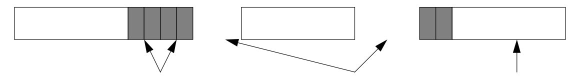
CprE 489
Lecture 26

Fall Semester 19976

Collision Detection (CSMA/CD)

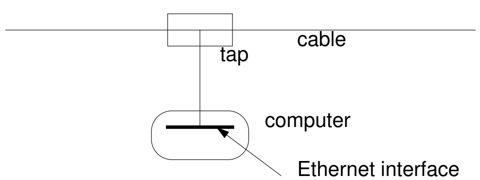
- If a collision is detected then transmission is halted after jamming. Thus, successful frames can be much longer than collision intervals.



- If propagation time is τ then a collision slot will be at least 2τ in length because it might take that long for a station to learn that transmissions started at distant stations collide.
- typical τ for coaxial cable 1 km long is 5 μs.
- Important example is IEEE 802.3 - Ethernet protocol

Ethernet Protocol

- Runs on a coaxial cable with transceivers tapped in.



- tap functions
  - sense the channel
  - jam the channel on collision
  - pass bit stream to interface
  - place bit stream onto channel
- Interface functions
  - constructs frames
  - error checking
  - runs MAC protocol

Ethernet Frame

- preamble - 7 bytes of 10101010, used for synchronization of frames
- start of frame - 10101011
- destination address - 6 bytes
  - point-to-point address
  - broadcast address
- source address - 6 bytes
- length field - 2 bytes
- data field - 0 to 1500 bytes
- padding field - 0 to 46 bytes (data + padding must be at least 46 bytes)
- checksum - 4 bytes uses CRC

Exponential Backoff Protocol

- The Ethernet protocol is 1-persistent.
- Binary exponential backoff

  i := 0

  repeat

    Choose a number s uniformly at random among $\{0,1,2,\ldots,2^i-1\}$

    Attempt to transmit in slot s from now

      if collision then set i = i +1 else done

  until done
- IEEE 802.3 version - 16 repetitions at most and i is never allowed to exceed 10.

Binary Exponential Backoff Example

a,b,c	a,b	a,c		b		c		a		

a	0	0	5
b	0	2	
c	1		3

- 1-persistent - may not work so well under heavy loads, but works well in light loads
- Unfair - a new station can join in and transmit while stations which tried to transmit earlier are backing off.
- no acknowledgement - acks must come from a higher layer.