Rdt3.0 (ABP) timeline problem:
Suppose that the transmission time for a packet by the sender is 1 sec., and the transmission time for an ACK by the receiver is 0.5 sec., and the propagation time for a bit sent from the sender to the receiver (or receiver to sender) is 2 seconds.

Suppose that the processing time for a complete packet or ACK is negligible (0 sec). The amount of time for a receiver to deliver a successfully received packet to the application layer is similarly negligible.

Suppose at time = 0 the sender begins to send a sequence of 4 packets of identical size to the receiver using the ABP rdt3.0 with a timer set to 6 sec. The timer in the sender starts immediately when the first bit of the packet has been transmitted, and the timer stops when the last bit of the ACK is received. The sender uses sequence # 0 for the first packet sent.

While attempting to successfully deliver this 4 packet sequence with rdt3.0, three problems occur: (i) during the initial attempt to send the 2nd packet in this sequence of 4 packets, the packet is corrupted in transit; (ii) in the initial attempt to transmit the 3rd packet, the timer prematurely has a timeout in 3 sec; (iii) the initial acknowledgement of the 4th packet of the sequence is lost.

1. At what time is the 2nd packet of the sequence successfully delivered to the receiver?
   ____________________________________________

2. What is the sequence number used for 4th packet successfully delivered to the transport layer of the receiver?
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3. At what time does the receiver successfully deliver the 3rd packet in the sequence to the application process?
   ____________________________________________

4. What is the minimum timeout value that could successfully be used in this rdt3.0 protocol?
   ____________________________________________

5. What is Utilization value for the successful delivery of the set of three packets by the send to the receiver?
   ____________________________________________
Show timeline of ABP problem on this sheet.
Suppose that the transmission time of a packet by the sender is 1 sec., and the transmission time of an ACK by the receiver is 1 sec., and the propagation time for a bit sent from the sender to the receiver (or receiver to sender) is 3 sec.

Suppose that the processing time for a complete packet or ACK is negligible (0 sec.). The amount of time for the transport layer of the receiver to deliver a non-corrupted completely received packet to the application layer is similarly negligible.

Suppose at time = 0 the sender begins to send a sequence of 7 packets (denoted P1, P2, …, P6, P7) of identical size to the receiver using the GBN where N=3 with a single timer set to 10 sec.

The single timer runs only for the packet with the base sequence number. When the sender gets the ACK for that packet, the timer is re-started for the packet that has the new base sequence number.

1. Using the smallest set of sequence numbers possible for the successful transmission of 6 the packets using GB3, show the complete time diagram for their delivery to the receiver assuming there is no packet loss or corruption.

Assume next that while attempting to successfully deliver this 7 packet sequence with GB3, two problems occur:
(1) The Ack for the 2nd packet of the sequence is lost.
(2) The initial transmit of the 5th packet of the sequence is corrupt.

2. At what time(s) is the P6 packet of the sequence successfully delivered to application layer of the receiver?

3. What is the sequence number used for the 6th packet successfully delivered to the transport layer of the receiver?

4. At what time does the receiver successfully deliver the 3rd packet in the sequence to the application process?

5. What is the minimum timeout value that could successfully be used in this rdt3.0 protocol?

6. What is Utilization value for the successful delivery of the 3 packets by the sender to the receiver?

7. Indicate the times when the packets are delivered to the application layer.
Suppose that the transmission time of a packet by the sender is 1 sec., and the transmission time of an ACK by the receiver is 1 sec., and the propagation time for a bit sent from the sender to the receiver (or receiver to sender) is 3 sec.

Suppose that the processing time for a complete packet or ACK is negligible (0 sec.). The amount of time for the transport layer of the receiver to deliver a non-corrupted completely received packet to the application layer is similarly negligible.

Suppose at time = 0 the sender begins to send a sequence of 7 packets (denoted P1, P2, … , P6, P7) of identical size to the receiver using the GBN where N=3 with a single timer set to 10 sec.

The single timer runs only for the packet with the base sequence number. When the sender gets the ACK for that packet, the timer is re-started for the packet that has the new base sequence number.

1. Using the smallest set of sequence numbers possible for the successful transmission of 7 packets using GB3, show the complete time diagram for their delivery to the receiver assuming there is no packet loss or corruption.

Assume next that while attempting to successfully deliver this 7 packet sequence with GB3, two problems occur:
(1) The Ack for the 2nd packet of the sequence is lost.
(2) The initial transmit of the 5th packet of the sequence (P5) is corrupt.

2. At what time(s) is the P6 packet of the sequence successfully delivered to application layer of the receiver?

3. What is the sequence number used for the 6th packet successfully delivered to the transport layer of the receiver?

4. At what time does the receiver successfully deliver the 3rd packet in the sequence to the application process?

5. What is the minimum timeout value that could successfully be used in this rdt3.0 protocol?

6. What is Utilization value for the successful delivery of the 3 packets by the sender to the receiver?
Show timeline of GB3 problem on this sheet

Time at sender (in sec.)

Time at receiver (in sec.)
Suppose that the transmission time of a packet by the sender is 1 sec., and the transmission time of an ACK by the receiver is 1 sec., and the propagation time for a bit sent from the sender to the receiver (or receiver to sender) is 3 sec.

Suppose that the processing time for a complete packet or ACK is negligible (0 sec.). The amount of time for the transport layer of the receiver to deliver a non-corrupted completely received packet to the application layer is similarly negligible.

Suppose at time = 0 the sender begins to send a sequence of 7 packets (denoted P1, P2, …, P6, P7) of identical size to the receiver using the Selective Repeat where window size N=3 and each timer set to 10 sec.

The timer in the sender starts immediately when the first bit of the packet has been transmitted, and the time stops when the last bit of the ACK is received or a timeout occurs. The sender uses sequence # 0 for the first packet sent.

Assume next that while attempting to successfully deliver this 7 packet sequence with SR, two problems occur:
(1) The Ack for the 2nd packet of the sequence is lost.
(2) The initial transmit of the 5th packet of the sequence is corrupt.

Show the timeline and when all packets are delivered to the application.
Selective Repeat Example: Window size N=3. A sequence of 7 packets denoted P1, P2, … , P7 must be delivered. Assume no transmission packet (ACK corruption or loss) occurs. Seq#'s used: [0,1,2,3,4,5]. Timeouts = 10 sec.

All 7 packets delivered and ACKed in 24 sec. Utilization=7/24
Show timeline of SR problem on this sheet