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Homework 6

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Problem A mss = 536 bytes

a.) 4 bytes, 2^{32} = 4294967296 = largest # with 4 byte Sequence field

$2^{32}/536$ = 8012998 segments

b.) 8012998 * 66 = additional bytes = 528857868

2^{32} + 528857868 = 4823825164 bytes (payload and headers)

$\frac{4823825164 * 8 \text{ bits}}{(155\text{Mbps} * 10^6)}$ = 249 s

Problem B

Segment 1
Seq_num = 127
Source Port = 302
dest Port = 80
Payload size = 80 bytes

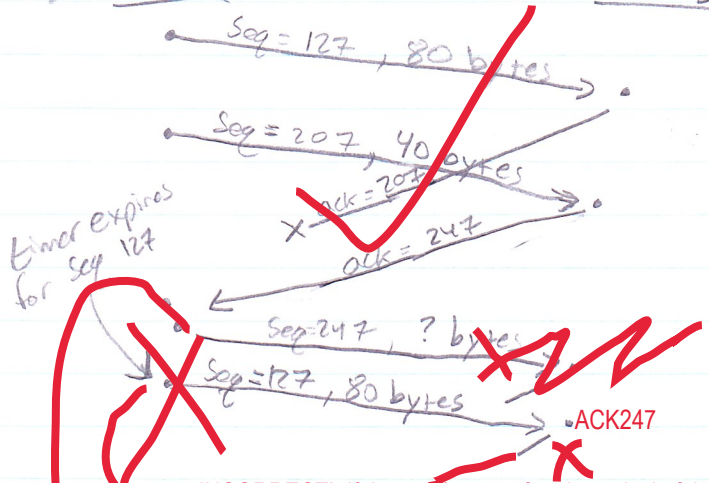
Segment 2
Seq_num = 207
Source Port = 302
dest Port = 80
Payload size = 40 bytes

a.) Sequence num = 207, Source Port = 302, dest Port = 80

b.) Ack num = 207, Source Port = 80, dest Port = 302

c) Ack num = 127 still waiting for 127 and on

d.)



-8 points

-8 points

INCORRECT! If timeout() were after the arrival of the first ACK247, timer(127) would be canceled and no timeout(127). In this problem, the 2nd ACK (ACK247) arrives AFTER the first timeout interval, i.e., timeout(127). So there is a re-transmission of the 1st segment.

No more bytes according to this problem (only two segments being considered) although it's fine to show a third segment

Problem C RcvBuffer = 4096 bytes, 1280 bytes buffered

a.) 4096 - 1280 = 2816 bytes = rwnd

b.) 2816 - 2560 = 256 bytes left

Problem D

a.) 1st → tcp Segment [Syn bit = 1, Seq = 125

2nd → tcp Segment [Syn bit = 1, Seq = 58, Ackbit = 1, Acknum = 126]

3rd → tcp Segment [Syn bit = 1, Seq = 59

b.) 1st → Client to Server

2nd → Server to Client

3rd → Client to Server

c.) the Seq = 125 is the Client's Choice

d.) the Seq = 58 is the Server's Choice

Problem E

a.) 1st → tcp Segment [fin = 1, Seq = 1743]

2nd → tcp Segment [Ackbit = 1, ACKnum = 1744]

3rd → tcp Segment [Fin = 1, Seq = 6030]

4th → tcp Segment [Ackbit = 1, Acknum = 6030]

ACKnum=6031 -2 points

b.) 1st → Client to Server

2nd → Server to Client

3rd → Server to Client

4th → Client to Server

-2 points

Problem F. The initial ssthresh is 16, the sender experiences a ***3-duplicate-ACKs*** event **right after the 9th transmission round** in both Tahoe and Reno cases, and then the sender experiences ***a timeout*** event **right after the 16th round in a TCP Tahoe case** and **after right after the 19th round in a TCP Reno case**, FILL the following table to illustrate the congestion window size in segments (**cwnd**) and **ssthresh** as functions of transmission round for the time from the **1st** to the **22th** round if (a) TCP Tahoe is used for congestion control; and (b) TCP Reno is used for congestion control. (**Hint**: be aware that the figure in the slide titled "TCP: switching from slow start to CA" illustrates both cases in the same graph.)

	TCP Tahoe				TCP Reno		
	Trans. Round	cwnd	ssthresh		Trans. Round	cwnd	Ssthresh
	1st	1 mss	16		1st	1 mss	16
	2nd	2 mss	16		2nd	2 mss	16
	3rd	4 mss	16		3rd	4 mss	16
	4th	8 mss	16		4th	8 mss	16
	5th	16 mss	16		5th	16 mss	16
	6th	17 mss	16		6th	17 mss	16
	7th	18 mss	16		7th	18 mss	16
	8th	19 mss	16		8th	19 mss	16
	9th	20 mss			9th	20 mss	16
	10th	1 mss	10		10th	13 mss	10
	11th	2 mss	10		11th	14 mss	10
	12th	4 mss	10		12th	15 mss	10
	13th	8 mss	10		13th	16 mss	10
	14th	10 mss	10		14th	17 mss	10
	15th	11 mss	10		15th	18 mss	10
	16th	12 mss	10		16th	19 mss	10
	17th 1	13 mss	0		17th	20 mss	10
	18th 2	14 mss	10		18th	21 mss	10
-8 points	19th	15 mss	10		19th	22 mss	10
	20th 4 6	1 mss	7		20th 1	14 mss	11
	21st 7	2 mss	7		21st 2	15 mss	11
	22nd 8	4 mss	7		22nd 4	16 mss	11

-4 points

-12 points