Electrical, Computer, and Systems Engineering
ECSE-6600: Internet Protocols
Spring 2000

Problem Set 2- Due Monday, March 6th 2000

Your Name	

Notes:

1. Be brief.
2. A significant part of the homework credit is given to reading. Reading assignments will be quizzed in both informal and formal quizzes
3. Please write your answers on separate sheets and staple it along with the questions to facilitate easy grading.

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1	2	3	4	5	Total
30	20	20	20	20	100

TA Signature :_____

1. *Reading assignment*: Read RFC 793, 1323 (TCP) in conjunction with chapters 19-24. Summarize key features of commands; identify few details in RFC not covered in class.
2. TCP is a self-clocking protocol i.e., data packets are sent only when acks are received. One problem with TCP is that it sends data in bursts, which have a high probability of being lost and retransmitted in a high-speed environment. A router could smoothen TCP's data flow by controlling the reverse flow of acks. Moreover, if the router knew the ideal window size, it could also write to the receiver window field in the TCP header of the ack and constrain the source transmission. Explain how you could use a combination of the above two techniques to control the average network delay and smooth out TCP traffic. What are the other advantages of doing this ? A company called Packeteer does that today (www.packeteer.com).
3. A three-way handshake is both necessary and sufficient for correct synchronization between the two end points during connection establishment. Explain why. (Hint: consider lost, delayed, and duplicate packets. "Sufficient" means given three-way handshake, you get correct synchronization. "Necessary" means if you want correct synchronization, you need 3-way hand-shake)
4. Why is routing more efficient than bridging ? Explain the efficiencies achieved both in the data plane (when real packets are received and need to be forwarded), and the control plane (the number of control messages exchanged to setup a routing table).
5. Identify web sites in different parts of the US, Asia and Europe. Choose both academic and business sites covering a wide range of RTTs, and geographical diversity (max 10 sites should be enough). Run multiple ping and traceroute to these sites, (and optionally repeat the experiment at different times of the day and different days). What can you say about (in some cases you may not be able to say much, but try anyway…):
   - **a)** The average RTT and standard deviation in RTT based upon multiple ping/traceroutes to the same site.
   - **b)** The loss rate experienced in accessing the site.
   - **c)** The average end-to-end bandwidth one can expect when accessing the site
   - **d)** The average number of hops in accessing the site and the types of backbone and regional networks traversed along the path.