

CIS 375

CHAPTER 4

Data Link Layer



Outline

- Media Access Control
- Error Control
- Data Link Layer Protocols
 - (Ethernet)
- Transmission Efficiency
- Implications for Cyber Security



4. 1 Introduction

- Purpose of the Data Link Layer is
- Data Link Layer is divided into 2 sub-layers
 - Logical Link Control (LLC) sub-layer
 - Media Access Control (MAC) sub-layer
- Data Link Layer has three functions:
 1. Media Access Control
 2. Error Control
 3. Message Delineation



4.2 Media Access Control

- Controlled Access
 - By Request
 - Roll Call Polling
 - Token Passing
- Contention Based
- Relative Performance



4.3 Error Control

Error control

- Detect, Correct, and Prevent Errors
- 2 types of network errors
 - Corrupted data
 - Lost data

Sources of error

- White Noise
- Impulse Noise
- Echo
- Cross Talk
- Attenuation



4.3.2 Error Detection

Parity Check

- One bit check code
- Count the # of 1's in the message and add the check code to make the count of 1's either even or odd

10110110|_

10110111|_

$P_{\text{(detecting and error/error occurred)}} =$

CRC

- CRC-16 add 16 bits to message
- Treats message as a binary number
- Divides by a preset #
- Uses remainder as check code

CRC-16 $P() = 99.998\%$

CRC-32 $P() = 99.99999998\%$



4.3.3 Error Correction

- ❖ If error is detected → packet is discarded
- ❖ Which layer fixes it then?



4.4 Data Link Layer Protocols

- ASYNC (VT100, Telnet)
- Ethernet



4.4.1 ASYNC

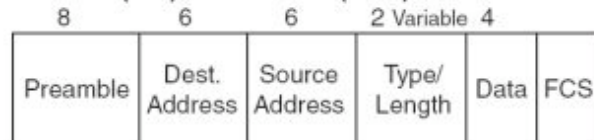
- transmits 1 character at time
 - FRAME = 1 start bit + character + parity bit + stop bit
-
- Transmission efficiency = $(\# \text{ databits} / \# \text{ databits} + \# \text{ overhead bits}) =$



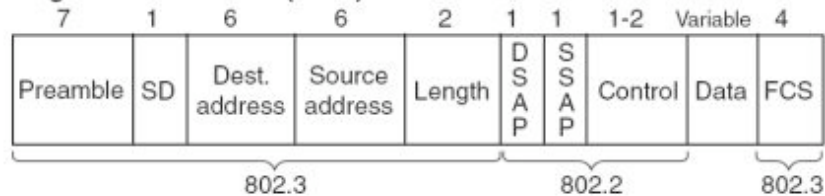
4.4.2 Ethernet

802.3ac Ethernet II

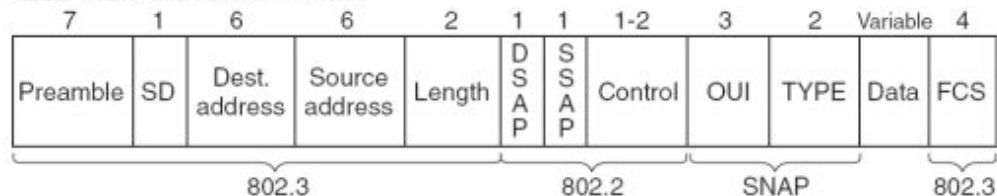
Ethernet (DIX) and Revised (1997) IEEE 802.3



Original IEEE Ethernet (802.3)



IEEE 802.3 with SNAP Header



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- Efficiency =
- Destination Address
- Source Address



4.5 Implications for Cyber Security

