SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107

Accredited by NAAC-UGC with 'A' Grade

Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

Department of Information Technology

Course Name – 19IT401 Computer Networks

II Year / IV Semester

Unit 1 – Introduction and Physical Layer

Topic 4- OSI Model

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 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 there products are compatible with current and future technologies.

What is "THE MODEL?"
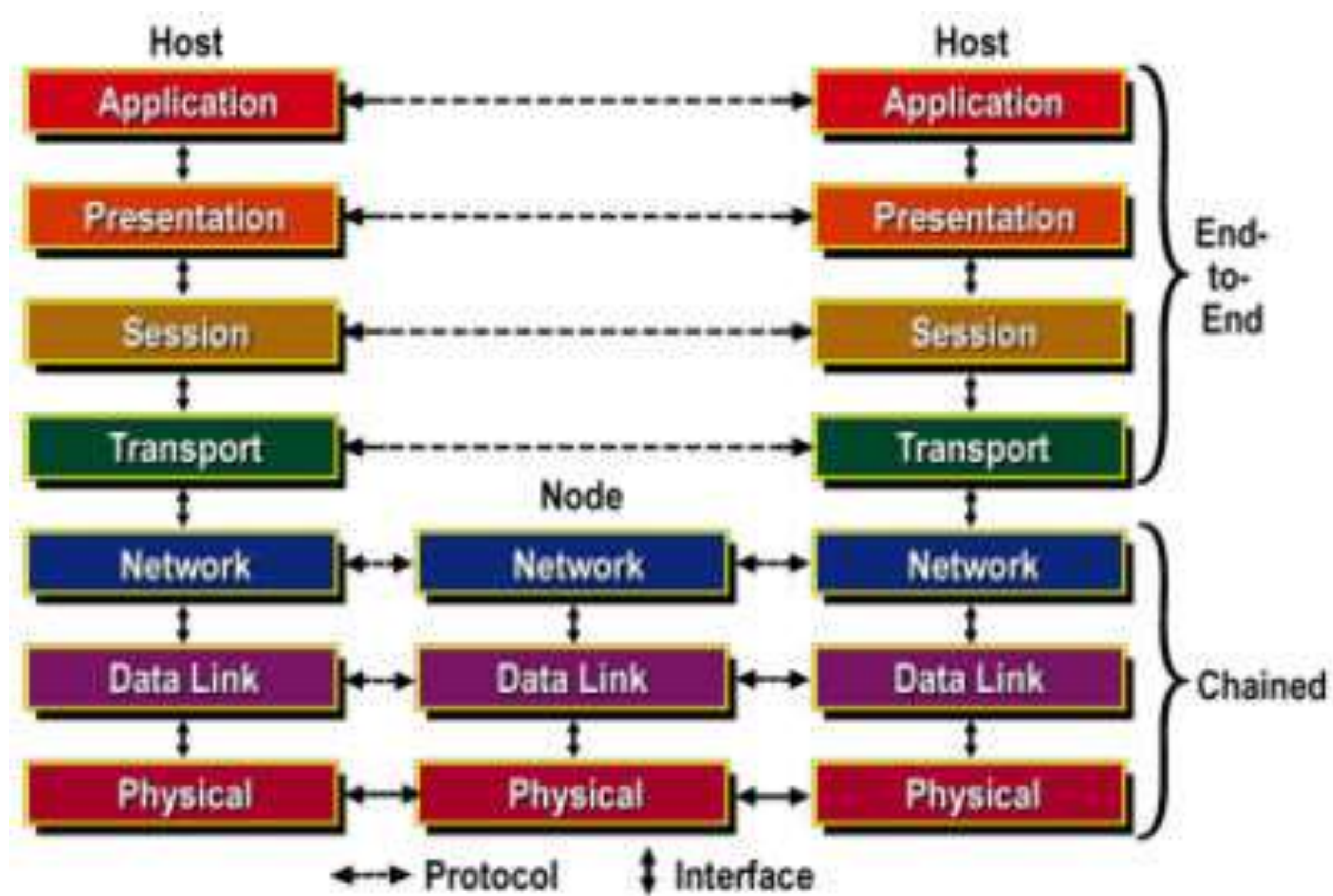
Physical Layer

- 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)
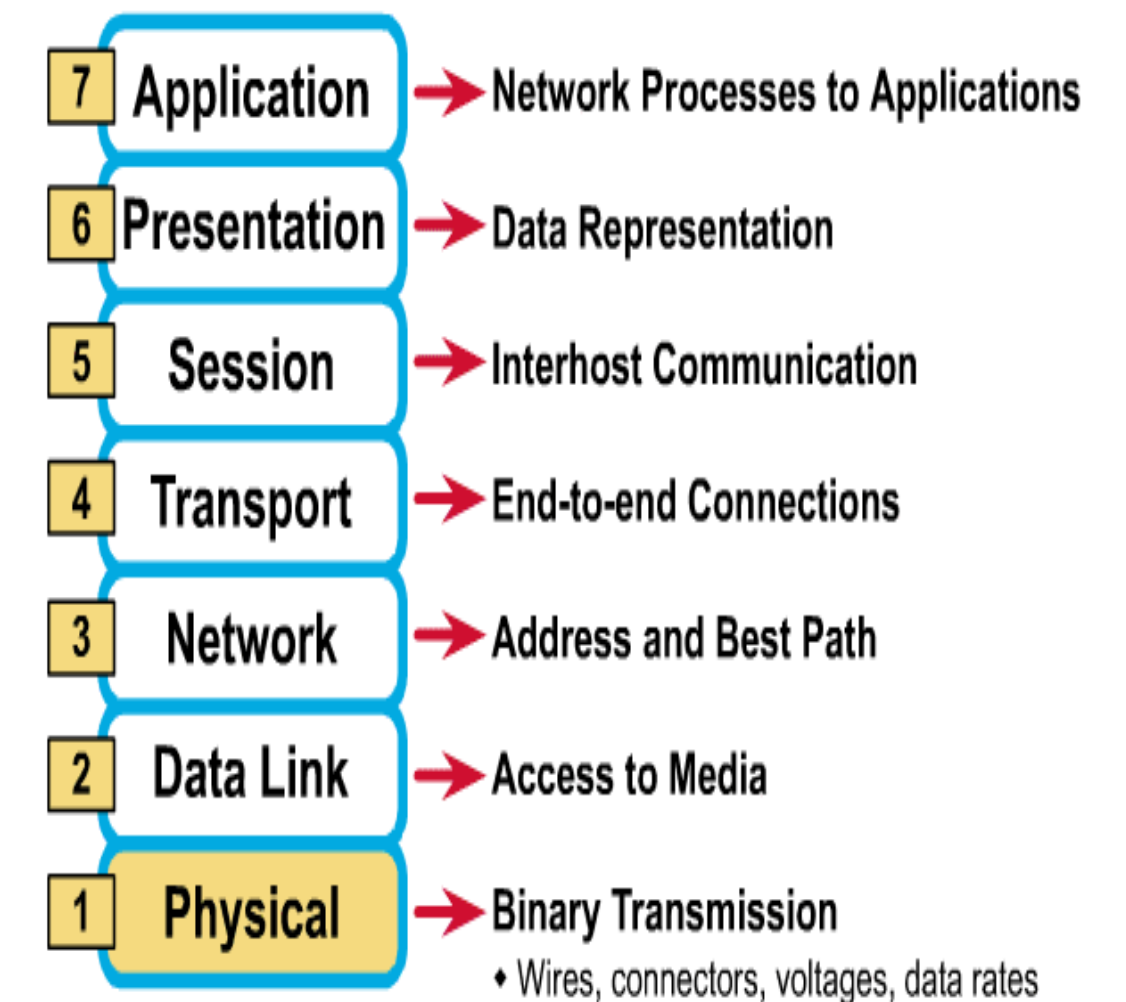   Electrical properties
    Transmission mode

Examples:
    Ethernet (IEEE 802.3)
    Token Ring (IEEE 802.5)
    Wireless (IEEE 802.11b)

The 7 Layers of the OSI Model

7	Application	→ Network Processes to Applications
6	Presentation	→ Data Representation
5	Session	→ Interhost Communication
4	Transport	→ End-to-end Connections
3	Network	→ Address and Best Path
2	Data Link	→ Access to Media
1	Physical	→ Binary Transmission

♦ Wires, connectors, voltages, data rates

Physical Layer

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

From data link layer

To data link layer

1010100000010111 110

1010100000010111 110

Physical layer

Physical layer

Transmission medium

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

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
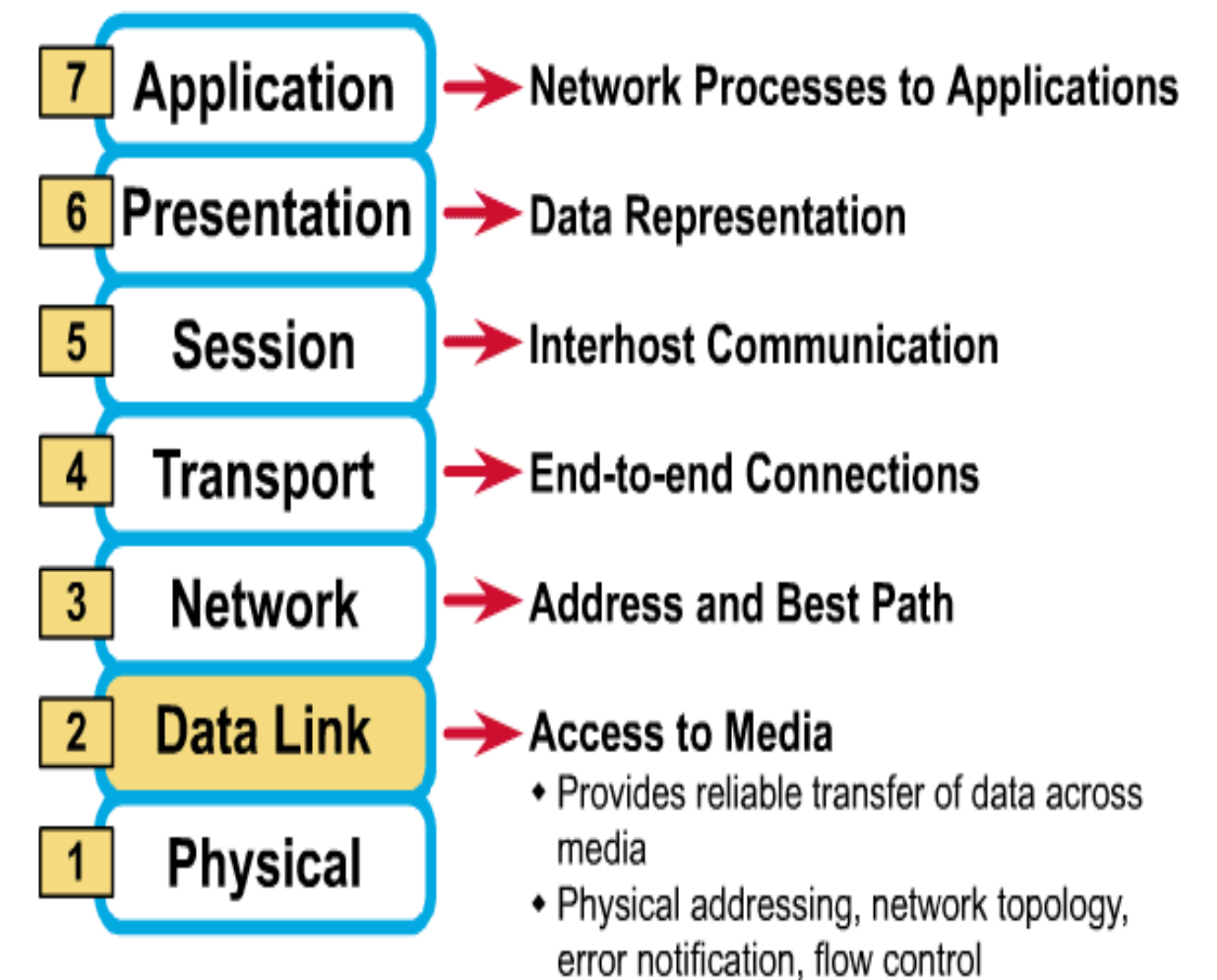   Twister Pair
   Fiber Optic
   Coax Cable

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

The 7 Layers of the OSI Model

7	Application	→ Network Processes to Applications
6	Presentation	→ Data Representation
5	Session	→ Interhost Communication
4	Transport	→ End-to-end Connections
3	Network	→ Address and Best Path
2	Data Link	→ Access to Media
1	Physical	

- Provides reliable transfer of data across media
- Physical addressing, network topology, error notification, flow control
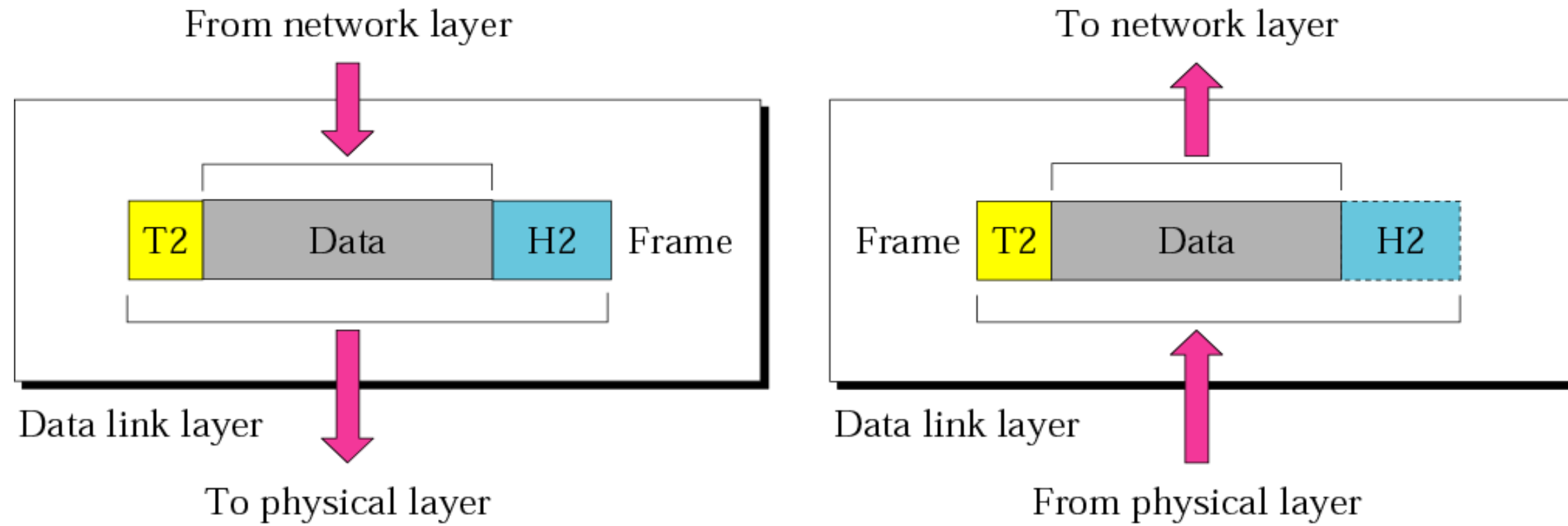
Data Link Layer

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

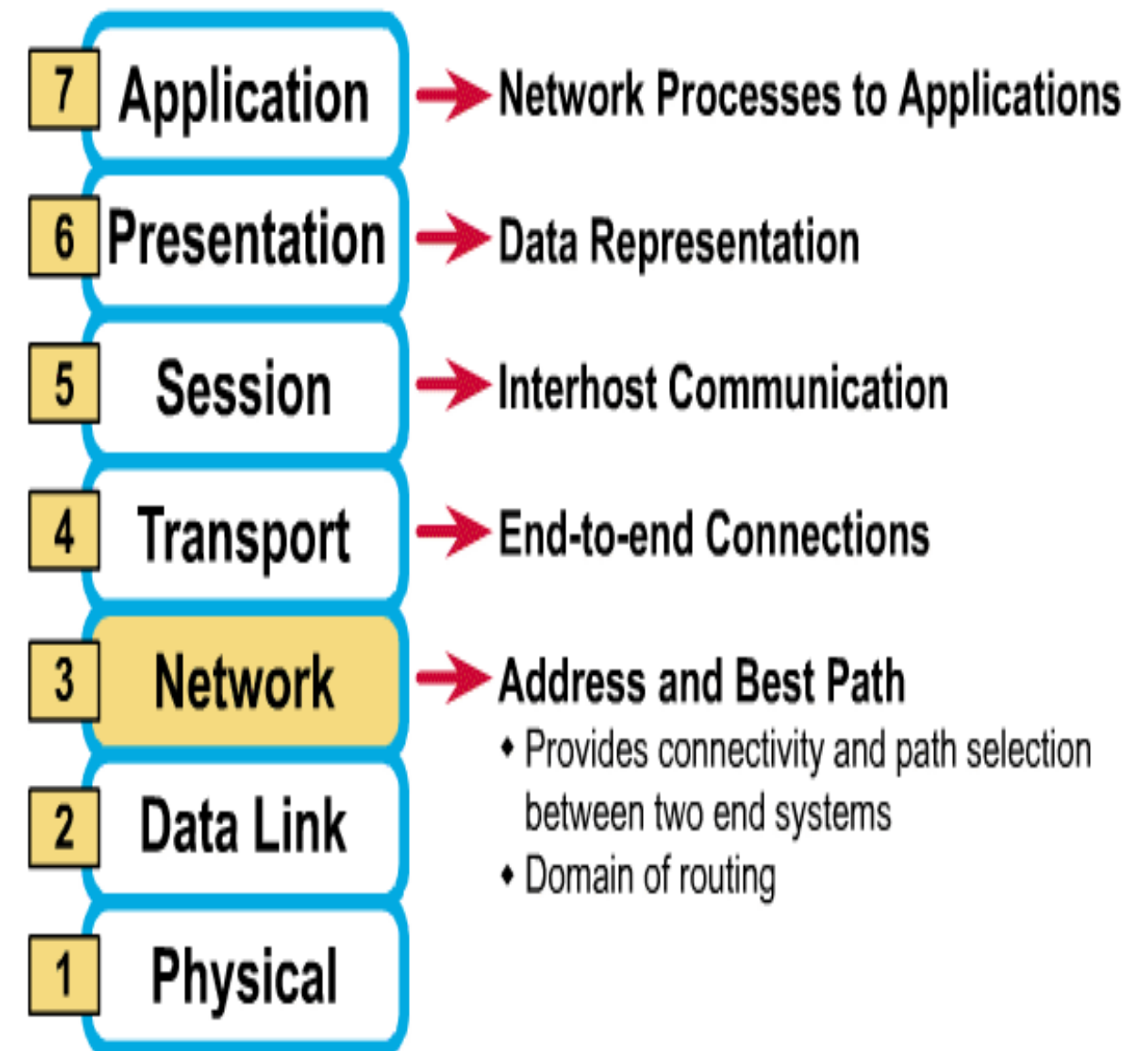Provides network-wide addressing and a mechanism to move packets between networks (routing)

Responsibilities:
Network addressing or Logical addressing
Routing

Example:
IP from TCP/IP

The 7 Layers of the OSI Model

7	Application	→ Network Processes to Applications
6	Presentation	→ Data Representation
5	Session	→ Interhost Communication
4	Transport	→ End-to-end Connections
3	Network	→ Address and Best Path
2	Data Link	
1	Physical	

• Provides connectivity and path selection between two end systems
• Domain of routing

Network Layer

From transport layer

Data | H3 | Packet

Network layer

To data link layer

To transport layer

Data | H3 | Packet

Network layer
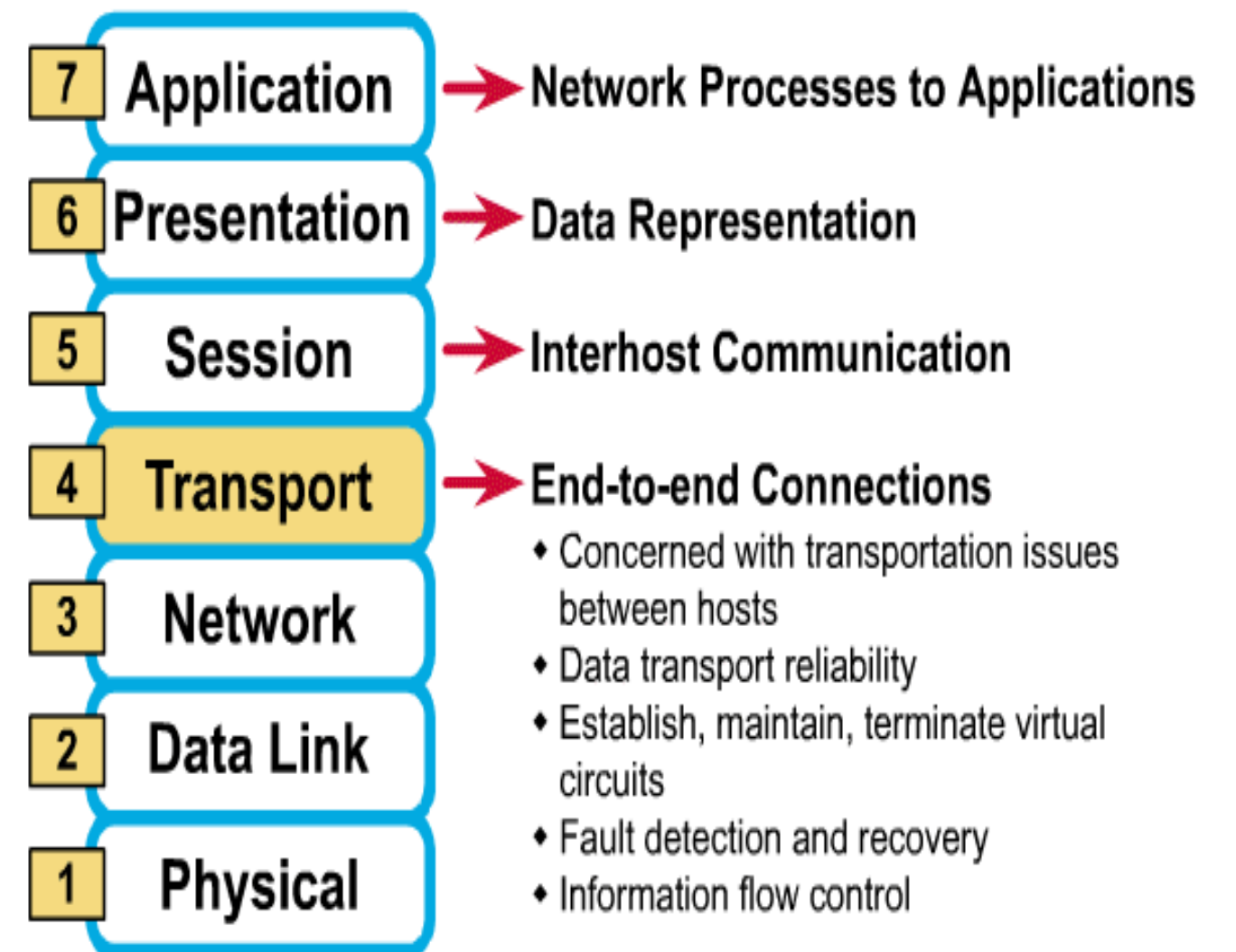
From data link layer

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
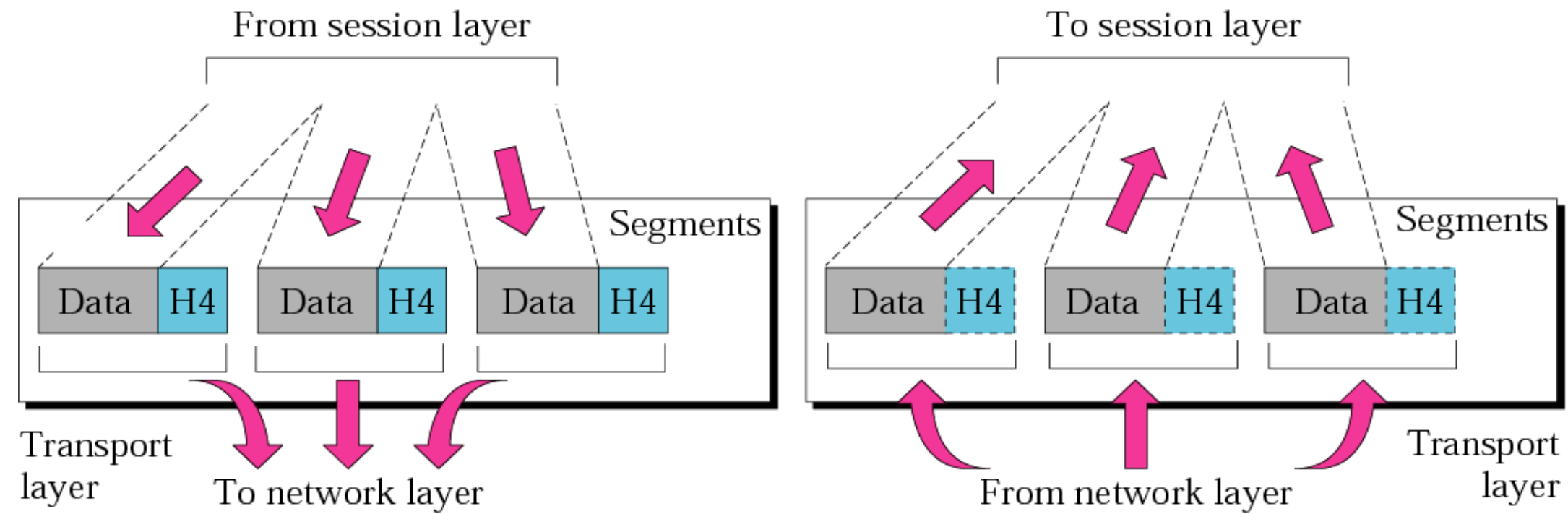
- Port Addressing

- 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

The 7 Layers of the OSI Model

7	Application	→	Network Processes to Applications
6	Presentation	→	Data Representation
5	Session	→	Interhost Communication
4	Transport	→	End-to-end Connections
3	Network		
2	Data Link		
1	Physical		

- Concerned with transportation issues between hosts
- Data transport reliability
- Establish, maintain, terminate virtual circuits
- Fault detection and recovery
- Information flow control

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
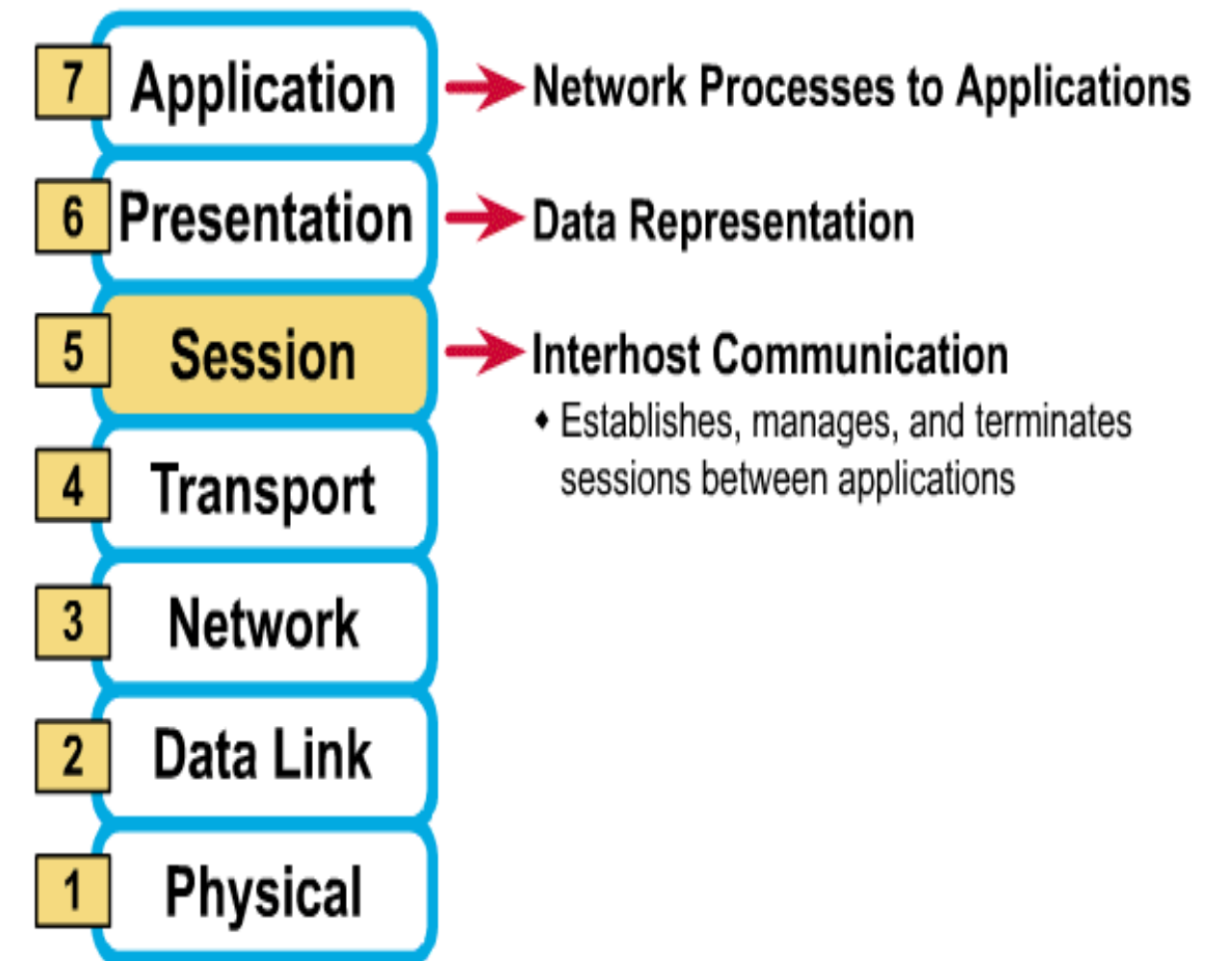Synchronization (Check Points)

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)

The 7 Layers of the OSI Model

7 Application → Network Processes to Applications

6 Presentation → Data Representation

5 Session → Interhost Communication
    • Establishes, manages, and terminates sessions between applications

4 Transport
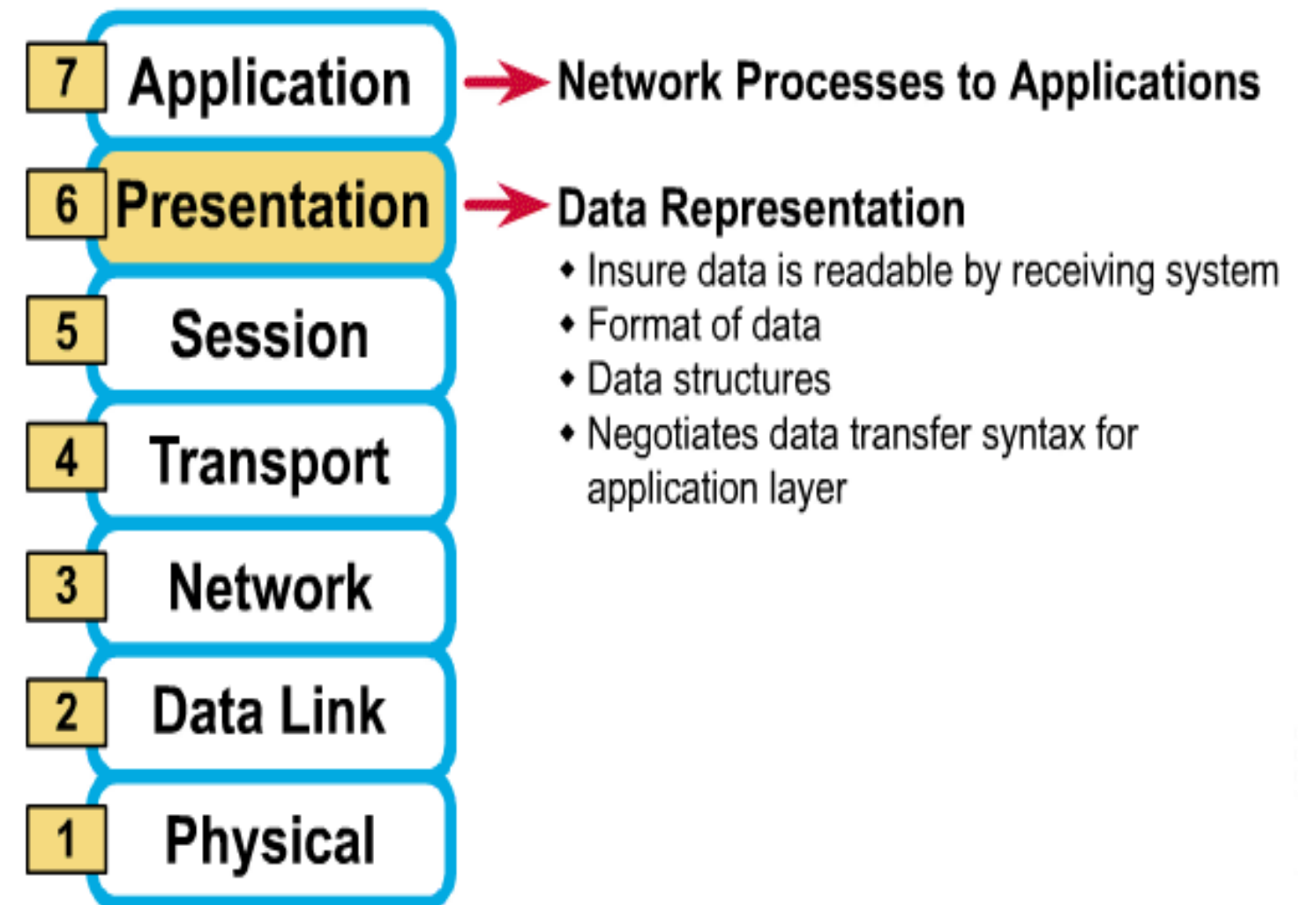
3 Network

2 Data Link

1 Physical

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

The 7 Layers of the OSI Model

7	Application	→ Network Processes to Applications
6	Presentation	→ Data Representation
5	Session	
4	Transport	
3	Network	
2	Data Link	
1	Physical	

- Insure data is readable by receiving system
- Format of data
- Data structures
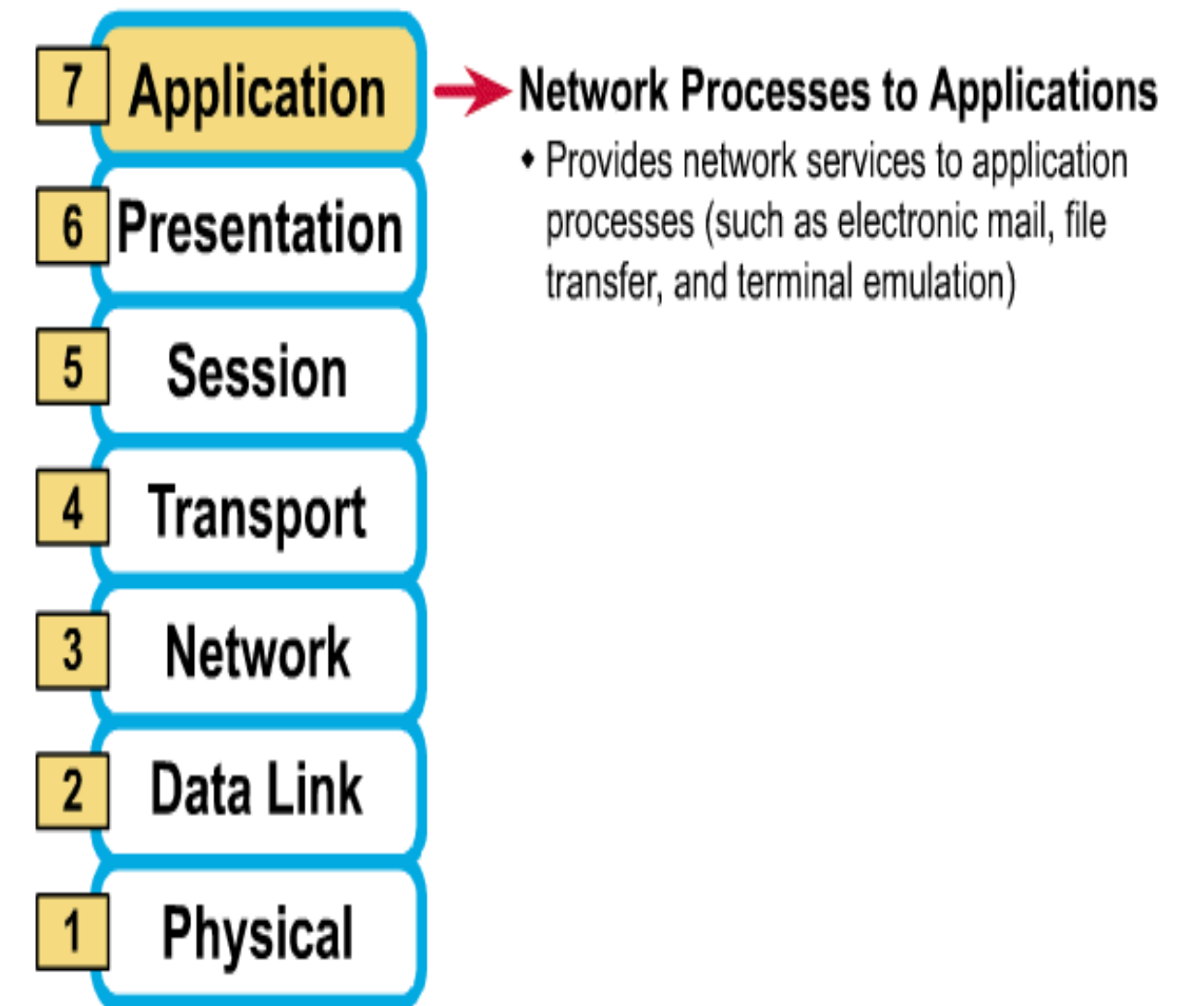- Negotiates data transfer syntax for application layer

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

The 7 Layers of the OSI Model

7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Data Link
1	Physical

→ Network Processes to Applications
- Provides network services to application processes (such as electronic mail, file transfer, and terminal emulation)
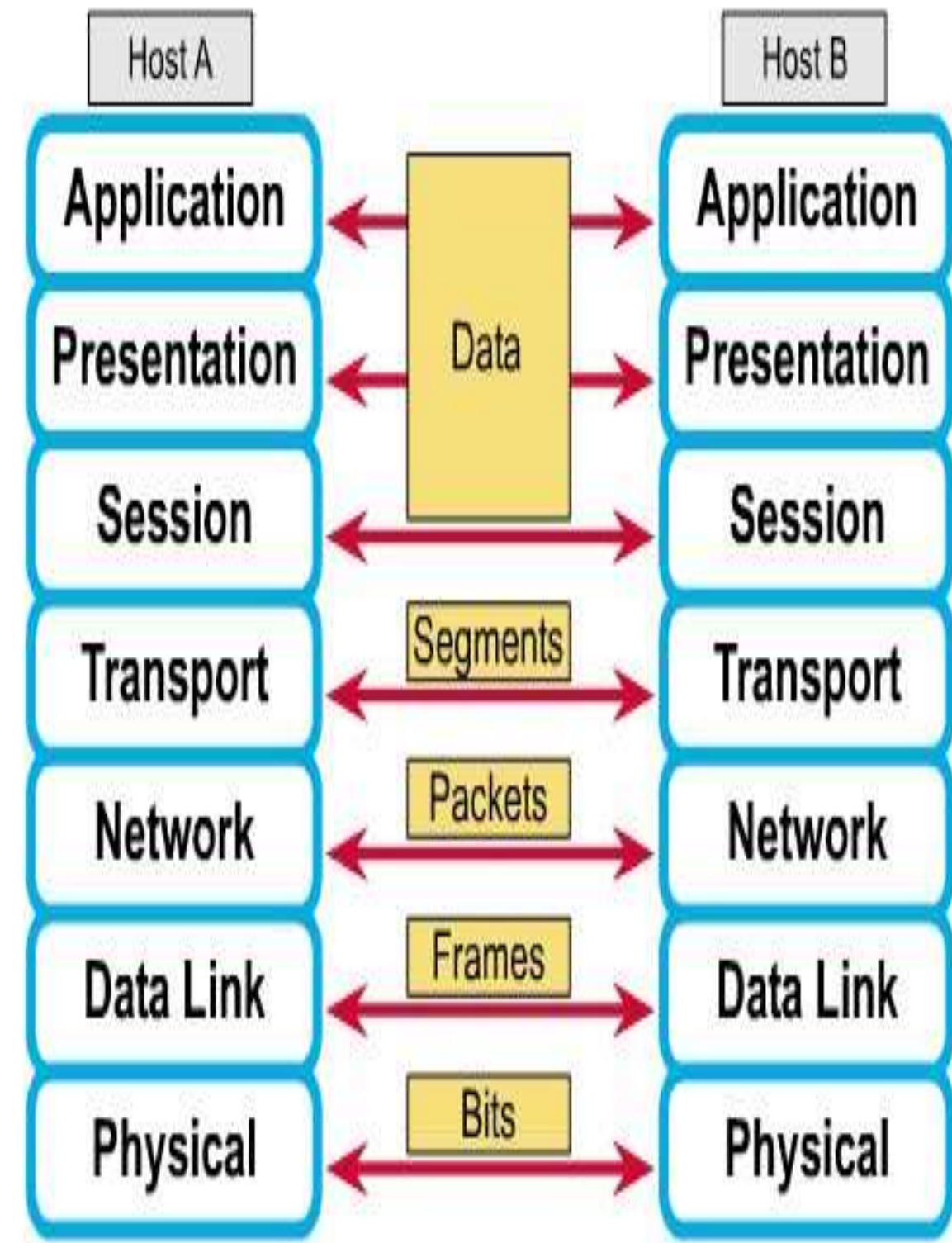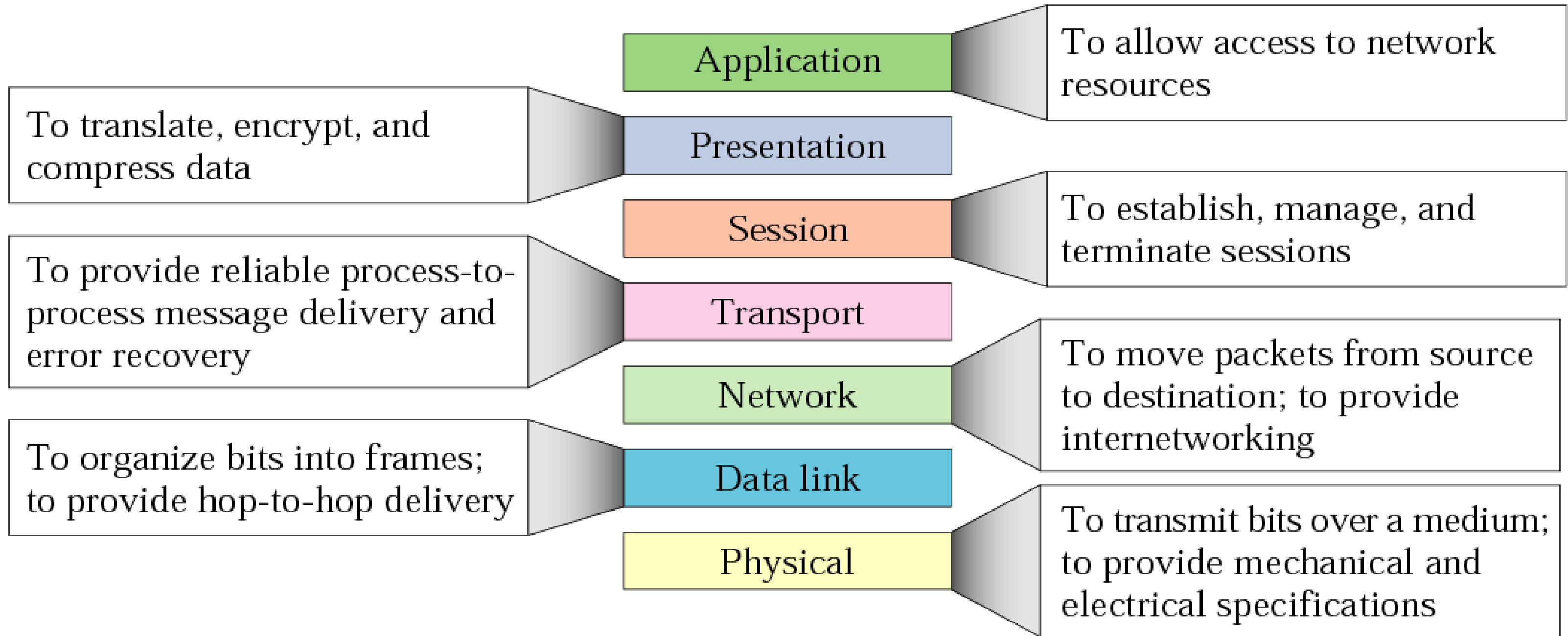
How Does It All Work Together

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

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

Analogy – Postal System

Layer
Application
Presentation
Session
Transport
Network
Data-Link
Physical

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

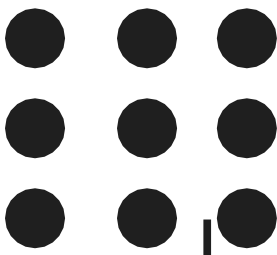**P-** Translate the letter so the receiver can read it.

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.

THANK YOU