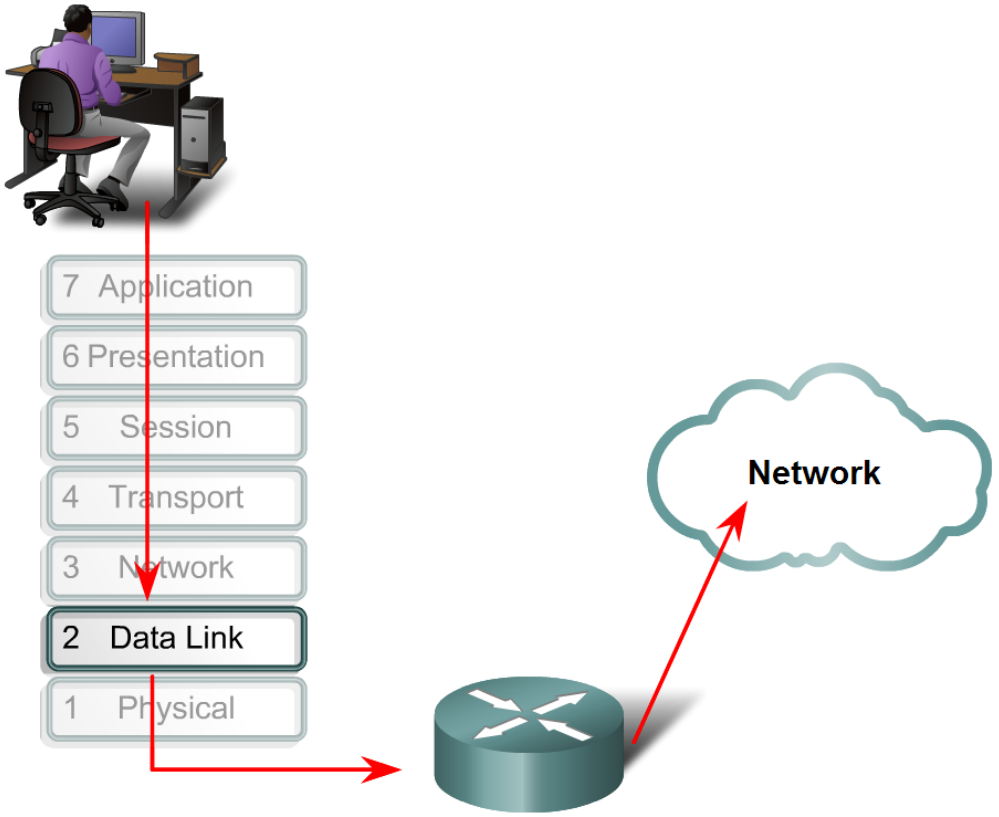
OSI Data Link Layer

Network Fundamentals

Data Link Layer – Accessing the Media

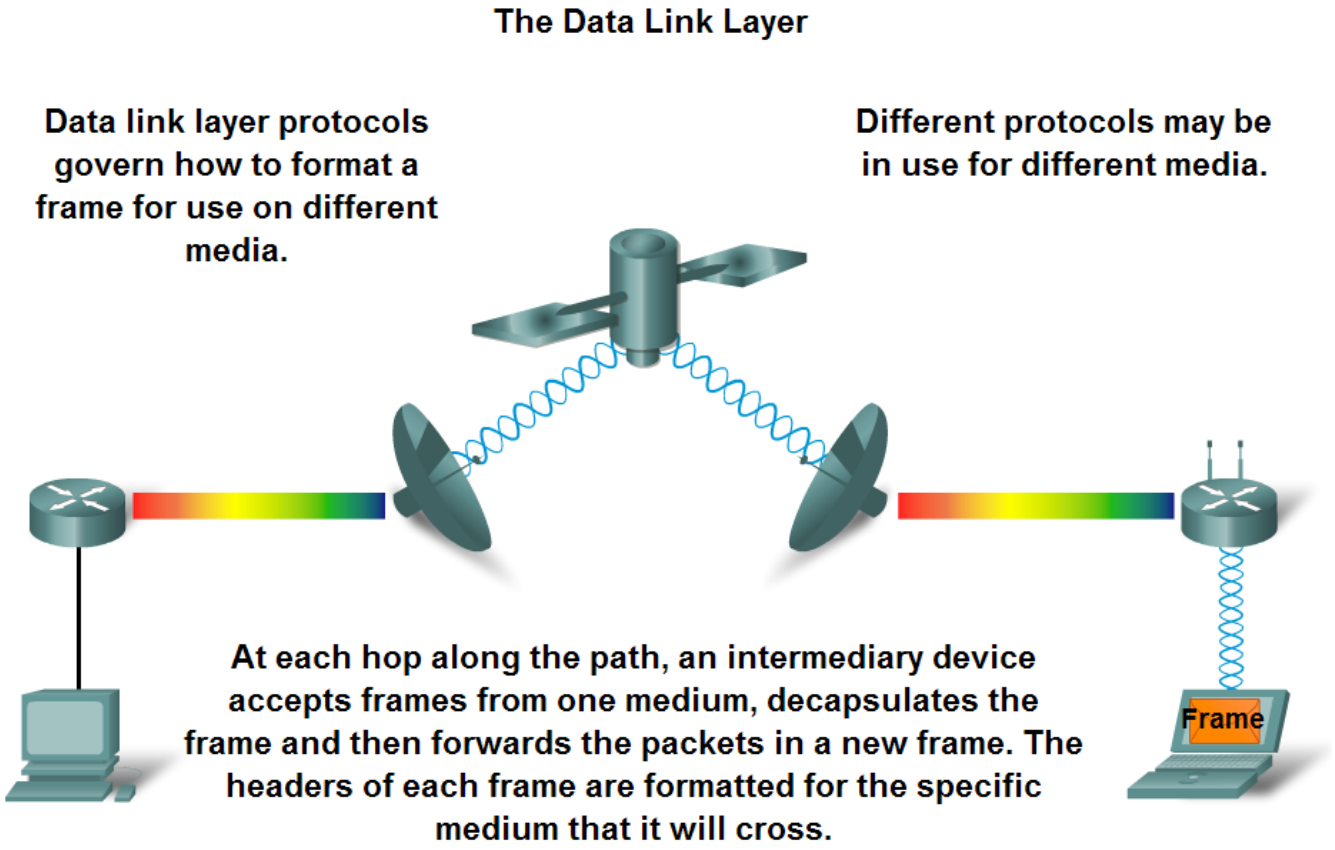
- Describe the service the Data Link Layer provides as it prepares communication for transmission on specific media



The Data Link layer prepares network data for the physical network.

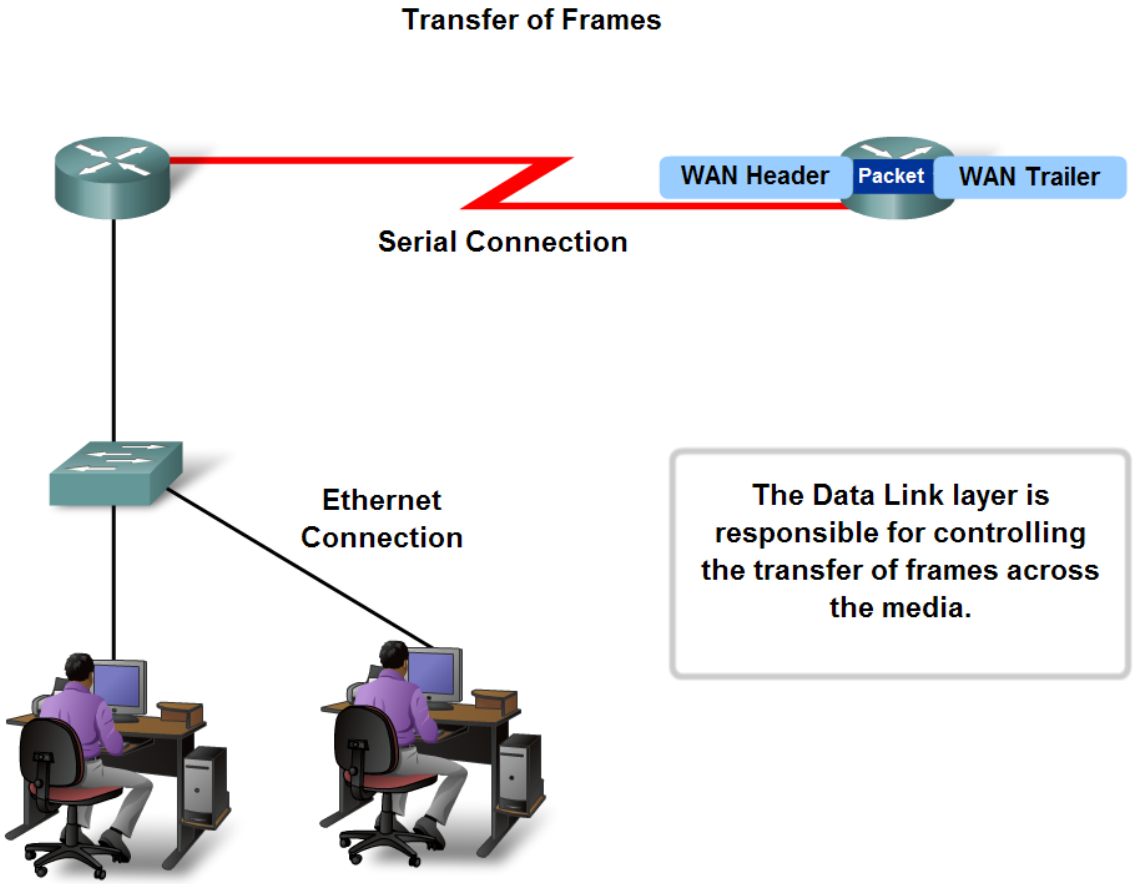
Data Link Layer – Accessing the Media

- Describe why Data Link layer protocols are required to control media access



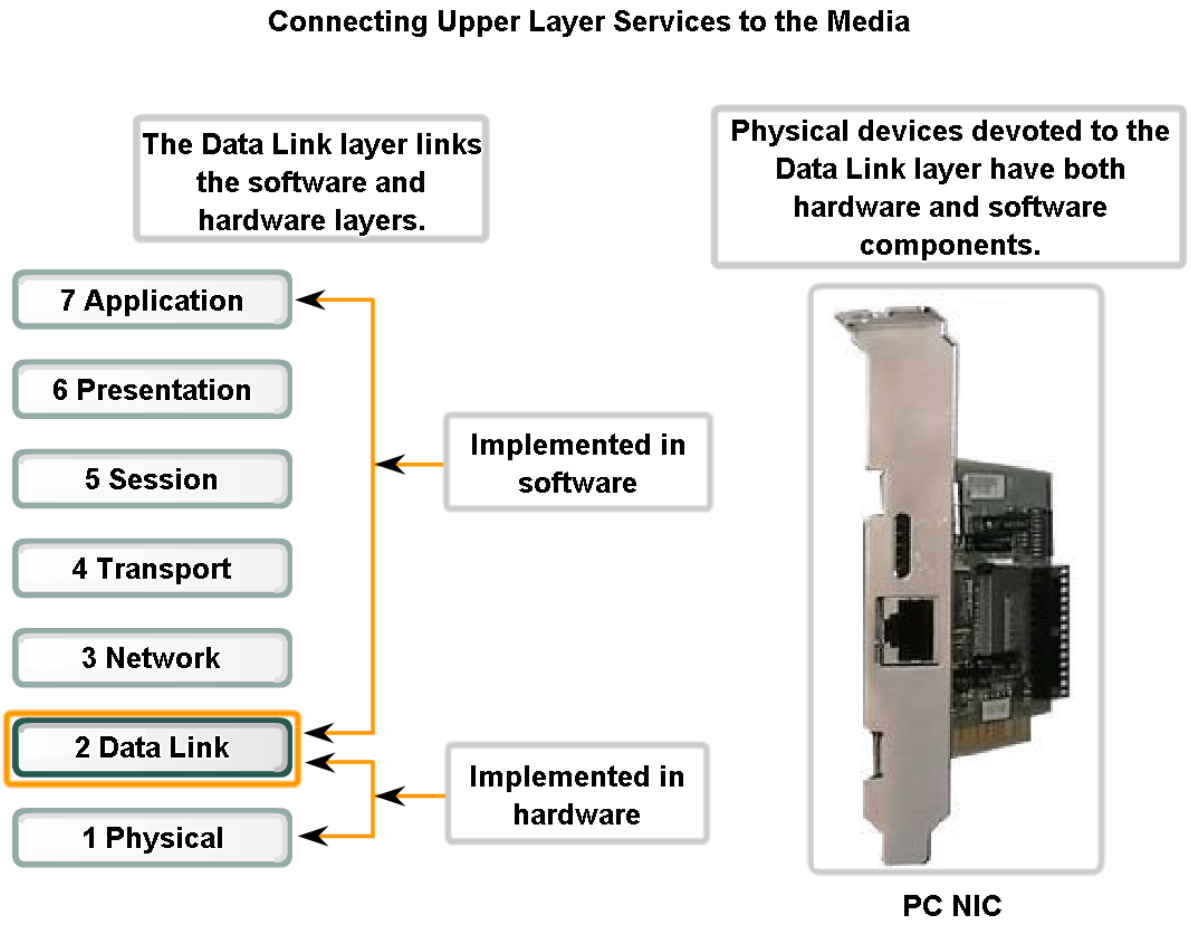
Data Link Layer – Accessing the Media

- Describe the role of framing in preparing a packet for transmission on a given media



Data Link Layer – Accessing the Media

- Describe the role the Data Link layer plays in linking the software and hardware layers



Data Link Layer – Accessing the Media

- Identify several sources for the protocols and standards used by the Data Link layer

Standards for the Data Link Layer

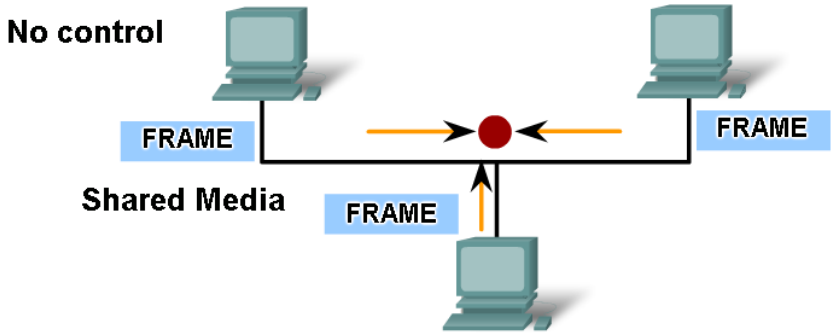
ISO:	HDLC (High Level Data Link Control)
IEEE:	802.2 (LLC), 802.3 (Ethernet) 802.5 (Token Ring) 802.11(Wireless LAN)
ITU:	Q.922 (Frame Relay Standard) Q.921 (ISDN Data Link Standard) HDLC (High Level Data Link Control)
ANSI:	3T9.5 ADCCP (Advanced Data Communications Control Protocol)

Media Access Control Techniques

- Explain the necessity for controlling access to the media

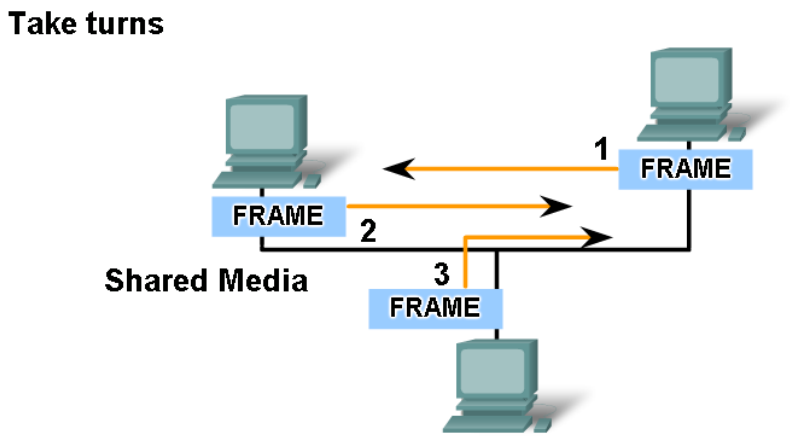
Media Access Control Methods

No control at all would result in many collisions. Collisions cause corrupted frames that must be resent.



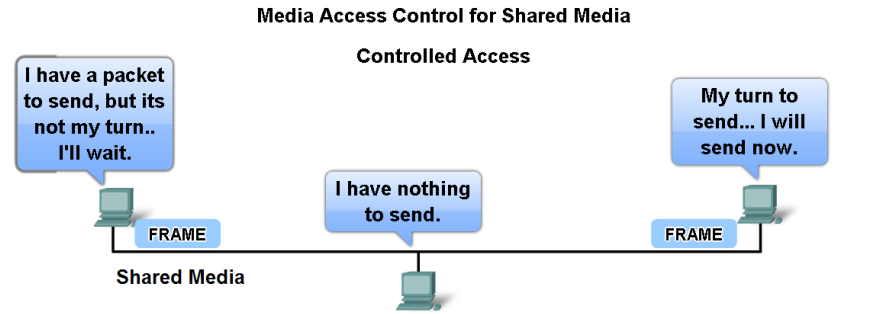
Methods that enforce a high degree of control prevent collisions, but the process has high overhead.

Methods that enforce a low degree of control have low overhead, but there are more frequent collisions.

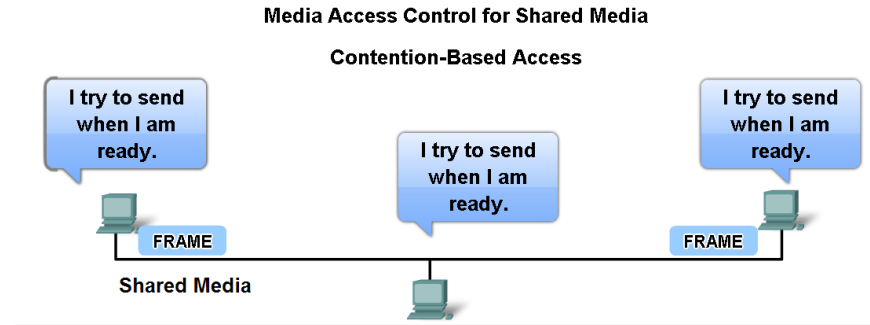


Media Access Control Techniques

- Identify two media access control methods for shared media and the basic characteristics of each



Method	Characteristics	Example
Controlled Access	• Only one station transmits at a time • Devices wishing to transmit must wait their turn • No collisions • Some deterministic networks use token passing	• Token Ring • FDDI

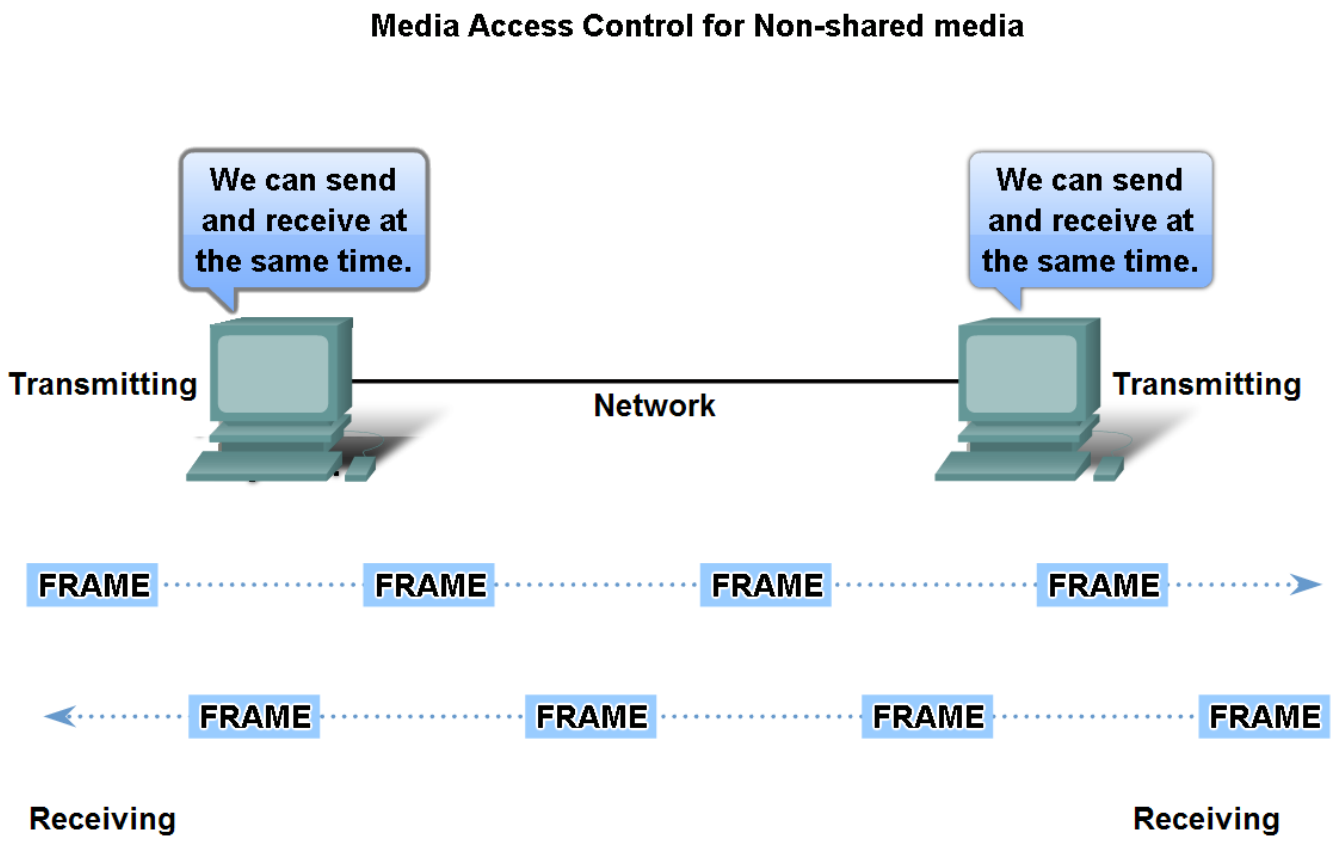


Method	Characteristics	Example

Contention Based Access	• Stations can transmit at any time
	• Collisions exist
	• Mechanisms exist to resolve contention:
	  • CSMA/CD for Ethernet networks
	  • CSMA/CA for 802.11 wireless networks
		• Ethernet
		• Wireless

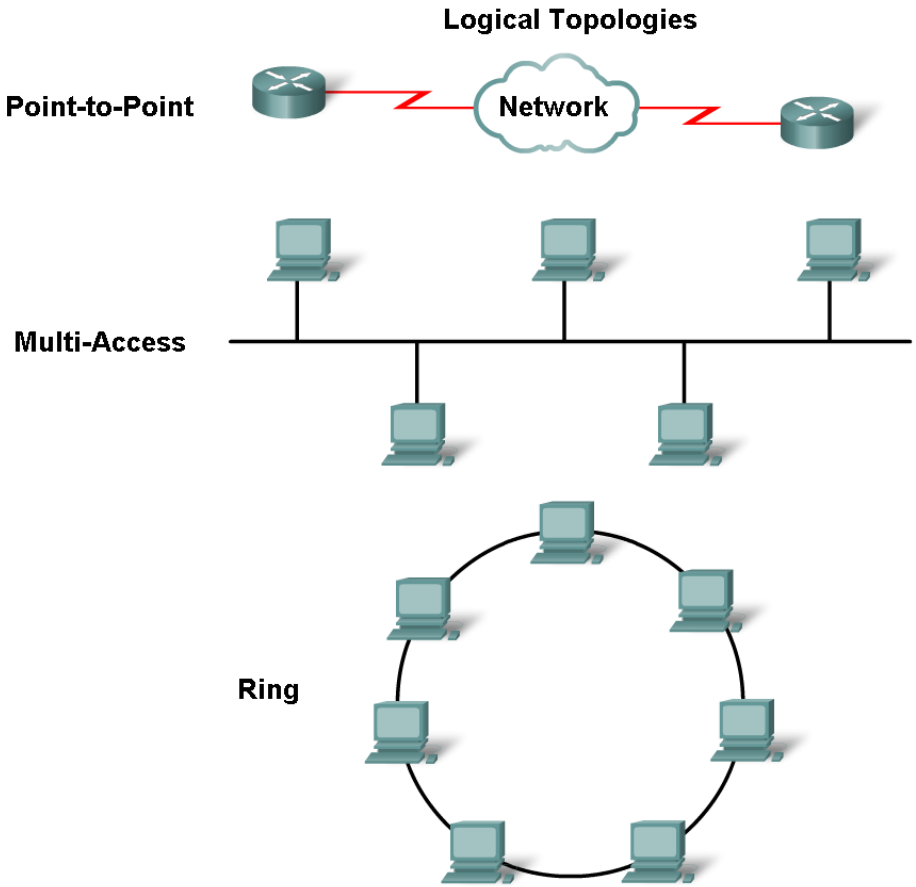
Media Access Control Techniques

- Define Full Duplex and Half Duplex as it relates to Media Access Control for non-shared media



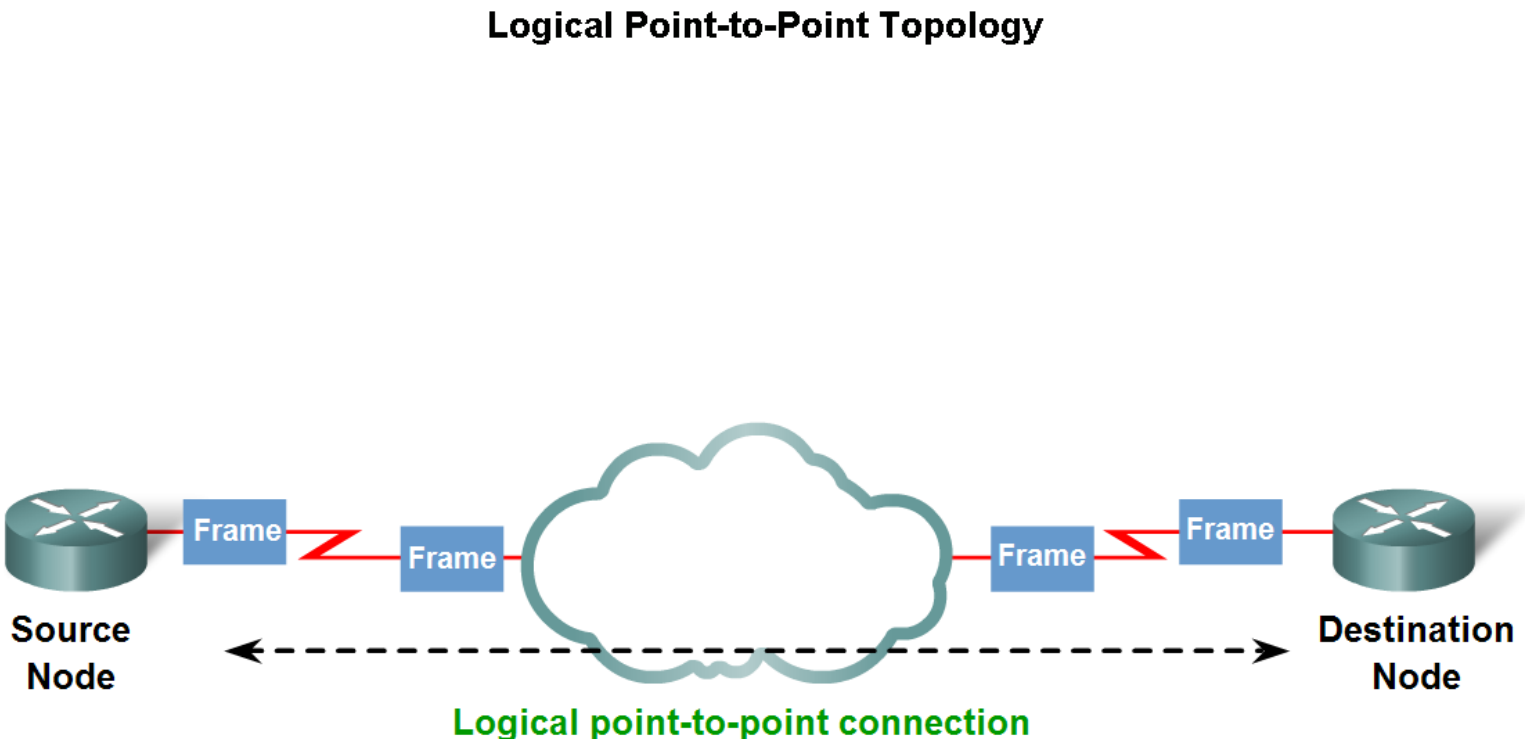
Media Access Control Techniques

- Describe the purpose of a logical topology and identify several common logical topologies



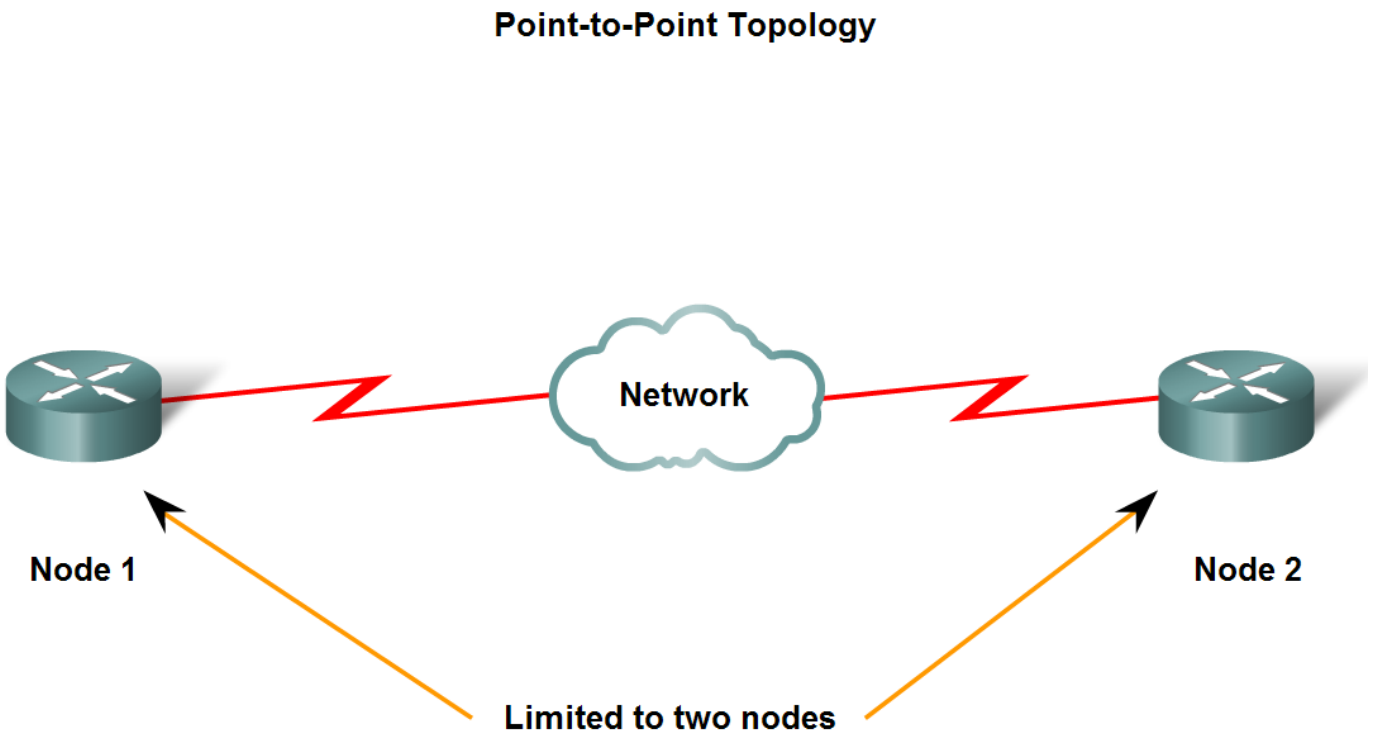
Media Access Control Techniques

- Contrast logical and physical topologies



Media Access Control Techniques

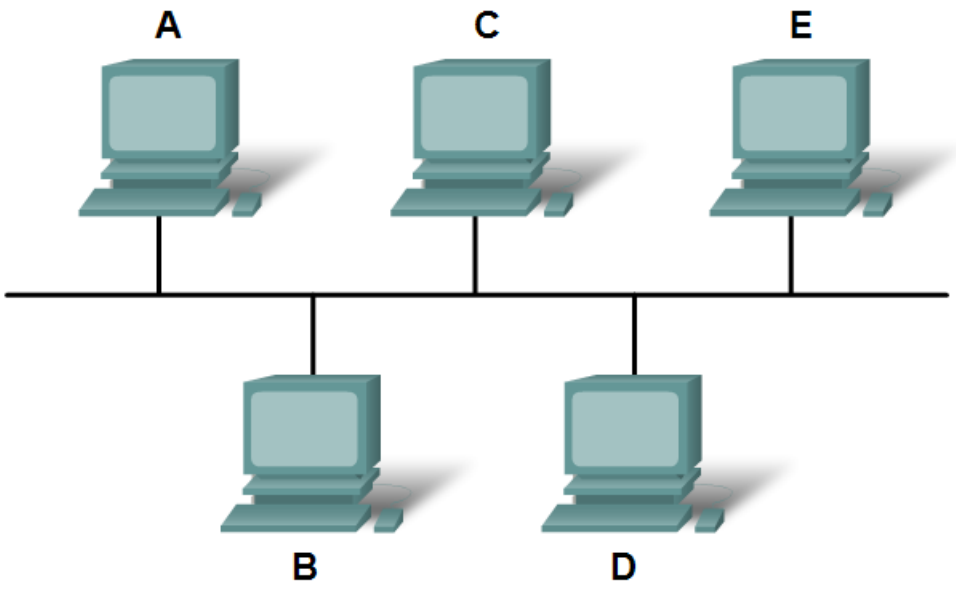
- Identify the characteristics of point-to-point topology and describe the implications for media access when using this topology



Media Access Control Techniques

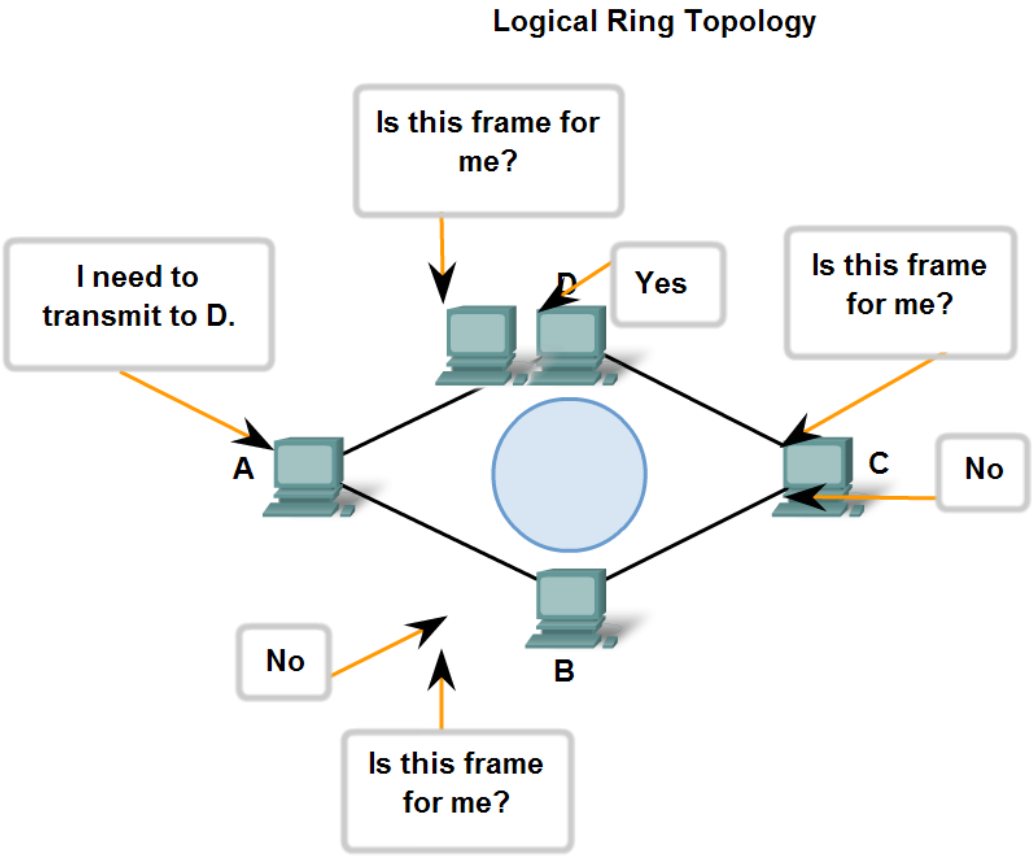
- Identify the characteristics of multi-access topology and describe the implications for media access when using this topology

Logical Multi-Access Topology



Media Access Control Techniques

- Identify the characteristics of ring topology and describe the implications for media access when using this topology



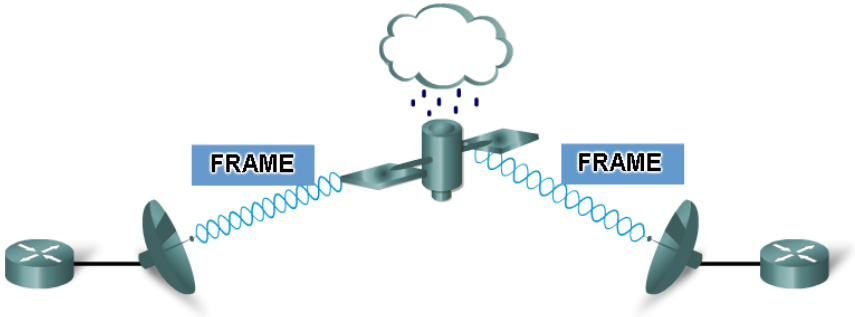
Media Access Control Addressing and Framing Data

- Describe the purpose of encapsulating packets into frames to facilitate the entry and exit of data on media

Data Link Layer Protocols - The Frame

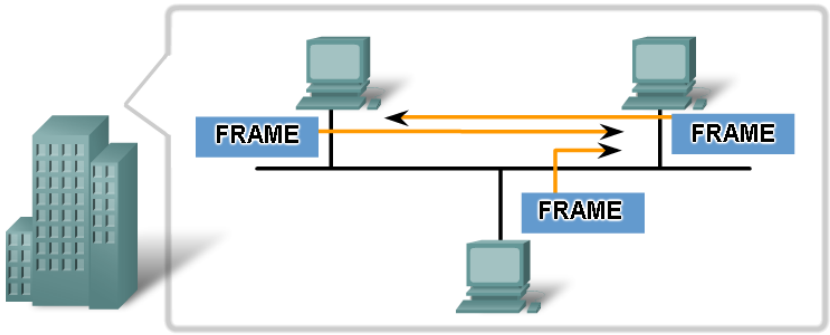
In a fragile environment, more controls are needed to ensure delivery. The header and trailer fields are larger as more control information is needed.

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.

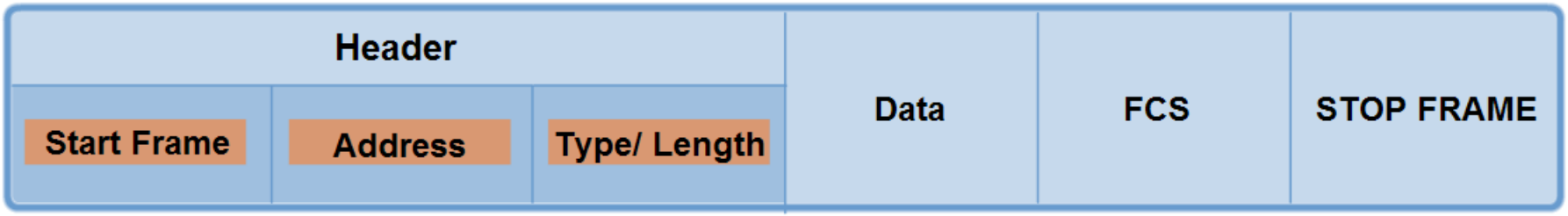
Less effort needed to ensure delivery = lower overhead = faster transmission rates



Media access control addressing and framing data

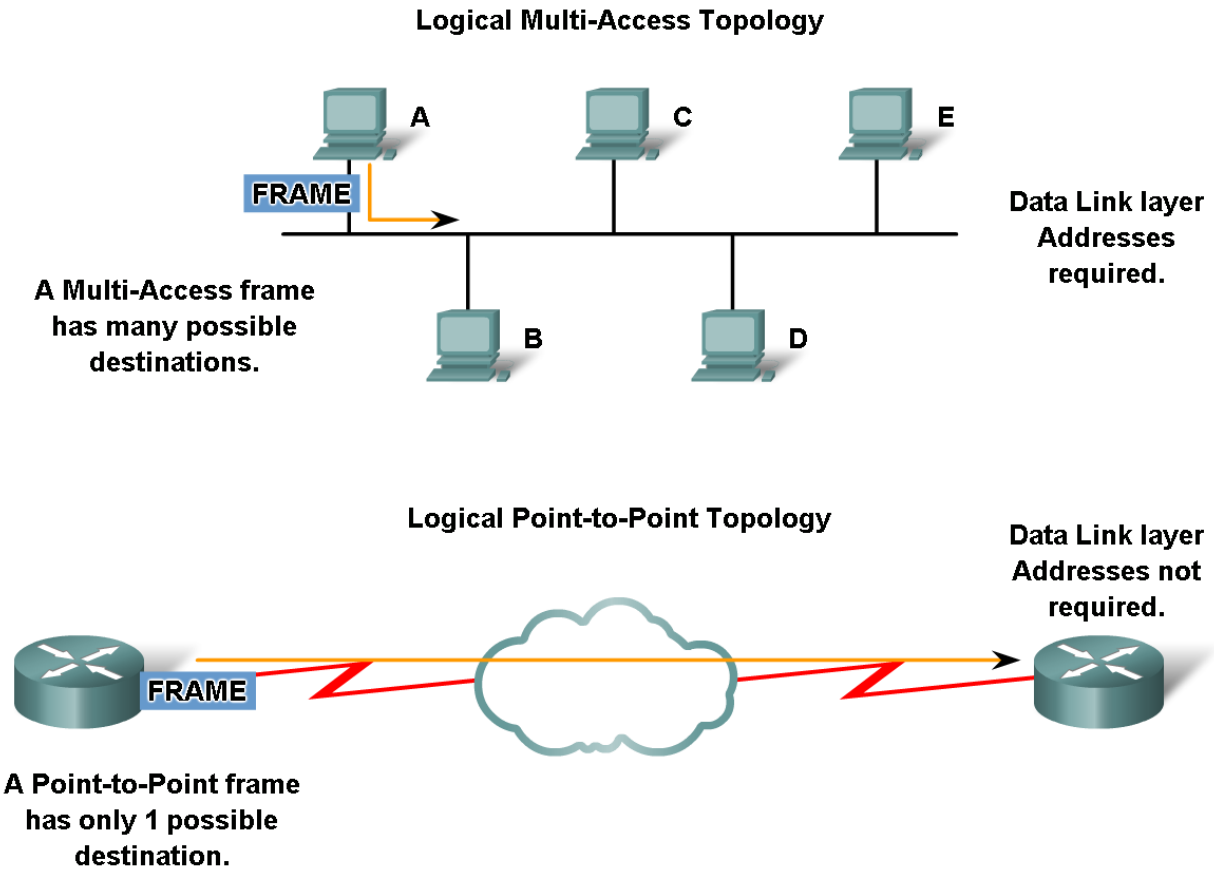
- Describe the role of the frame header in the Data Link layer and identify the fields commonly found in protocols specifying the header structure

The Role of the Header



Media access control addressing and framing data

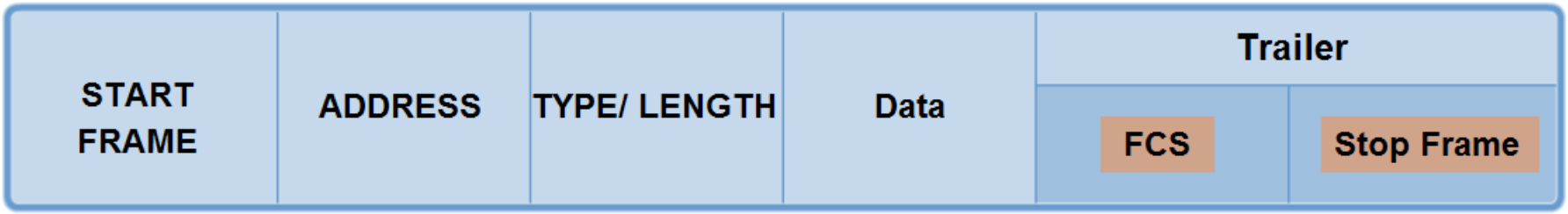
- Describe the role of addressing in the Data Link layer and identify cases where addresses are needed and cases where addresses are not needed



Media access control addressing and framing data

- Describe the importance of the trailer in the Data Link layer and its implications for use on Ethernet, a "non-reliable" media

The Role of the Trailer



Thank You