Sample Questions on Transport Layer + IP Layer

Q1) Figure 1 shows the trace of Congestion window for a particular TCP implementation. Would it be a TCP Reno or TCP Tahoe? Why?

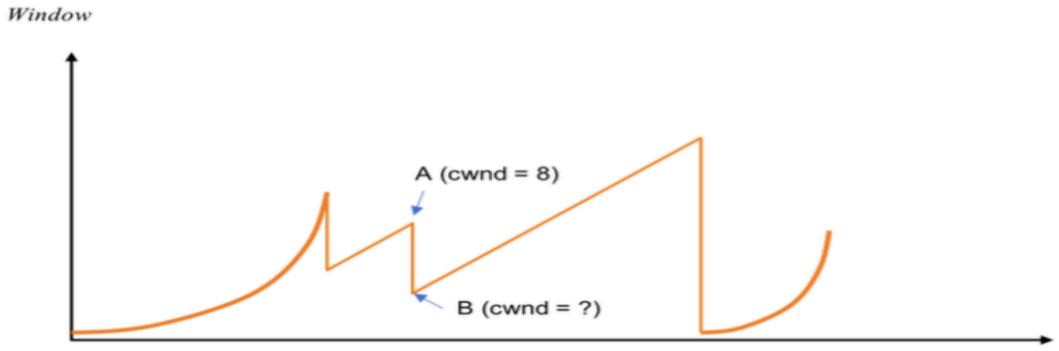

Figure 1. TCP Congestion Window trace

Answer: It is TCP Reno. Note that Congestion Window is reduced to half twice in this trace. TCP Tahoe would always reduce its Congestion Window to 1 in reposne to a congestion event.

Q2) In Figure 1, what would be the value of TCP Congestion window at point B?

Answer: 8/2 = 4 as the congestion window is halved.

Q3) Figure 2 shows congestion window traces for both TCP Tahoe and TCP Reno where up to transmission round of 8, both follow the same blue curve, but after that TCP Tahoe follows the blue curve and TCP Reno follow the black curve.

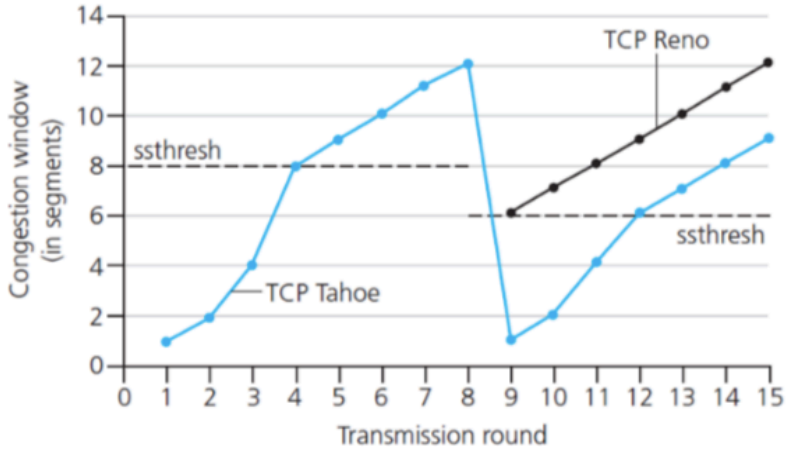

Figure 2: Congestion window trace for TCP Tahoe and TCP Reno

Answer the following Questions:

a) What has happened at transmission round No 8?

   A Triple Duplicate ACK has been observed. Note different reactions for TCP Tahoe and TCP Reno.

b) Identify the regions where Slow Start (SS) and Congestion Avoidance (CA) are in operation?

   Answer:

   SS =

   Round 1-4 (both TCP Tahoe and Reno) and

   Round 9-12 for TCP Tahoe

   CA=

   Round 4-8 (both TCP Tahoe and Reno)

   Round 9-15 for TCP Reno

   Round 12-15 for TCP Tahoe

c) How many total segments has been transferred by TCP Tahoe and TCP Reno at the end of round 15?

   Answer:

   Add all the congestion window sizes till round 15.

   TCP Tahoe: 1+2+4+8+9+10+11+12+1+2+4+6+7+8+9=94 segments

   TCP Reno: 1+2+4+8+9+10+11+12+6+7+8+9+10+11+12=120 segments

Q4). IP Packets on a certain network can carry a maximum of only 500 Bytes in the data portion. An application using TCP/IP on a node on this network generates a TCP segment with 1,000 Bytes in the data portion. How many IP packets are transmitted to carry this TCP segment, and what are their sizes (including the header)?

Answer: TCP segment size = Payload + Header = 1020 Bytes. We require 3 IP packets of sizes (including IP headers) 520, 520 and 40 Bytes.

Q5). Suppose datagrams are limited to 1,500 Bytes including the headers (based on an

MTU of 1460 bytes) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send a file consisting of 4 million Bytes.

Answer: File size = 4 million Bytes. Each datagram can carry 1500-40(headers)=1460 Bytes of the file.

Number of datagrams required = $4 * 10^6 / 1460 = 2739.72$, We thus have 2739 datagrams each of size 1460+40 =1500 Bytes and the last datagram of size 1060 + 40 = 1100 Bytes.