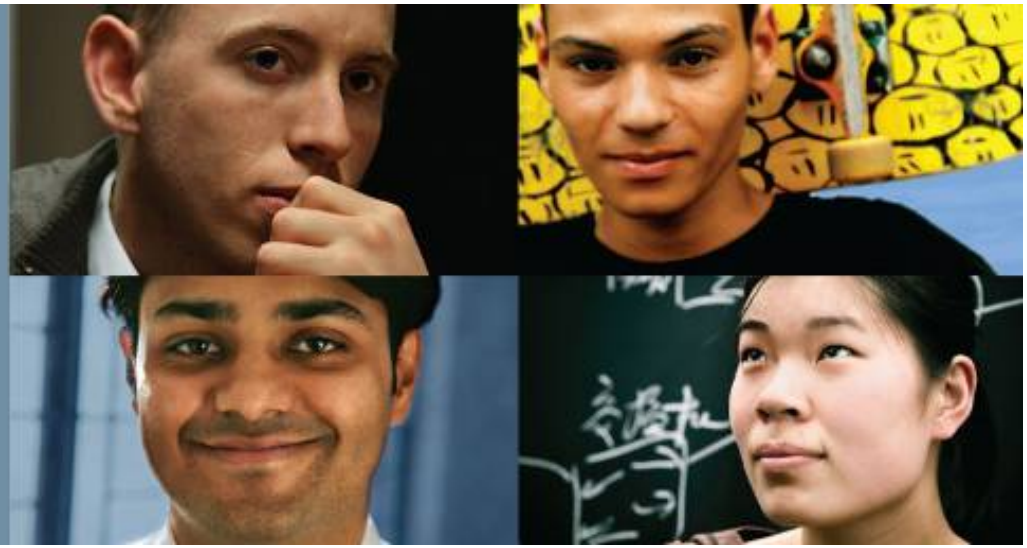
TNE10006/TNE60006: Networks and Switching



Data Link Layer

Cisco Networking Academy®
Mind Wide Open™

Outline

- The Purpose of the Data Link Layer
- Data Link Layer Formatting
- MAC – Media Access Control
- Network Topologies – Logical and Physical
- Link Layer Frame and Addressing

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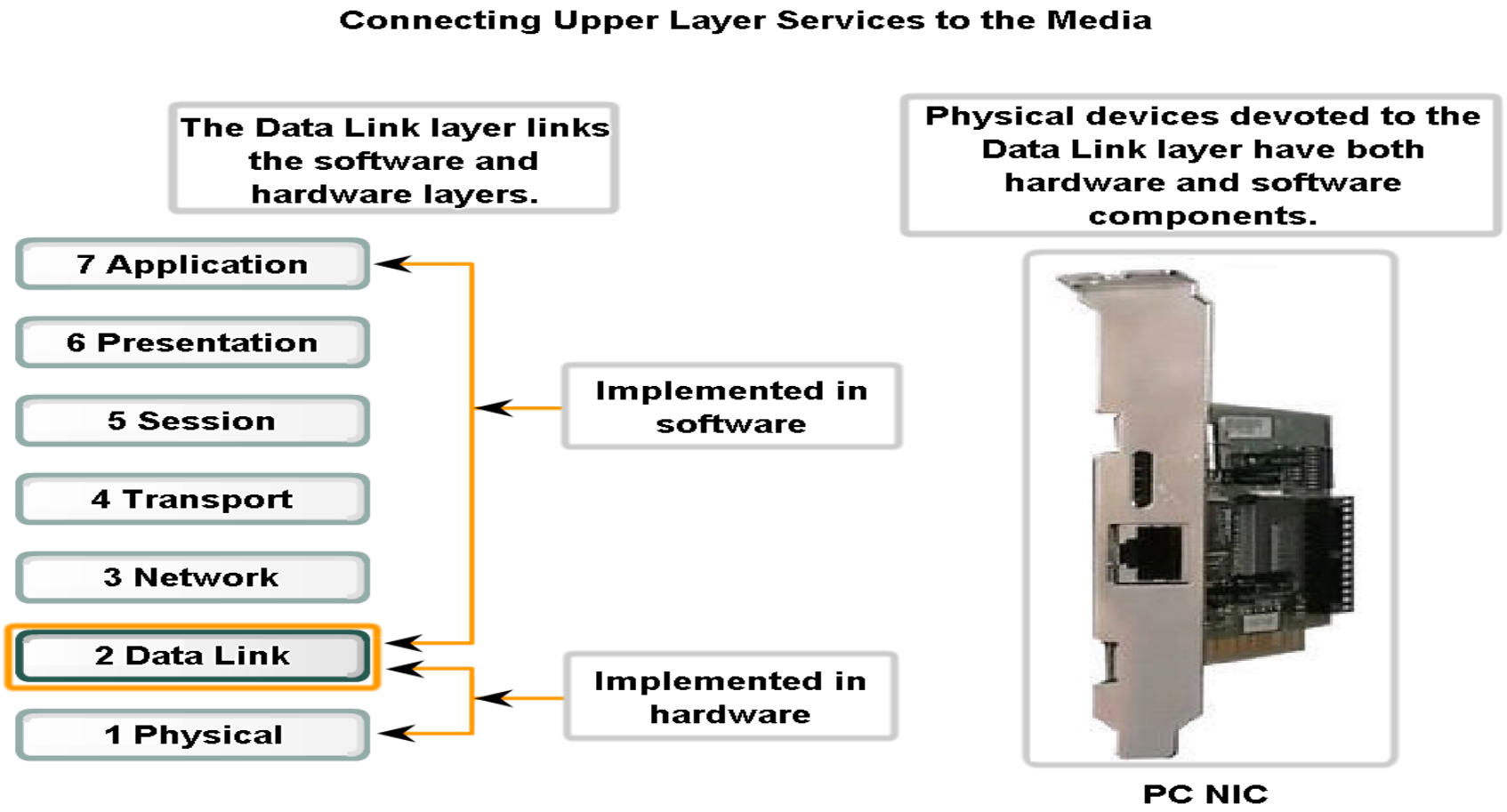
The Data Link Layer

The Data Link layer links the software and hardware layers

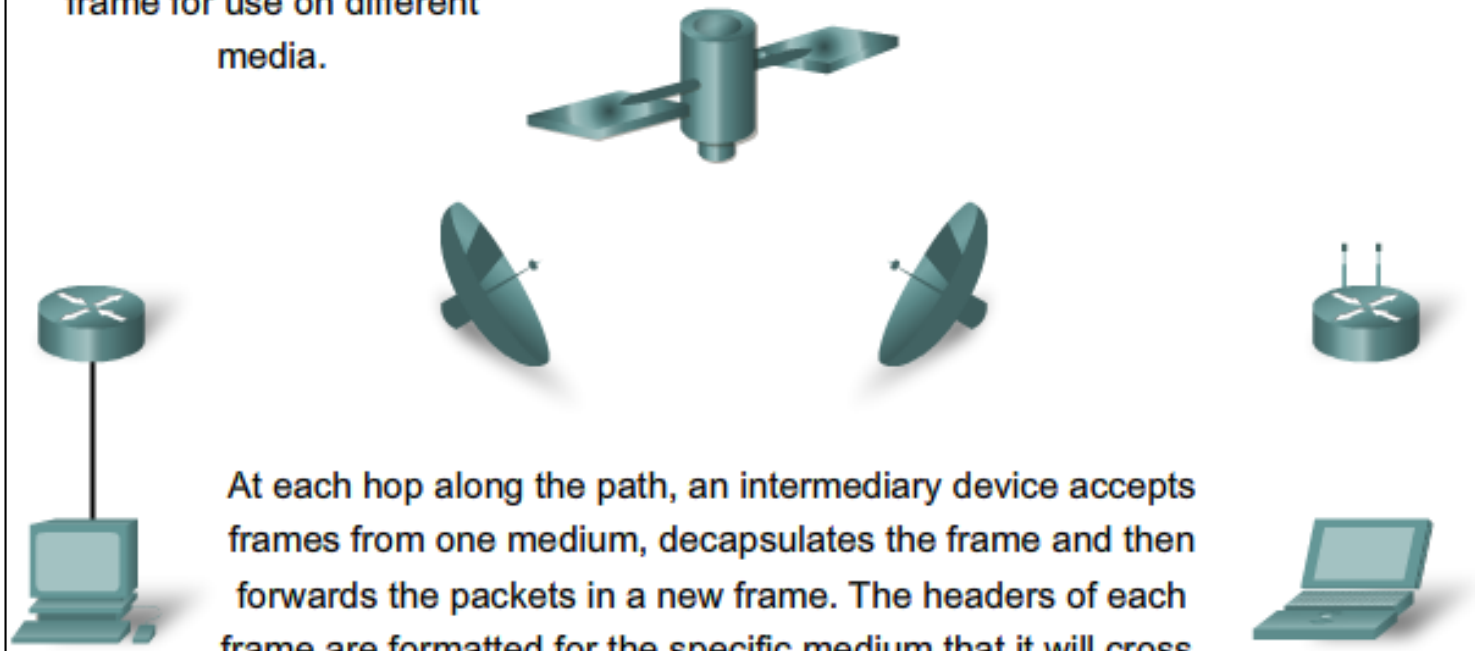


Media Access Control

The Data Link Layer

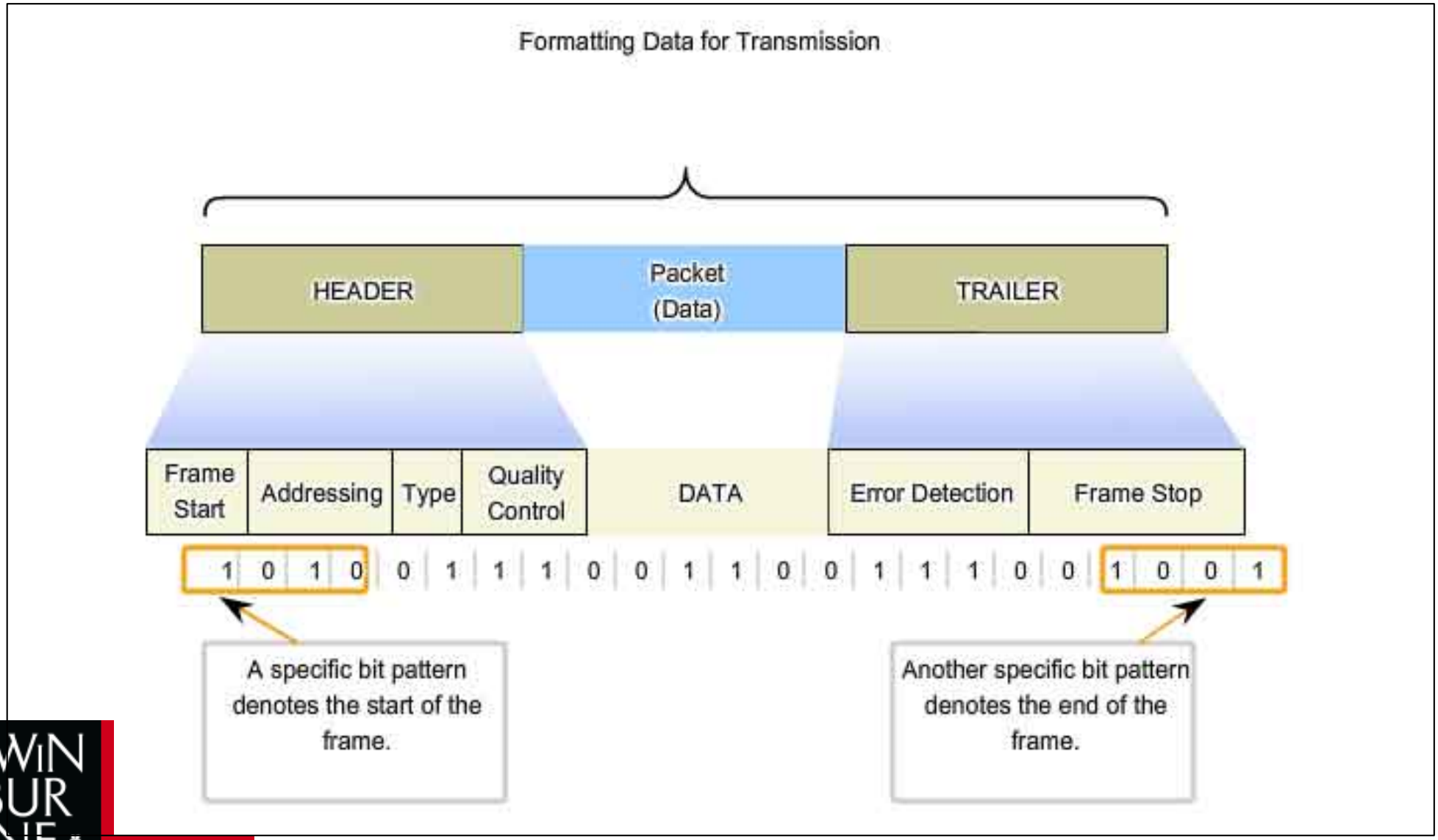
Data link layer protocols govern how to format a frame for use on different media.

Different protocols may be in use for different media.



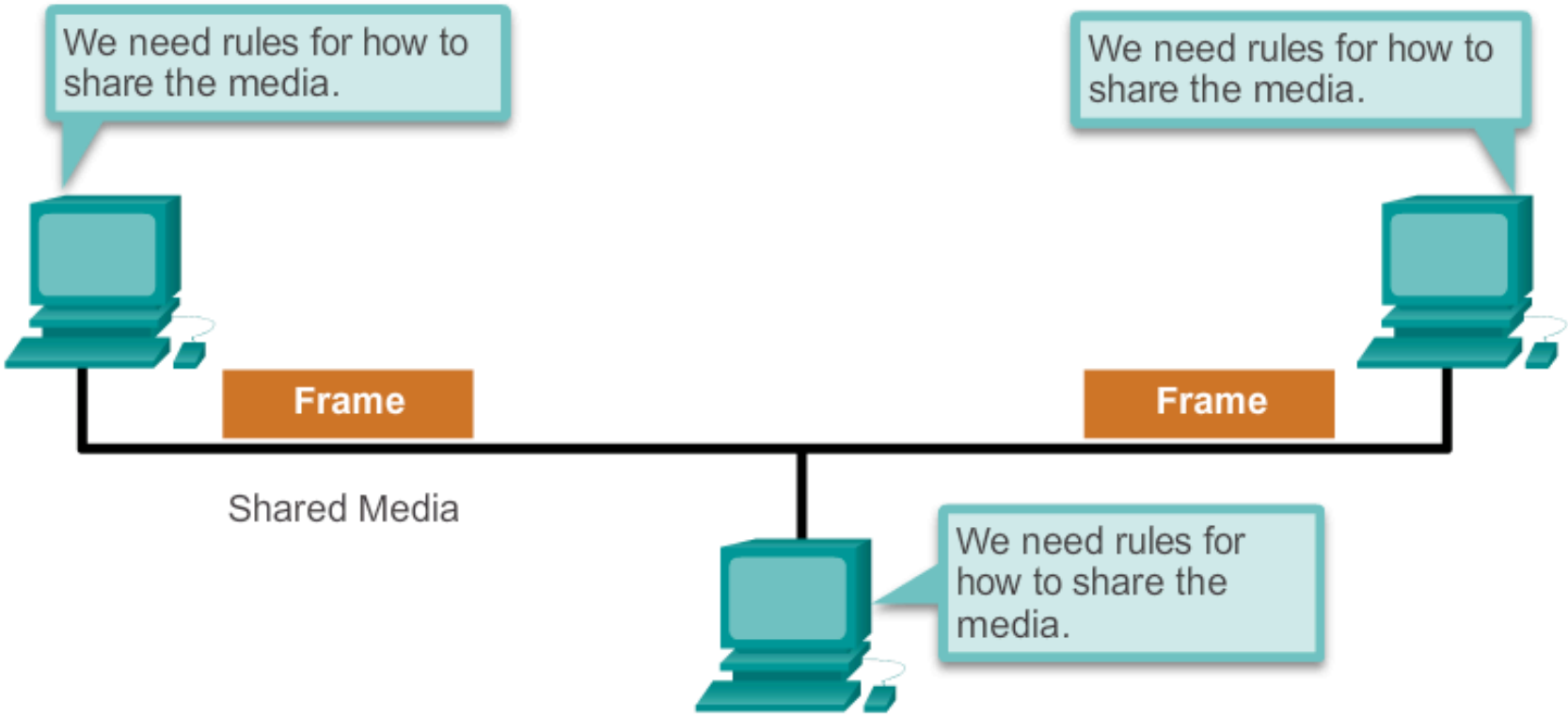
At each hop along the path, an intermediary device accepts frames from one medium, decapsulates the frame and then forwards the packets in a new frame. The headers of each frame are formatted for the specific medium that it will cross.

Formatting Data for Transmission



Controlling Access to the Media

Sharing the Media



Physical vs Logical

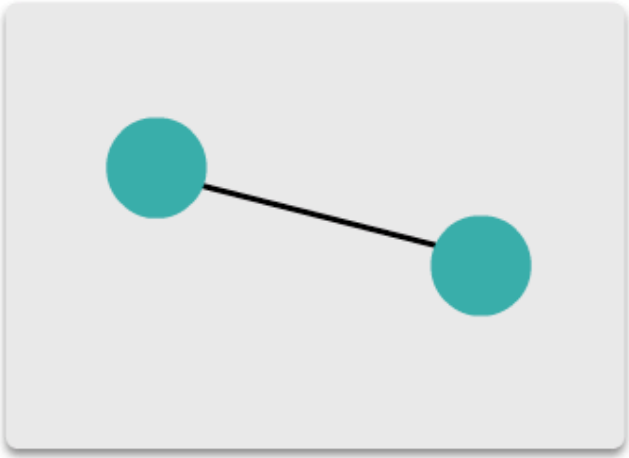
Physical

- Arrangement of nodes and the physical connections between them
- What the network ***looks like***

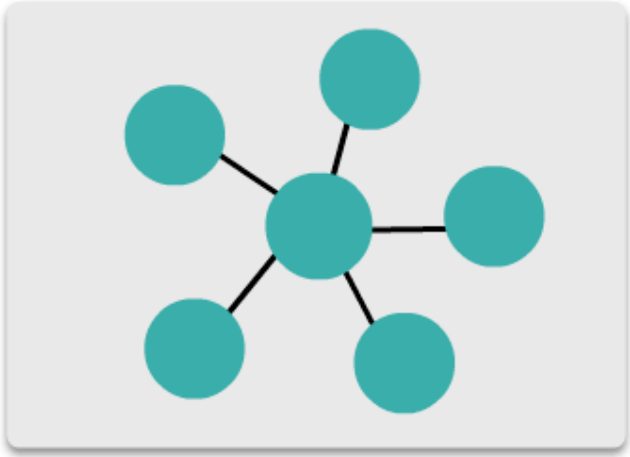
Logical

- Virtual arrangement of nodes independent of their physical connectivity
- The Data Link Layer ***sees*** the Logical Topology
- Influences network framing and MAC

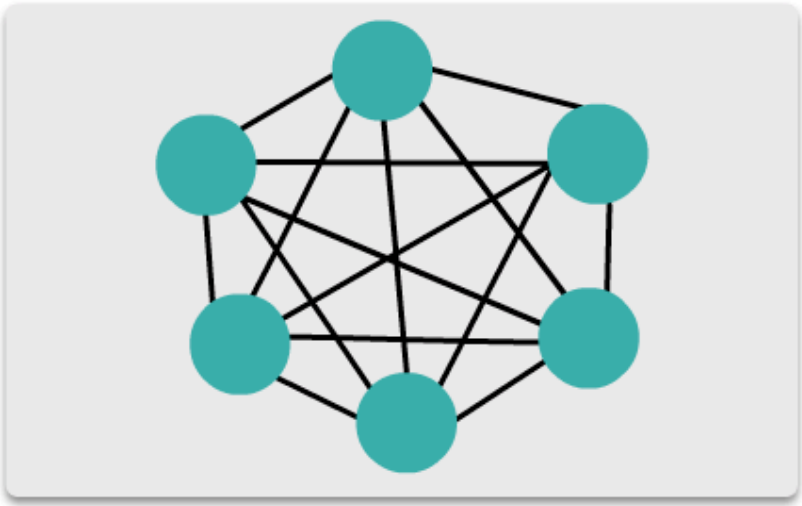
Common Physical WAN Topologies



Point-to-point topology

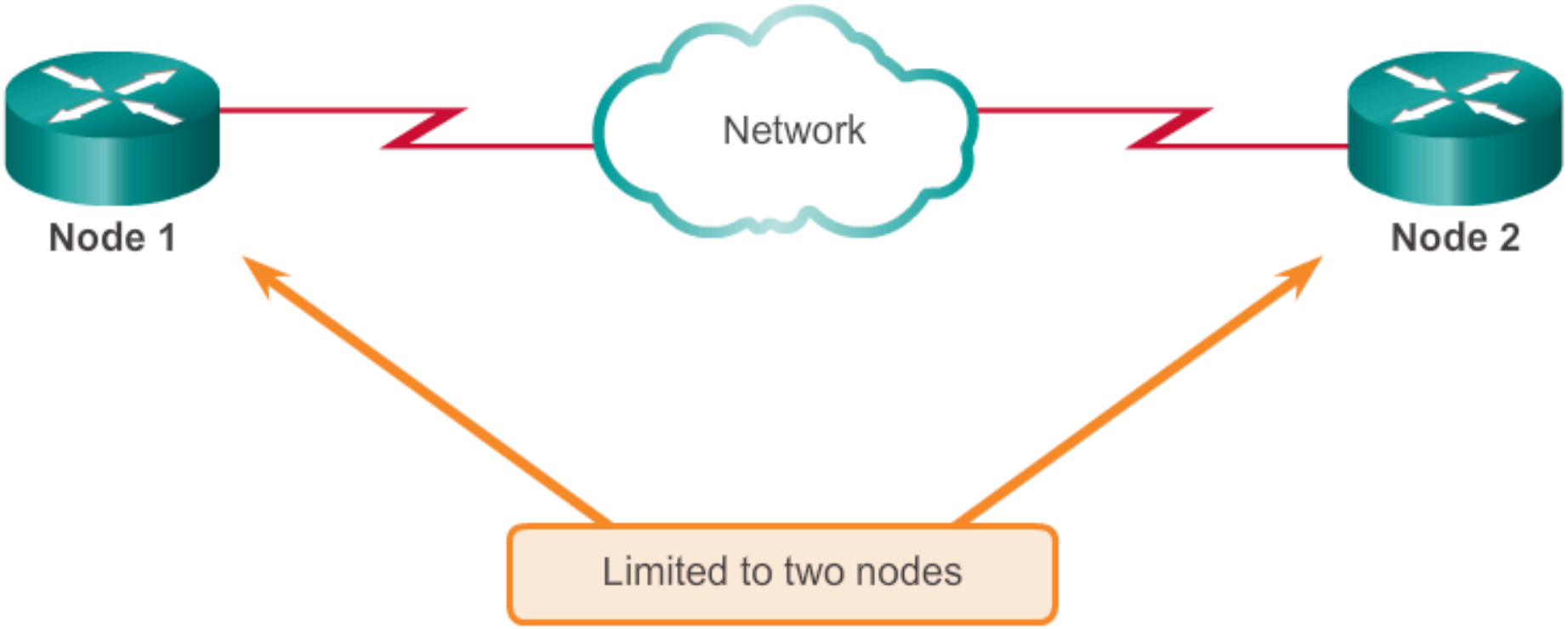


Hub and spoke topology

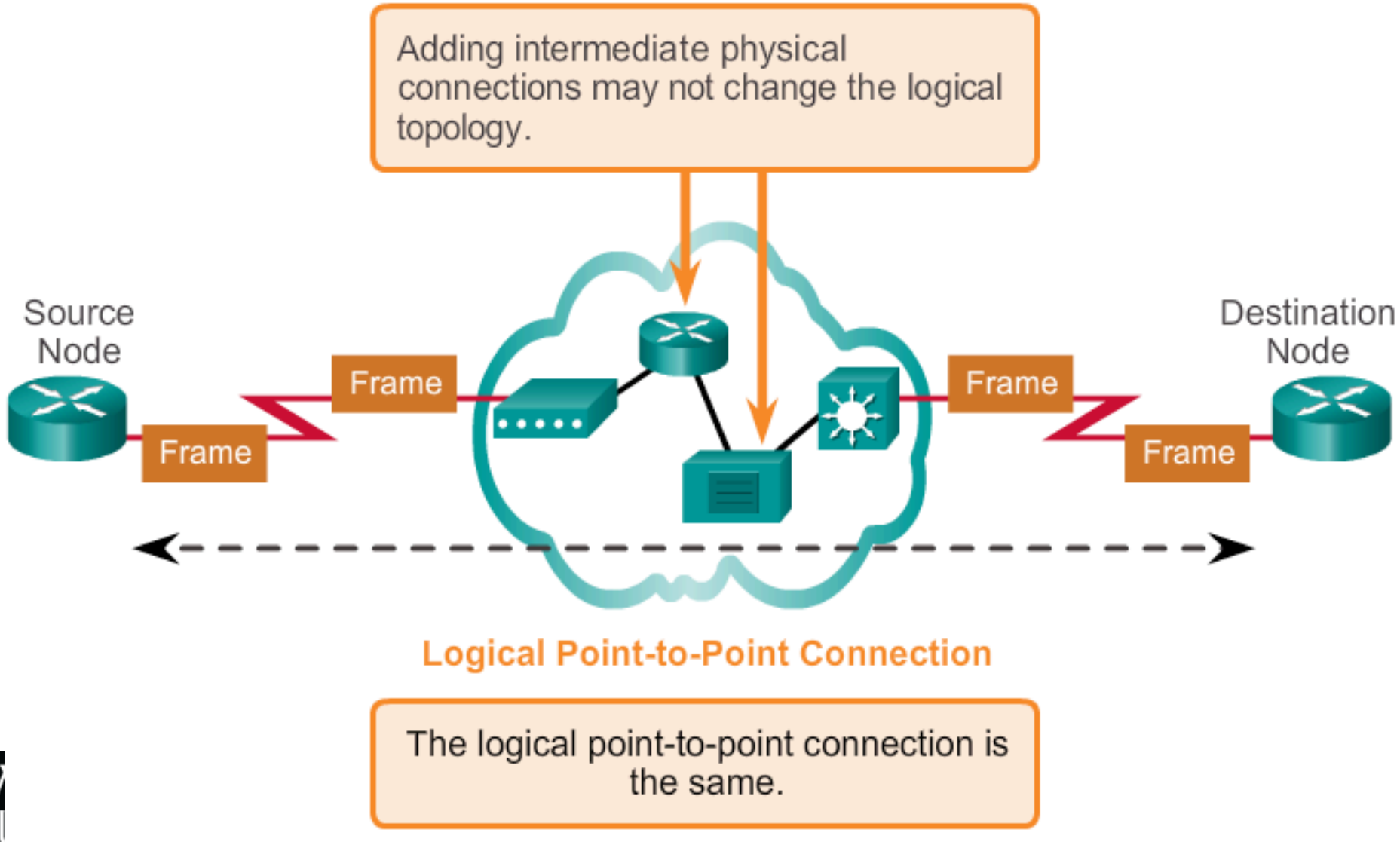


Full mesh topology

Physical Point-to-Point Topology



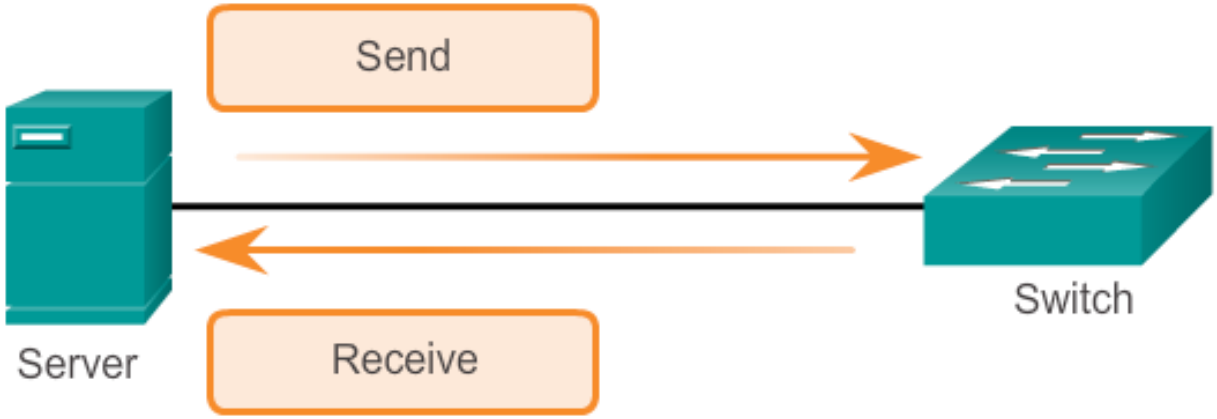
Logical Point-to-Point Topology



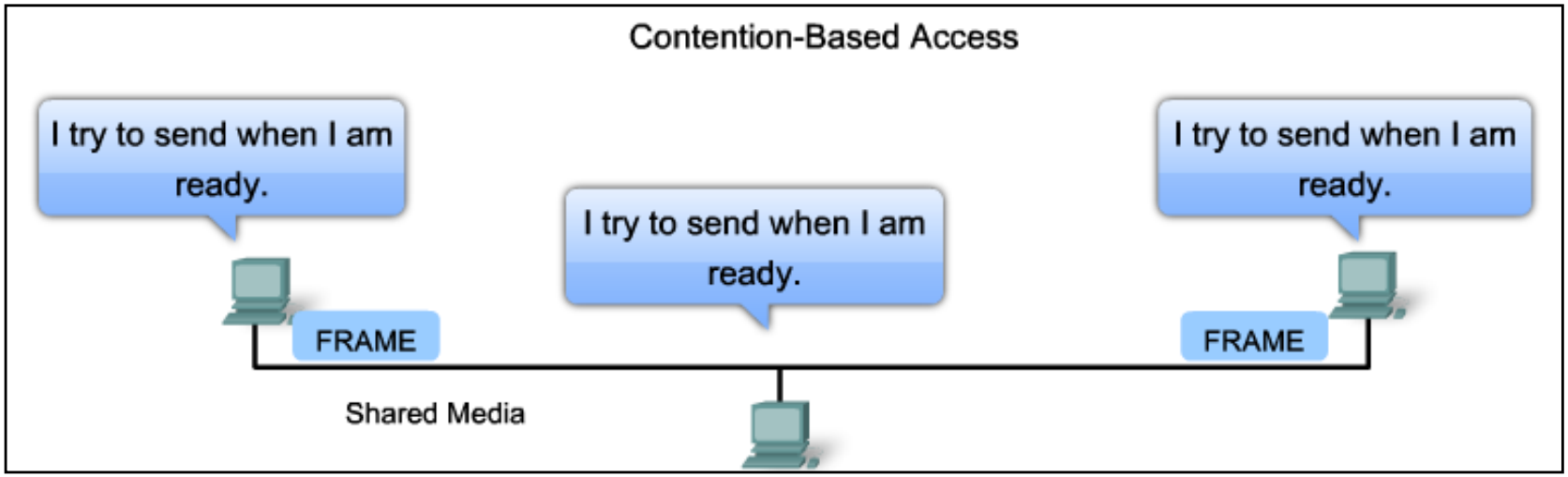
Half- and Full-Duplex

Half-Duplex

Full-Duplex

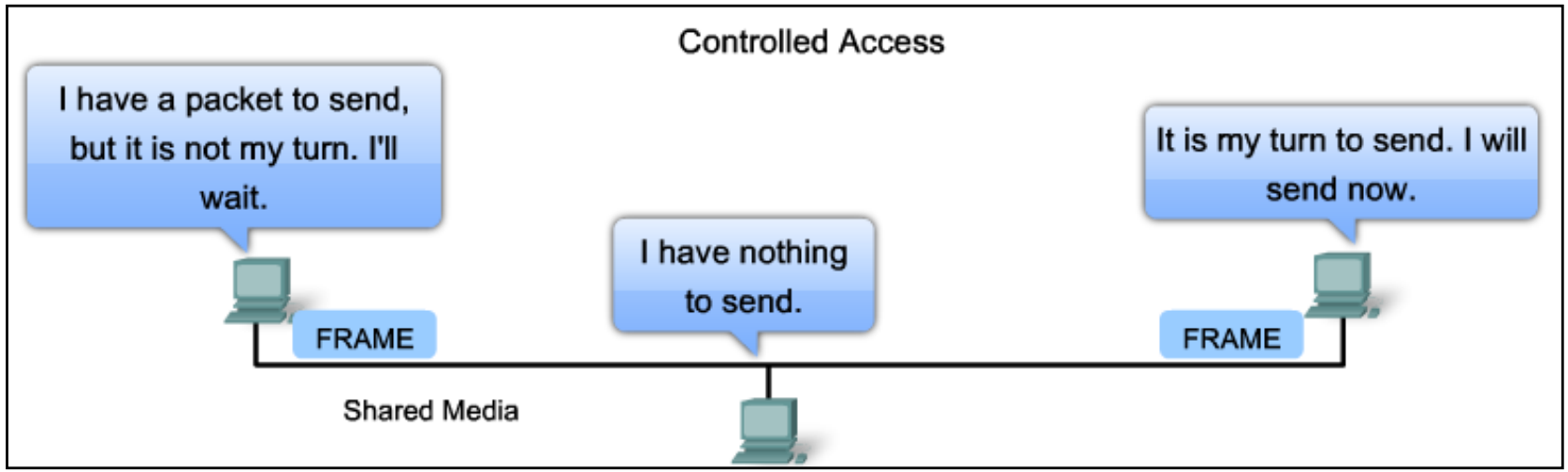


Contention-Based Access



Characteristics	Contention-Based Technologies
• Stations can transmit at any time • Collision exist • There are mechanisms to resolve contention for the media	• CSMA/CD for 802.3 Ethernet networks • CSMA/CA for 802.11 wireless networks

Controlled Access



Characteristics	Controlled Access Technologies
• Only one station can transmit at a time • Devices wanting to transmit must wait their turn • No collisions • May use a token passing method	• Token Ring (IEEE 802.5) • FDDI

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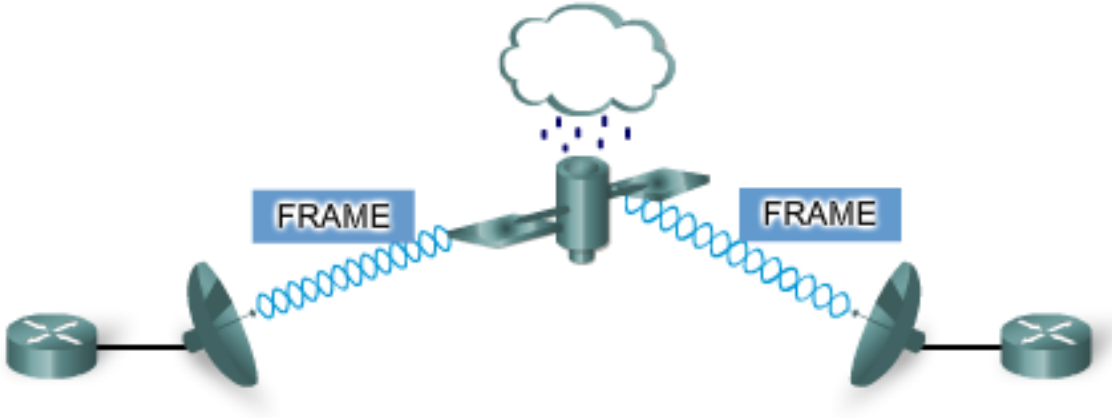
The Frame

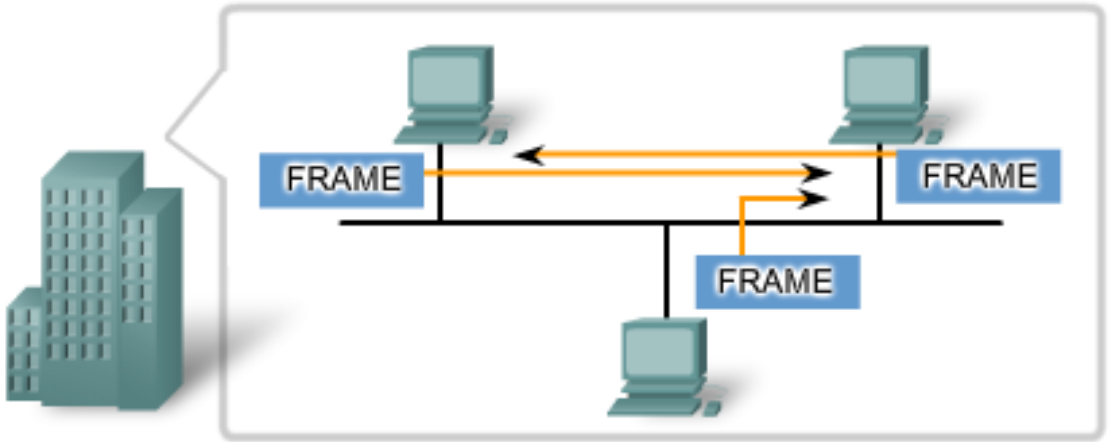
In a fragile environment, more controls are needed to ensure delivery. The header and trailer fields are larger as more control information is needed.

Greater effort needed to ensure delivery = higher overhead = slower transmission rates

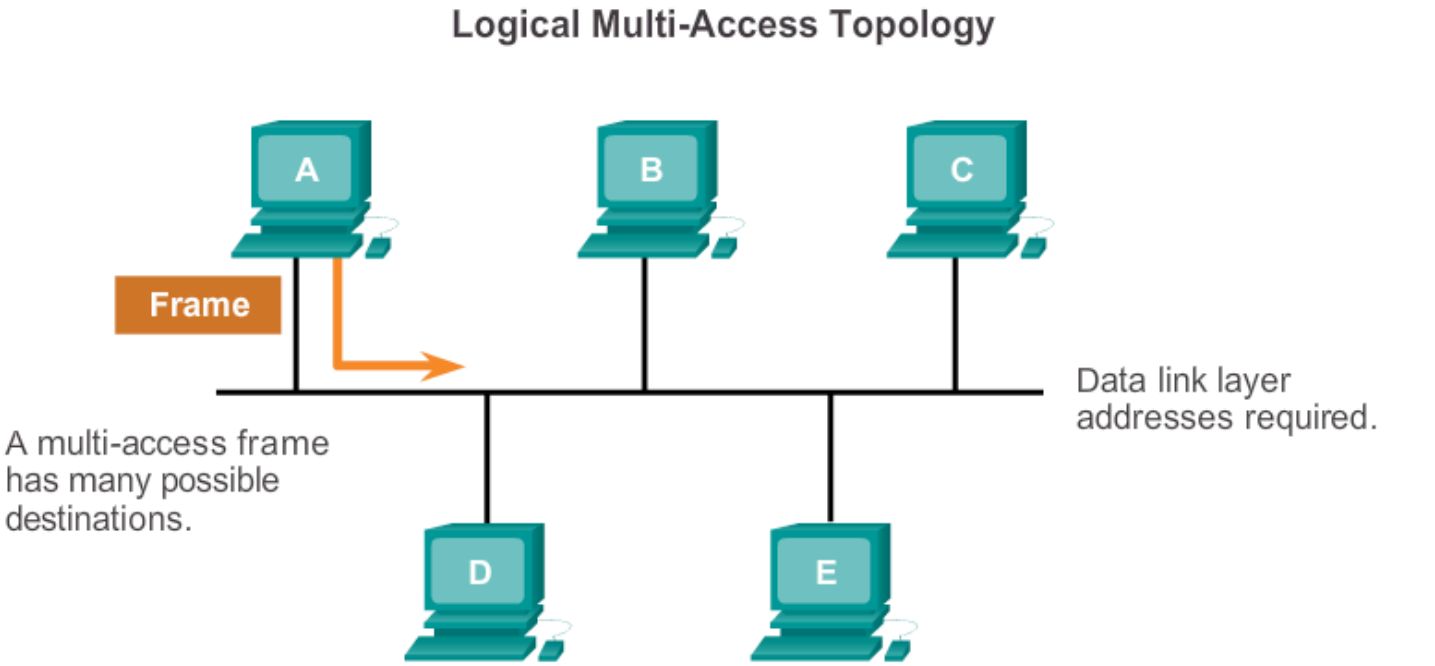


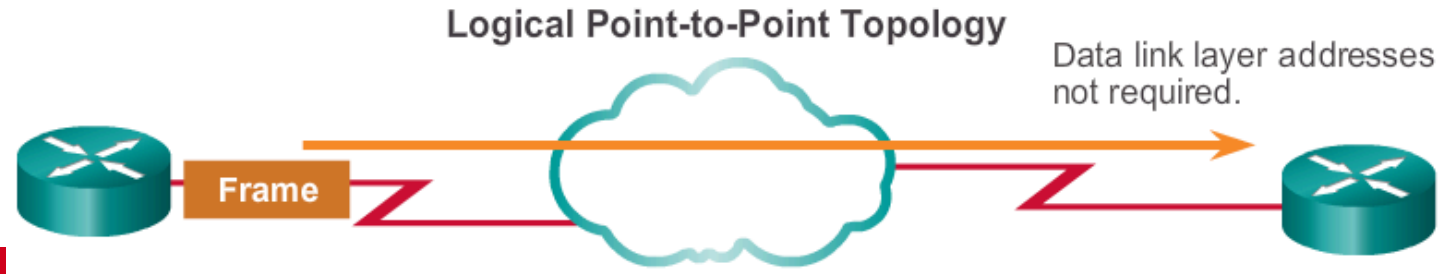
In a protected environment, we can count on the frame arriving at its destination. Fewer controls are needed, resulting in smaller fields and smaller frames.

Less effort needed to ensure delivery = lower overhead = faster transmission rates



Layer 2 Address





Summary

In this lecture, we covered:

- The Purpose of the Data Link Layer
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- Network Topologies – Logical and Physical
- Link Layer Frame and Addressing