Announcements

- Reading
  - Today: 4.3 & 4.4

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Ethernet Cable Options

- 10base5: Thicknet - first Ethernet
  - Thick cable, doesn't bend well
  - vampire taps used to "tap" the network
  - max run is 500 meters
- 10Base2: Thin coax (cheaper net),
  - uses "T" connectors
  - max run is 200 meters
- 10baseT: twisted pair
  - uses a central hub
  - easier to find faults and problems
  - max run is 100 meters to hub

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Manchester Encoding

- Problem: How to send zero/ones?
  - need to know timing information
  - when does on bit end?
- Answer: Force many transitions
  - every bit is half low and half high
  - 1 is high then low
  - 0 is low then high
  - but this doubles bandwidth
- Differential Manchester Encoding
  - better noise immunity
  - 0 is a transition at the start, 1 none
  - both transition during the middle

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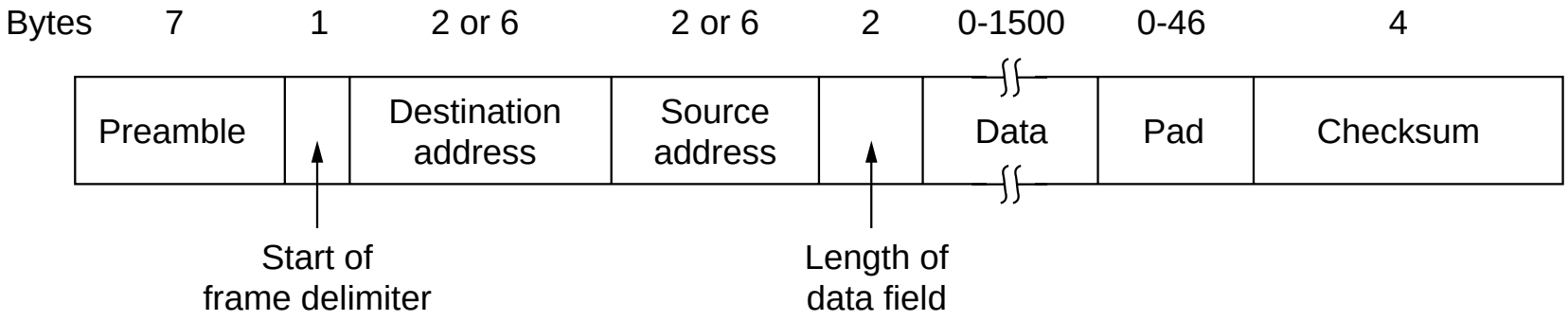
Ethernet Frame Format



- Preamble used to sync clock
- Addresses
  - 48 bits
  - if it starts with a 0 it is globally unique (assigned by IEEE)
  - if it starts with a 1 it is locally unique
- Length
  - 0 to 1500 bytes
  - **min** length is 46 bytes
    - ensures frame reaches end of cable before end of frame is sent
- Checksum
  - 32 bit CRC to detect garbled data at link level

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Collision Management

- Binary Exponential Backoff
  - after collision, divide into slot times
  - after first collision, wait either 0 or 1 slot times
  - after second collision, wait either 0, 1, 2, or 3 slot times
  - limited to 1023 slots
  - after 16 collisions, link layer gives up
- Performance
  - each station wants to transmit with probability p, then
    - A = k $[p^1(1-p)^{k-1}]$
    - A --> 1/*e* as k --> infinity
  - probability a contention interval has j slots is $A(1-A)^{j-1}$
  - mean number of slots per contention is:

$$\sum_{j=0}^{\infty} jA(1-A)^{j-1} = \frac{1}{A}$$

mean contention interval is then $2\tau/A$

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- A discussion of the project was held

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