

# Performance

$$U = \frac{\text{DataTime}}{\text{TotalTime}}$$

A convenient frame of reference is the time it takes for a full round where every node gets an opportunity to send.

$$U = \frac{\text{Data Time}}{\text{Message Time} + \text{Prop Time} + \text{Token Time} + \text{Bit Delays}}$$

For example, 10 stations,  $p = 0.20$ ,  $D = 1000 \text{ m}$ ,  
 $R = 10^6 \text{ b/s}$ ,  $L = 1024 \text{ b}$ ,  $M = 896 \text{ b}$ , 4 bit delays per station.

$$U = \frac{(10)(0.2)(896)/R}{(10)(0.2)(1024)/R + (10)(0.2)(D/V) + (10)(24)/R + D/V + (10)(4)/R}$$

$$U = \frac{.001792}{.002338}$$

$$U = 0.77$$

## Formalizing

N = the number of nodes on the ring

P = the probability that a station sends

D = length of the ring

B = the number of bit delays per station

R = bit rate

L = message length

M = data bits in the message (e.g. header length = L-M)

T = token length

V = signal propagation rate

$$U = \frac{NPM/R}{NPL/R + NPD/V + NT/R + D/V + NB/R}$$

## A Simple Model

If we let  $M = L$  and ignore the token passing and delay bits:

$$U = \frac{NP(L/R)}{NP(L/R) + NP(D/V) + D/V}$$

and then divide by  $L/R$  and then  $NP$ :

$$U = \frac{NP}{NP + NP a + a}$$

$$U = \frac{1}{1 + a + a/NP}$$

## Performance

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Let  $a = 2.0$ :

<b>NP</b>	<b>U</b>
0.1	0.05
0.5	0.20
1.0	0.33
2.0	0.50
4.0	0.67
10.0	0.87
20.0	0.99

## FDDI

- Fiber Distributed Data Interface
- Sizes to 200 km
- Fiber, coaxial and twisted pair media
- Often used for backbone and campus/MAN applications
- Allows multiple tokens
- Complex access control that allows priorities.