CS 447: Networks and Data Communications
Homework #02

Assigned Date   : Friday, October 03, 2014
Due Date   : Monday, October 13, 2014 @ 02:59:59 p.m.

Instructions

- This is an individual assignment. **Do your own work**. Acts of academic misconduct (plagiarism, use of illegal solutions manuals, etc.) will be strictly monitored and will be subjected to one or more of the penalties outlined in the course syllabus.
- Your answers should be produced using a word processing application.
- Handover a printed, stapled copy of your solutions to the instructor at the beginning of class on due date. Make sure to include your name and the last 3 digits of your SIUE ID in the first page of your solutions sheet.
- A moodle dropbox will become available the day before the due date as a secondary submission option. Ensure to submit a PDF document if you decide to use the moodle dropbox. **DO NOT** email your solutions to the instructor.
- Make proper arrangements, after consulting the instructor, to deliver your solutions **BEFORE** the due date, if you have a planned absence on the due date.
- Answer all questions
- Your assignment is due on **Monday, October 13, 2014 @ 02:59:59 p.m.**
- Total points: [**200 points**]

Questions

Q1. Assume you are asked to develop a client-server application. What are the port number addresses you can use for your *client* and *server* if:

   (a) Both processes run on your laptop [**4 points**]
   (b) Each process run on a different host (a laptop and a desktop) at your home [**4 points**]
   (c) *client* runs on your laptop while the *server* runs on **SIUE home server** [**4 points**]
   (d) *server* runs on your laptop while the *client* runs on **SIUE home server** [**4 points**]

Q2. Can you use the same port number for each of the above cases? [**4 points**]

Q3. For Q1 above, a student decides to use process numbers (assigned by the operating system) instead of using port numbers. Is this feasible? Explain your answer [**10 points**]

Q4. Assume the *receive window* for a particular network as 1 packet. Argue in terms of *sender window* which of the following protocols can be used by the network.

   (a) Stop-and-Wait [**5 points**]
   (b) Go-Back-*N* [**5 points**]

(c) Selective-Repeat [**5 points**]

Q5. A sender is using a 5-bit sequence number to send 100 packets to the same receiver. What is the sequence number of the 100th packet if the sequence numbers start with 10. [**10 points**]

Q6. What is the maximum size of the send and receive windows, for each of the cases in Q4 above. [**15 points**]

Q7. Properly justify your answers for the followings. Assume that you've been asked to design a Go-Back-N sliding window protocol for a network in which the bandwidth is 100 Mbps and the average distance between the sender and the receiver is 5,000 km. Assume the average packet size is 100,000 bits and the propagation speed is $2 \times 10^8 m/s$.

(a) Find the average RTT [**5 points**]
(b) Find the maximum size of the send the receive windows [**20 points**]
(c) The number of bits in the sequence number field [**10 points**]
(d) Appropriate timeout value [**10 points**]

Q8. What is the maximum size of the TCP header? What is the minimum size of the TCP header? [**10 points**]

Q9. Justify why TCP prefers the use of Selective-Repeat over Go-Back-*N*. [**10 points**]

Q10. For each of the following cases, explain and justify the appropriate reaction

(a) A TCP server expecting to receive byte 4320 receives a segment with sequence number 5422 [**10 points**]
(b) A TCP client expecting to receive byte 4320 receives a segment with sequence number 3119 [**10 points**]
(c) A TCP server missing bytes 4320 to 4989 receives a segment with the sequence number 4320 with 280 bytes [**10 points**]

Q11. Problem P23 on pg. 293 [**15 points**]
Q12. Problem P24 on pg. 293 [**20 points**]