**CS 3840 Computer Networking**

**Homework 3**

Please refer to the syllabus for expectations of homework professionalism and appearance. Your homework is expected to be an individual effort. It is also expected to be neat and clearly organized. The University provides access to many software applications. Use them. Handwritten papers and poorly drawn diagrams are not acceptable. You must submit your answers of the problems in one Word or PDF file by the specified due date and time. You can find the link for your softcopy submission on Blackboard.

***Total points: 40***

The cover page of your homework will contain only the following information in the format given below:

**Name:**

**700#:**

**Course #: CS 3840**

**Homework #: Homework 3**

1. [6 pts] Compare GBN and SR. Suppose Host A sends 5 data segments to Host B, and the 2nd segments (sent from A) is lost. In the end, all 5 data segments have been correctly received by Host B. Assume that the timeout values for both protocols are sufficiently long such that 5 consecutive data segments and their corresponding ACKs can be received (if not lost in the channel) by the receiving host (host B) and the sending host (host A) respectively.

Assume the sequence numbers are from 1 to 5 for these 5 data segments.

* 1. [3 pts] For GBN, how many segments has Host A sent in total and What are their sequence numbers? How many ACKs has Host B sent in total and what are the ACK numbers? Answer this question for both protocols, respectively. For GBN Host A sends 1,2,3,4,5. After not getting the ACK for 2, Host A will resend 2,3,4,5. Meaning Host A sends 9 in total. Host B sends Ack 1 and then no more because the received frames are out of order. Once it gets the rest in order it sends Ack 2,3,4,5. Meaning 5 Ack are sent.
  2. [3 pts] For SR, how many segments has Host A sent in total and what are their sequence numbers? How many ACKs has Host B sent in total and what are their ACK numbers?

For SR Host A sends 1,2,3,4,5. When it doesn’t get the Ack for frame 2, it sends only frame 2 again. So host A only sends 6 frames. Host B sends an Ack for each frame it gets so it only sends 5 Acks.

1. [10 pts] Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 99. Suppose Host A then sends three segments to Host B back-to-back. The first, second and third segments contain 30, 50, and 70 bytes of data, respectively. In the first segment, the sequence number is 100, the source port number is 4321, and the destination port number is 80. Host B sends an ACK whenever it receives a segment from Host A, i.e., no delayed ACK.
2. [2 pt] In the second and third segments sent from Host A to B, what are the sequence number, respectively? You would take the first sequence number 100 with 30 bytes of data. So the sequence number for the second will be 130. The third will be 130 + the 50 bytes in the second segment making it 180.
3. [2 pts] If the first segment arrives before the second segment, in the ACKs of two arriving segments, what are the acknowledgment numbers of the first and second arriving segment, respectively? What are the source port number and the destination port number in ACK? The first will be 130, and the second will also be 130 because it hasn’t gotten the second. Source port will be 80 and destination will be 4321
4. [2 pts] If the second segment arrives before the first segment, in the ACKs of two arriving segments, what are the acknowledgment numbers of the first and second arriving segment, respectively? They will be 100 and 180
5. [2 pts] Suppose the first and second segments sent by A arrive in order at B. The first ACK is lost and the second ACK arrives before the first timeout interval. Will Host A retransmit some segment? If so, what are the sequence number and the number of bytes of the data? If not, explain. Host A will understand that both segments have been received so it will not retransmit the first since the second implies that both were received.
6. [2 pts] Now assume the first ACK is lost and the second ACK arrives after the first timeout interval. Will Host A retransmit some segment? If so, what are the sequence number and the number of bytes of the data? If not, explain. Host A will assume the first segment was lost and retransmit it with sequence number 100 and 30 bytes.

Wireshark Lab

Refer to <https://gaia.cs.umass.edu/kurose_ross/wireshark.htm>

Download the zip file <http://www-net.cs.umass.edu/wireshark-labs/wireshark-traces-8.1.zip>

The traces in this zip file were collected by Wireshark running on one of the author’s computers, while performing the steps indicated in the Wireshark lab.

1. (8 pts) Refer to <http://www-net.cs.umass.edu/wireshark-labs/Wireshark_UDP_v8.1.doc>

Extract the file dns-wireshark-trace1-1 (Yes, the same trace file used in HW 2 Q4) from the zip file. It should have 563 messages.

Check from the first packet, identify the first UDP segment in the trace. Filter the packets displayed in the Wireshark window by entering “udp” (lowercase, no quotes, and don’t forget to press return after entering!) into the display filter. Answer the following questions:

What is the packet number (assigned by Wireshark for listing purposes only) of this segment in the trace file? 5

What type of application-layer payload or protocol message is being carried in this UDP segment? SSDP

(2 pts) How many fields there are in the UDP header? What are the names of these fields, and the length (in bytes) of each of the UDP header fields? 5. Destination port, length, checksum, and payload.

1. The value in the Length field is the length of what? (You can consult the text for this answer). The length of the header and payload together
2. What is the maximum number of bytes that can be included in a UDP payload? (Hint: the answer to this question can be determined by your answers to the two previous sub-problems) 65527
3. What is the largest possible source port number? 65535
4. What is the protocol number for UDP? Give your answer in decimal notation. To answer this question, you’ll need to look into the Protocol field of the IP datagram containing this UDP segment (see Figure 4.13 in the text, and the discussion of IP header fields). 17
5. (16 pts) Refer to <http://www-net.cs.umass.edu/wireshark-labs/Wireshark_TCP_v8.1.doc>. Extract the file tcp-wireshark-trace1-1 from the zip file. The display should have 180 messages.

Answer the following questions:

1. (1 pt) What is the IP address and TCP port number used by the client computer (source) that is transferring the file to gaia.cs.umass.edu? 192.168.86.68 55639
2. (1 pt) What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection? 128.119.245.12 80
3. (2 pts) What is the “raw” sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and gaia.cs.umass.edu? What is it in the segment that identifies the segment as a SYN segment? 0, ack number 0
4. (4 pts) What is the “raw” sequence number of the SYNACK segment sent by gaia.cs.umass.edu to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment? Also 0, because it is the first one sent to the client.
5. (2 pts) Consider the TCP segment containing the HTTP POST as the first data-containing segment in the TCP connection. What is the sequence number of this segment? How many bytes of data are contained in the payload (data) field of this TCP segment? 1449. 1448 bytes
6. (4 pts) Still considering the first data-containing segment, at what time was it sent? At what time was the ACK for this segment received? What is the RTT for this segment? How about the second data-containing TCP segment? 0.024048. 0.022505000
7. (2 pts) What are the sequence numbers and the lengths of the 3rd and 4th data-containing segments in the TCP connection?2897 and 1448 4645 and 1448