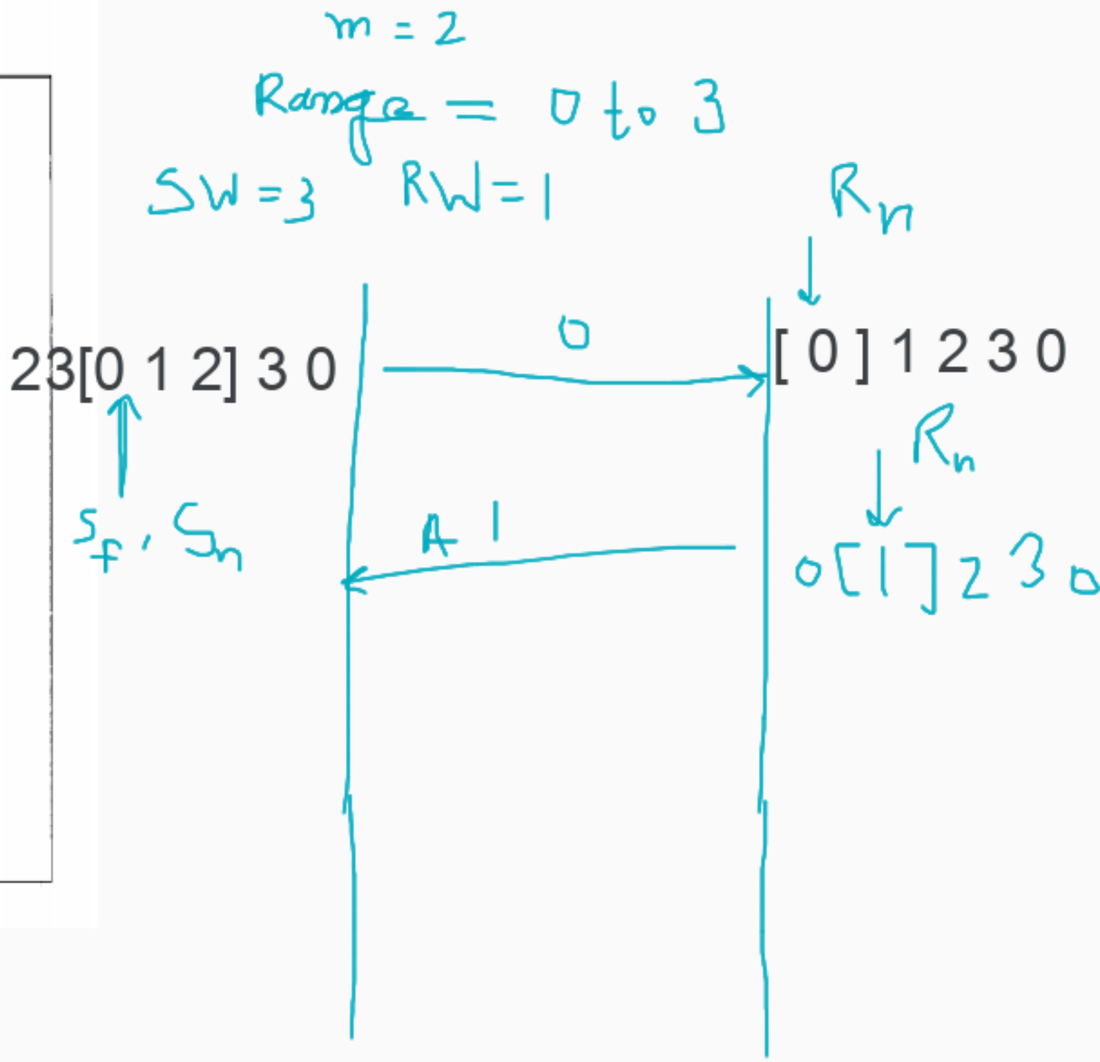
Algorithm 11.8 *Go-Back-N receiver algorithm*

```
1  Rn = 0;

2
3  while (true)                          //Repeat forever
4  {
5    WaitForEvent();
6
7    if(Event(ArrivalNotification)) /Data frame arrives
8    {
9      Receive(Frame);
10     if(corrupted(Frame))
11         Sleep();
12     if(seqNo == Rn)                   //If expected frame
13     {
14       DeliverData();                  //Deliver data
15       Rn = Rn + 1;                    //Slide window
16       SendACK(Rn);
17     }
18   }
19 }
```



Efficiency of Go-Back-N ARQ Protocol

-More efficient that stop-and-wait ARQ (Sliding window protocol with size 1)

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Efficiency of stop-and-wait = L/L + BR

Efficiency of go back n= window size x (L / L + BR)

Throughput = efficiency x Bandwidth

Question 1
Station A uses 32 byte packets to transmit messages to station B using a slidind window protocol. RTT between A and B is 80ms and bandwidth is 128kbps. What is the optimal window size that A should use ?

Hint: Optimal window size => efficiency is 100%
i.e. 1 = Window_size x (L / L + BR)
Window_size = L + BR / L

L = 32 byte = 32 x 8 bits
B = 128 kbps = 128 x 10^3 bps
R = 80ms = 80 x 10^-3 s

Question 2

Frames of 1000 bits are sent over a 10^6 bps duplex link between 2 hosts. The propagation time is 25ms. Frames are to be transmitted into this link to maximally pack them in transit (within the link).

I. What is the minimum number of bits (l) that will be required to represent the sequence numbers distinctly? Assume that no time gap needs to be given between transmission of two frames.

a) l = 2 b) l = 3 c) l = 4 d) l = 5

II. Suppose that the sliding window protocol is used with the sender window size of 2^l where l is the number of bits identified in the earlier part and acknowledgments are always piggybacked. After sending 2^l frames, what is the minimum time the sender will have to wait before starting transmission of the next frame? (Identify the closest choice ignoring the frame processing time.)

(a) 16ms (b) 18ms (c) 20ms (d) 22ms

Question 3

Frames of 1000 bits are sent over a 1-Mbps channel using a geostationary satellite whose propagation time from the earth is 270 msec. Acknowledgements are always piggybacked onto data frames. The headers are very short. Three-bit sequence numbers are used. What is the maximum achievable channel utilization for:

a. Stop-and-wait.
b. Go-back-n

Question 4

Q2. Station A needs to send a message consisting of 9 packets to station B using a sliding window of size 3 & go-back-n protocol. All packets are ready & immediately available for transmission. If every 5th packet that A transmits gets lost (but no ack from B ever get lost), then what is the no. of packets that A'll transmit for sending the message to B?

Homework

30. A system uses the Stop-and-Wait ARQ Protocol. If each packet carries 1000 bits of data, how long does it take to send 1 million bits of data if the distance between the sender and receiver is 5000 Km and the propagation speed is 2×10^8 m? Ignore transmission, waiting, and processing delays. We assume no data or control frame is lost or damaged.
31. Repeat Exercise 30 using the Go-back-*N* ARQ Protocol with a window size of 7. Ignore the overhead due to the header and trailer.