

CSE 4/598N: Home work assignment 1

Assigned: Feb 3

Due: Feb 17, 12:30 PM

(LATE SUBMISSIONS WILL NOT BE ACCEPTED)

(INDIVIDUAL EFFORT ONLY.)

1. Peterson and Davie: Exercises: Chapter 2, Question 22.
2. Peterson and Davie: Exercises: Chapter 2, Question 23.
3. Peterson and Davie: Exercises: Chapter 2, Question 24.
4. Peterson and Davie: Exercises: Chapter 2, Question 33.
5. Peterson and Davie: Exercises: Chapter 2, Question 39.
6. Peterson and Davie: Exercises: Chapter 2, Question 54.
7. **Probe packets** The Internet architecture supports "probe" packets - on receipt of a probe packet, the destination immediately transmits a response to the source. Further, routers will reply immediately back to the source when a packet's hop count reaches 0. Explain how a source can use the elapsed round-trip time for these probe packets to infer the bandwidth and delay of every link between the source and the destination. (First show how it can be done for the first hop, and then show how it can be done recursively.) Assume the rate and delay are the same in both directions.
8. **Latency reduction** Suppose we are only concerned with reducing the latency to transmit a packet over an unloaded store and forward network (for example, to download a page from a web server). Suppose each stage in the network has both a fixed overhead (o) to handle a packet (prepare it to be forwarded), and a bandwidth (b) to transmit the packet once the overhead has been paid. Explain why, as a function of (o), (b), and the packet size (s), it is sometimes more efficient to fragment the packet before sending it.

The next two problems measure the throughput achieved by TCP and UDP streams. We will use the cluster in the lab for this question. The cluster in the lab utilizes 100 Mbps full duplex fast ethernet networks for interconnection

9. Throughput measurement: UDP

Write a UDP sender and receiver program to measure the effective throughputs for the network interface. The sender will continuously send UDP packets (of various sizes) with an application level sequence number. The receiver will measure the per second throughput (amount of packet data received in the past second) and the data loss rate (using the missing sequence numbers). Plot the throughput with time.

10. **Throughput measurement: TCP** Repeat the above experiment for TCP streams. Note that you should not notice any packet loss.

Before you use these commands between a pair of machines, please send email to the entire class and reserve a time slot so that you don't interfere with someone else's setup.