - Encoding and Decoding
- Encryption
- Compression





Application Layer

- ✓ The application layer enables the user, whether human or software, to access the network.
- ✓ It provides user interfaces and support for services such as electronic mail, remote file access and transfer etc



→ Network Processes to Applications

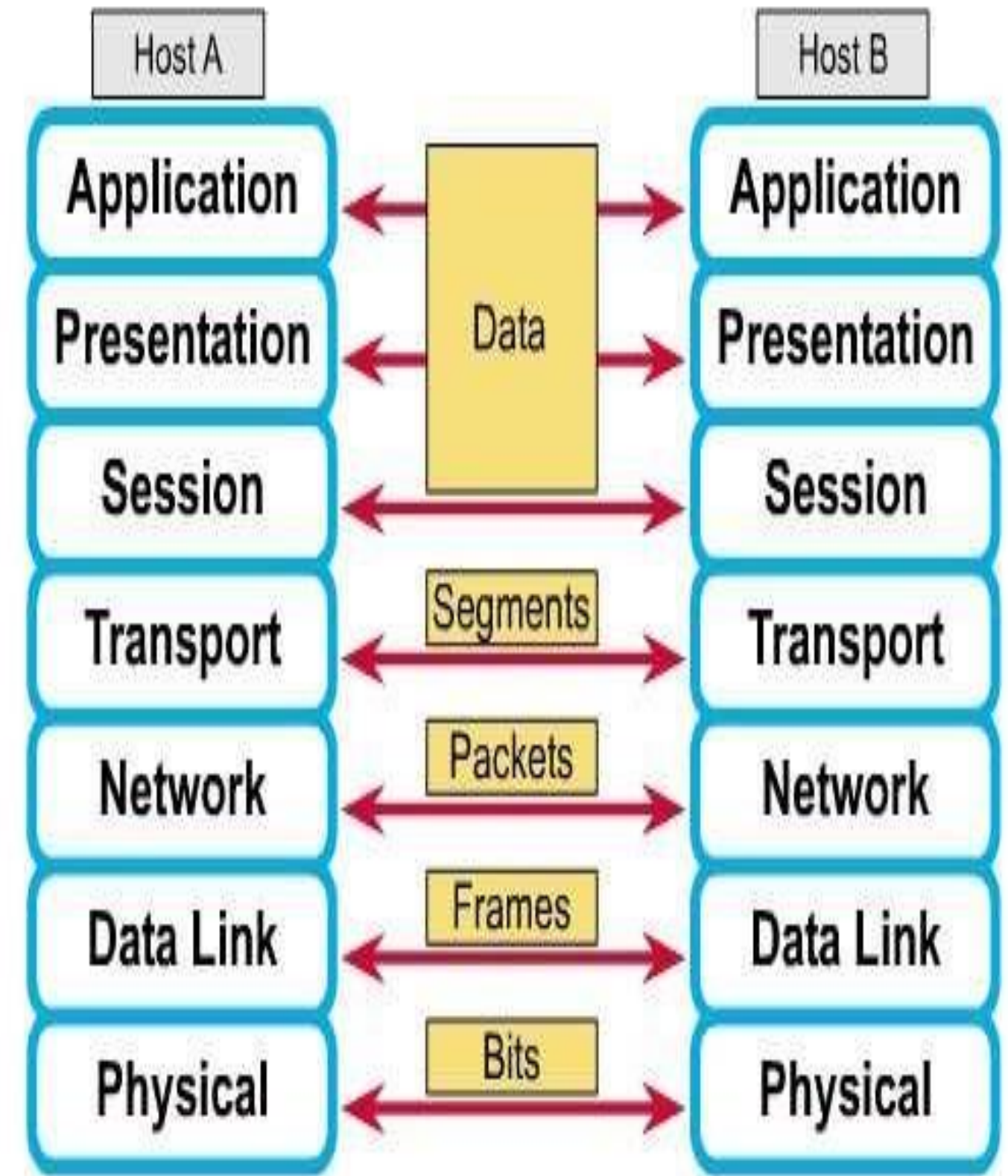
- ◆ Provides network services to application processes (such as electronic mail, file transfer, and terminal emulation)



How Does It All Work Together

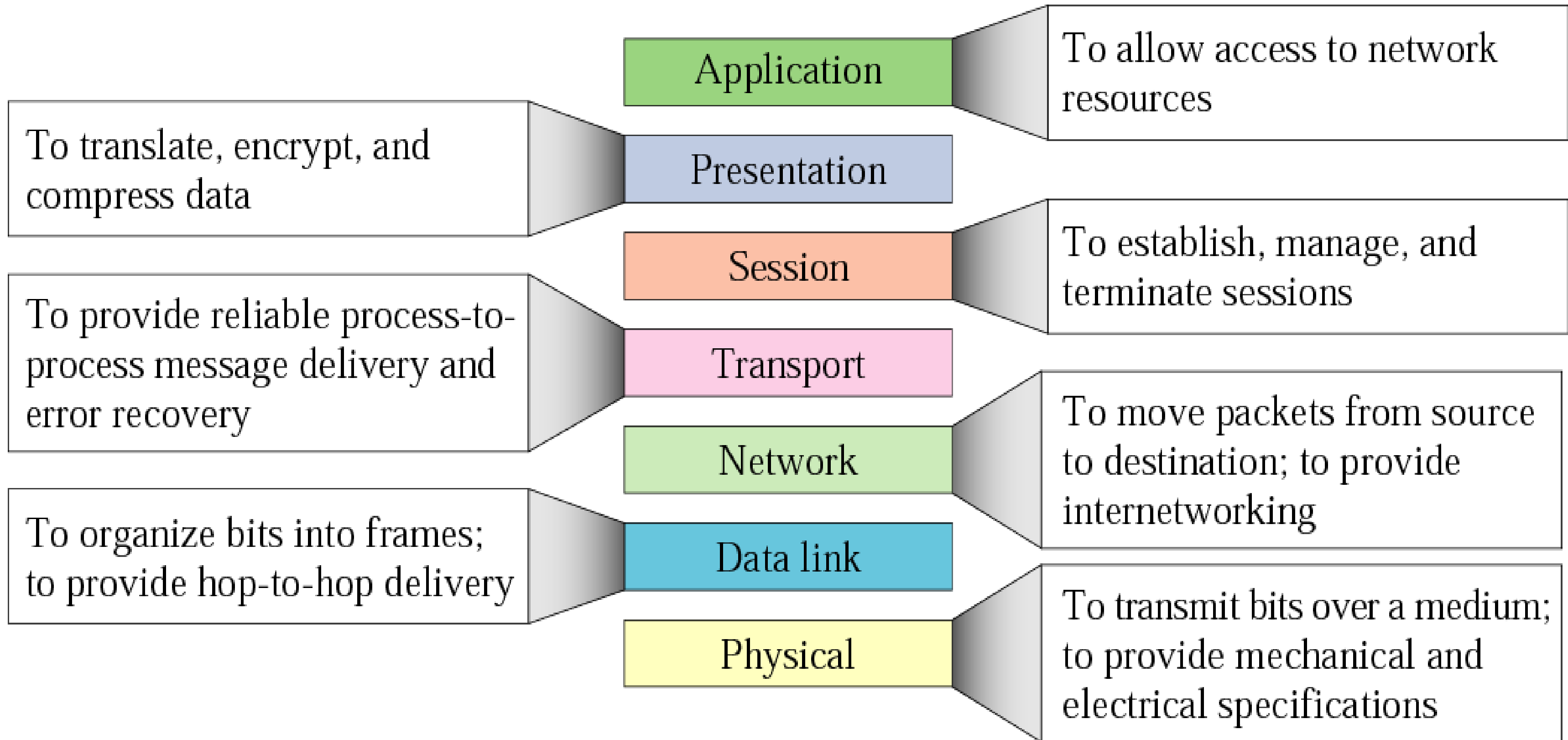
Each layer contains a **Protocol Data Unit (PDU)**

- PDU's are used for peer-to-peer contact between corresponding layers.
- Data is handled by the top three layers, then Segmented by the Transport layer.
- The Network layer places it into packets and the Data Link frames the packets for transmission.
- Physical layer converts it to bits and sends it out over the media.
- The receiving computer reverses the process using the information contained in the PDU.





Summary





Analogy – Postal System

Application

Presentation

Session

Transport

Network

Data-Link

Physical

A- Write a 20 page letter to a foreign country.

P- Translate the letter so the receiver can read it.

S- Insure the intended recipient can receive letter.

T- Separate and number pages. Like registered mail, tracks delivery and requests another package if one is “lost” or “damaged” in the mail.

N- Postal Center sorting letters by zip code to route them closer to destination.

D- Local Post Office determining which vehicles to deliver letters.

P- Physical Trucks, Planes, Rail, autos, etc which carry letter between stations.