

Homework 4

*Assigned: September 23***Due: September 28****Note the due date!!**

1. Consider a channel that can flip bits and lose packets (i.e., the second channel model discussed in class). Give an example to show what happens if the timer at the sender is too short (i.e., the timer for packet i expires and then the ACK for packet i arrives). Do the algorithms work correctly? Give your example in the form of a sender and receiver timing diagram like those drawn in class.
2. Suppose we modify the sender and receiver algorithms for the second channel model to include NAKs.
 - Show the modifications to the pseudocode (presented in class) at both the sender and the receiver when there are NAKs.
 - Do the NAKs need sequence numbers? If yes, show an example that demonstrates a problem if there are no sequence numbers. If no, give an argument why not.
3. Give an example that shows the worst case behavior for the go-back- N scheme when only **one** packet is lost. (“Worst case” means that the most packets end up getting retransmitted.) Assume that $N = 4$, and use a timing diagram like the one shown in class. (Your diagram should have only one packet loss on it.)
4. Show the values of the RTT and deviation estimates after each step in the following sequence of events. Use $\alpha = \beta = 0.8$.
 - Send packet at 0 msec, get ACK at 5 msec.
 - Send packet at 2 msec, get ACK at 10 msec.
 - Send packet at 4 msec. Timeout and resend. Get ACK at 20 msec.
 - Send packet at 22 msec, get ACK at 32 msec.
 - Send packet at 24 msec, get ACK at 36 msec.