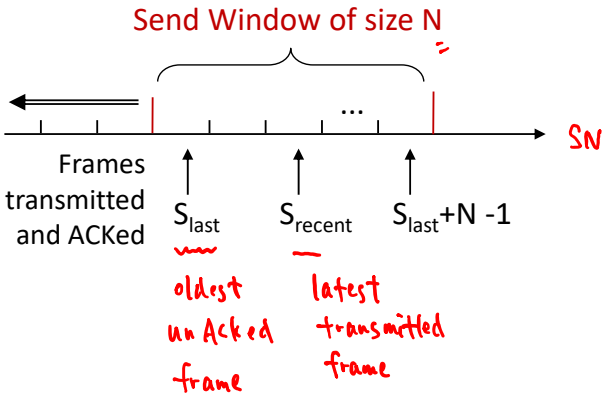
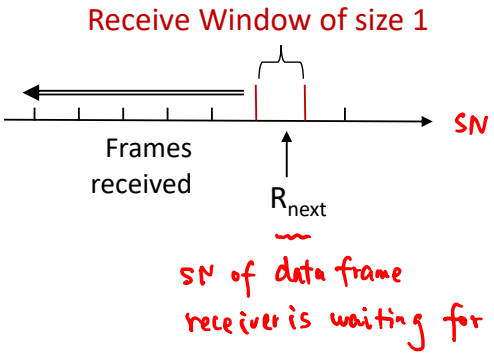
1. Go-Back-N ARQ (GBN)

- GBN allows the transmitter to keep sending data frames while waiting for acknowledgment from the receiver
  - At the transmitter side: Allow up to N outstanding frames

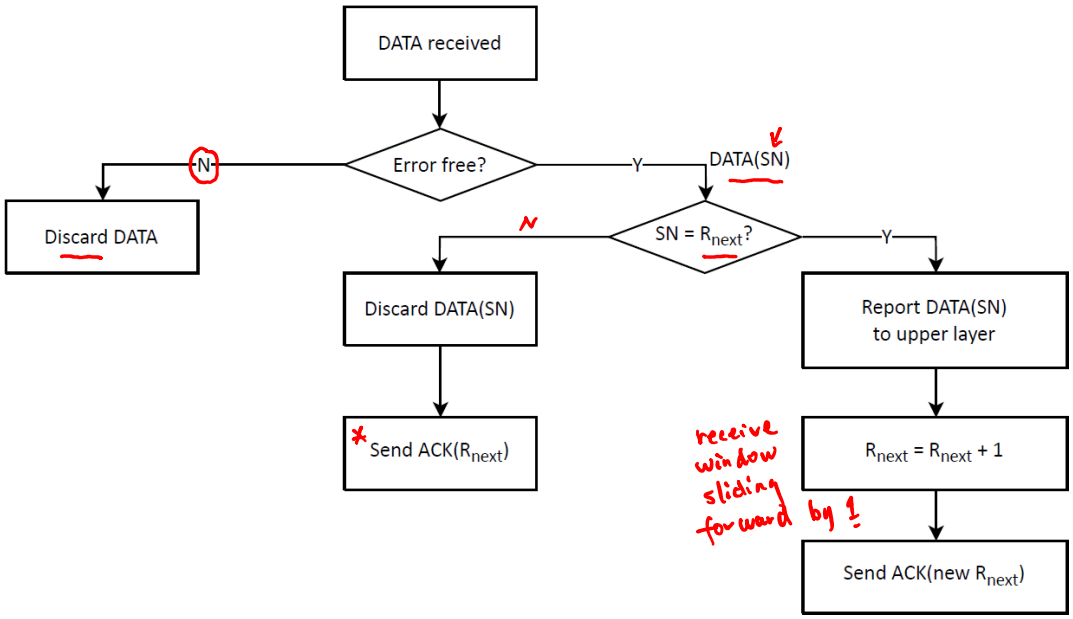


- GBN allows the transmitter to keep sending data frames while waiting for acknowledgment from the receiver
  - At the receiver side: Receive window of size 1



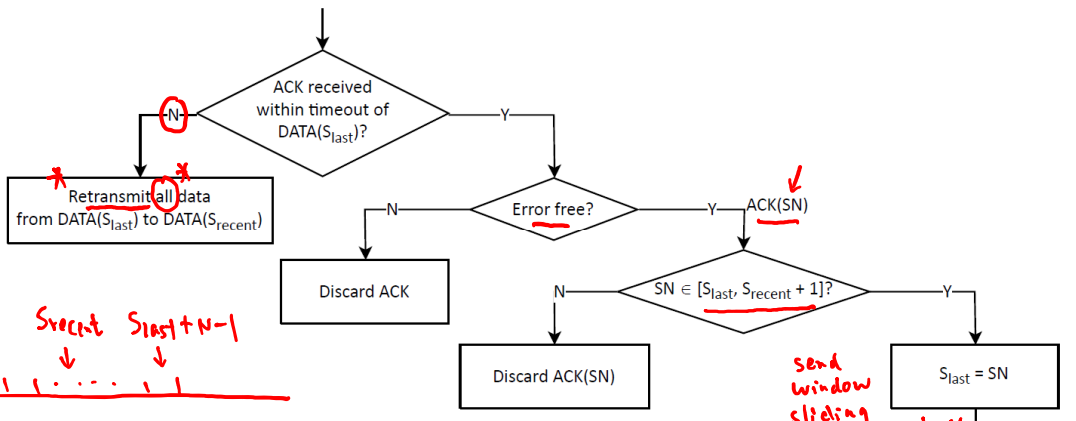
GBN ARQ: Receiver Flowchart

wait for data



GBN ARQ: Sender Flowchart

send up to N data frames
start a timer for each frame



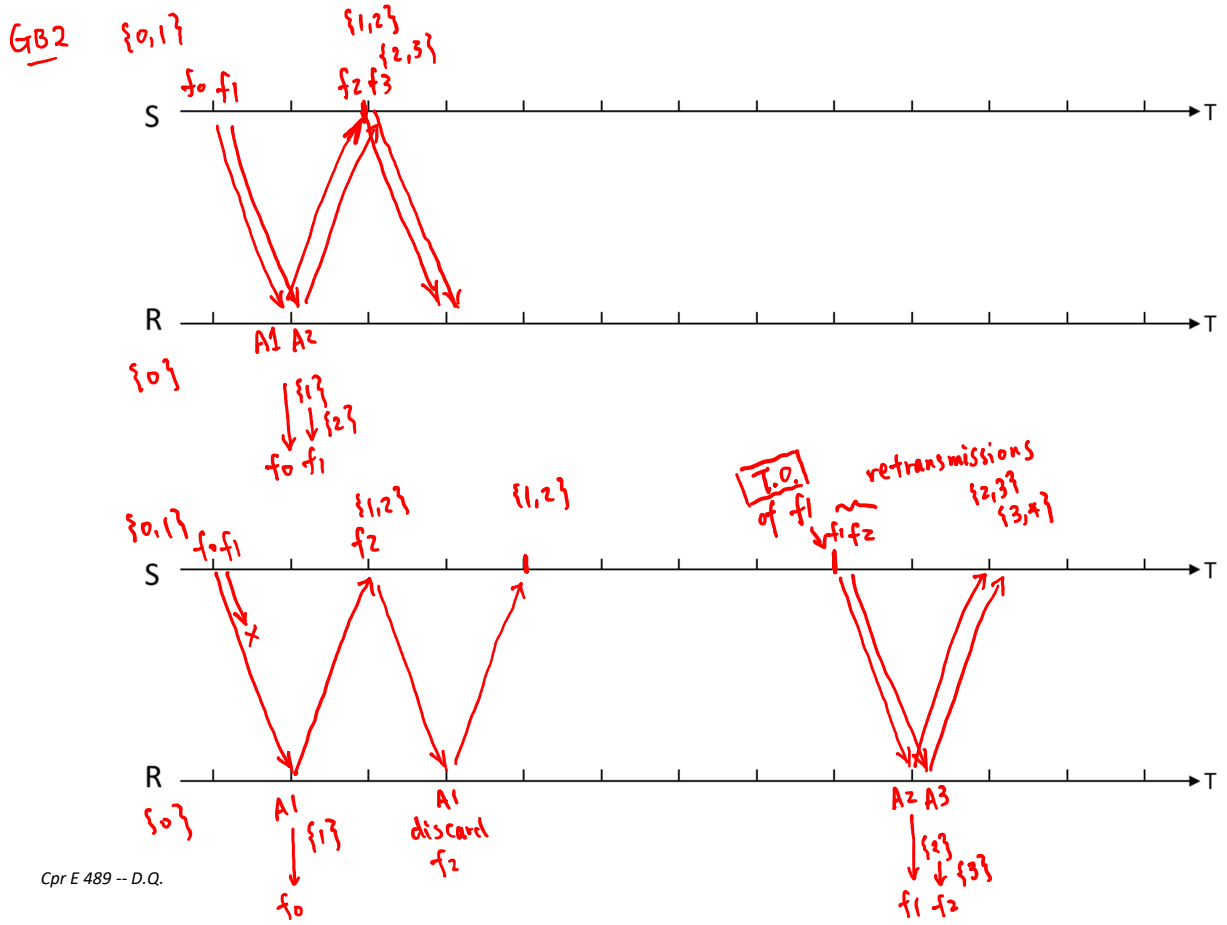
S_{last} S_{recent} $S_{last}+N-1$

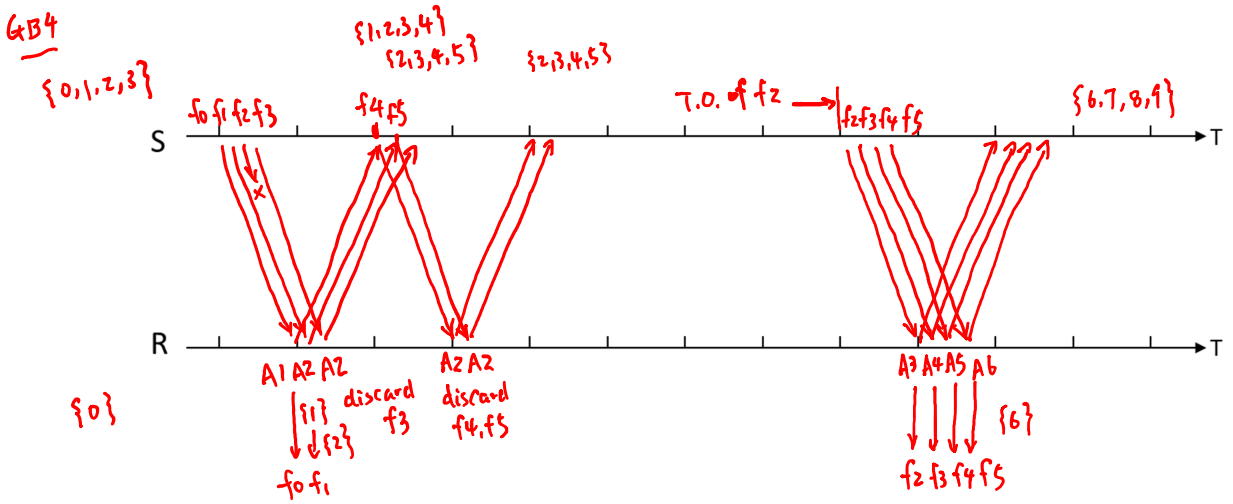
Eg. S_{last} received → $S_{last}+1$ in ACK(SN)

$S_{last}, \cdots, S_{recent} \rightarrow ACK(S_{recent}+1)$

$S_{last}, \cdots, S_{last}+N-1 \rightarrow ACK(S_{last}+N)$

~~S_{last}~~, $S_{last}+1, \cdots, S_{last}+N-1 \rightarrow ACK(S_{last})$


GB2
{0,1}
{1,2}
{2,3}
f0 f1
f2 f3
S
T
R
T
A1 A2
{0}
{1}
{2}
f0 f1
{0,1}
f0 f1
{1,2}
f2
{1,2}
T.O. of f1
f1 f2
retransmissions
{2,3}
{3,4}
S
T
R
T
{0}
A1
{1}
f0
A1
discard
f2
A2 A3
{2}
{3}
f1 f2


GB4
{0,1,2,3}
{1,2,3,4}
{2,3,4,5}
{2,3,4,5}
f0 f1 f2 f3
f4 f5
T.O. of f2
f2 f3 f4 f5
{6,7,8,9}
S
T
R
T
A1 A2 A2
A2 A2
A3 A4 A5 A6
{0}
{1}
{2}
discard
f3
discard
f4, f5
{6}
f0 f1
f2 f3 f4 f5