CS 447: Networks and Data Communications
Homework #02

Assigned Date   : Thursday, March 19, 2015
Due Date   : Tuesday, March 31, 2015 @ 09:29:59 a.m.

Instructions

- This is an individual assignment. **Do your own work**. Acts of academic misconduct (plagiarism, use of illicit solutions manuals, etc.) are subjected to university code of conduct.
- Produce your answers using an appropriate word processing application.
- Submit your solutions through Moodle. A dropbox will be available with 24 hours in advance of the deadline. Late policy is enforced per syllabus late policy. Your digital submission must be in PDF format. Grades and specific feedback will be communicated through Moodle.
    - You may, **in addition** to the digital submission, handover a printed, stapled copy of your answers to the instructor at the beginning of class, **if** you prefer to have explicit written feedback of your answers. This, however, is not required neither considered the primary submission option.
- **DO NOT** email your solutions to the instructor or the grader.
- 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 solutions are due on **Tuesday, March 31, 2015 @ 09:29:59 a.m.**
- Total points: [**UG: 200, MS: 350 points**]

Questions

Q1. [**10 points**] Explain why for SR receive window $\leq \dfrac{\text{sequence num. range}}{2}$

Q2. [**10 points**] Consider a 5-bit sequence number. If the sequence number starts with 0, what is the sequence number of the 100th packet?

Q3. [**30 points**] Using a 5-bit sequence number, what is the maximum size of the send and receive windows for each of the following protocols

  (a) Stop-and-Wait
  (b) Go-Back-N
  (c) Selective-Repeat

Q4. [**30 points**] We can define the bandwidth-delay product (BDP) in a network as the number of packets that can be in the pipe during the RTT. What is the BDP in each of the following cases?

    (a) Bandwidth: 1 Mbps. RTT: 20 ms, packet size 1000 bits
    (b) Bandwidth: 10 Mbps. RTT: 20 ms, packet size 2000 bits
    (c) Bandwidth: 1 Gbps. RTT: 4 ms, packet size 10,000 bits

Q5. [**30 points**] Assume we need 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 receiver is 10,000 km. Assume the average packet size is 100,000 bits and the propagation speed is $2 \times 10 * 8 m/s$. Find

    (a) the maximum size of the send and receive windows
    (b) the number of bits in the sequence number field
    (c) an appropriate timeout value for the timer (that determines packet loss at the sender)

Q6. [**10 points**] Explain the relationship between Maximum segment size (MSS) and maximum transmission unit (MTU)

Q7. [**30 points**] Answer the following questions.

    (a) What is the maximum size of TCP header?
    (b) What is the minimum size of TCP header?
    (c) What is the minimum size of UDP header?

Q8. [**50 points**] Complete the Wireshark Lab 01 found at http://www.cs.siue.edu/~tgamage/S15/CS447/A/WS01.pdf and answer the questions listed there.

MS Requirements

Q9. [**150 points**] Prepare a summary critique (between 3/4 - 1 page, single space, PDF format) for each of the graduate readings assigned to you on 01/29/2015. Formulate each critique based on your answers for the following questions.

    (a) Title, author(s), date of publication, and venue
    (b) What is the primary contribution(s) (according to the authors) of this paper?
    (c) What are the critical assumptions (if any) of this paper?
    (d) Justify the applicability (or inapplicability) and the validity (or invalidity) of the original contributions to present day networking. *You must logically justify your arguments*.
    (e) Propose at least 2 additional, preferably recent, (*within the last 8-10 years*) publications that a would be reader of this paper must read next.
    (f) What is your impression of the primary contribution of this paper?

Graduate Grading

- [**25 × 3 points**] Submit your critiques (3 individual PDFs) through the **Graduate Critique** forum in Moodle.
- [**25 × 3 points**] Select three critiques, preferably from three different colleagues, and *critique their paper critiques*. Post your comments as replies.