CS 455/655: Introduction to Computer Networks
Fall 2014

Homework 3

Due: 1:00 pm on Tuesday, November 25th, 2014

Homeworks are to be completed individually. Please type or write neatly and clearly. Answer all 6 questions.

1. Suppose that you are using an extended version of TCP that allows window sizes much larger than 64K bytes.[1] Suppose you are using it over a 1Gbps link with a round-trip time (RTT) of 100ms to transfer 10M-byte file, and the TCP receiver's advertised window is 1M bytes. If TCP sends 1K-byte segments, and assuming no congestion and no lost segments:

   (a) How many RTTs does it take until the sender's congestion window reaches 1M bytes? Recall that the congestion window is initialized to the size of a single segment, and assume that the slow-start threshold is initialized to a value higher than the receiver's advertised window.
   (b) How many RTTs does it take to send the file?
   (c) If the time to send the file is given by the number of required RTTs times the RTT value, what is the effective throughput for the transfer? What percentage of the link capacity is utilized?

Questions 2 to 6.

Answer problems P10, P13, P26, P37, and P38 (on pages 419-425) from chapter 4 in your Kurose & Ross textbook (sixth edition).

[1] A 16-bit receiver's advertised window in the TCP segment means that 2^{16} = 64K bytes is traditionally a maximum limit on the send window.