

CS158A – Computer Networks

Homework 6

(Due May 8, 2008)

1. You are hired to design a reliable byte-stream protocol that uses a sliding window (like TCP). This protocol will run over a 100-Mbps network. The RTT of the network is 100 ms, and the maximum segment lifetime is 60 seconds. How many bits would you include in the **AdvertisedWindow** and **SequenceNum** fields of your protocol header?
2. Suppose TCP operates over a 1-Gbps link.
 - (a) Assuming TCP could utilize the full bandwidth continuously, how long would it take the sequence numbers to wrap around completely?
 - (b) Suppose an added 32-bit timestamp field increments 1,000 times during the wraparound time you found above. How long would it take for the timestamp to wrap around?
3. Suppose, in TCP's adaptive retransmission mechanism, that **EstimatedRTT** is 4.0 at some point and subsequent measured RTTs all are 1.0. How long does it take before the **TimeOut** value, as calculated by the Jacobson/Karels algorithm, falls below 8.5? Assume initial value of Deviation as 1.0 and use $\delta = 1/8$.
4. Under what circumstances may coarse-grained timeouts still occur in TCP even when the fast retransmit mechanism is being used?
5. Consider the TCP trace in the following Figure. Identify time intervals representing slow start on startup, slow start on detection of loss, and linear-increase congestion avoidance. Is Fast-Retransmit feature turned on? Is Fast-Recovery feature turned on?

