Open system Interconnection (OSI)

DataLink Layer

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Go back N Protocol

- Go back N protocol is an implementation of a sliding window protocol.
- The features and working of this protocol are explained in the following points-
  - **In Go back N, sender window size is N and receiver window size is always 1.**
  - In Go back N,
    - Sender window size = N. Example in Go back 10, sender window size will be 10.
    - Receiver window size is always 1 for any value of N.
  - Go back N uses cumulative acknowledgments.
    - Receiver maintains an acknowledgment timer.
    - Each time the receiver receives a new frame, it starts a new acknowledgment timer.
    - After the timer expires, receiver sends the cumulative acknowledgment for all the frames that are unacknowledged at that moment.
  - **Note:** A new acknowledgment timer does not start after the expiry of old acknowledgment timer.
  - It starts after a new frame is received.

Go back N Protocol

- **Go back N may use independent acknowledgments too.**
  - The above point does not mean that Go back N can not use independent acknowledgments.
  - Go back N may use independent acknowledgments too if required.
  - The kind of acknowledgment used depends on the expiry of acknowledgment timer.
- **Example-**
  - Consider after the expiry of acknowledgment timer, there is only one frame left to be acknowledged.
  - Then, Go back N sends the independent acknowledgment for that frame.

Go back N Protocol

- **Go back N does not accept the corrupted frames and silently discards them.**
- In Go back N,
  - If receiver receives a frame that is corrupted, then it silently discards that frame.
  - The correct frame is retransmitted by the sender after the time out timer expires.
  - Silently discarding a frame means-
    - Simply rejecting the frame and not taking any action
    - (like not sending a NACK to the sender to send the correct frame)

Go back N Protocol

- **Go back N does not accept out of order frames and silently discards them**
- In Go back N,
  - If receiver receives a frame whose sequence number is not what the receiver expects, then it silently discards that frame.
  - All the following frames are also discarded.
  - This is because receiver window size is 1 and therefore receiver can not accept out of order frames.

Go back N Protocol

- **Go back N leads to retransmission of entire window if for any frame, no ACK is received by the sender.**
- In Go back N,
  - Receiver silently discards the frame if it founds the frame to be either corrupted or out of order.
  - It does not send any acknowledgement for such frame.
  - It silently discards the following frames too.
- Thus,
  - If for any particular frame, sender does not receive any acknowledgment, then it understands that along with that frame, all the following frames must also have been discarded by the receiver.
  - So, sender has to retransmit all the following frames too along with that particular frame.
  - Thus, it leads to the retransmission of entire window.
  - That is why, the protocol has been named as "Go back N".

Go back N Protocol

- **Go back N leads to retransmission of lost frames after expiry of time out timer.**
- In Go back N,
  - Consider a frame being sent to the receiver is lost on the way.
  - Then, it is retransmitted only after time out timer expires for that frame at senders side.
- Efficiency of Go back N-
  - **Efficiency = Sender Window Size in Protocol / (1 + 2a)**
  - In Go back N protocol, sender window size = N.
    Efficiency =N / (1 + 2a)

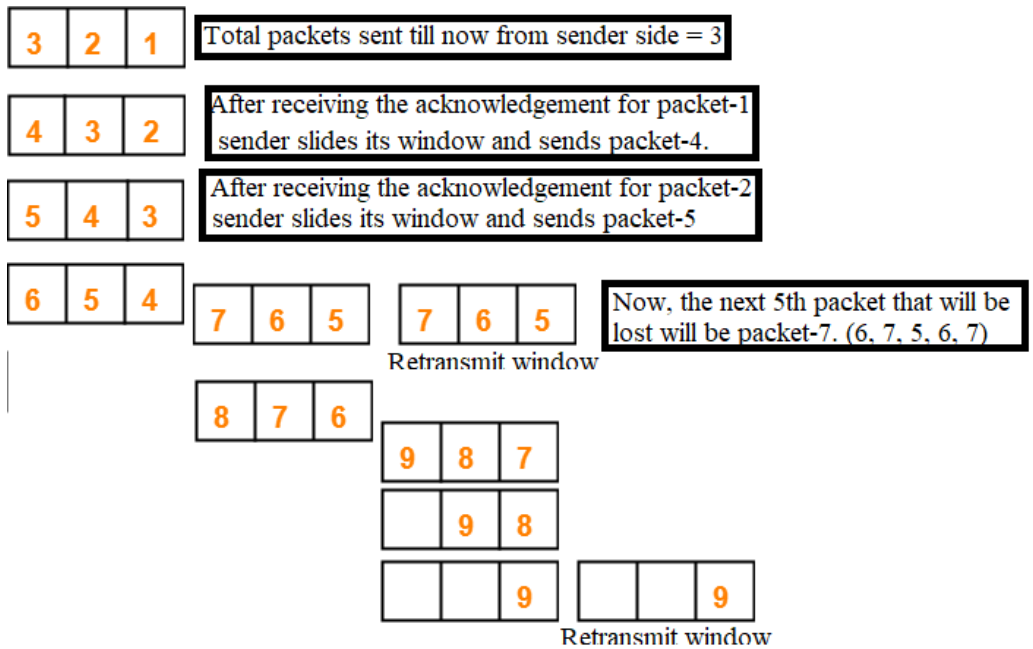
PRACTICE PROBLEMS BASED ON GO BACK N PROTOCOL-

Q1 A 20 Kbps satellite link has a propagation delay of 400 ms. The transmitter employs the go back n ARQ scheme with n set to 10. Assuming that each frame is 100 bytes long, what is the maximum data rate possible?

- Given- Bandwidth = 20 Kbps, Propagation delay (Tp) = 400 ms, Frame size = 100 bytes, Go back N is used where N = 10
- Calculating Transmission Delay = Frame size / Bandwidth
- Calculating Value Of a= Tp / Tt
- Calculating Efficiency-Efficiency (η)= N / (1+2a)
- Calculating Maximum Data Rate Possible= Efficiency x Bandwidth (10Kbps(approx))

Q2 Station A needs to send a message consisting of 9 packets to station B using a sliding window (window size 3) and go back n error control strategy. All packets are ready and immediately available for transmission.
If every 5th packet that A transmits gets lost (but no ACKs from B ever get lost), then what is the number of packets that A will transmit for sending the message to B? (16)

- Given-
Total number of packets to be sent = 9 Go back N is used where N = 3 Every 5th packet gets lost



Q3 In Go back 4, if every 6th packet that is being transmitted is lost and if total number of packets to be sent is 10, then how many transmissions will be required? (17)

Q4 A 1 Mbps satellite link connects two ground stations. The altitude of the satellite is 36504 km and speed of the signal is 3×10^8 m/sec. What should be the packet size for a channel utilization of 25% for a satellite link using go back 127 sliding window protocol?

- Given-
  Bandwidth = 1 Mbps, Distance = 2 x 36504 km = 73008 km, Propagation speed = 3×10^8 m/sec, Efficiency = 25% = 1/4, Go back N is used where N = 127
- **120 bytes**

Q5 Consider a network connecting two systems located 8000 km apart. The bandwidth of the network is 500 x 10^6 bits per second. The propagation speed of the media is 4 x 10^6 meters per second. It is needed to design a Go back N sliding window protocol for this network. The average packet size is 107 bits. The network is to be used to its full capacity.
Assume that processing delays at nodes are negligible. Then, the minimum size in bits of the sequence number field has to be ?

- Given-
  Distance = 8000 km. Bandwidth = 500 x 10^6 bps Propagation speed = 4 x 10^6 m/sec Packet size = 107 bits,
  For using the network to its full capacity, Efficiency (η) = 1
  Efficiency (η) = 1 when sender window size = 1+2a
- **Minimum size of sequence number field = 8 bits.**

Thank You