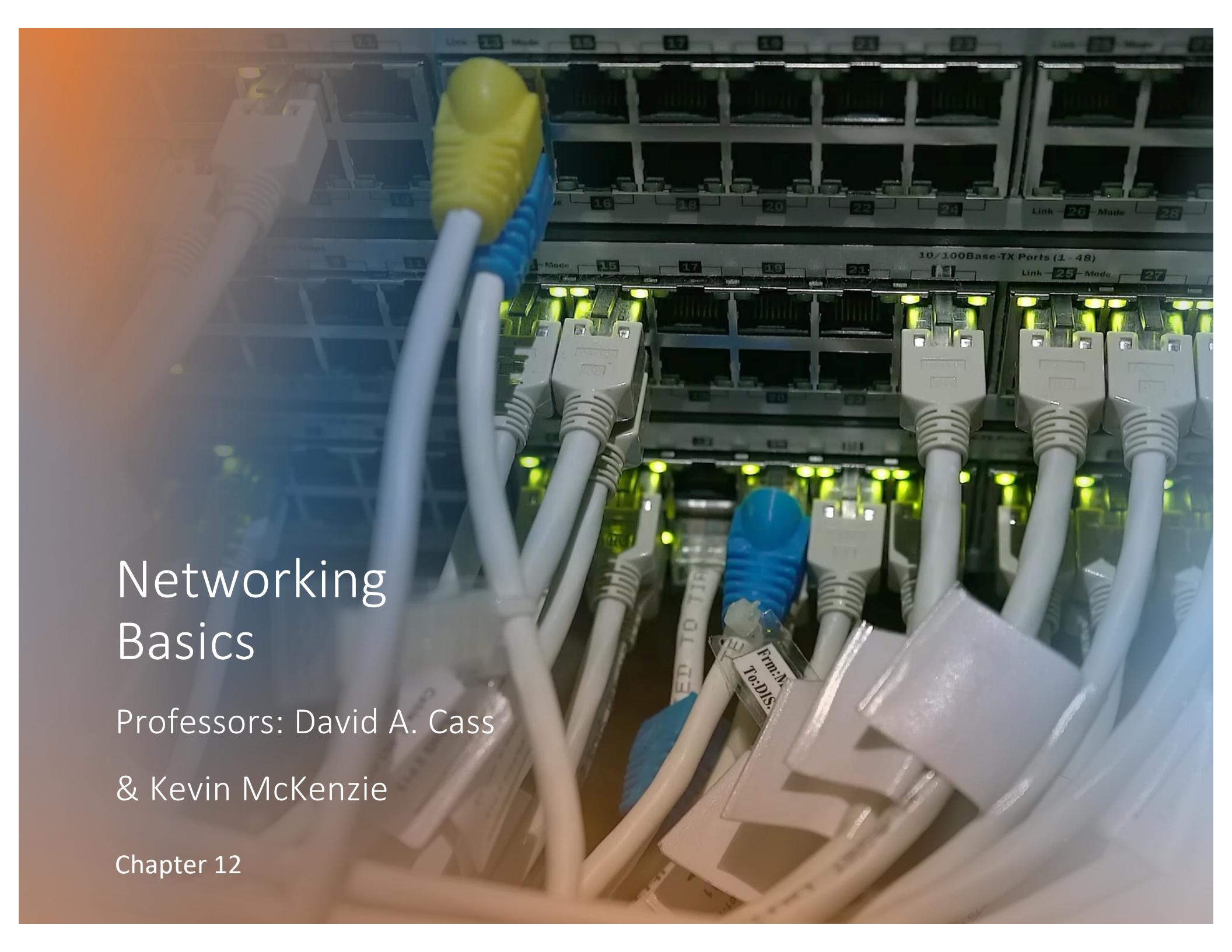


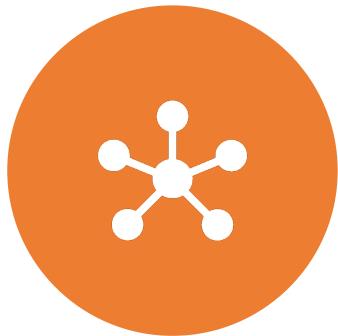
Networking Basics

Professors: David A. Cass
& Kevin McKenzie

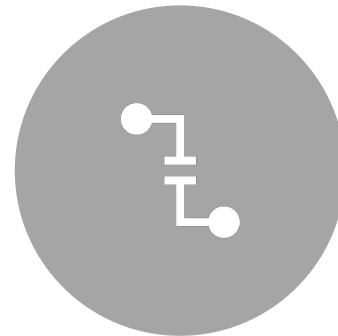
Chapter 12



In this chapter, you'll learn to:



IDENTIFY THE CHARACTERISTICS OF
COMMON NETWORK TYPES



DESCRIBE THE PRIMARY FUNCTION OF
THE DIFFERENT LAYERS OF THE OSI
NETWORKING MODEL



DISCUSS HOW THE LAYERS OF THE OSI
MODEL CORRESPOND TO THE
GENERATION OF NETWORK DATA
TRANSMISSION PACKETS

In this chapter, you'll learn to:



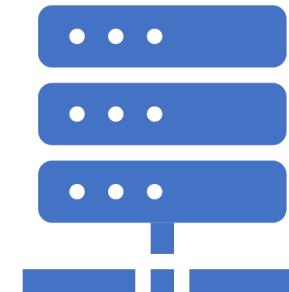
EXPLAIN HOW DIFFERENT OSI MODEL LAYERS APPLY TO CYBERSECURITY ISSUES

DESCRIBE STANDARD NETWORKING TOPOLOGIES

Two Types of Networks



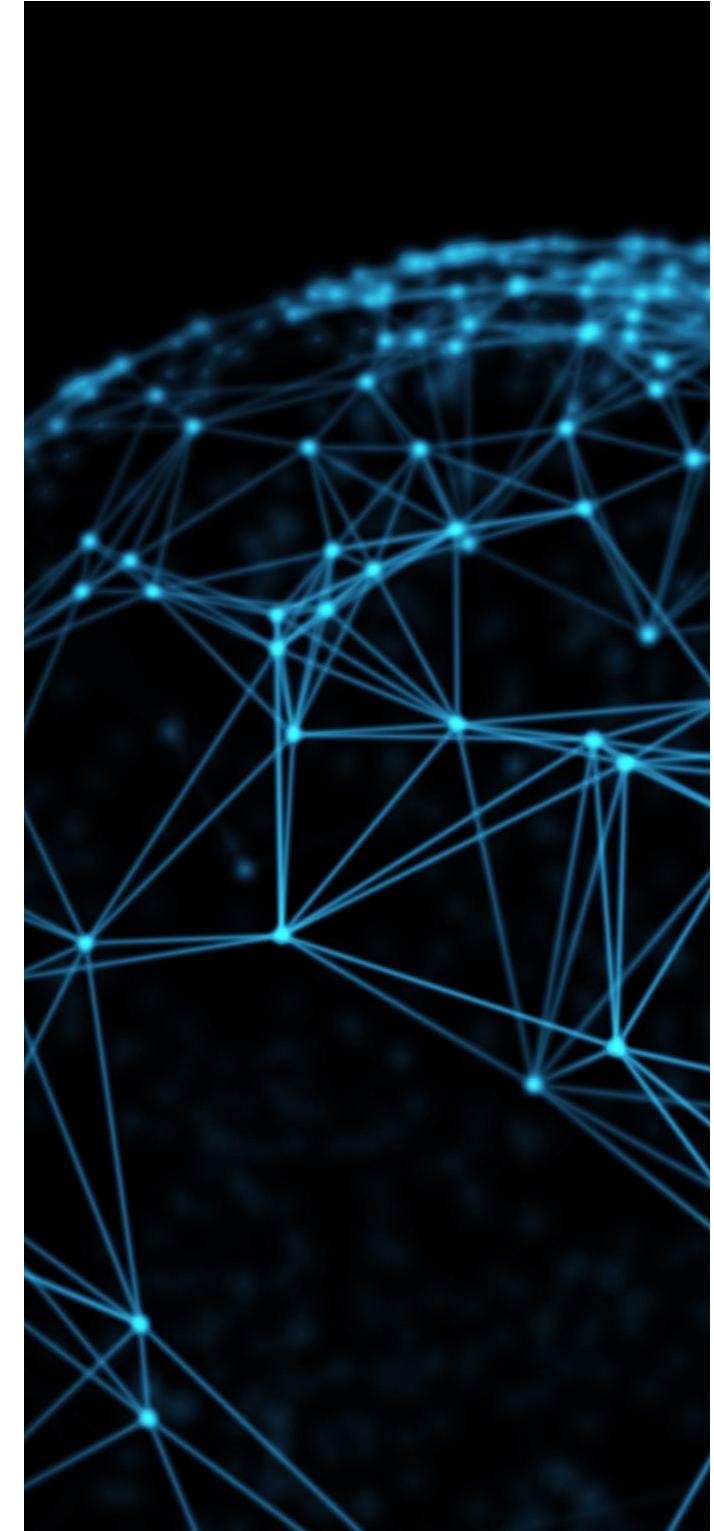
Networks that exist in a relatively confined geographical area are referred to as local area networks (LANs).



Networks distributed over wider geographical areas are referred to as wide area networks (WANs).

Campus Area Networks or Corporate Area Networks

- Campus Area Networks or Corporate Area Networks (CANs) are combinations of interconnected local area networks inside a limited geographical area.



Metropolitan Area Networks

- Metropolitan Area Networks (MANs) are widespread combinations of interconnected local area networks inside a medium-sized geographical area.

- Wireless Local Area Networks (WLANs) are local area networks of more than two devices that are connected by wireless radio communication methods.

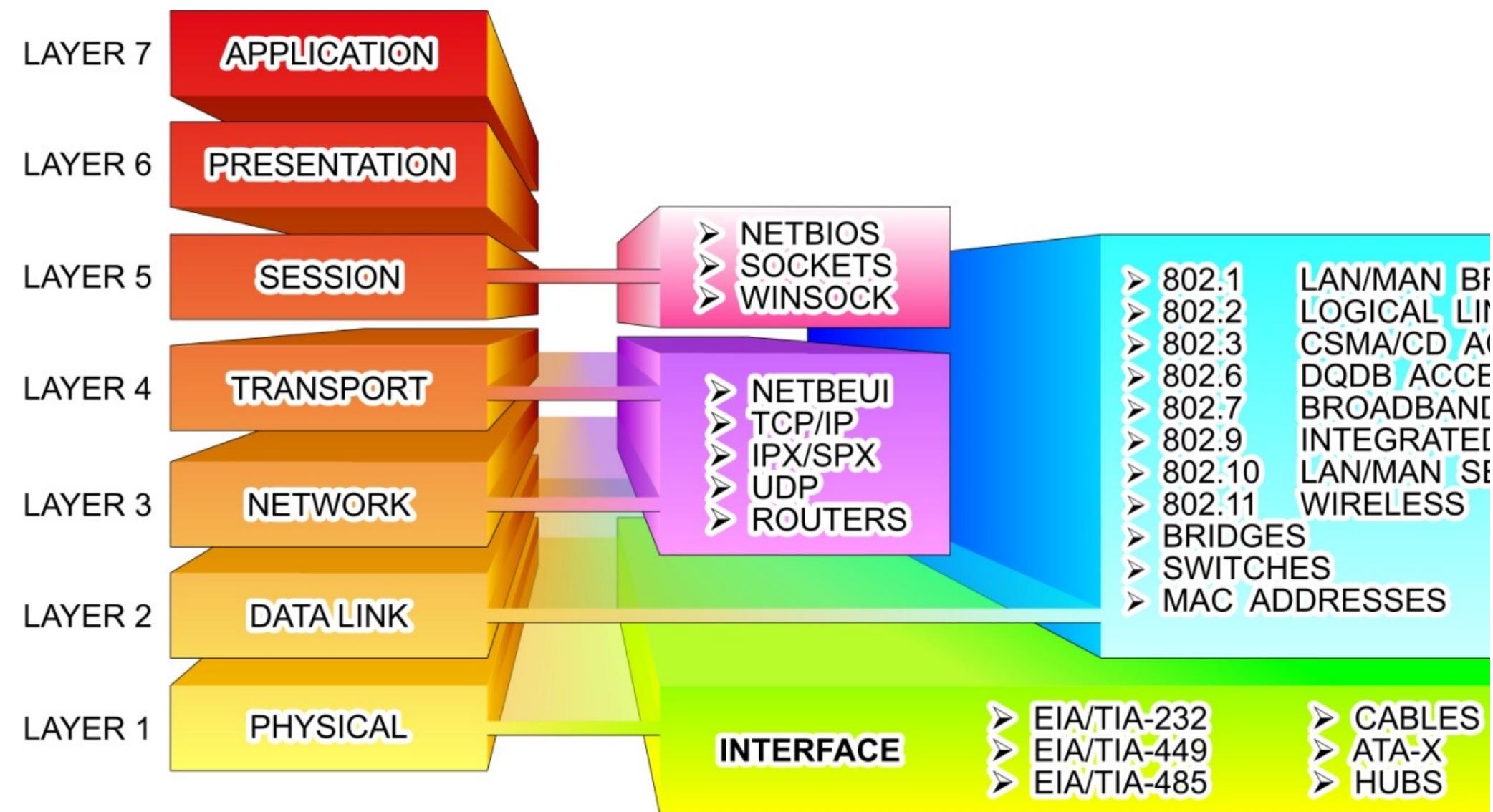


Wireless Local Area Networks

- Storage Area Networks (SANs) are a network of dedicated storage devices configured for the express purpose of providing consolidated data storage.



Storage Area Networks



The OSI Networking Model

Layer 1: Physical

This layer is concerned with the transmission media used to move data.

Layer 2: Data Link

- This layer involves controlling how the data is packaged and moved between communication points.



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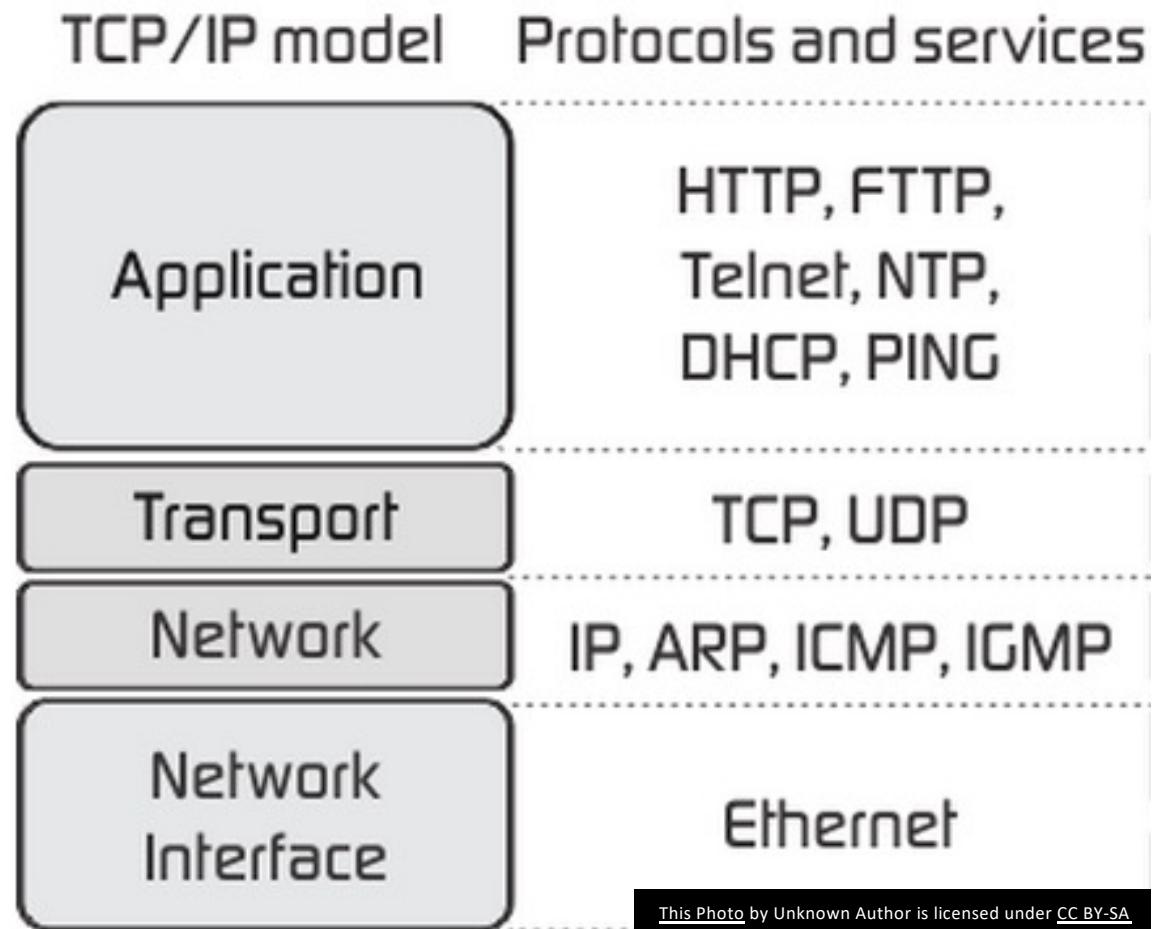
Layer 3: Network

- Elements of the network layer are responsible for controlling the routing of data packets between different communication nodes, network segments, or media types.



Layer 4: Transport

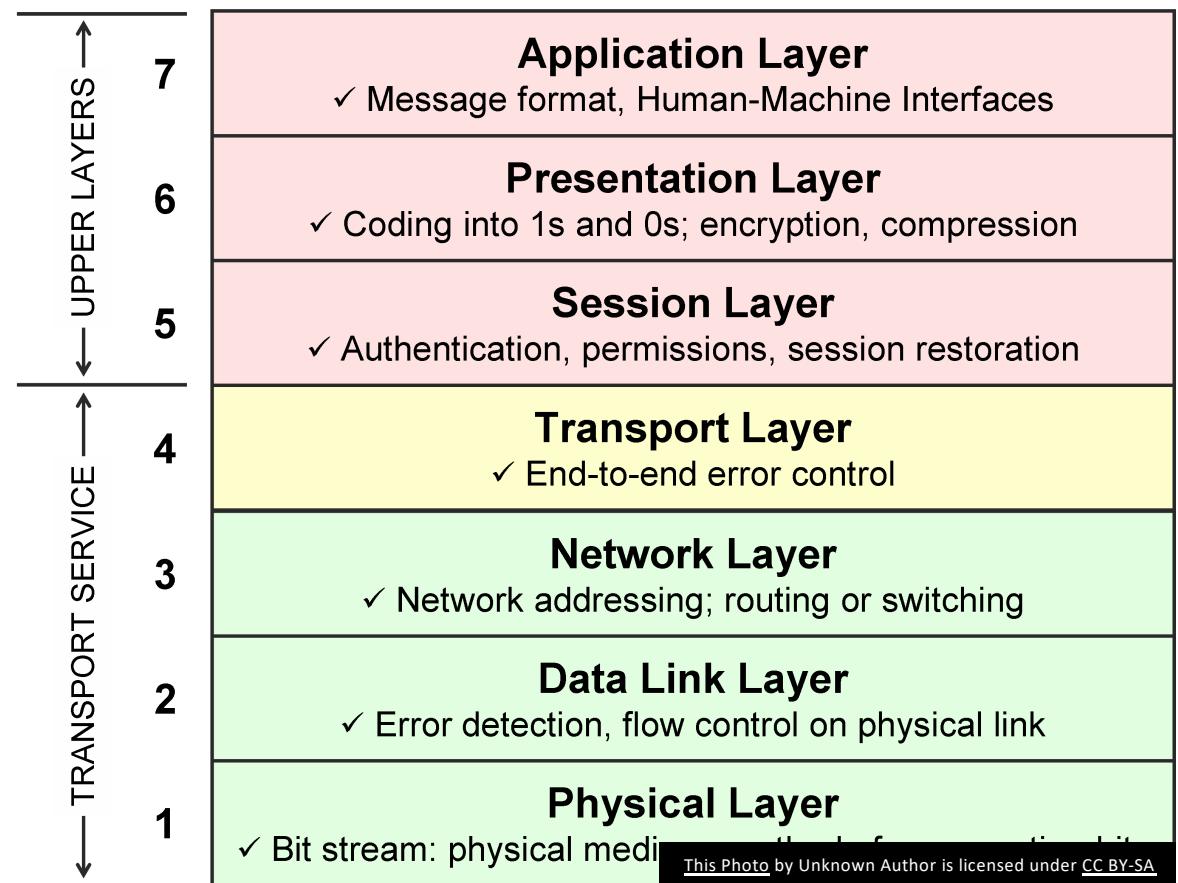
- The transport-level components are responsible for providing an orderly end-to-end flow of data that includes sequencing of data packets and providing basic error-recovery functions and flow control.



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Layer 5: Session

- This layer of the model is dedicated to setting up and managing sessions between applications as well as providing parameters such as security.



Layer 6: Presentation



- The elements of this level are tasked with controlling how the data looks to the user at the destination end.

Layer	Function	Example
Application (7)	Services that are used with end user applications	SMTP,
Presentation (6)	Formats the data so that it can be viewed by the user Encrypt and decrypt	JPG, GIF, HTTPS, SSL, TLS
Session (5)	Establishes/ends connections between two hosts	NetBIOS, PPTP
Transport (4)	Responsible for the transport protocol and error handling	TCP, UDP
Network (3)	Reads the IP address from the packet.	Routers, Layer 3 Switches
Data Link (2)	Reads the MAC address from the data packet	Switches
Physical (1)	Send data on to the physical wire.	Hubs, NICS, Cable

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Layer 7: Application

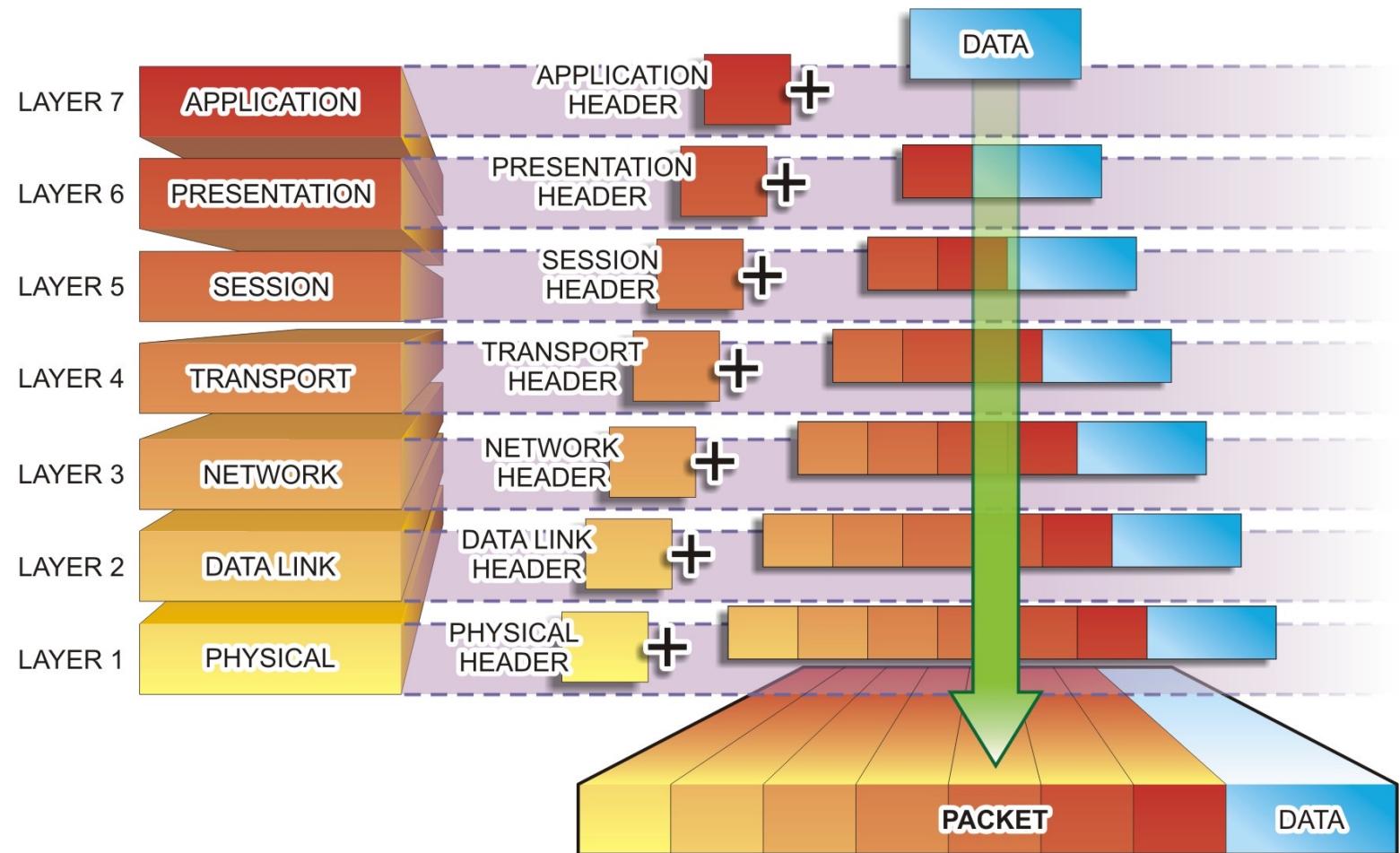
- The highest level of the OSI model is concerned with the destination and handling of data and deals with services such as email and file transfers.

OSI (Open Source Interconnection) 7 Layer Model

Layer	Application/Example
Application (7) <small>Serves as the window for users and application processes to access the network services.</small>	End User layer Program that opens what was sent or creates what is to be sent Resource sharing • Remote file access • Remote printer access • Directory services • Network management
Presentation (6) <small>Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.</small>	Syntax layer encrypt & decrypt (if needed) Character code translation • Data conversion • Data compression • Data encryption • Character Set Translation
Session (5) <small>Allows session establishment between processes running on different stations.</small>	Synch & send to ports (logical ports) Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.
Transport (4) <small>Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.</small>	TCP Host to Host, Flow Control Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing
Network (3) <small>Controls the operations of the subnet, deciding which physical path the data takes.</small>	Packets ("letter", contains IP address) Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting
Data Link (2) <small>Provides error-free transfer of data frames from one node to another over the Physical layer.</small>	Frames ("envelopes", contains MAC address) [NIC card — Switch — NIC card] (end to end) Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control
Physical (1) <small>Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.</small>	Physical structure Cables, hubs, etc. Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts

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Building Transmission Packets



OSI Layer Security

OSI Layer	Network Security Model	Exploit Type	Security Focus
1) Physical Layer	7) Physical Level	Physical Tampering/ Break-in	Physical Security
2) Data Link Layer	6) VLAN Level	Network Scanning Local/Internet	Access Security
3) Network Layer	5) ACL Level	Network Scanning Complete/Internal	Domain Security
4) Transport Layer	4) Software Level	Software Specific Exploits	Port Security

OSI Layer Security

OSI Layer	Network Security Model	Exploit Type	Security Focus
5) Session Level	3) User Level	Social Engineering - Users	Authentication /Encryption
6) Presentation Level	2) Administrative Level	Social Engineering - Administrators	Authentication
7) Application Level	1) IT Department Level	Social Engineering - IT Staff	ID/ Authentication

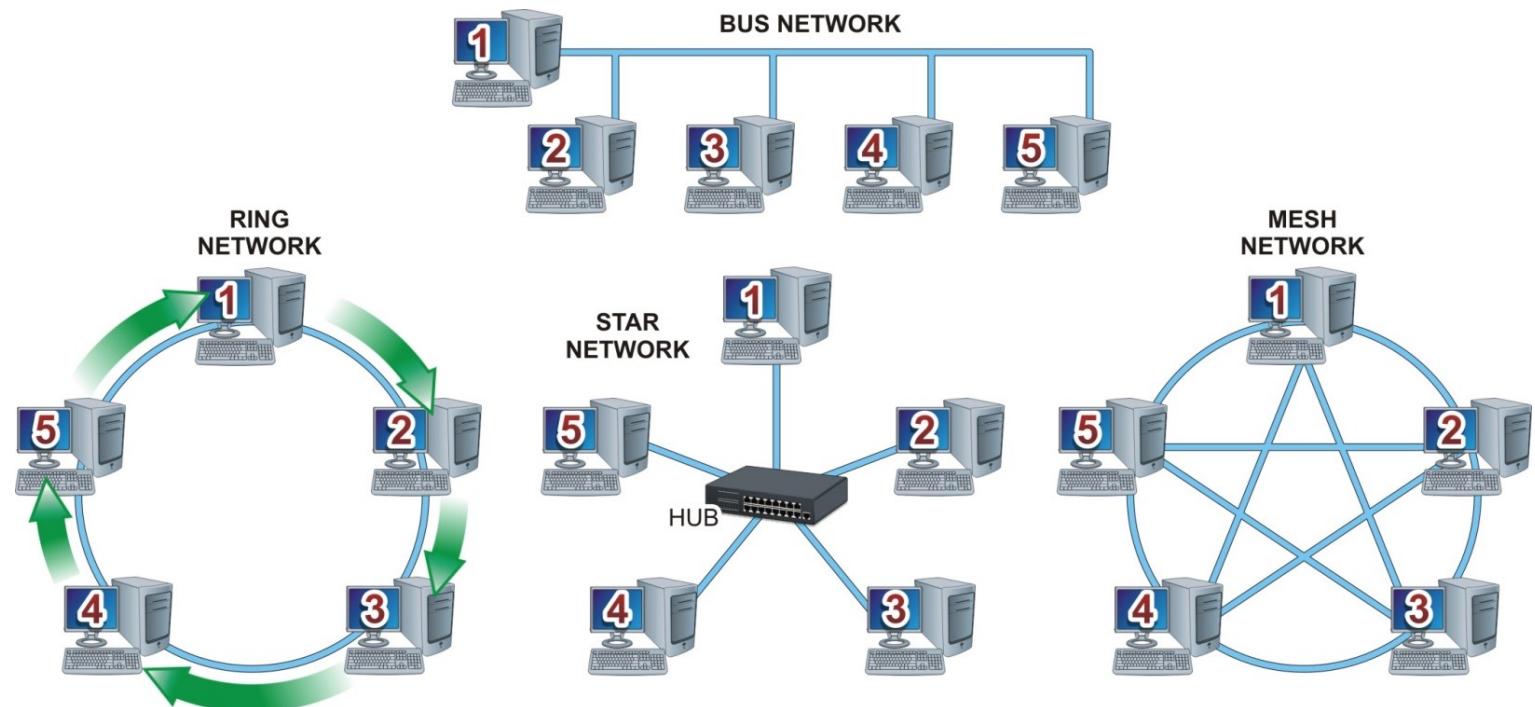
Network Topologies



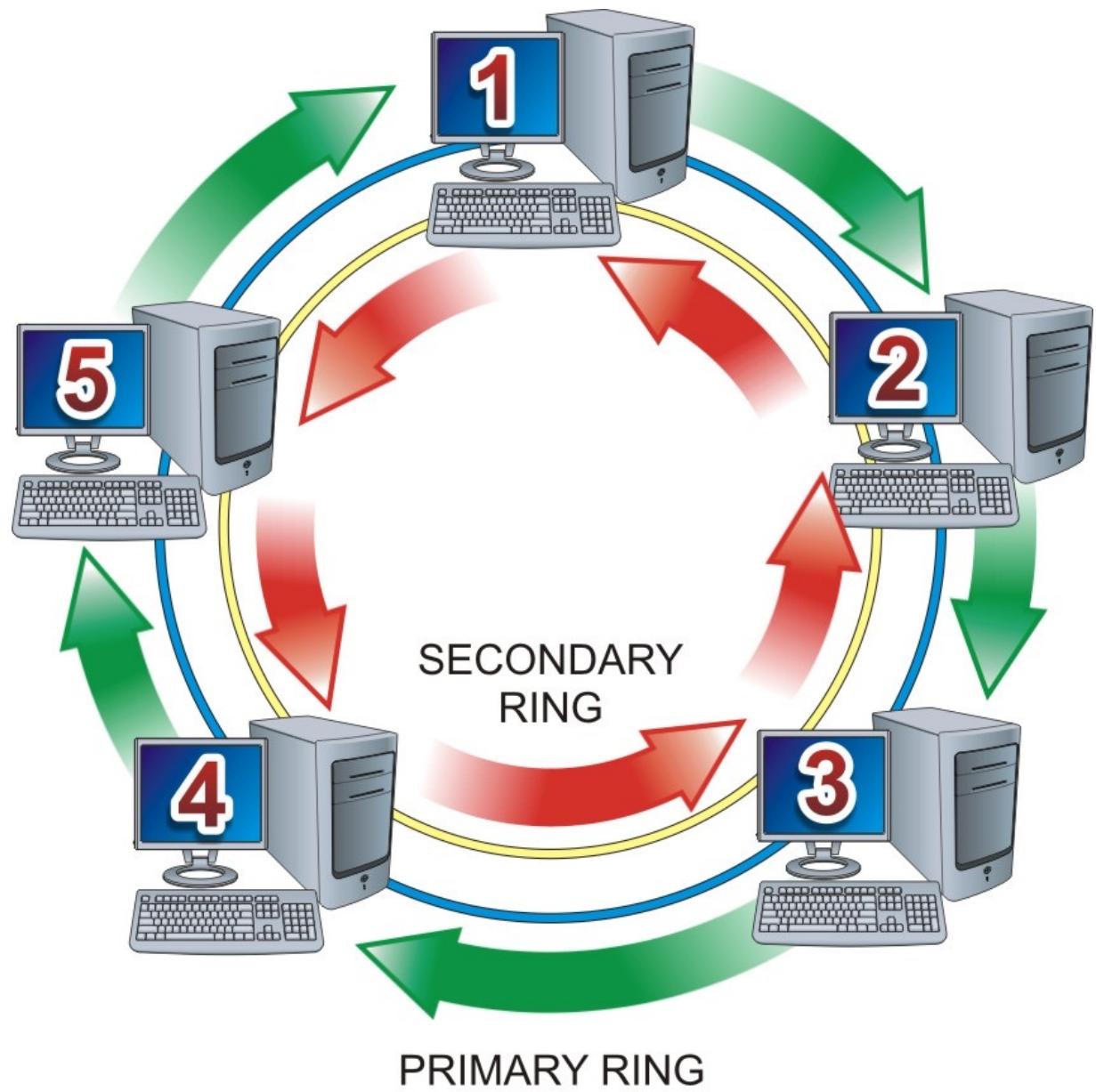
- Bus
- Ring
- Star
- Mesh



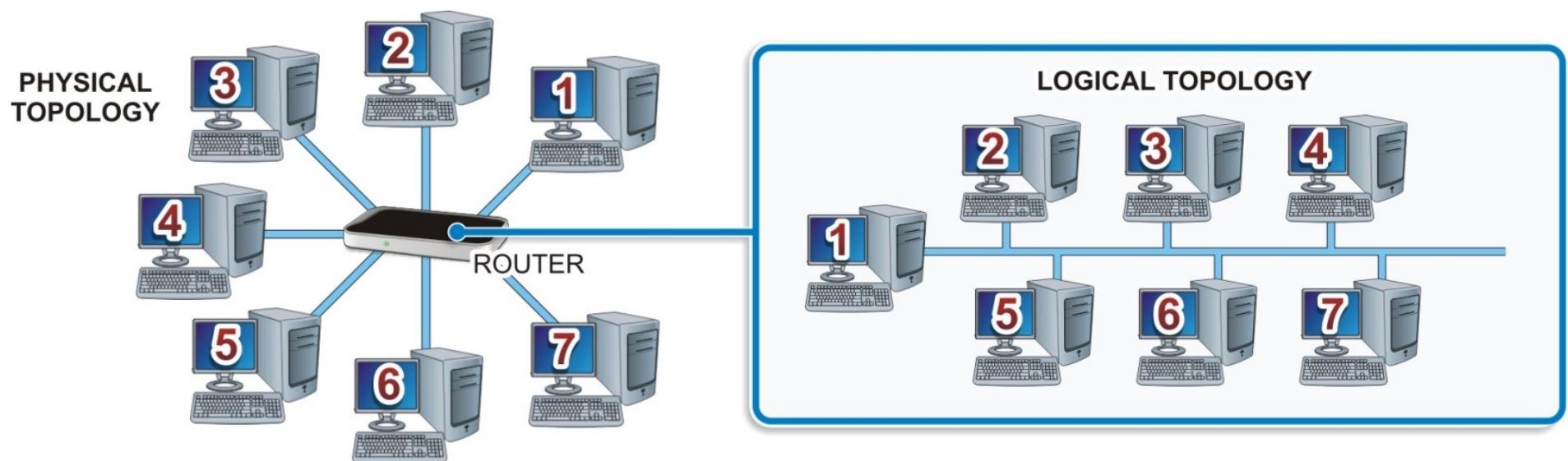
Star, Bus, Ring, and Mesh Configurations



Primary/Secondary Ring Topologies



Logical Topologies



Questions?

