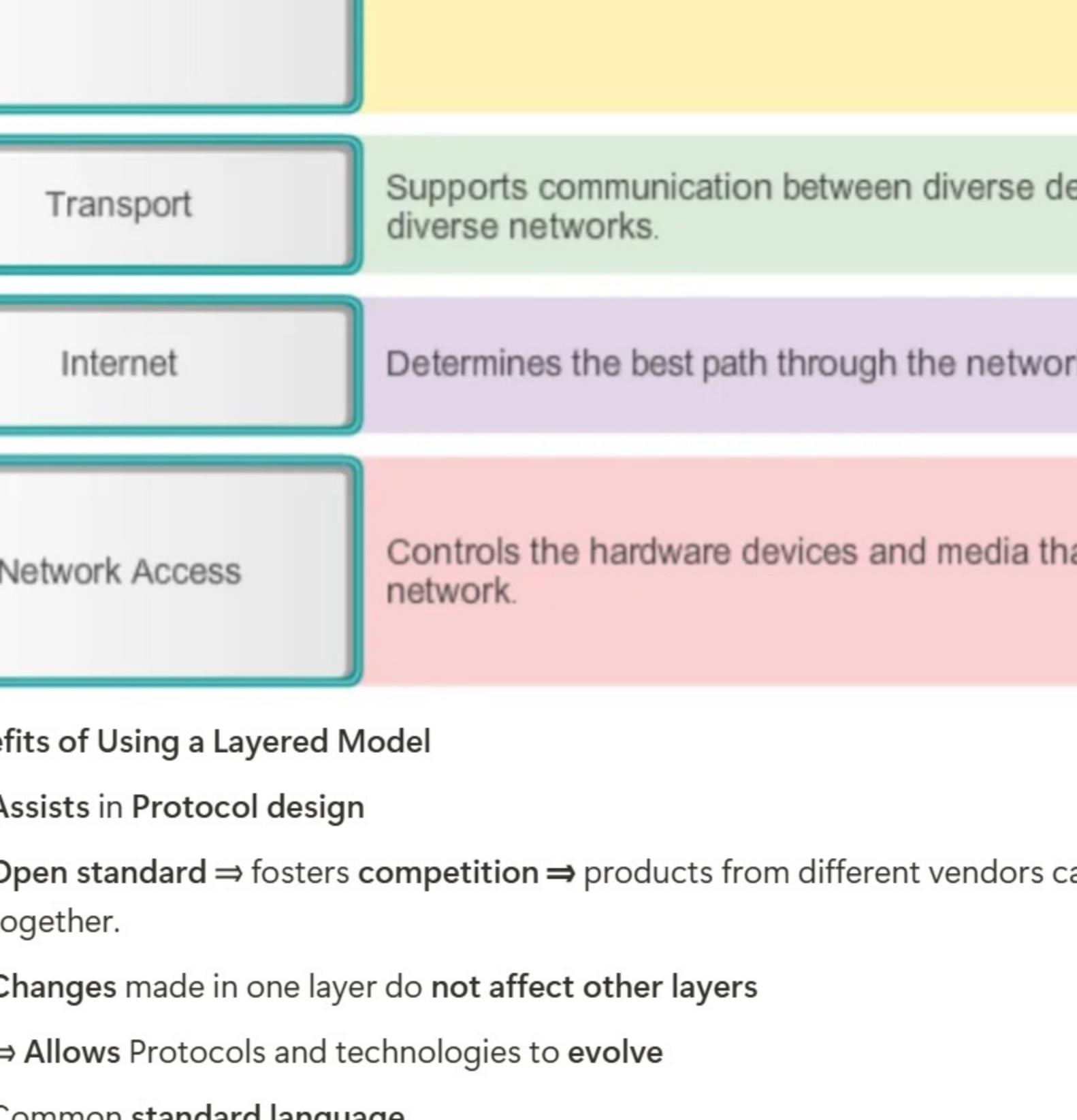


Lecture 1a - Networking Protocols

Type	Lecture
Materials	Empty
Reviewed	<input checked="" type="checkbox"/>
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	

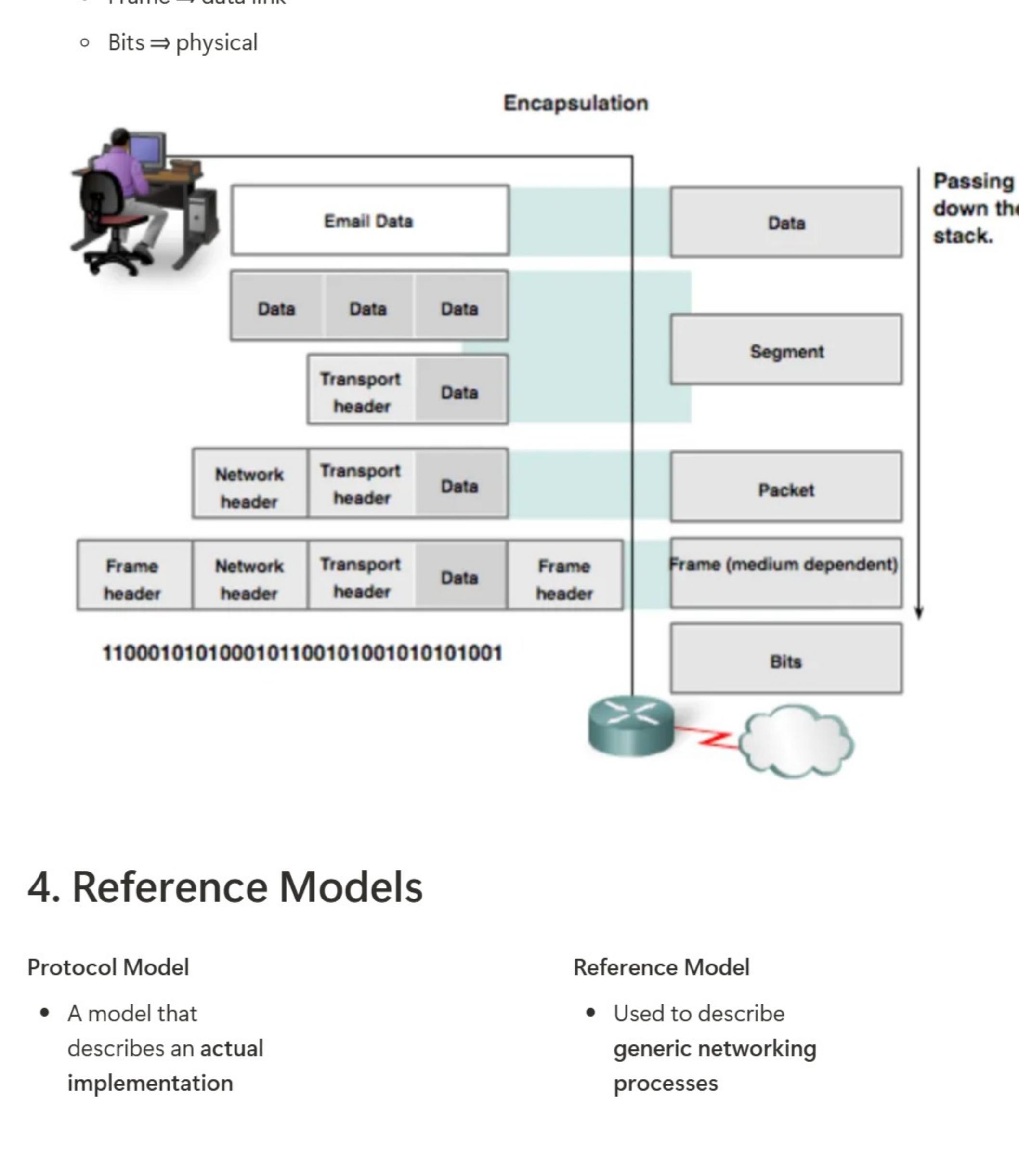
1. Network Protocols

- 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

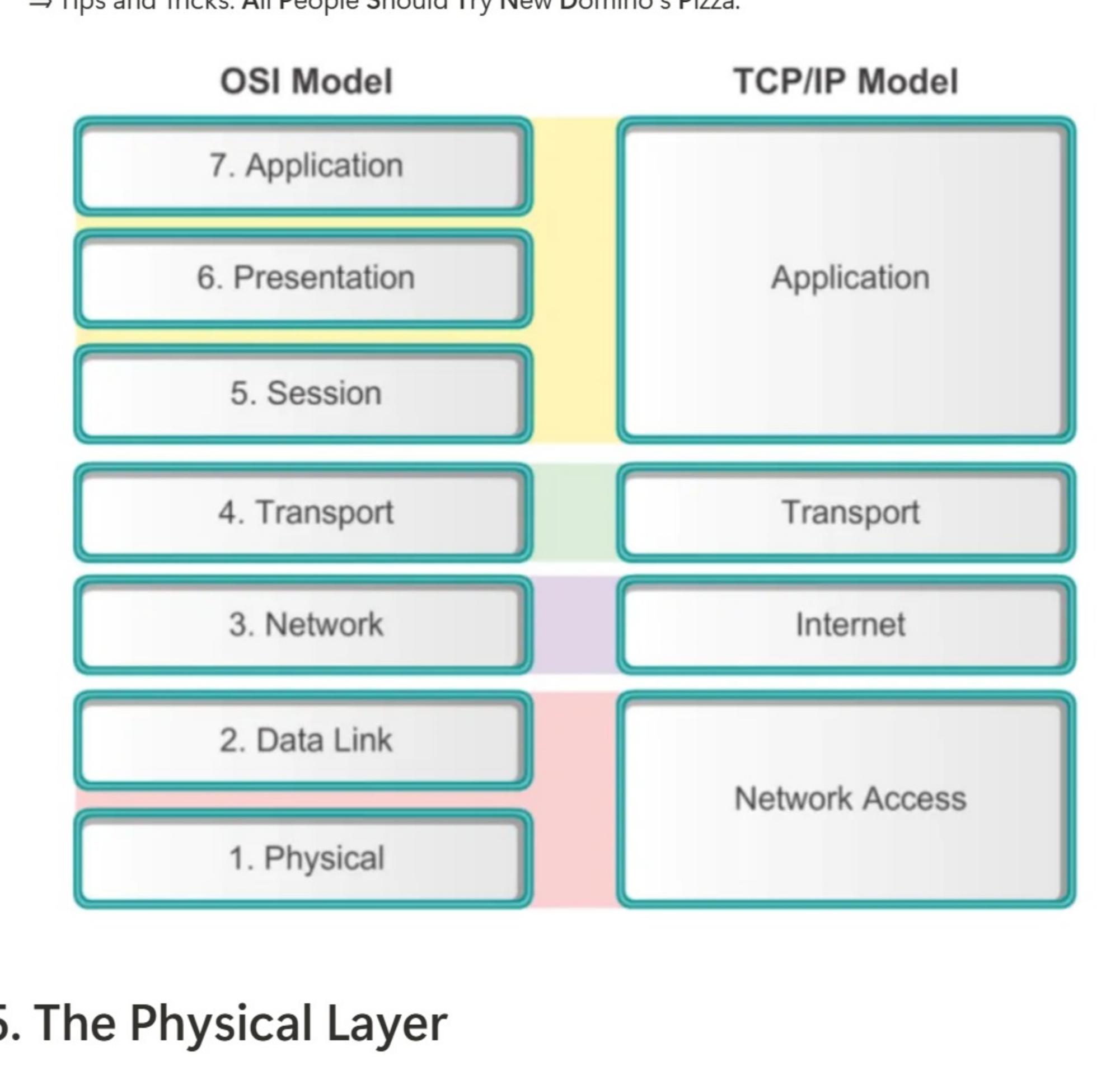
- The TCP/IP Layered Architecture Model



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

3. Data Encapsulation

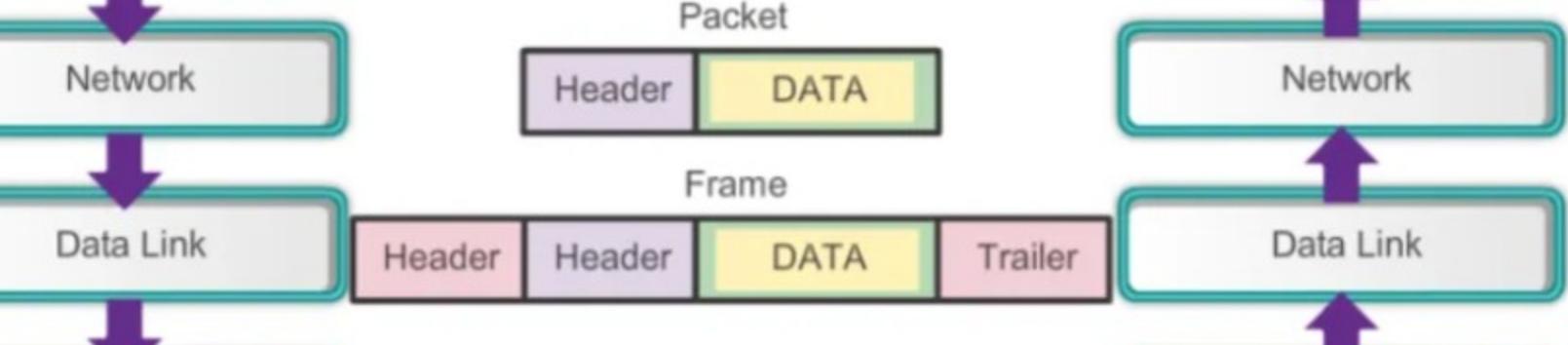
- Protocol Data Units (PDUs)
 - Data \Rightarrow application
 - Segment \Rightarrow Transport
 - Packet \Rightarrow Network, Internet
 - Frame \Rightarrow data link
 - Bits \Rightarrow physical



4. Reference Models

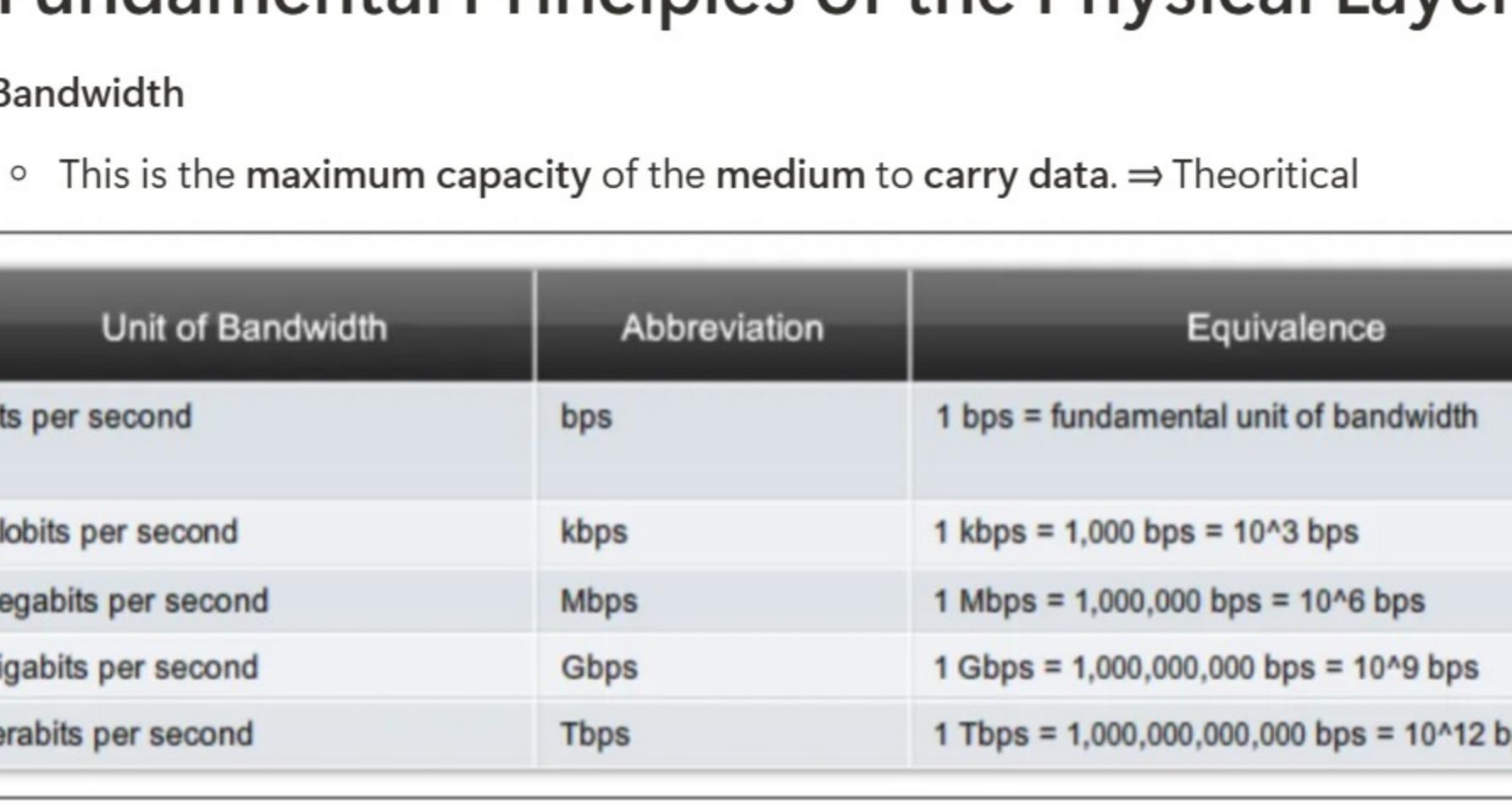
Protocol Model	Reference Model
<ul style="list-style-type: none">A model that describes an actual implementation	<ul style="list-style-type: none">Used to describe generic networking processes

A networking model is only a representation of a network operation. The model is not the actual network.



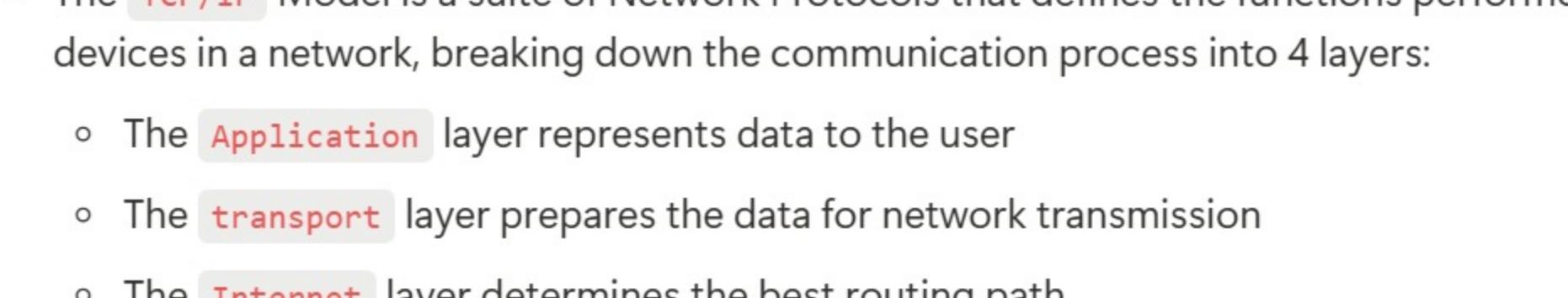
- Comparing the OSI and TCP/IP Models

\Rightarrow 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 \Rightarrow convert to signal \Rightarrow Signaling
 - Receiving
 - Receives a signal over a common media
 - Converts back into a sequence of bits \Rightarrow 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. \Rightarrow 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 over 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:

\circ The Application layer represents data to the user

\circ The transport layer prepares the data for network transmission

\circ The Internet layer determines the best routing path

\circ The Network Access layer controls hardware and media components