

OSI Data Link Layer



Network Fundamentals – Chapter 7



Version 4.0

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Objectives:

- Explain the role of Data Link layer protocols in data transmission.
- Describe how the Data Link layer prepares data for transmission on network media.
- Describe the different types of media access control methods.
- Identify several common logical network topologies and describe how the logical topology determines the media access control method for that network.
- Explain the purpose of encapsulating packets into frames to facilitate media access.
- Describe the Layer 2 frame structure and identify generic fields.
- Explain the role of key frame header and trailer fields including addressing, QoS, type of protocol and Frame Check Sequence.



Data Link layer protocols Control Access to Media



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



Data Link Layer Uses "Frames" for Transmission

Transfer of Frames



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Data Link Layer Links Software & Hardware

Connecting Upper Layer Services to the Media



Sublayers in Data Link



Data Link Layer Standards

Standards for the Data Link Layer

ISO:	HDLC (High Level Data Link Control)
IEEE:	802.2 (LLC), 802.3 (Etnernet) 202.5 (Token Ding) 802.11(Wireless LAN)
ITU:	Q.922 (Frame Relay Standard) 9.921 USEN Para Link Standard) HDLC (High Level Data Link Control)
ANSI:	3T9.5 ADCCP (Advanced Data Communications Control Protocol)
int Serial 0/0 ip address 192.168.100.2 255.255.255.252 Encapsulation ppp no shut	



Media Access Control Flow Control

Media Access Control Methods



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Two Media Access Control Methods

cisco.



Full Duplex and Half Duplex



Modern Switches are Full Duplex



Logical Topologies



Multi-Access Broadcast Topology

Logical Multi-Access Topology



Implications:

- Half duplex with shared bandwidth
- Transmission sent to all stations
- Contention
- Distance Limitations are End-to-End
- Requires Address (MAC)
- Broadcast used for Layer 3 Address

Full Duplex?

ARP = Address Resolution Protocol Station A is 192.168.100.54 mask 255.255.255.0 To send packet to 192.168.100.106

- 1. The address is in this subnet
- 2. Broadcast (address of FF.FF.FF.FF) soliciting 192.168.100.106
- 3. All stations hear broadcast
- 4. Station D responds with it's MAC Address
- 5. Station A sends frame to Station D
- 6. IP Address Mapped to MAC Address is Stored in apr table



Logical Ring Topology





Frames can accommodate varying environments

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.



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





Encapsulation:





Frame Formats

The Role of the Header





Address Requirements for Frames

Logical Multi-Access Topology



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