Notes 5

n stations content in a slot for multiple access.

Each stations transmits with probability p.
How to determine the value of p to use?

n stations contend each transmitting with probability p.

Binomial Theorem!

$$P(k \text{ transmissions from } n \text{ stations}) = \binom{n}{k} p^k (1-p)^{n-k}$$

For the "best" result, $k = 1$. <u>One</u> station transmits.

$$P(1 \text{ transmission}) = \binom{n}{1} p^{1} (1-p)^{n-1} = n p (1-p)^{n-1}$$

$$P_{succes}(p) = np(1-p)^{n-1}$$ (note: view n as <u>fixed</u>)

Take derivative and set to 0.

$$\frac{d}{dp}\left(np(1-p)^{n-1} \right) = 0$$

$$p = 1/n.$$

CLARIFICATION

Reservation Systems

Bit map

High Load — High Load $\frac{n \cdot d}{nd + n}$ bits for n frames, d is the frame size.

$nd + n$ → n bits (1 for each frame)

$= \frac{d}{d+1}$ is the utilization rate.

High load — High load delay → wait for round to finish, content, then send after others $\approx (N-1)d + N$

Low Load — N bits delay for low load. (still have to check ie contend.)

Low Load — utilization: $d/(d+N)$

Binary Countdown

why log(N)?

Log(N) is the # bits needed to represent an address for N stations.

Limited Contention.

expected # of contention slots to resolve? log N. for heavy load.

Ethernet

$2 \cdot t_{prop} = 45 \mu sec.$

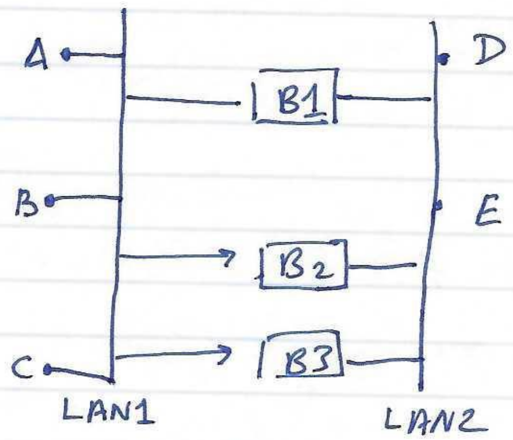
$51.2 \mu secs$ how many bits go out?

$51.2 \times 10^{-6} \times 10 \times 10^6 = \frac{512 \text{ bits}}{8}$

$= 64$ bytes

Clarification

A → E



① A transmits to E, B1, B2, B3, receive; update their view of A as on LAN1

B1 : A → E for LAN 2 ;
B2 : A → E for LAN2 ; B3 : A → E for LAN2.

② Suppose B1 succeeds first.

∴ B1 has nothing.

B2 has : A → E queued for LAN 2, receives another A → E from Lan 2 ; ∴ queues it for LAN 1.

B3 is as in B2 : has 2 packets (frames) for A → E.

③ ∴ B2 & B3 decide A is on LAN 2. (but don't know where E is)

Let B2 succeed

B1 now has A → E presumable from LAN1

B2 has A → E A → E queued for LAN1.

B2 has now 3 packets queued

⋮