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1. If the TCP round-trip time, RTT, is currently 30 msec and the following acknowledgements come in after 26, 32, and 24 msec, respectively, what is the new RTT estimate using the Jacobson algorithm? Use $\alpha = 0.9$

Sample RTT= α RTT+(1- α)R

where α= .9

Sample RTT_1= .9 *30+(1- .9)*26=29.6

Sample RTT_2= .9 *29.6+(1- .9)*32=29.84

Sample RTT_3= .9 *29.84+(1- .9)*24=29.256

2. A TCP machine is sending full windows of 65,535 bytes over a 1-Gbps channel that has a 10-msec one-way delay. What is the maximum throughput achievable? What is the line efficiency?
Problem 33, page 609 of the text

One window takes 2*10ms= 20ms

1sec/20ms= 50 windows per second

50windows*65535bytes*8bits= 26,214,000 bits per second maximum throughput

26.214bits/ 1000= 2.6214% line effciency

3. What is the fastest line speed at which a host can blast out 1500-byte TCP payloads with a 120-sec maximum packet lifetime without having the sequence numbers wrap around? Take TCP, IP, and Ethernet overhead into consideration. Assume that Ethernet frames may be sent continuously. Problem 34, page 609 of the text

• TCP overhead is 20 bytes, IP overhead is 20 bytes, Ethernet overhead is 26 bytes, Total 66 bytes

Since overhead must be included:

20bytes+20bytes+26bytes=66bytes for overhead

1500+66= 1566 total bytes of payload

2^{32}/120sec= 35,791,394.13 payload bytes per sec

35,791,394.13/1500= 23,860 1566-byte frames per sec

So, since we must send 23,860 1566-byte frames per second we need a line that is 299 Mbps

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4. In a network whose max segment is 128 bytes, max segment lifetime is 30 sec, and has 8-bit sequence numbers, what is the maximum data rate per connection?

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2^8=256 packets

256*128*8= 262,144 bits

262,144/30= 8738.13333 bits per sec