

**CS5222 Computer Networks and Internets**  
**Tutorial 5 (week 5)**

*The following two questions are designed to help you understand that, in **Go-back-N**, the sender window size must be **less than the size of the sequence number space**:*

1. Suppose that the **Go-back-N** protocol is used. The sequence number space is  $\{0, 1, 2, 3\}$ . Suppose the sender window size is 4. The sender sends packets  $\{0, 1, 2, 3\}$ . The receivers receive all these 4 packets in order and generate acks. Suppose that all acks are lost.
  - a) After the receiver sends out all acks, what will be the expected sequence number at the receiver side?
  - b) After the timeout interval for packet 0, the sender retransmits packet 0. Suppose that the receiver receives the packet. What will the receiver do?
  
2. Suppose that **Go-back-N** protocol is used. The sequence number space is  $\{0, 1, 2, 3\}$ . **Suppose the sender window size is 3.** The sender sends packets  $\{0, 1, 2\}$ . The receiver receives all these 3 packets in order and generates acks. Suppose that all acks are lost.
  - a) After the receiver sends out all acks, what will be the expected sequence number at the receiver side?
  - b) After the timeout interval for packet 0, the sender retransmits packet 0. Suppose that the receiver receives the packet. What will the receiver do?
  
3. Suppose that Host A and Host B use a **Go-back-N** protocol with window size  $N=3$  and a long-enough range of sequence numbers. Assume Host A sends six application messages to Host B and that all messages are correctly received except for the first acknowledgement and the fifth data segment.
  - a) Draw a timing diagram, showing data segments and the acknowledgements sent along with the corresponding sequence and acknowledge numbers, respectively. Assume that the first packet's sequence number starts with 0.
  - b) Draw a timing diagram for this problem if the **Selective-Repeat** protocol instead of **Go-back-N** protocol is used.
  
4. Suppose that the **Selective-Repeat** protocol is used, and the sequence number space is  $\{0, 1, 2, 3\}$ . Suppose that the sender window size is 2. The sender sends packets with sequence number  $\{0, 1\}$  at the beginning. The receiver receives these packets (with sequence number  $\{0, 1\}$ ) and therefore responds by sending ack 0 and ack 1, respectively. However, both acks are lost.
  - a) After the receiver sends ack 0 and ack 1, what will be the receiver-base? What packets are expected/acceptable at the receiver side?
  - b) After the timeout interval for packet 0, the sender retransmits packet 0. What will the receiver do when it receives that packet?

