

Lecture 1a - Networking Protocols

Type

Lecture

Materials

Empty

Reviewed

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1. Network Protocols

2. Layered Protocol Models

3. Data Encapsulation

4. Reference Models

5. The Physical Layer

6. Fundamental Principles of the Physical Layer

7. Quizzes

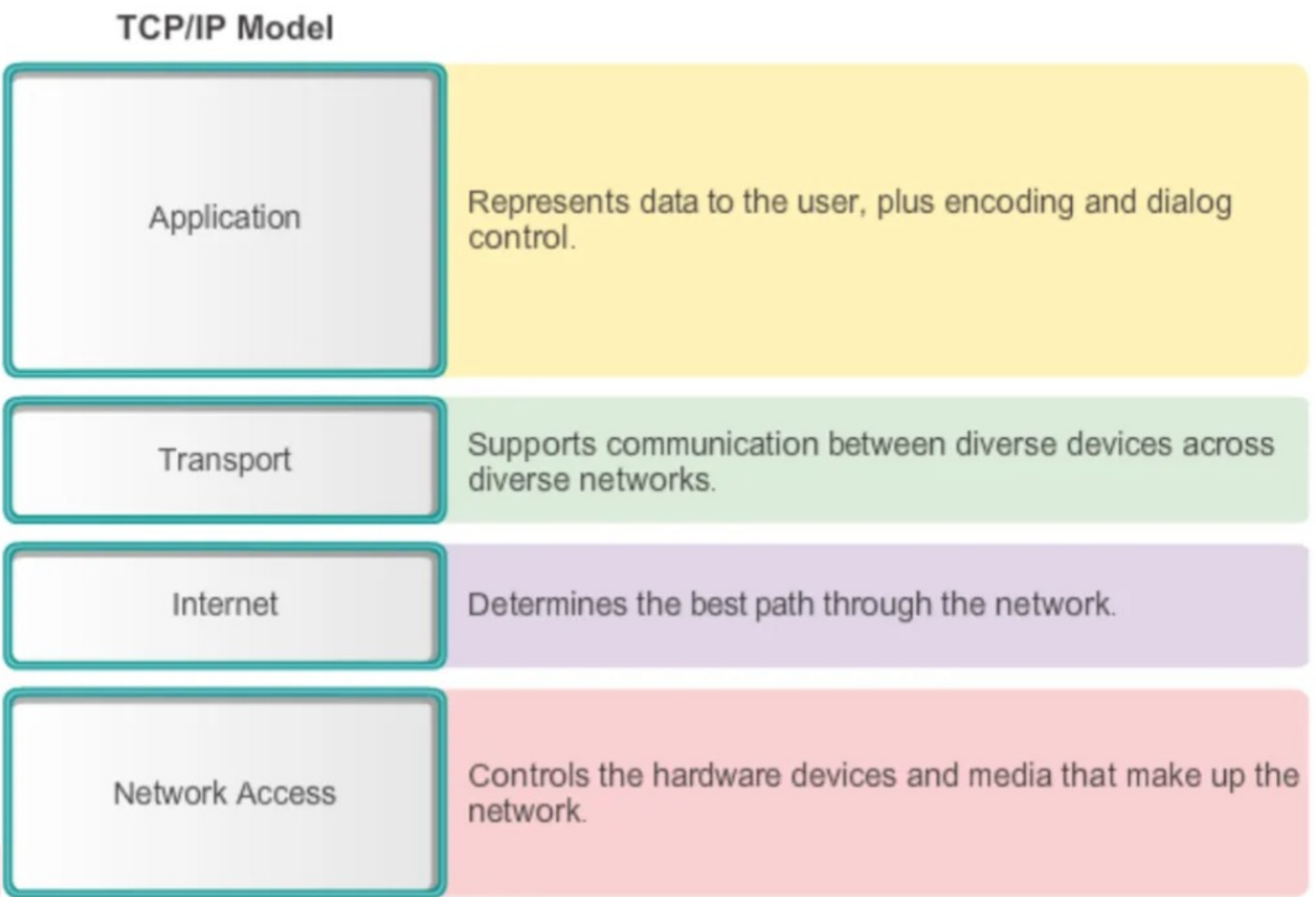
1. Network Protocols

- Defines how communications take place between two devices
- How the message is formatted or structured
- Rules of Communication
- Message Formatting and Encapsulation
 - Headers
 - Data



2. Layered Protocol Models

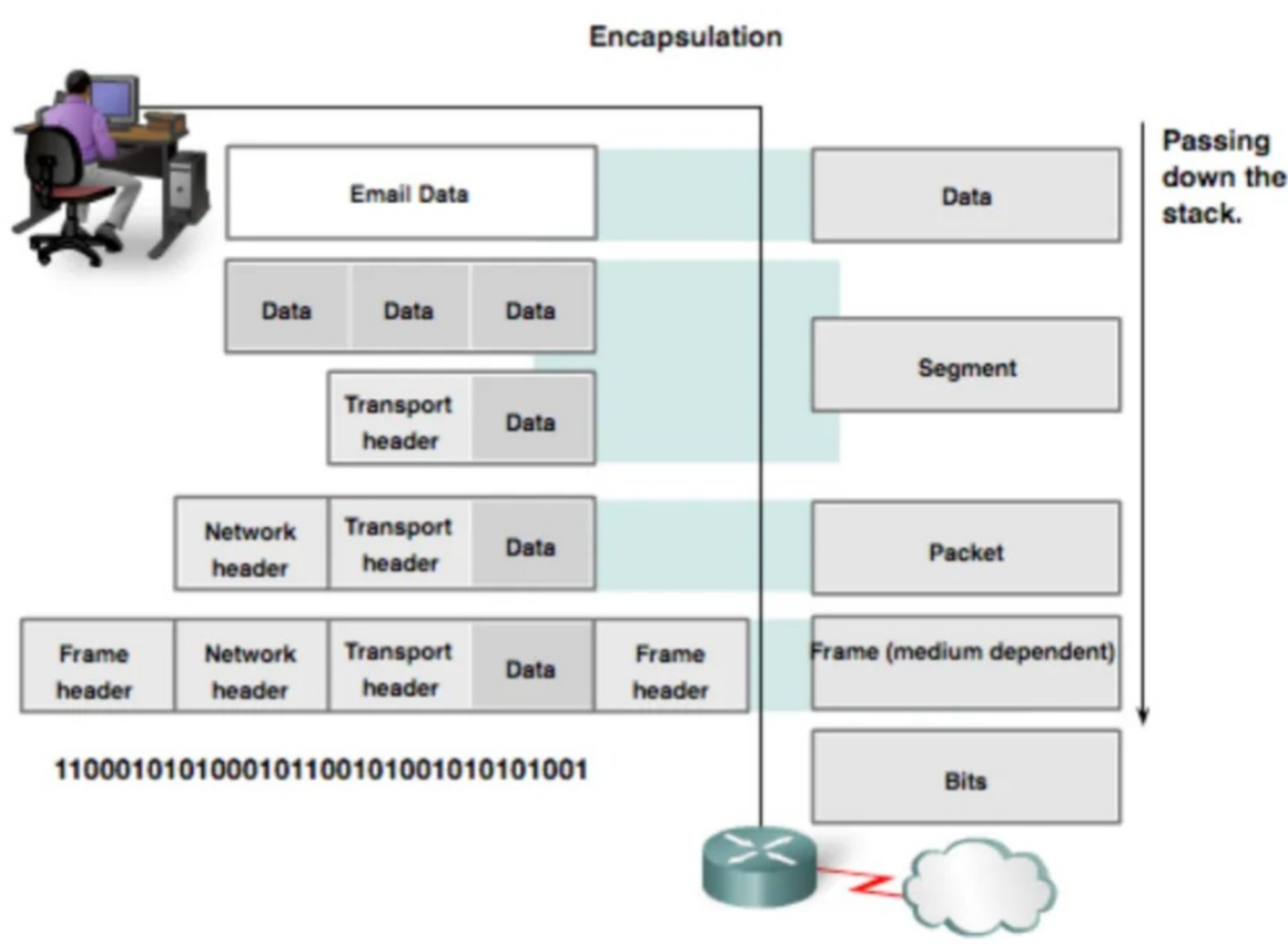
- The TCP/IP Layered Architecture Model



- Benefits of Using a Layered Model
 - Assists in Protocol design
 - Open standard ⇒ fosters competition ⇒ products from different vendors can work together.
 - Changes made in one layer do not affect other layers ⇒ Allows Protocols and technologies to evolve
 - Common standard language

3. Data Encapsulation

- Protocol Data Units (PDUs)
 - Data ⇒ application
 - Segment ⇒ Transport
 - Packet ⇒ Network, Internet
 - Frame ⇒ data link
 - Bits ⇒ physical



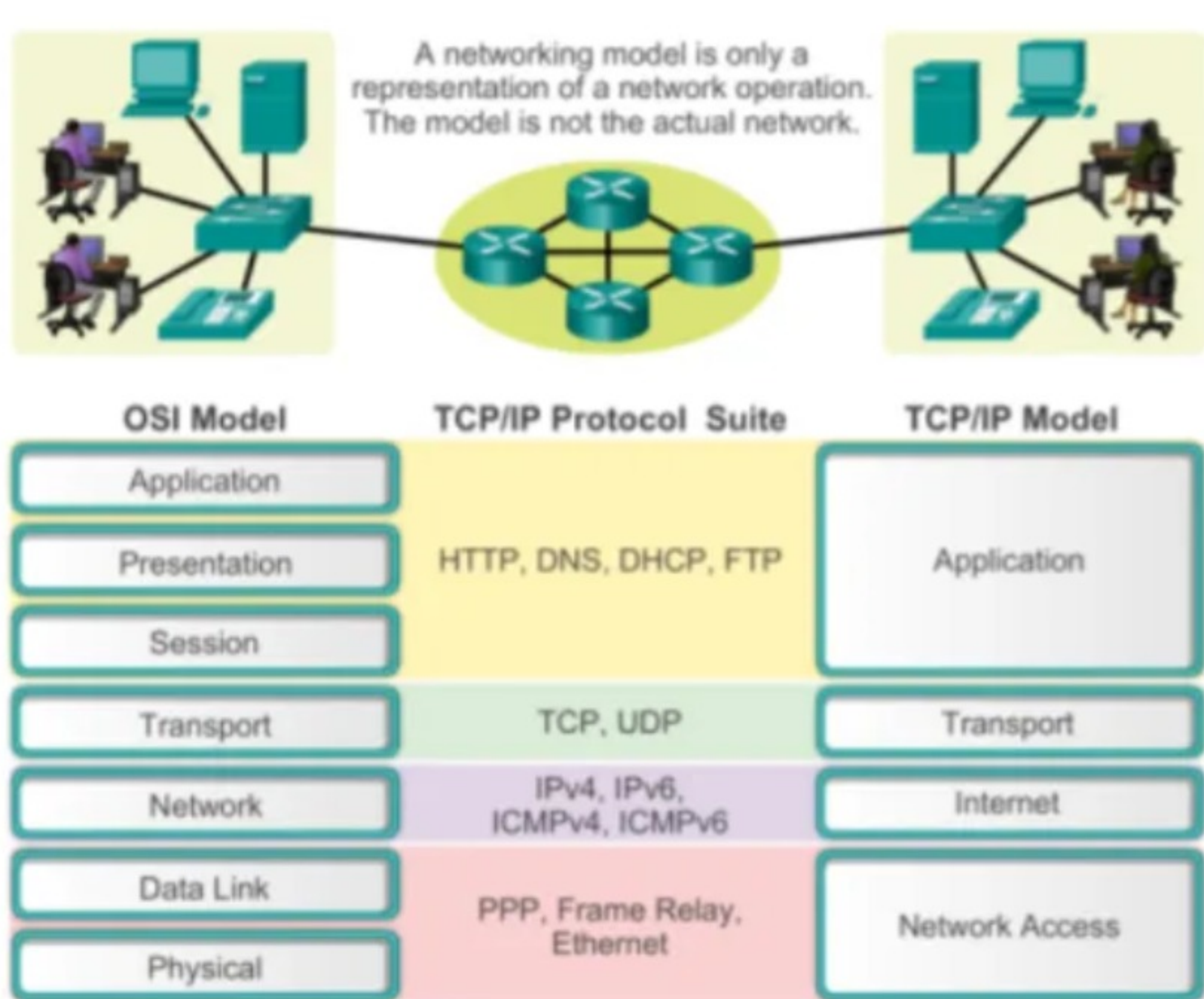
4. Reference Models

Protocol Model

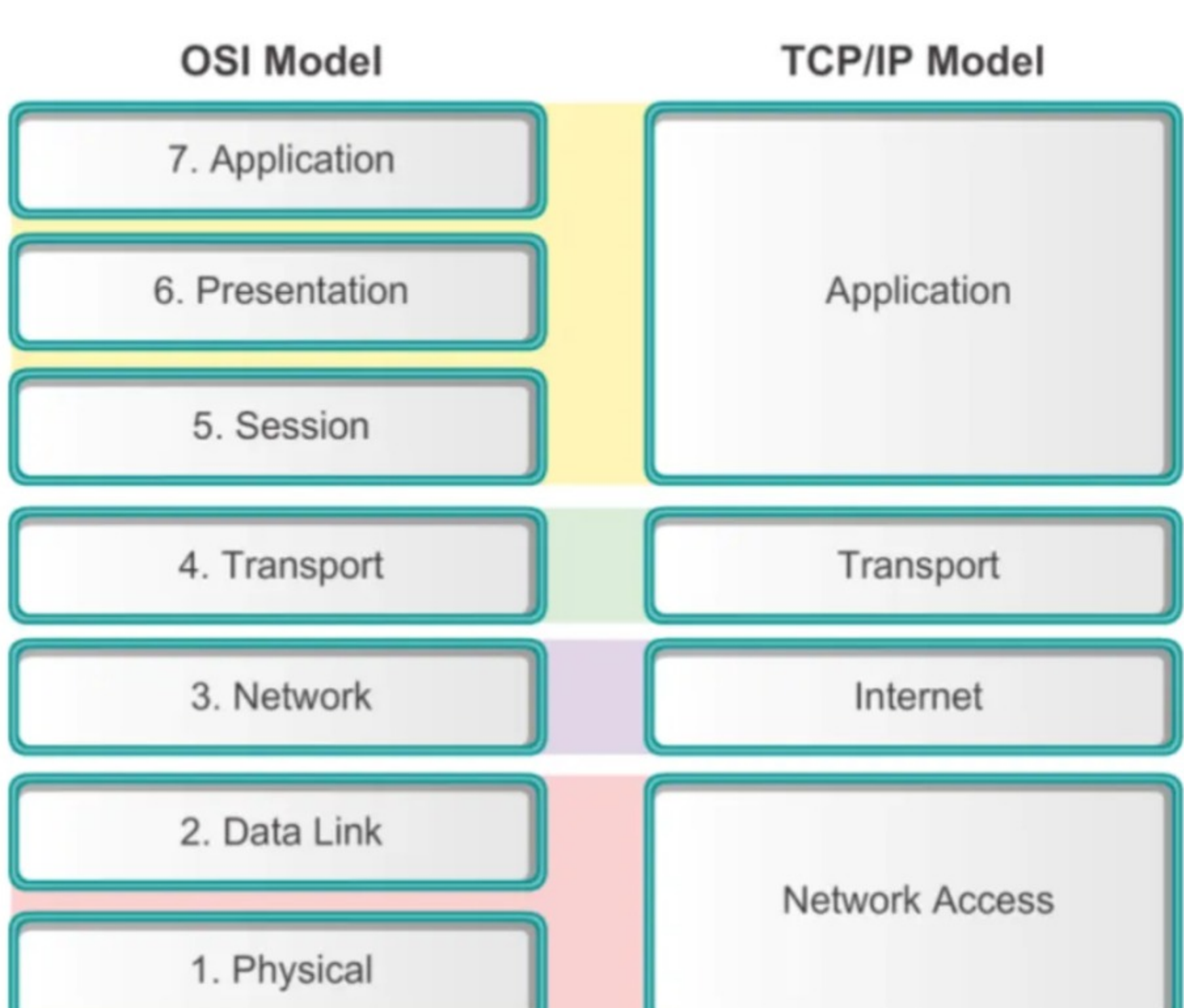
- A model that describes an actual implementation

Reference Model

- Used to describe generic networking processes

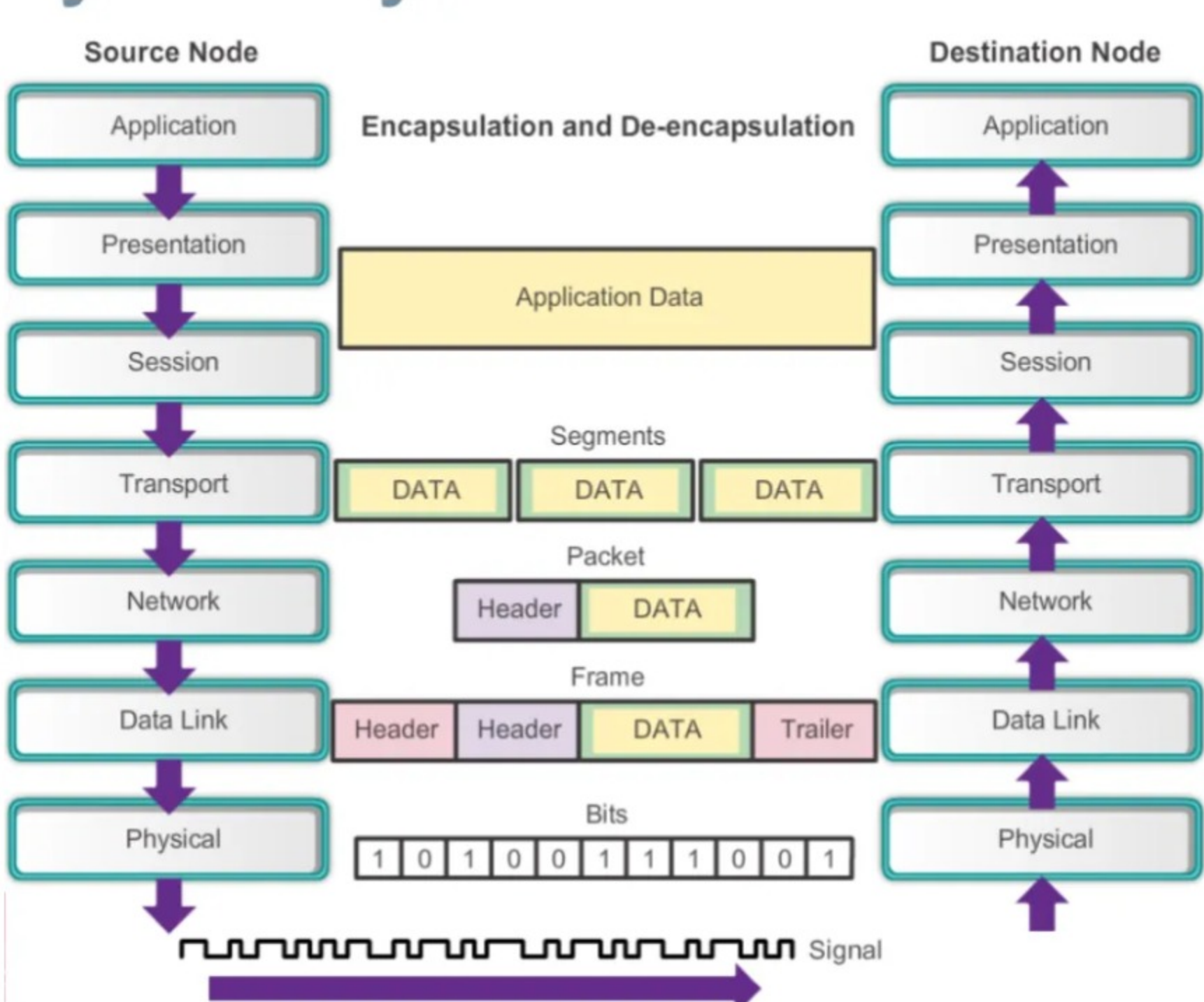


- Comparing the OSI and TCP/IP Models
 - ⇒ Tips and Tricks: All People Should Try New Domino's Pizza.



5. The Physical Layer

- General Purpose
 - Sending
 - Accepts a frame from the Data Link Layer
 - Encoding
 - Transmits as binary bits over media between devices ⇒ convert to signal ⇒ Signaling
 - Receiving
 - Receives a signal over a common media
 - Converts back into a sequence of bits ⇒ Decoding
 - Passes to the Data Link Layer as a frame for processing



6. Fundamental Principles of the Physical Layer

- Bandwidth
 - This is the maximum capacity of the medium to carry data. ⇒ Theoretical

| Unit of Bandwidth | Abbreviation | Equivalence |
|---------------------|--------------|---|
| Bits per second | bps | 1 bps = fundamental unit of bandwidth |
| Kilobits per second | kbps | 1 kbps = 1,000 bps = 10 ³ bps |
| Megabits per second | Mbps | 1 Mbps = 1,000,000 bps = 10 ⁶ bps |
| Gigabits per second | Gbps | 1 Gbps = 1,000,000,000 bps = 10 ⁹ bps |
| Terabits per second | Tbps | 1 Tbps = 1,000,000,000,000 bps = 10 ¹² bps |

- Throughput
 - Throughput is the actual transmission rate at a given period of time.
- Goodput
 - Transmission rate of “usable” data (not considering overhead)

7. Quizzes

- The TCP/IP Model is a suite of Network Protocols that defines the functions performed by devices in a network, breaking down the communication process into 4 layers:
 - The Application layer represents data to the user
 - The transport layer prepares the data for network transmission
 - The Internet layer determines the best routing path
 - The Network Access layer controls hardware and media components