

$$\cdot \binom{n}{k} = \frac{n!}{(n-k)! k!}$$

$$\cdot 1 \text{ Bytes} = 8 \text{ bits}$$

$$1 \text{ Kb} = 10^3$$

$$1 \text{ Mb} = 10^6$$

$$1 \text{ Gb} = 10^9$$

• Slotted Aloha:

$$P(x=0) = (1-p)^N$$

$$P(x=1) = N(1-p)^{N-1} p \quad \text{Efficiency, Normalized throughput}$$

$$P(x \geq 2) = 1 - P(x=0) - P(x=1)$$

$$P_s = P_i \prod_{k=1}^{N-1} (1-p_k) = P(1-p)^{N-1} \quad \text{Avg throughput of a node}$$

$$P(\text{success at } k^{\text{th}}) = (1-p)^{k-1} p$$

$$E(D) = \left\lceil \frac{1}{P_s} \right\rceil \quad \text{平均需要多少个 slot 才发送成功}$$

# • CSMA-CD

$$t_{prop} = \frac{\text{Cable length}}{\text{propagation speed}}$$

$$t_{trans} = \frac{1 \text{ Frame Size}}{\text{channel rate}}$$

$$\text{Efficiency} = \frac{1}{1 + S \frac{t_{prop}}{t_{trans}}}$$

$$\text{Max \# of Node} = \left\lfloor \frac{\text{Efficiency} \times \text{channel rate}}{\text{Node traffic}} \right\rfloor$$

1 subnet

with multiple subnet  $\Rightarrow$  max length within same subnet

# • TCP Reno

$$\left\lfloor \frac{23}{2} \right\rfloor = 11 = \text{cwnd size}$$

# • Both TCP Reno/Tahoe

$$ssthresh = \frac{\text{cwnd}}{2}$$

after either 3 dup, or time out

## • NAT Translation Table

inter IP Port External IP Port

$$\cdot \text{Estimated } RTT_i = ERTT_{i-1} \cdot (1-\alpha) + \alpha \cdot \text{Sample } RTT_i$$

$$\text{Dev } RTT_i = \text{Dev } RTT_{i-1} (1-\beta) + \beta |ERTT_i - SRTT_i|$$

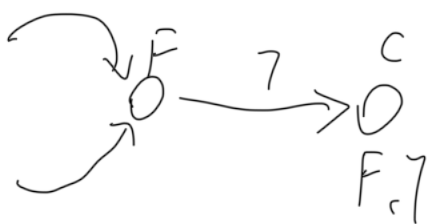
$$\text{timeoutInterval} = ERTT + 4 \text{Dev } RTT$$

## • PZP

$$\text{Distribution} \geq \max \left\{ \frac{F}{U_s}, \frac{F}{\min\{D_1, \dots, D_n\}}, \frac{NF}{U_s + \epsilon U_s} \right\}$$

## • Client-to-Server

$$\text{Distribution} \geq \max \left\{ \frac{NF}{U_s}, \frac{F}{\min\{D_1, \dots, D_n\}} \right\}$$

· Distance Vector  $\frac{\square}{\nwarrow} \rightarrow \uparrow$  node 

Link State  $\frac{\square}{\nwarrow} \rightarrow \uparrow$  node 