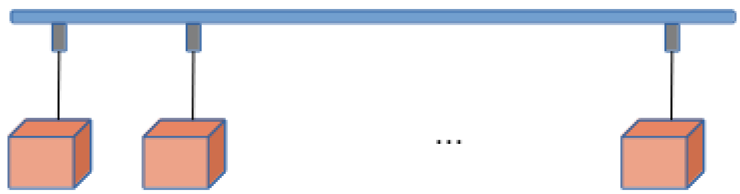
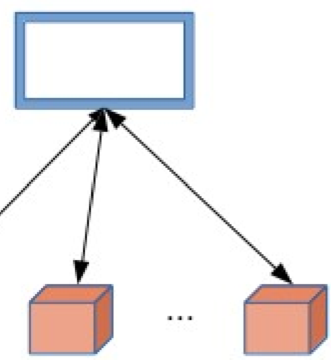
CSE 461 - Module 7B: MAC Layer Part 2

Ethernet: Overview

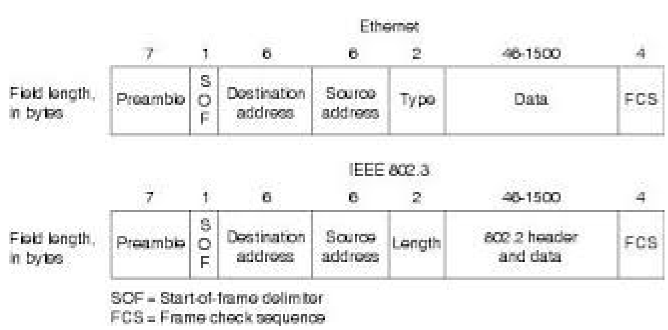
- Adapt/improve Aloha for wires
- Original Ethernet
  - 1, 3, 10 Mbps



  - Collisions are possible
  - Maximum length of segment is restricted by signal attentuation AND collision resolution protocol
- Subsequent Ethernets
  - 100, 1000, 10000 Mbps



- Ethernet header



Original Ethernet

- It's a wire. Carrier sense is easy.
- It's a wire. Losses occur only if there are collisions.
  - No ACKs
  - Collision detection (by listening while transmitting)
- There is a:
  - minimum frame length
  - maximum segment length
- Ethernet collision resolution addresses congestion collapse
  - If we set the window size, W, in Aloha's collision resolution scheme, then once the number of stations gets large the goodput falls to zero

Collision Resolution: Binary Exponential Backoff

- An adaptive version of Aloha
- First: When you collide, **stop transmitting**
  - This is one benefit of collision detection
- Second: Choose a delay U[0,W] and wait that long
  - W is initially 1
  - Delay measured in "contention intervals"
- Third: When delay expires, perform carrier sense. Defer if the medium is busy. Transmit when the medium becomes free.
- Fourth: If you collide again, set W = 2 * W and go to the second step
- Try some maximum number of times (e.g., 16) and then report that you can't send the frame

Informal Analysis

- If we knew there were N stations involved in the collision, the best choice of W would be N
- We don't know N
- We search for it, trading off the number of collisions required to resolve it against the number of idle contention intervals that go by unused
- Note: transmissions tend to synchronize stations those stations that become active, leading to a collision

Ethernet Evolution

- Why is modern Ethernet a star topology?