CS 455/655: Introduction to Computer Networks
Fall 2014
Homework 1

Assigned: September 10, 2014 **Due:** 1:00 pm on September 18, 2014

To be completed individually. Please type or write neatly and clearly. Answer all questions. Note that textbook questions come from the **6th edition** of Kurose & Ross.

1. What is a network protocol? What is a network service? What is the difference between a service interface and implementation of a service? Discuss these concepts in the context of layered network architecture.

2. The utility ping can be used to find the RTT to various Internet hosts. Read the man page for ping (type 'man ping' on Linux), and use it to find the RTT to some host, say cs.stanford.edu or cs.umass.edu. Measure the RTT values at different times of day, and compare the results. What do you think accounts for the differences? Include the output with your answer.

3. Answer problem P10, page 73 from chapter 1 in your Kurose & Ross textbook.

4. Answer problem P13, page 73 from chapter 1 in your Kurose & Ross textbook.

5. Answer problem P18, page 74 from chapter 1 in your Kurose & Ross textbook. (*Hint:* type 'man traceroute' on Linux.)

6. Answer problem P25, page 76 from chapter 1 in your Kurose & Ross textbook. (*Hint:* d_{prop} here represents the *one-way propagation delay* from A to B. Also, note that the length of a football (not soccer!) field is 100 yards, which is 91.44 meters.)

7. Answer problem P31, page 77 from chapter 1 in your Kurose & Ross textbook. (*Hint:* ignore the transmission of header bits in your calculations.)

8. Suppose that a certain communications protocol involves a per-packet overhead of 100 bytes for headers. We send 1 million bytes of data using this protocol; however, when one data byte is corrupted, the entire packet containing it is lost. Give the total number of overhead + loss bytes for packet data sizes (i.e. the size of only the data portion of the packet) of 1000, 5000, 10000, and 20000 bytes, assuming a) the connection loses a single byte of data, and b) the sender does not retransmit lost packets. Which of these sizes is optimal?