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CS 118

Dis 1A

Homework 4

24. a. True, if the sender sends duplicates of packets, it will receive ACK for a packet once and move on and then receive the ACK again when the window has changed.

b. True, if the sender sends duplicates again, the same as above will happen

c. True, packets will always be in order and SR will function the same way as alternating bit

d. True, packets will always be in order and there’s no cumulative ACKs, thus GBN will function the same way as alternating bit

31. 1st sample:

EstimatedRTT : (0.875) \* 100ms + 0.125 \* 106ms = 100.75ms

DevRTT = (0.75) \* 5ms + 0.25 \* | 106ms – 100.75ms | = 5.0625ms

TimeoutInterval = 100.75ms + 4 \* 5.0625ms = 121ms

2nd sample:

EstimatedRTT : (0.875) \* 100.75ms + 0.125 \* 120ms = 103.1563ms

DevRTT = (0.75) \* 5.0625ms + 0.25 \* | 120ms – 103.15625ms | = 8.0078ms

TimeoutInterval = 103.15625ms + 4 \* 8.0078125ms = 135.1875ms

3rd sample:

EstimatedRTT : (0.875) \* 103.15625ms + 0.125 \* 140ms = 107.7617ms

DevRTT = (0.75) \* 8.0078ms + 0.25 \* | 140ms – 107.7617ms | = 14.0654ms

TimeoutInterval = 107.7617ms + 4 \* 14.0654ms = 164.0234ms

4th sample:

EstimatedRTT : (0.875) \* 107.7617ms + 0.125 \* 90ms = 105.5415ms

DevRTT = (0.75) \* 14.0654ms + 0.25 \* | 90ms – 105.5415ms | = 14.4344ms

TimeoutInterval = 105.5415ms + 4 \* 14.4344ms = 163.2791ms

5th sample:

EstimatedRTT : (0.875) \* 105.5415ms + 0.125 \* 115ms = 106.7238ms

DevRTT = (0.75) \* 14.4344ms + 0.25 \* | 115ms – 106.7238ms | = 12.8949ms

TimeoutInterval = 106.7238ms + 4 \* 12.8949ms = 158.3032ms

36. The problem with performing a fast retransmit after the first duplicate ACK is that there is a possibility of retransmitting when it is not actually needed. An example: a first packet is sent and received. A second packet and third packet is sent but the third is received first. In this case, TCP will prematurely retransmit instead of waiting for the second to arrive.

40. a. Slow start is operating at 1-6 and 23-26 due to exponential growth

b. Congestion avoidance is operating at 6-16 and 17-22 due to linear growth

c. It’s probably a triple duplicate ACK since the window size doesn’t drop all the way down to 1

d. It is a timeout since the window size drops to 1

e. The ssthresh is at 32 when congestion avoidance first starts

f. The ssthresh is 21 which is half of the previous window size before the triple duplicate

g. The ssthresh is 14.5 which is half of the previous window size before the timeout

h. Counting from the first transmission round, we find that packets 64-96 are sent in the 7th transmission round, thus 70th packet is sent in 7th round

i. The congestion window size and ssthresh would drop to 4 which is half of what the window size was before.

j. The congestion window size would drop to 1 regardless of timeout or duplicates and the ssthresh would be 21 which is half of previous cwnd

k. At 17, the window size starts at 1 so: 1 packet at 17, 2 packets at 18, 4 packets at 19, 8 packets at round 20, 16 packets at round 21, and 21 packets at round 22. The exponential growth stops at 21 because that is the ssthresh. The total packets is 52.

5.