

Continuous ARQ

Go-back N

Selective Repeat
(SR-ARQ)

General Guidelines

in continuous ARQ, Sender can send multiple frames (back-to-back)

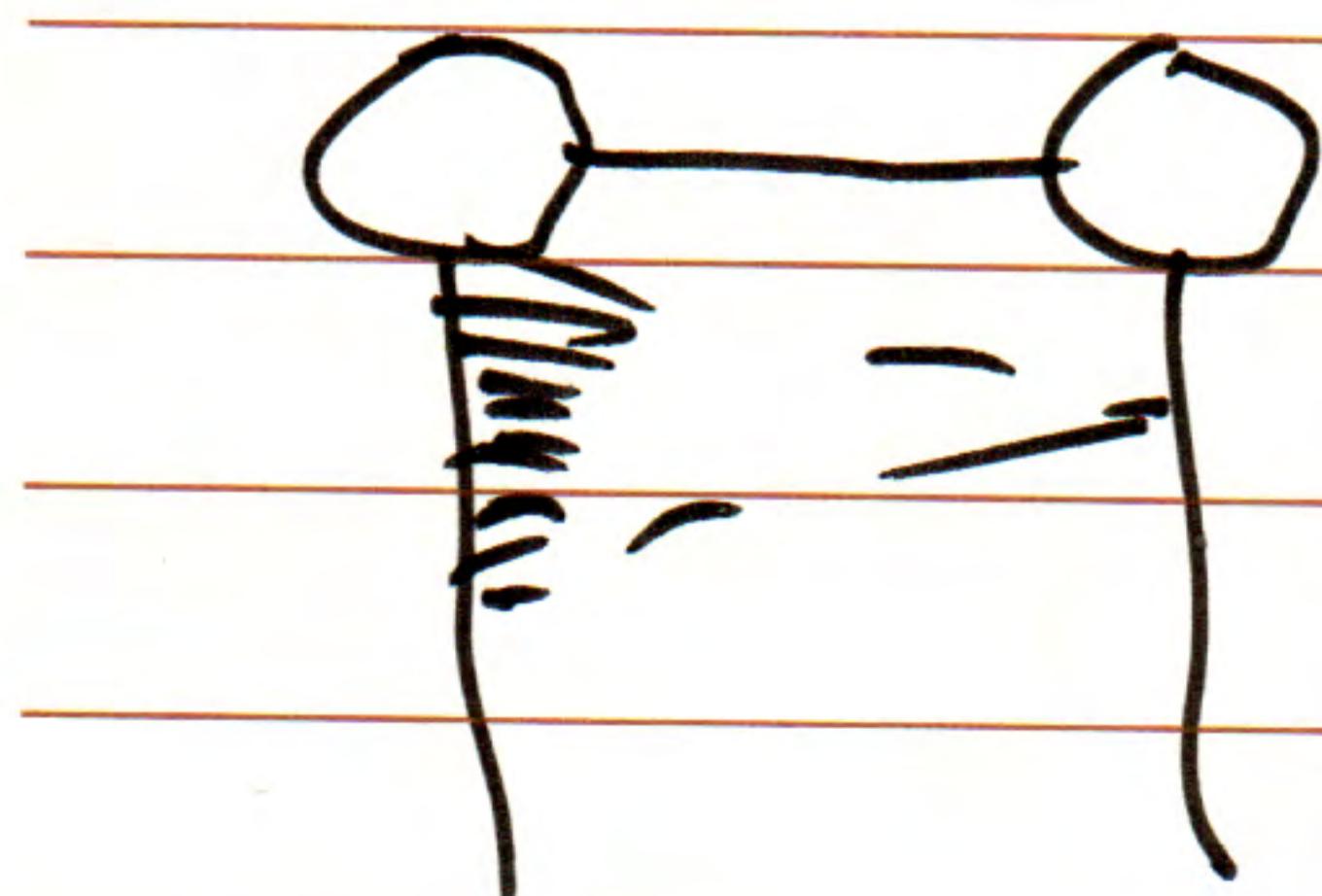
before he has to stop for ACKs.

What determines the # of frames he can transmit?

~~Bandwidth RTT product~~

Sequence bits

Let us assume there are N -bits for sequencing.

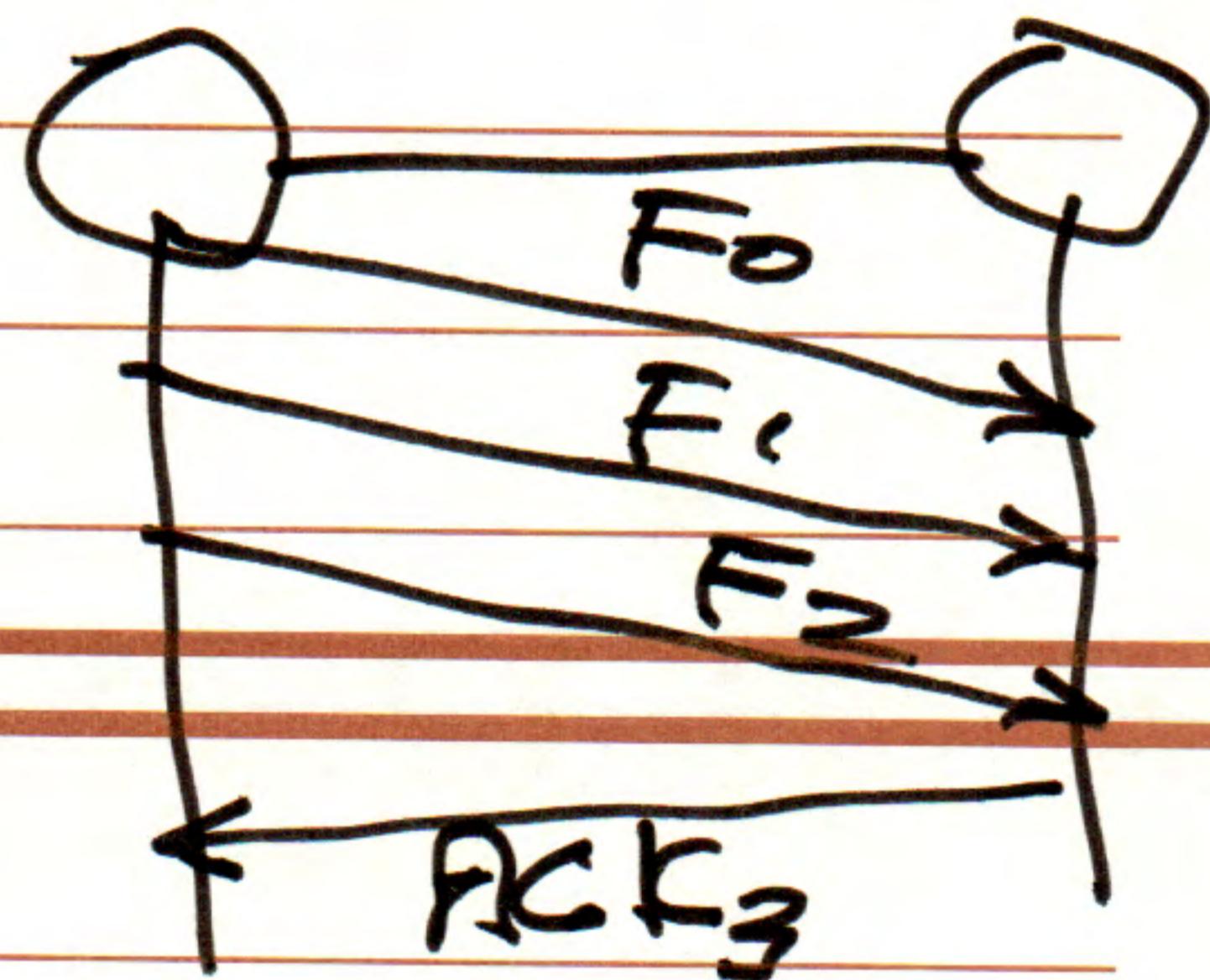


segmenting
 $m \sim 2^N - 1$

for ex if $m = 3$

0, 1, 2, ..., 7, 0, 1, 2,

also in continuous ARQ, receiver has the option of cancelation ACKs for ex:



sliding
also each side uses two windows

SWS = Sender window size

this is the max # of framed unacknowledged the Sender can send.

(3)

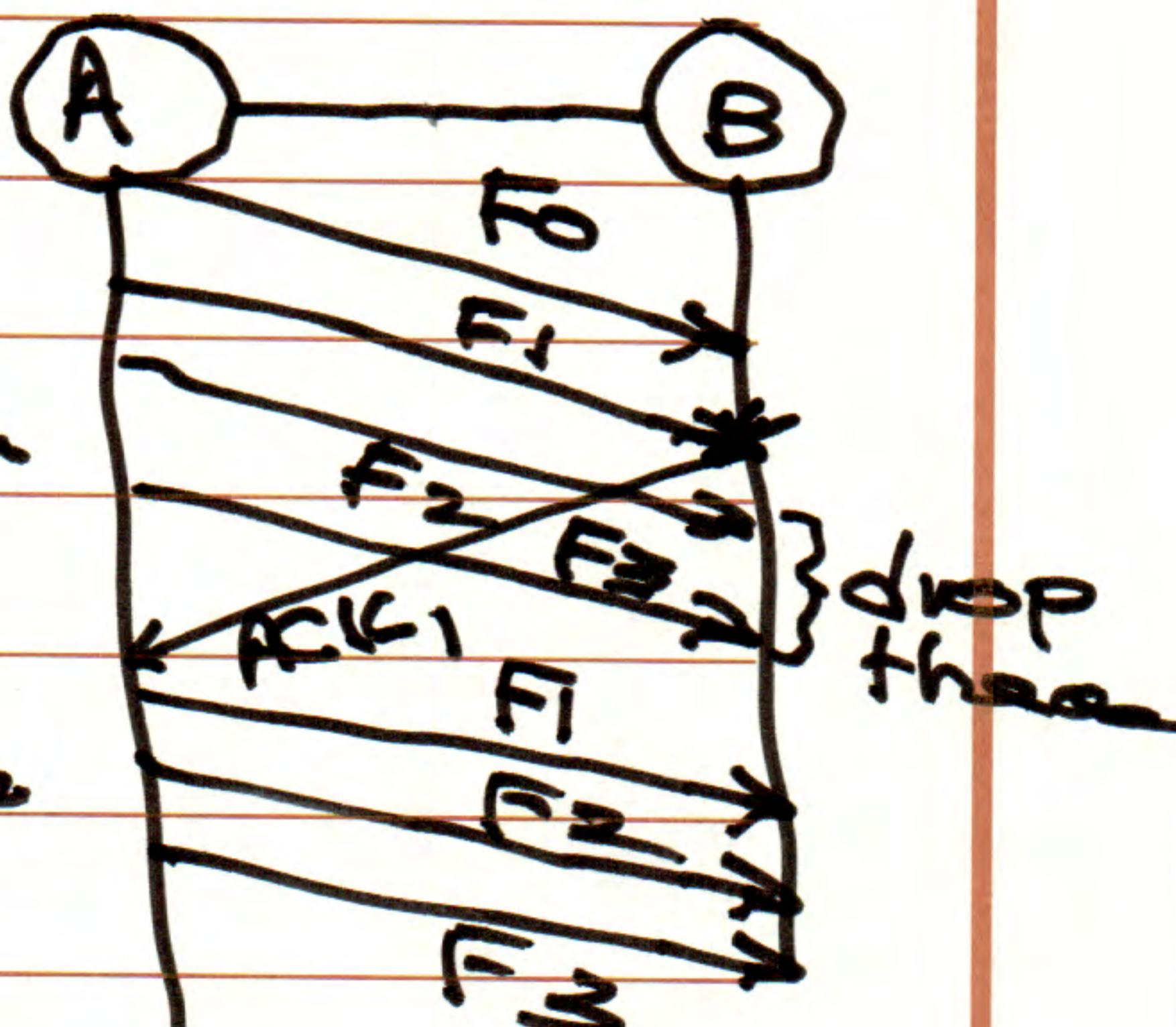
RWS = Receiver window size
 = Max # of frames (in-order and out-of-order) the receiver is willing to accept.

Go-back-N ARQ

Here, the receiver is NOT willing to accept (i.e. buffer) any out-of-order frames

$$\Rightarrow \text{RWS} = 1$$

When receiver receives a frame detected in error
 he will ask the sender to Go-back and retransmit that frame and any subsequent frames that the sender may have already sent



In Go-back-N

Let $m = \# \text{ of retransmissions}$
bits

$$0, 1, \dots, 2^m - 1$$

for ex: if $m=3$

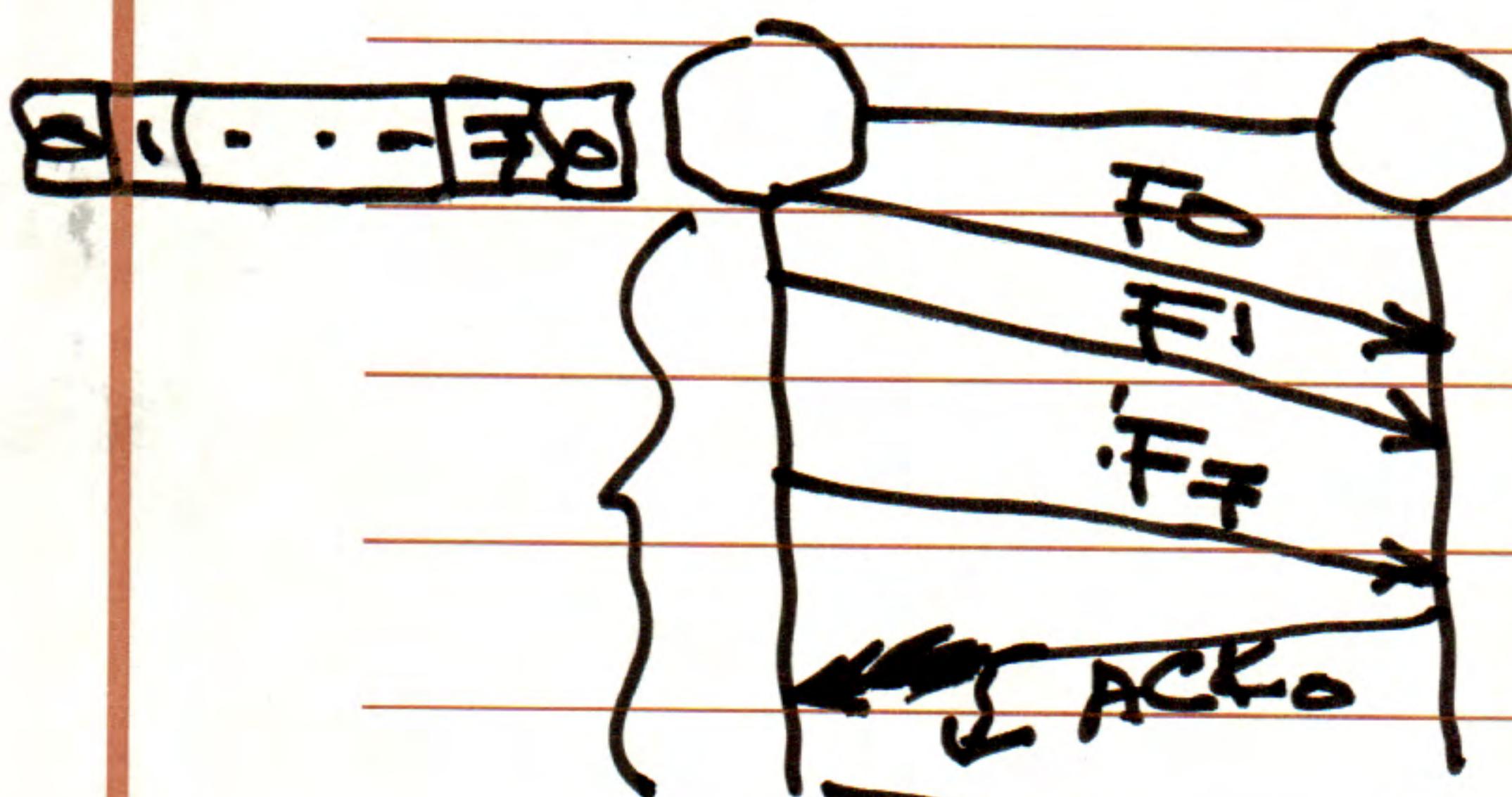
$$0, 1, 2, \dots, 7, 0, 1, \dots$$

In Go-back-N,

$$\text{SWS} \leq 2^m - 1$$

for $m=3$, SWS ≤ 7
why?

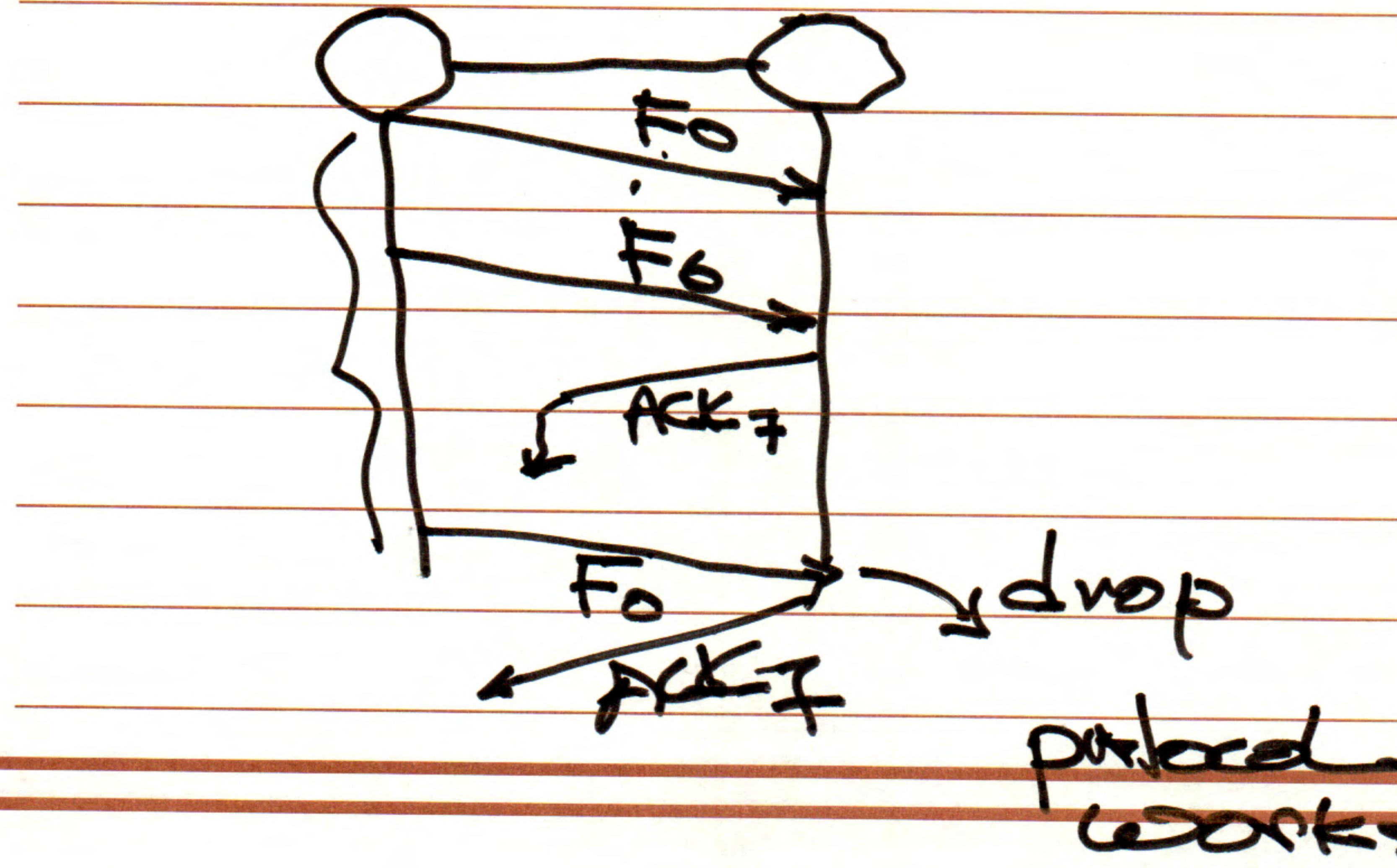
$$\text{SWS} = 8 \text{ (Violation)}$$



$F_0 \rightarrow \leftarrow$ we've accepted this
frame as a
problem. no more!

(5)

Now assume SWS = 7 (No Violation)



Summary

$$SWS \leq 2^m - 1$$

$$RWS = 1$$

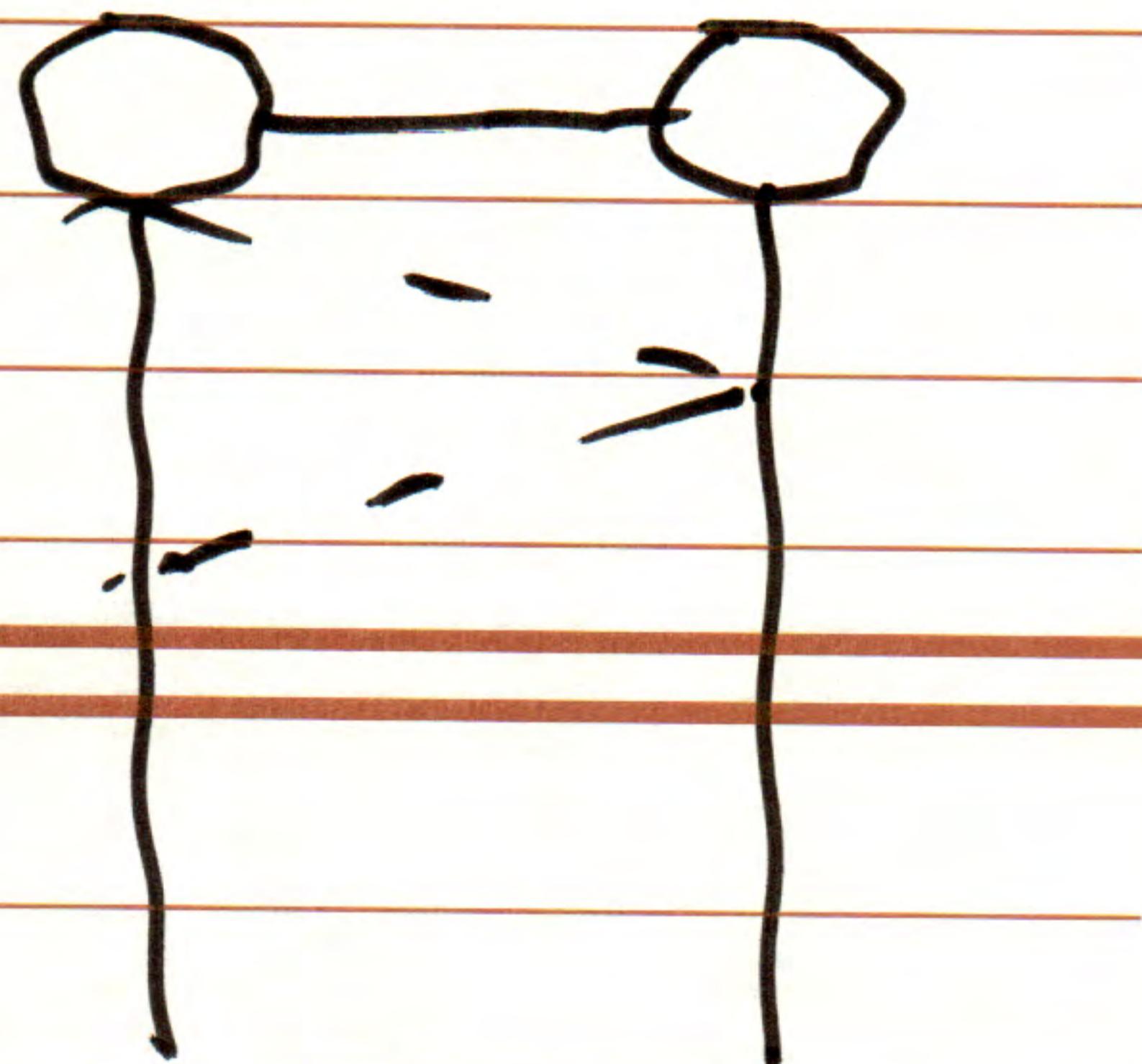
(b)

How do we calculate the throughput of a link (Case 1)

case 1

$$SWS \geq BWS \times Delay_{Round Trip}$$

Sender window
will never
close.



Link utilization

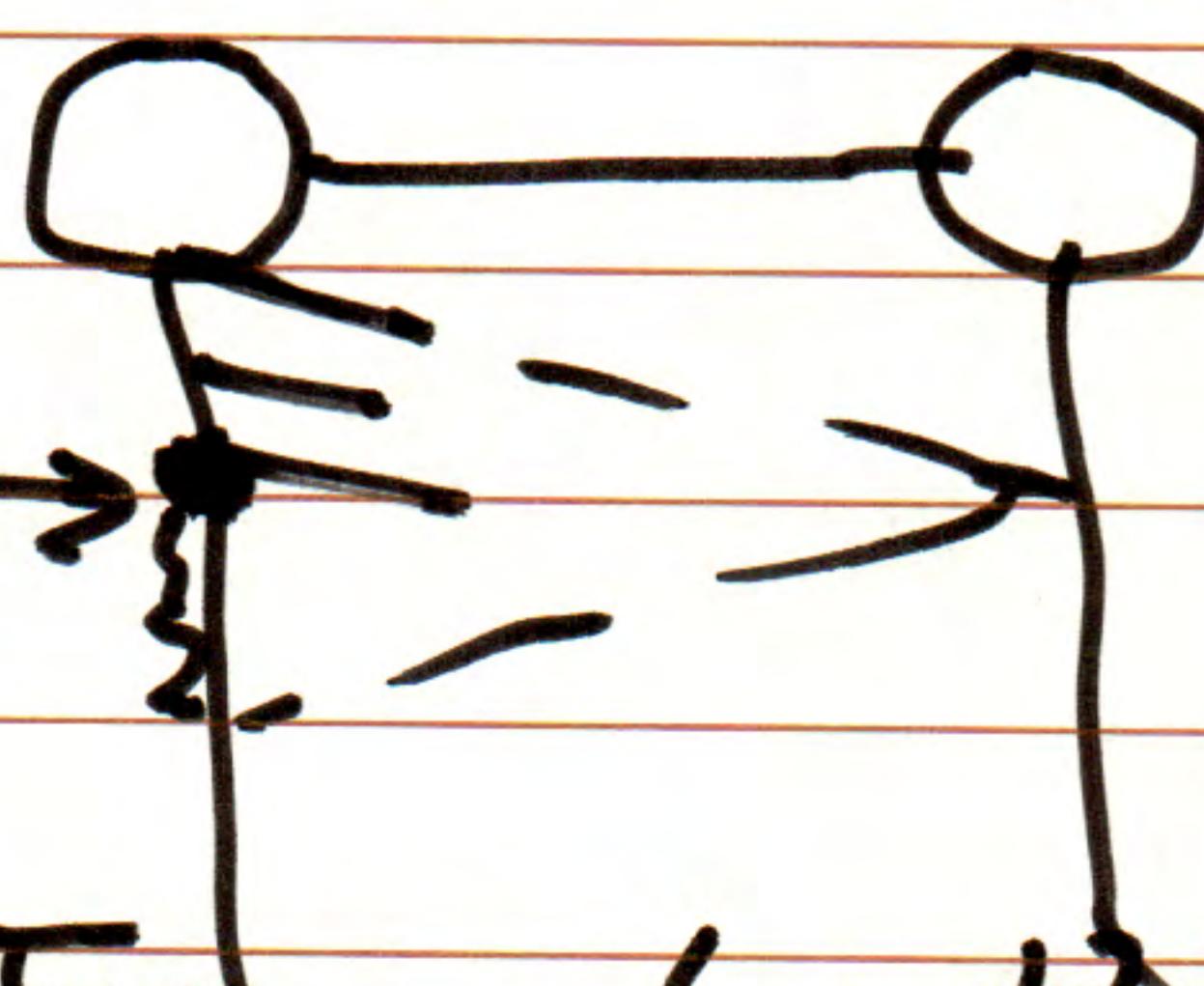
$$\approx 100\%$$

$$Throughput \approx R_b$$

case 2 $SWS < BWS \times Delay_{Round Trip}$

Link utilization

$$\frac{(SWS)(T_f)}{RTT} < \frac{\text{window}}{\text{closed.}}$$



$$Throughput = \frac{(SWS)(Frame Length)}{RTT}$$

SR - ARQ

- * in SR, the receiver is willing to accept out-of-order frames and whenever he detects errors in ~~the~~ frame, he asks the sender to retransmit the ~~the~~ frame only.
- * in SR-ARQ, no cumulative ACKs are used.
- * in SR, when receiver receives F_{n_2} he send ACK_{n_2}

In SR

$$SWS \leq 2^{m-1} \quad \text{why?}$$

$$RWS \leq SWS$$

(in our course

we shall assume

$$RWS = SWS.$$

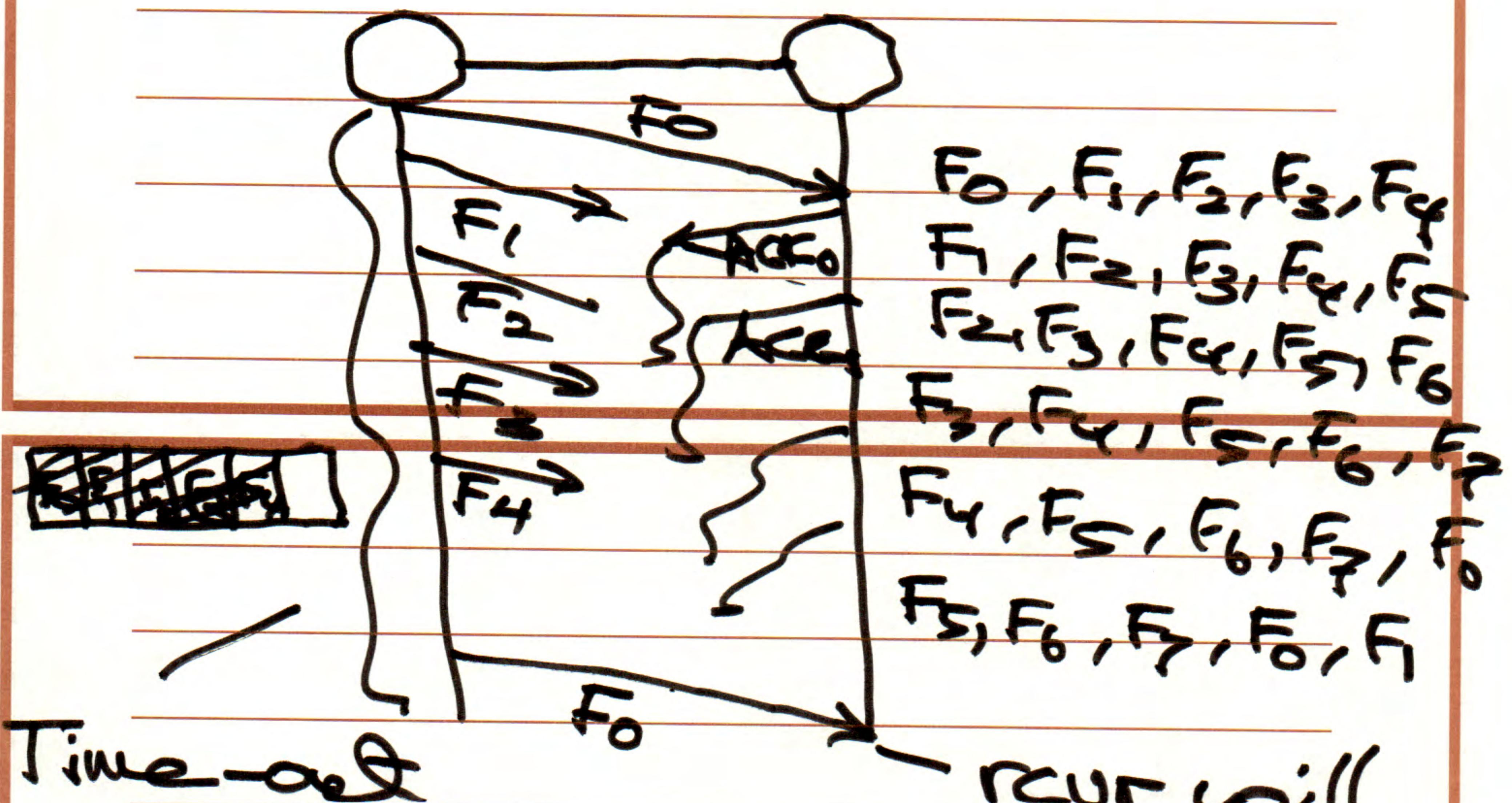
8

address $m = 3$

$0, 1, 2, \dots, F, 0, 1, 2, \dots$

Q-SLICER $SIXS = ROTS = 5$

(Vidya)



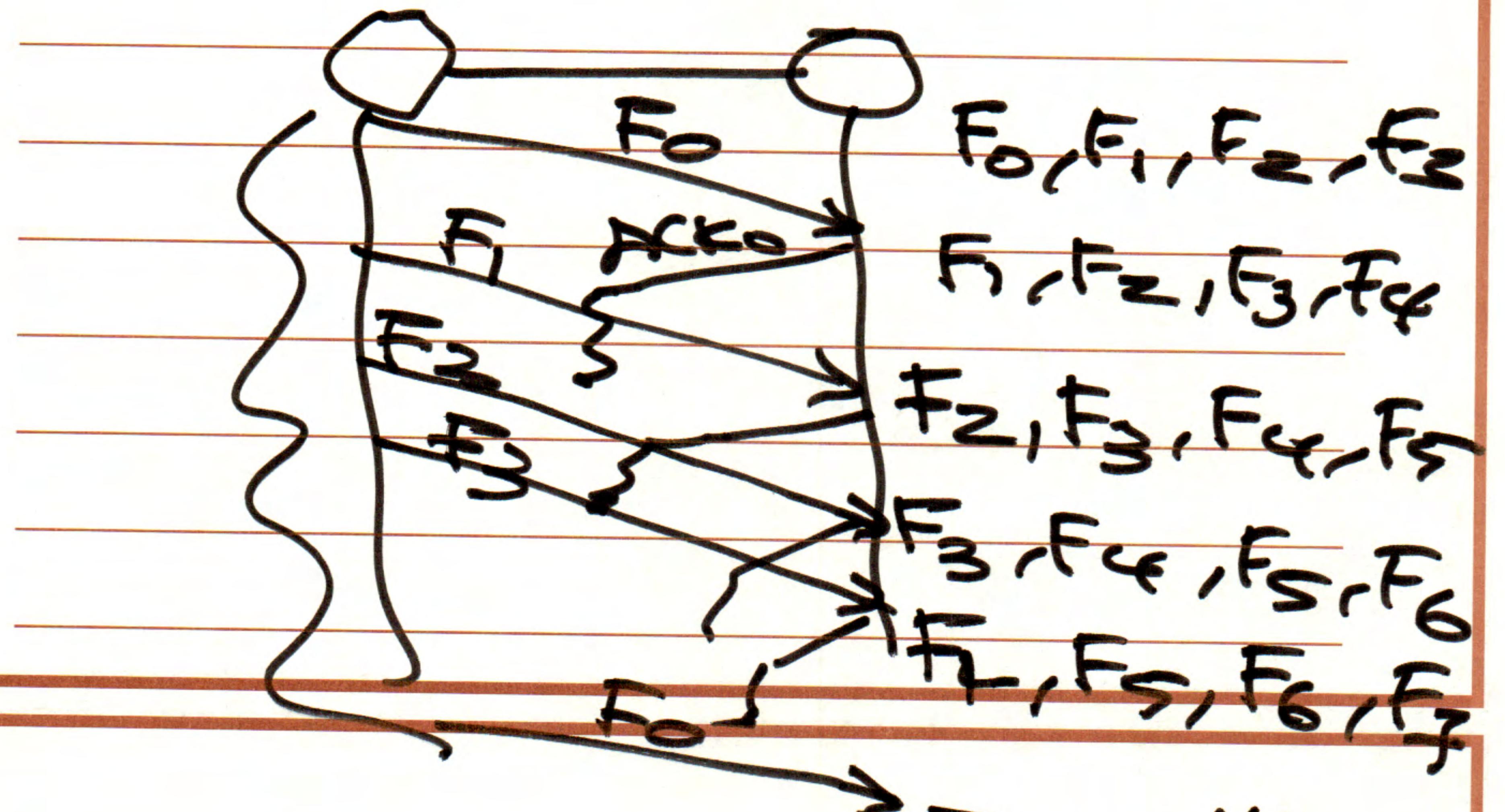
Time-out

rcur will
 accept this
 as a valid
 nosegives
 because
 seg# is
 within the
 window.

(3)

$$SWS = RDS = 4$$

(no violation) ~~✓~~



will not
be accepted