Comp 7005 – Data Communication Principles

Assignment Two – September, 2017

Due Date: 0800 hrs - Tuesday, October 17, 2017

Criteria: You may work in groups of two. Assignments must be submitted in PDF format by the date and time specified above.

Note: Clearly state any assumptions that you make in the solution of any of the questions. Substantiate your answers and show all your work for each problem – the answer alone is insufficient to receive credit for the question.

Section A

Using two machines perform a bulk TCP transfer between them and capture the session using Wireshark or tcpdump. Perform this task as follows:

    I.   Over a LAN between two machines (wired and wireless).
   II.   Over the Internet between two machines.

Analyze both sets of captures, and for each data set answer the following questions:

1. Plot a TCP Round Trip Time Graph and provide a clear and detailed explanation of what the graph is indicating.

2. Select a set of 6 to 10 segments and analyze the difference between when each TCP segment was sent, and when its acknowledgement was received. Given your analysis, what is the RTT value for each of the segments you have selected? What is the `EstimatedRTT` value after the receipt of each ACK? Assume that the value of the `EstimatedRTT` is equal to the measured RTT for the first segment, and then is computed using the `EstimatedRTT` equation on page 249 for all subsequent segments.

3. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender? Plot the Window size versus time for each of the data sets and comment on the results.

4. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

5. Use the **Time-Sequence-Graph(Stevens)** plotting tool to view the sequence number versus time plot of segments being sent from the one machine to another. Identify where TCP's slowstart phase begins and ends, and where congestion avoidance takes over? Comment on ways in which the measured data differs from the idealized behavior of TCP that we have discussed in lectures.

Section B

1. Read Jacobson's paper in detail. Clearly explain what he means by "The 'obvious' ways to implement a window-based transport protocol can result in exactly the wrong behavior in response to network congestion."

2. Given what you have just read in this paper, provide a set of at least 3 guidelines that you would follow (as a software developer) in implementing an audio and video streaming application. Use the conclusions arrived at in the paper to justify your guideline.

Section C

Work out the following problems in your textbook:

Chapter 3: P14, P46, P55

To Be Submitted:

- Hand in a complete document in pdf format.
- Submit a **zip** file containing the documents as well as your Wireshark captures in the sharein folder for this course under "**Assignment #2-FT**".