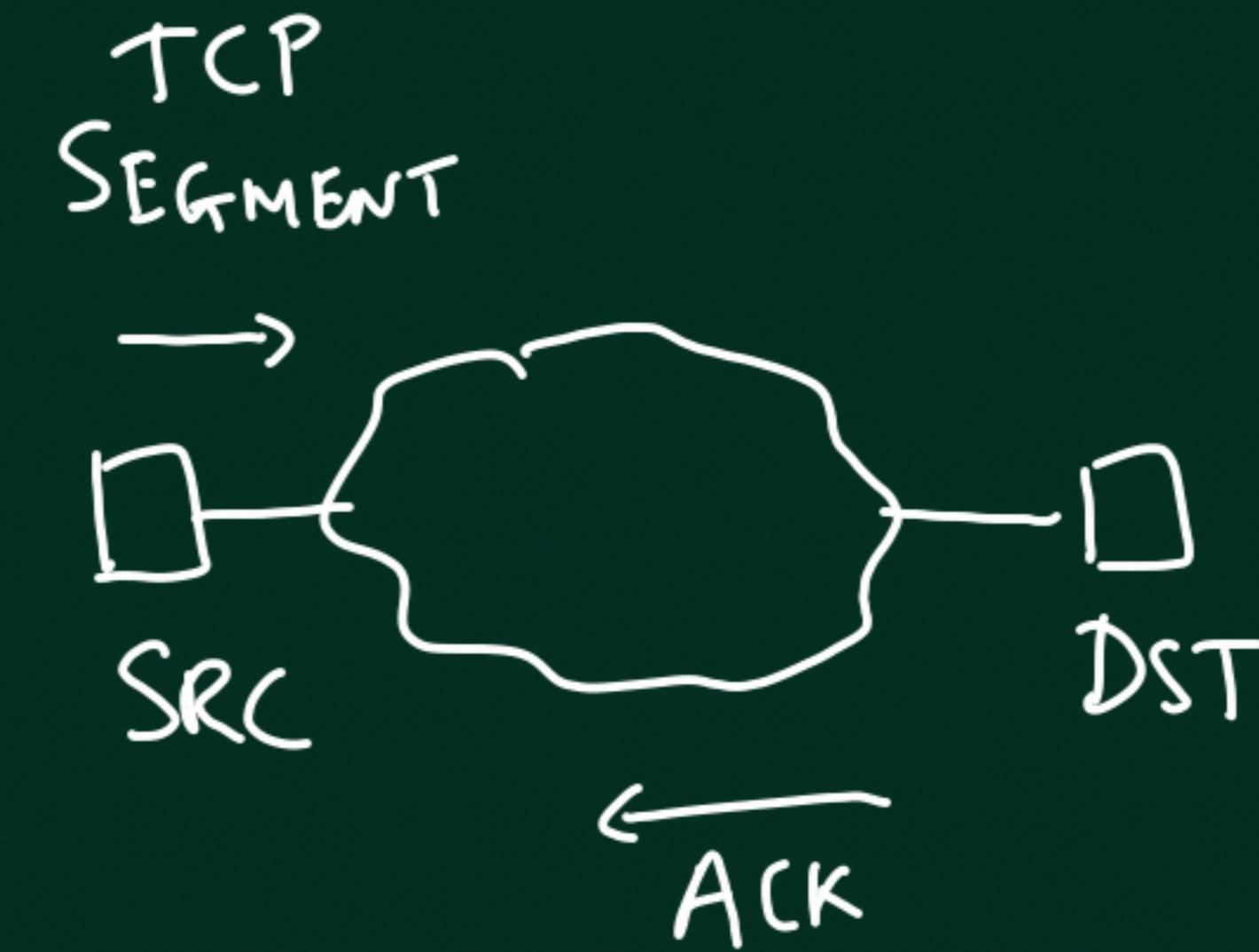
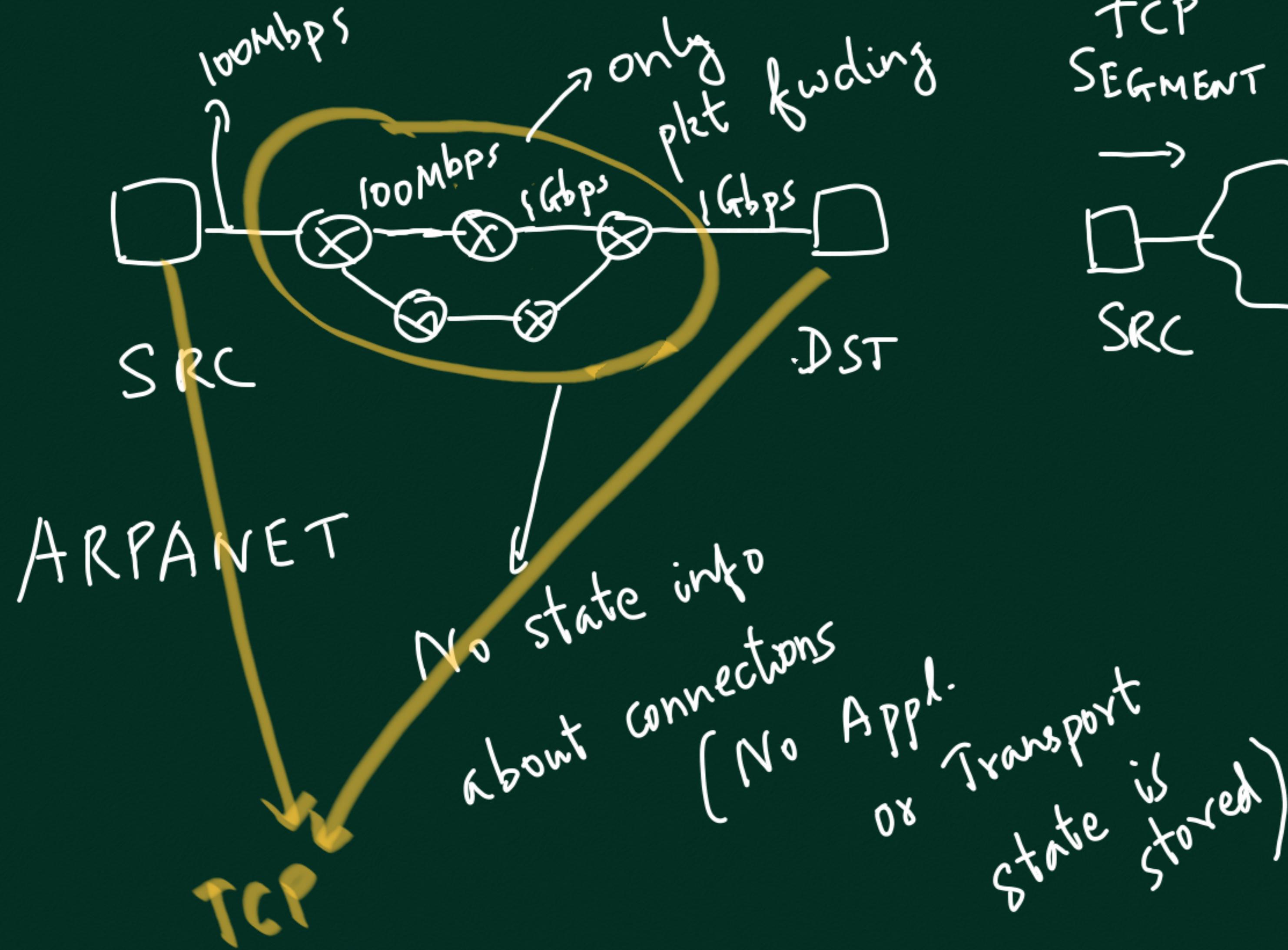


TCP CONGESTION CONTROL

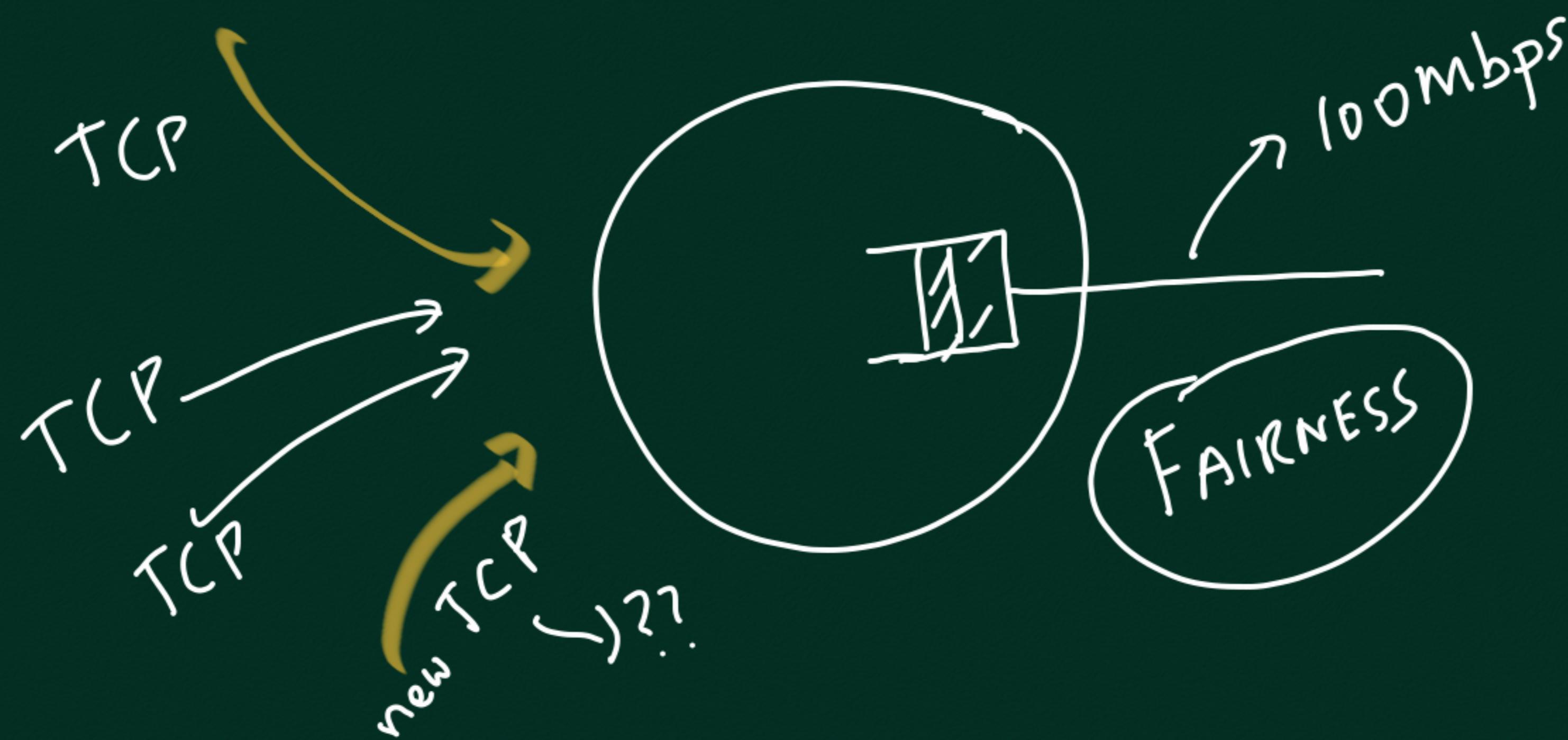


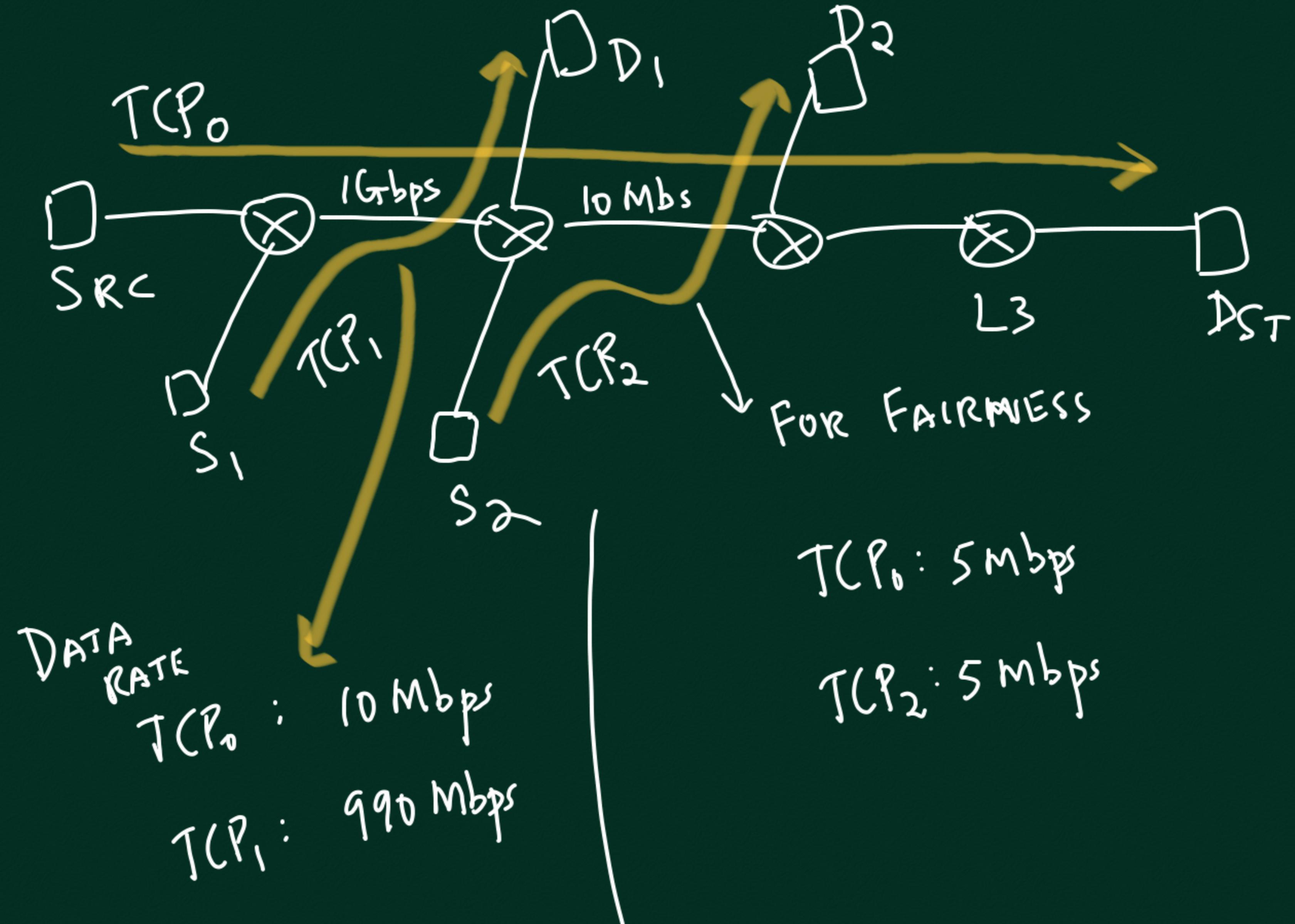
END-HOSTS RUNNING TCP

- DON'T KNOW LINK SPEEDS

- DON'T KNOW # other TCP connections sharing same path

- DON'T KNOW LNK UTILIZATIONS

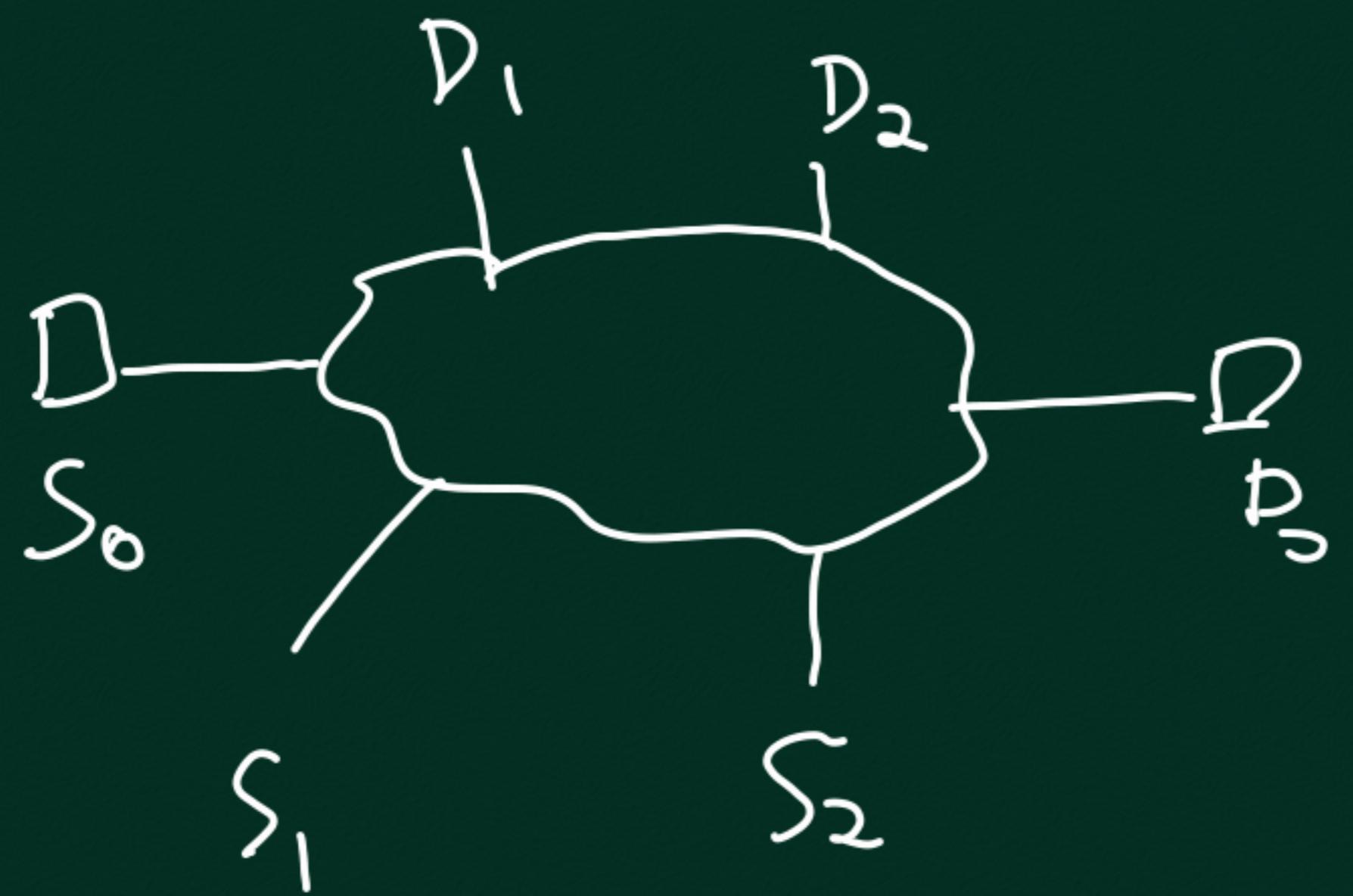




Congestion Control Issues

TCP Connection

- WANTS TO USE BANDWIDTH RESOURCES EFFICIENTLY
- DO NOT WANT TO CAUSE CONGESTION
PACKET LOSS, QUEUES FILLING UP
- FAIRNESS — ONE TCP CONNECTION SHOULD NOT GRAB MOST OF BANDWIDTH AT EXPENSE OF OTHER CONNECTIONS



10 photos of 10^4 bits each

every 10 ms

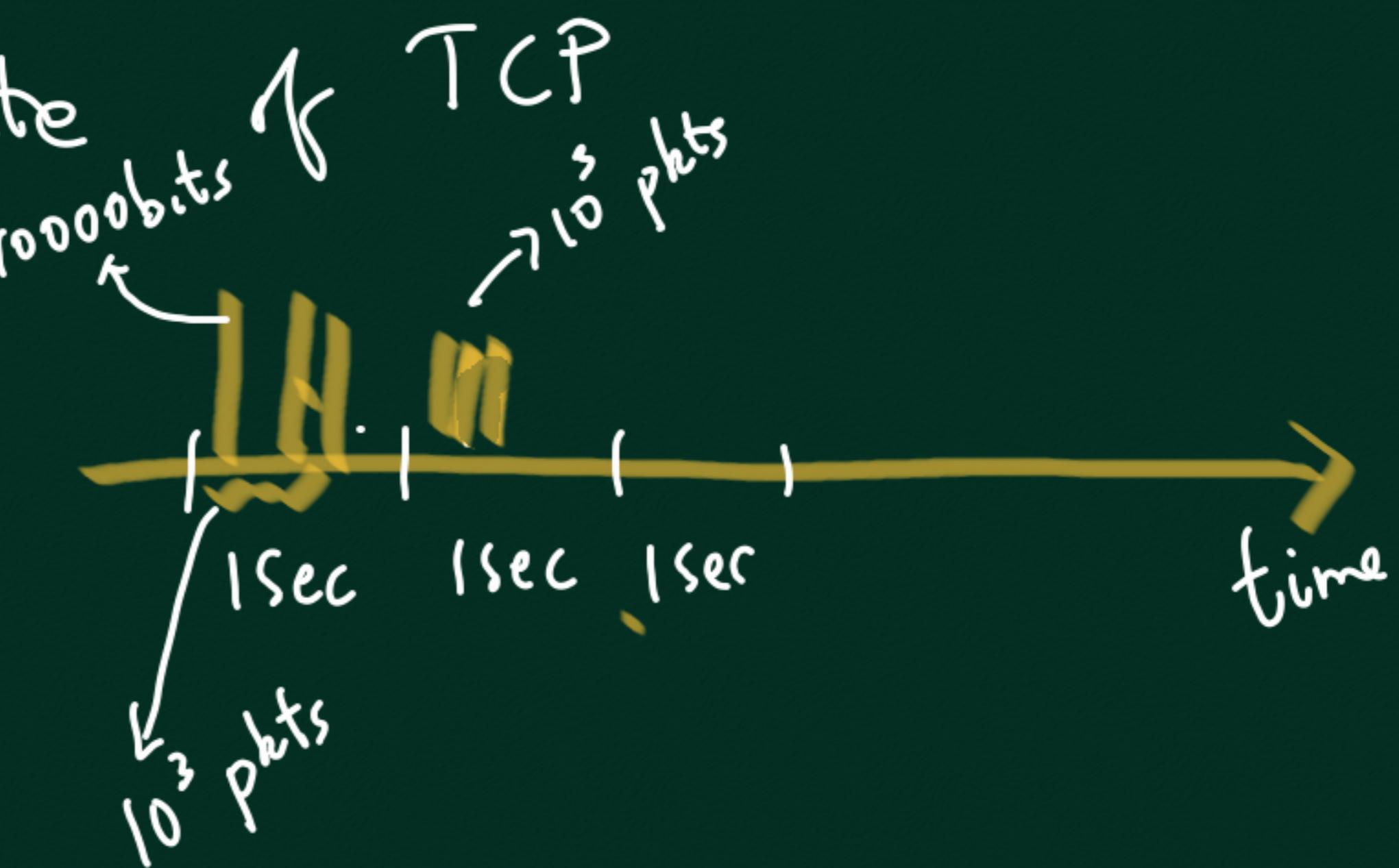
INSTEAD

of 1 sec granularity

Q. How to set data rate if TCP



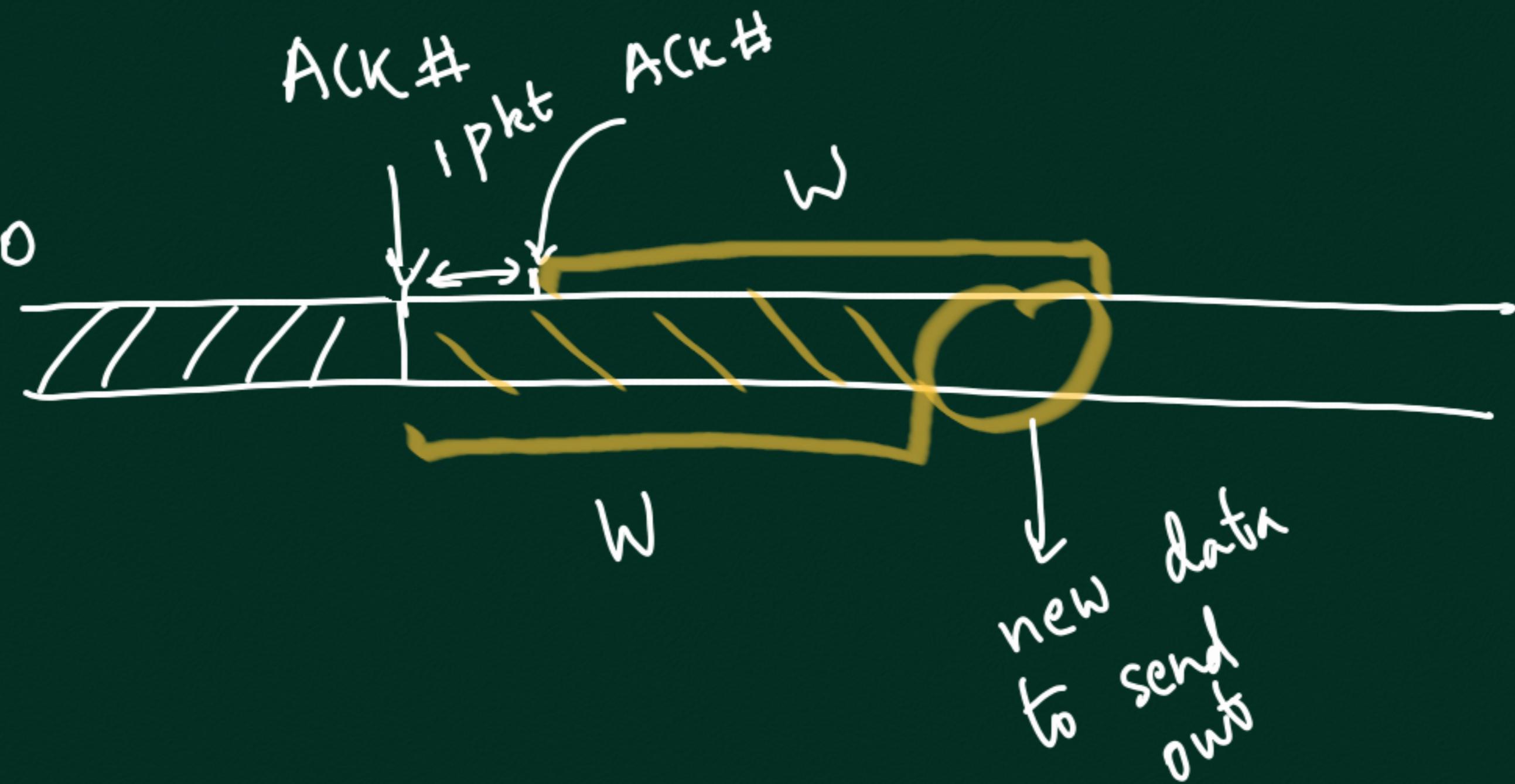
10 Mbps



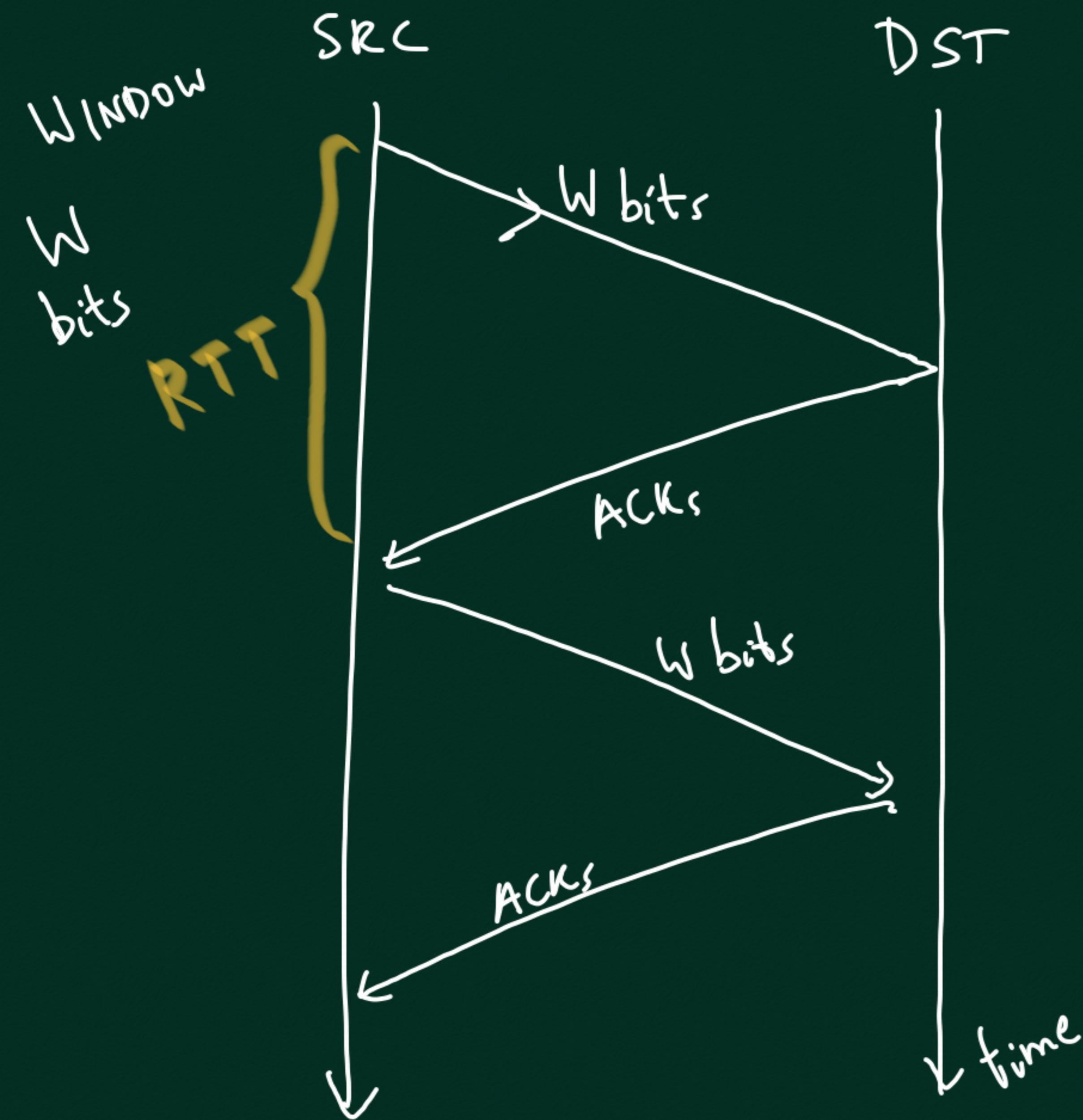
WINDOW
BASED
DATE RATE
CONTROL

SRC

FILE

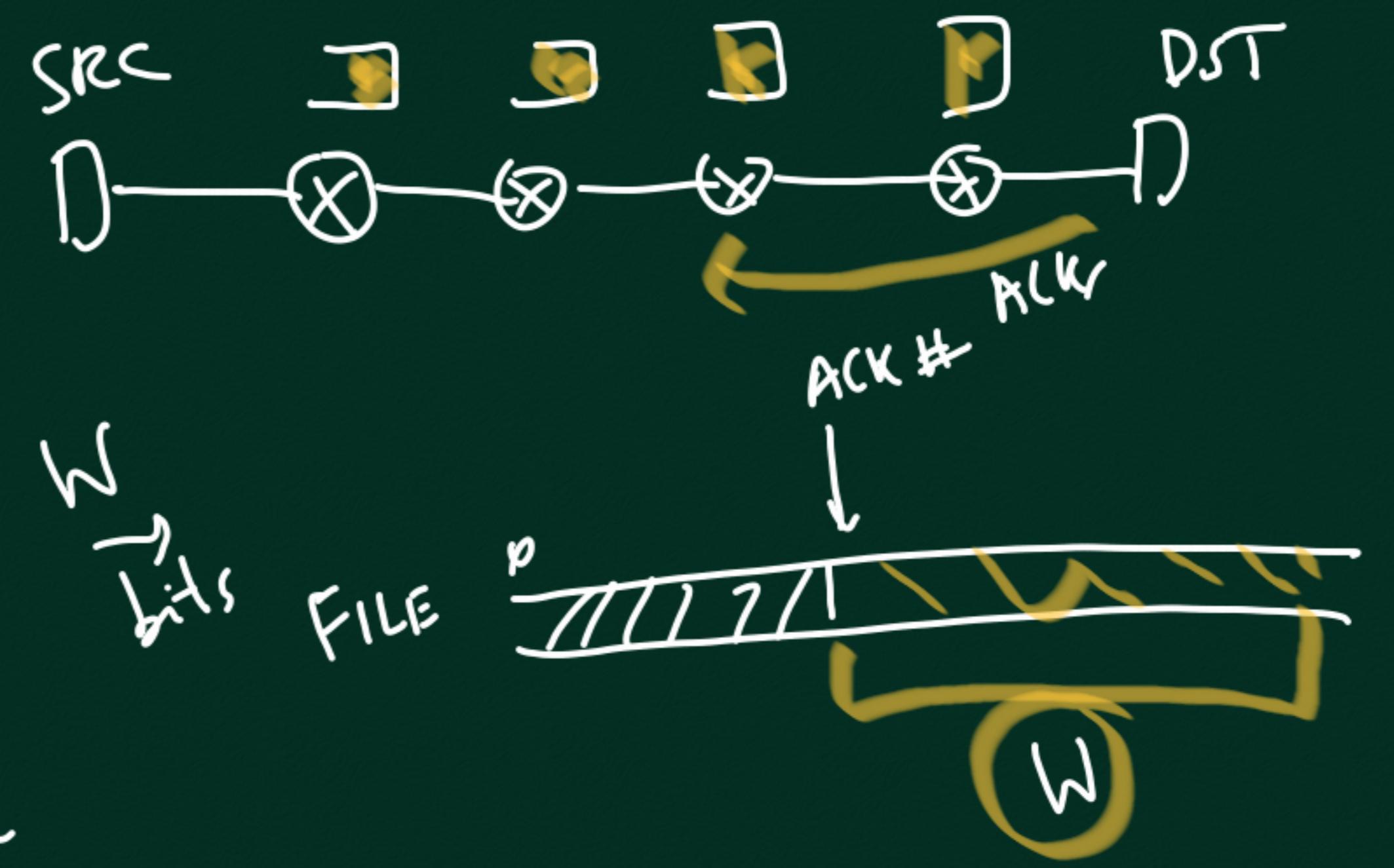


W : Max. amount of Un-Acked data
in flight in the network



INCREASE
OR
DECREASE
to
vary
data rate

Data rate = $\frac{W}{RTT}$



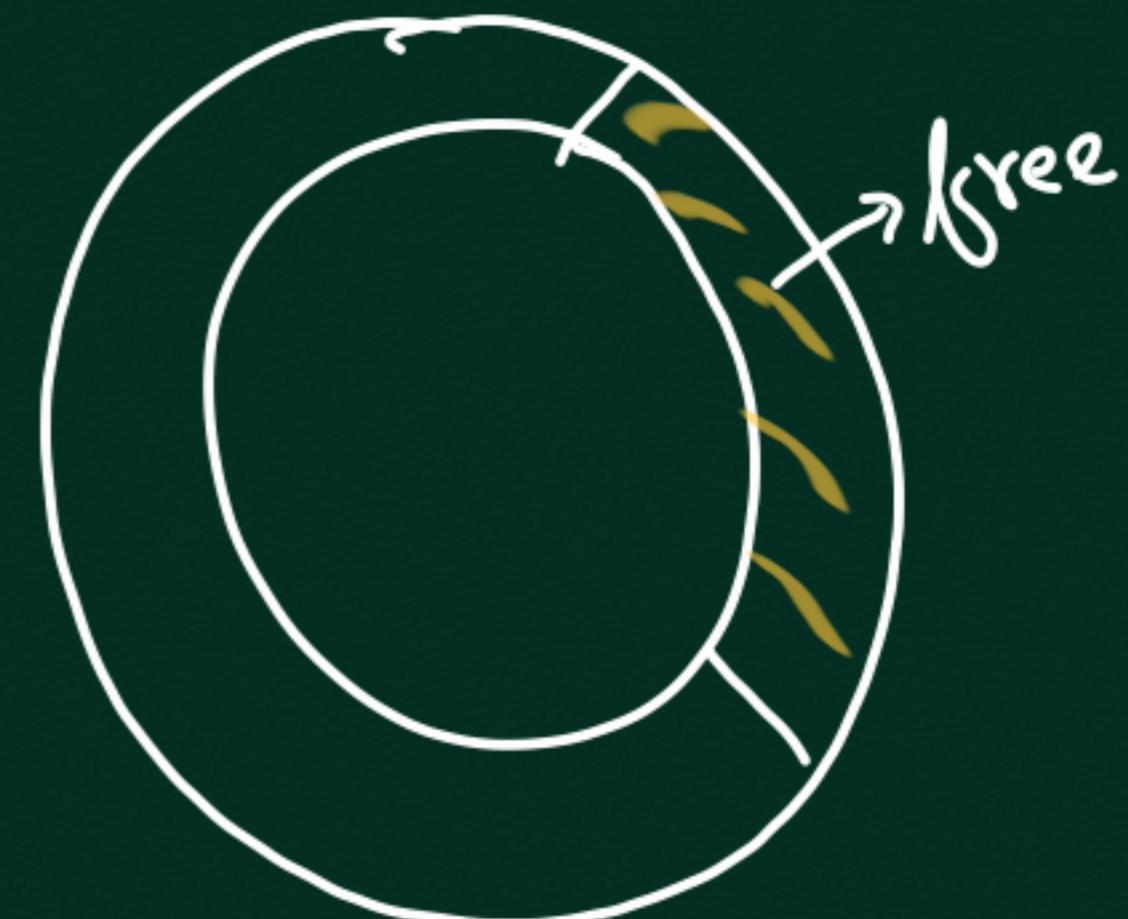
$W = ??$

$$W = \min \left(\text{Cong. Window}, \text{Adv. Window} \right)$$

(CW)

CONGESTION CONTROL CONTROL

↓
FLOW CONTROL



INITIAL VALUE
OK $W = ??$

SRC
 \square

DST
 \square

Suppose $W = 10^3$ phots $\rightarrow 10^7$ bits | RTT : 1 ms
 $1 \text{ phot} = 10^4 \text{ bits}$

$$\text{Data rate} = \frac{W}{\text{RTT}} = \frac{10^7}{10^{-3}} = 10 \text{ Gbps}$$

IDEA: SET $W = 1 \text{ MSS}$ (Max. SEGMENT SIZE)

$$1 \text{ MSS} \sim 10^4 \text{ bits}$$

RFC5681

SLOW-START : start with $W = 1 \text{ MSS}$

