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CS 372 Lab

January 21s, 2021

Lab #1

(***TCP***)

1. *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?*

Answer: The IP address and the PORT number of the client that sending the data to gaia.cs.umass.edu.

Client's IP: **192.168.1.102**

Client's port number: **1161**

2. *What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?*

Answer: The IP address and the PORT number that the gaia.cs.umass.edu use to send & receive is:

IP: **128.119.245.12**

Port number: **80**

3. *What is the IP address and TCP port number used by your client computer (source) to transfer the file to gaia.cs.umass.edu?*

Answer: The Internet address (IP) and port number used by my computer is the following:

IP Address: **192.168.1.5**

Port number: **53288**

4. *What is the 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?*

Answer: The sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client and gaia.cs.umass.edu is **seq = 0**. The segment that identifies the segment as a SYN segment is in ***TCP sub-section***, there is a **flag section** where the SYN is **set to 1** meaning it identify as a SYN.

5. *What is the 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?*

Answer: The sequence number of the SYNACK is **seq = 0**. The value of pf the Acknowledgement field in SYNACK segment is **1**. Gaia.cs.umass.edu determine the Acknowledgement number by **adding 1 to the sequence number** from SYN segment of the client's computer. In the ***flag section***, the **segment identifies SYNACK is set at 1 for SYN and ACK.**

6. *What is the sequence number of the TCP segment containing the HTTP POST command?*

Answer: The sequence number of the TCP segment containing the HTTP POST command is **seq = 1**.

7. *Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? Given the difference between when each TCP segment was sent, and when its acknowledgement was received, what is the RTT value for each of the six segments? What is the EstimatedRTT* *value (see Section 3.5.3, page 242 in text) after the receipt of each ACK?*

Answer: Below is the table showing the first six segments and their sequence (1 is the HTTP POST follow by 5 segments after it):

Note: The 6 segments are use is No. 4, 5, 7, 8, 10, 11
The 6 ACK of segments 1-6 is No. 6, 9, 12, 14, 15, 16

Segment(s)	Sequence Number(s)
1 (HTTP POST)	1
2	566
3	2026
4	3486
5	4946
6	6406

Below is another table that include the time of each segment was sent, the ACK time of receive, and the RTT of the six segments:

Segment(s)	Time Sent	ACK Time	RTT
1	0.026477	0.053937	0.027460
2	0.041737	0.077294	0.035557
3	0.054026	0.124085	0.070059
4	0.054690	0.169118	0.114428
5	0.077405	0.217299	0.139894
6	0.078157	0.267802	0.189645

Given the equation of the EstimatedRTT = $(1-\alpha) * EstimatedRTT + \alpha * SampleRTT$.

Segment #1: ACK receipt of segment 1

EstimatedRTT = **0.027460** second (Only 1st segment, so it is RTT of 1st segment)

Segment #2: ACK receipt of segment 2

EstimatedRTT = (1-0.125)*0.027460 + 0.125*0.035557 = **0.028474** second

Segment #3: ACK receipt of segment 3

EstimatedRTT = 0.875*0.028474 + 0.125*0.070059 = **0.033672** second

Segment #4: ACK receipt of segment 4

EstimatedRTT = 0.875*0.033672 + 0.125*0.114428 = **0.043766** second

Segment #5: ACK receipt of segment 5

EstimatedRTT = 0.875*0.043766 + 0.125*0.139894 = **0.055782** second

Segment #6: ACK receipt of segment 6

EstimatedRTT = 0.875*0.055782 + 0.125*0.189645 = **0.072515** second

8. *What is the length of each of the first six TCP segments?*

Answer: Below is the table of the length of the first six TCP segments:

Note: This is the segment No. 4, 5, 7, 8, 10, 11

Segment(s)	Length
1	565
2	1460
3	1460
4	1460
5	1460
6	1460

9. *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?*

Answer: Based on looking at the WireShark, the minimum available buffer space (receiver window) advertised at the received is the value **5840 bytes**. The lack of receiver buffer space **will not throttle** to the sender as the buffer space grow steadily as the maximum is 62780 bytes.

10. *Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?*

Answer: There **are no retransmitted segments** as we can **check the sequence number from the sender (192.168.1.1020 to the receiver**

(128.119.245.12) and saw the sequence is increasing and there's no repeat of sequence that has been retransmitted.

11. *How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment (see Table 3.2 on page 250 in the text).*

Answer: Below is an example of the data the receiver typically acknowledges in the first six segments ACK:

ACK(s)	**Acknowledge Data(s)**
1	565
2	1460
3	1460
4	1460
5	1460
6	1460

And more…

The way we can identify where the receiver is ACKing every other received segment is **by looking at segment at no. 80 where the acknowledge data is 2920 bytes which is the equivalent of 1460 bytes * 2.**

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

Answer: The throughput can be computed through the ratio between the total amount of data and the total transmission time. Below is the equation:

$$\frac{Total\ amount\ data}{Total\ transmission\ time}\ \frac{bytes}{sec}$$

So, the **throughput is** $\frac{164090}{5.4294} = 30222\frac{Bytes}{sec}$

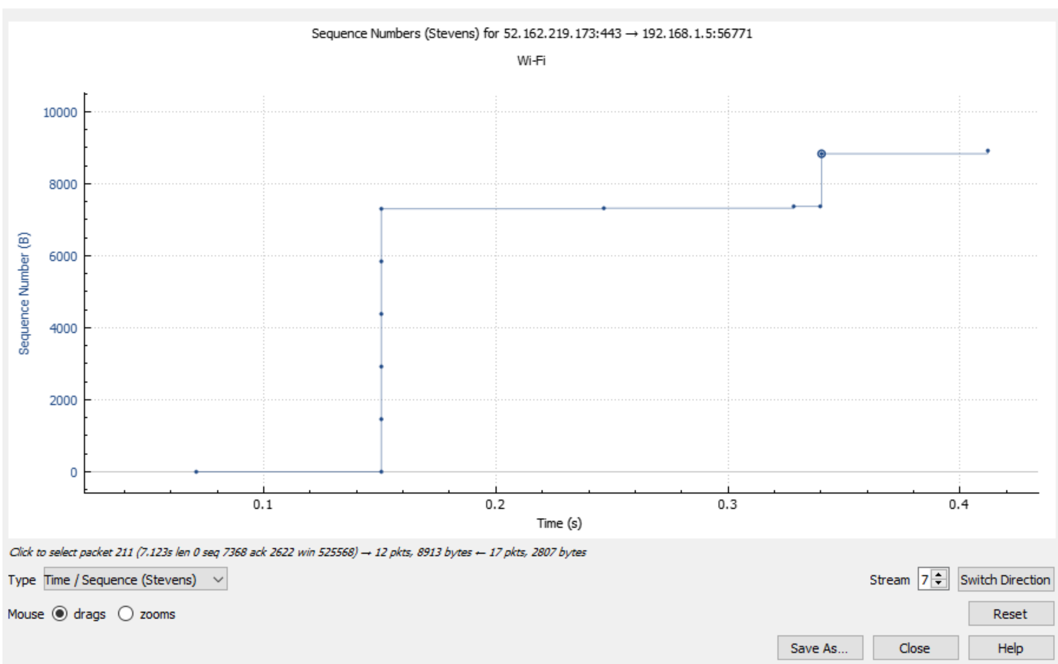
We can calculate this with the total amount data is taking the first sequence number and the last sequence number in the TCP connection and subtract them both to get the total amount data (164091 – 1). Then to get the total transmission is to take the transmission time from the 1st minus from the last TCP connection (5.455830 - 0.026477). Then divide the two to get the throughput.

13. *Use the Time-Sequence-Graph(Stevens) plotting tool to view the sequence number versus time plot of segments being sent from the client to the gaia.cs.umass.edu server. Can you identify where TCP's slow-start 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've studied in the text.*

Answer: The TCP's slowstart phase happen to start at **0 second and end roughly around the 0.1 second.** After **that the congestion avoidance takes over.** In a way data that has been measured is differ from the idealized behavior of TCP is that the idealized behavior is an aggressive in sending data and the graph will form a linear line in which case the measure data may not reflect this.

14. *Answer each of two questions above for the trace that you have gathered when you transferred a file from your computer to gaia.cs.umass.edu*

Answer: Below is an attach screenshot of my Time-Sequence-Graph:



From here, we can see the slowstart phase start **around 0-7500 sequence numbers around the 0.15 second.** Then after that the congestion avoidance take over until at 0.32 second and again after that.