**Worksheet 7**

1. In the rdt protocols, why did we need to introduce sequence numbers?

To handle duplicates when reassembling data.

2. In the rdt protocols, why did we need to introduce timers?

Solution Timers were introduced **to detect lost packets**. If the ACK for a transmitted packet is not received within the duration of the timer for the packet, the packet (or its ACK or NACK) is assumed to have been lost. Hence, the packet is retransmitted.

3. Suppose that the roundtrip delay between sender and receiver is constant and known to the sender. Would a timer still be necessary in protocol rdt 3.0, assuming that packets can be lost? Explain.

Yes, even when the round trip delay time between the sender and the receiver is constant and known to the sender, yet a timer would still be necessary in the protocol rdt 3.0.

• The round trip delay time will make the sender know whether the packet or the ACK for the packet is lost or not.

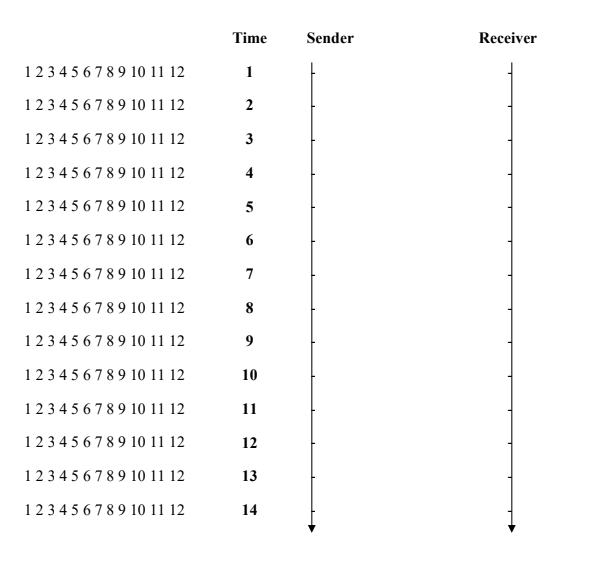
• The timers are used to keep track of time the packet is to be transmitted.

• A timer of constant duration is necessary at the sender to detect the loss for each packet.

4. Answer true or false to the following questions and briefly justify your answer: a. With the SR protocol, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.

b. With GBN, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.

5. Illustrate the segments sent using the Go-back-N reliable transport protocol (use the simplest version of this protocol we discussed). Assume that each segment receives one sequence number (i.e. do not count bytes like TCP) that begins with 1. The sender will have one segment ready at each time step (so segment 7 will be ready at timestep 7). It takes one timestep for a segment to travel between the two ends. The sender will timeout a segment on the third timestep, so that segment 1 would timeout at timestep 4. Window size N=4. Illustrate the window size, data segments with sequence numbers, and ACKs with numbers. Data segment 3 and the ACK for segment 6 will be lost the first time they are transmitted.

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