**Lab Exercise 4: Exploring TCP**

**Exercise 1: Understanding TCP using Wireshark**

**Question 1 . What is the IP address of gaia.cs.umass.edu? On what port number is it sending and receiving TCP segments for this connection?**

Table

Description automatically generated

IP address of gaia.cs.umass.edu: 128.119.245.12

Port number: 80

**What are the IP address and TCP port numbers used by the client computer (source) that is transferring the file to gaia.cs.umass.edu?**

IP address: 192.168.1.102

Port number: 1161

**Question 2. What is the sequence number of the TCP segment containing the HTTP POST command?**

**Table

Description automatically generated**

sequence number: 1

**Question 3. 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 sent from the client to the webserver? 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 after the receipt of each ACK? Assume that the initial value of EstimatedRTT is equal to the measured RTT for the first segment, and then is computed using the EstimatedRTT equation for all subsequent segments. Set alpha to 0.125.**

**Text

Description automatically generated**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Sequence number | Sent time (s) | ACK received time (s) | Sample RTT (s) | Estimated RTT (s) |
| 1 | 1 | 0.026477 | 0.053937 | 0.027460 | 0.0274600 |
| 2 | 566 | 0.041737 | 0.077294 | 0.035557 | 0.0284721 |
| 3 | 2026 | 0.054026 | 0.124085 | 0.070059 | 0.0336705 |
| 4 | 3486 | 0.054690 | 0.169118 | 0.114428 | 0.0437652 |
| 5 | 4946 | 0.077405 | 0.217299 | 0.139894 | 0.0557813 |
| 6 | 6406 | 0.078157 | 0.267802 | 0.189645 | 0.0725142 |

|  |
| --- |
| EstimatedRTT of  segment 1 = 0.02746 s |
| EstimatedRTT of  segment 2 = 0.02746 \* 0.875 + 0.035557 \* 0.125 = 0.0284721s |
| EstimatedRTT of  segment 3 = 0.0284721 \* 0.875 + 0.070059 \* 0.125 = 0.0336705s |
| EstimatedRTT of  segment 4 = 0.0336705 \* 0.875 + 0.114428 \* 0.125 = 0.0437652s |
| EstimatedRTT of  segment 5 = 0.0437652 \* 0.875 + 0.139894 \* 0.125 = 0.0557813s |
| EstimatedRTT of  segment 6 = 0.0557813 \* 0.875 + 0.189645 \* 0.125 = 0.0725142s |

**Question 4. What is the length of each of the first six TCP segments? (same six segments as Q3)**

|  |
| --- |
| Length of  segment 1 = 565 |
| Length of  segment 2, 3, 4, 5, 6 = 1460 |

**Question 5. What is the minimum amount of available buffer space advertised at the receiver for the entire trace? Does the lack of receiver buffer space ever throttle the sender?**

**Graphical user interface, application

Description automatically generated**

The minimum amount: 16384

No, this reviver window will grow until it reaches the maximum receiver buffer size (62780 bytes).

**Question 6. Are there any retransmitted segments in the trace file? What did you check for in order to answer this question?**

No. According to the result, All serial numbers from the source to the end increase over time. If there is a retransmission segment, the sequence number of the retransmission segment shall be less than its adjacent segment. Therefore, there is no retransmitted segments in the trace file.

**Question 7. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment?**

According to the result, in this case, the receiver typically acknowledges in an ACK normally get 1460 bytes data. The result is getting by checking the difference between the serial numbers of two consecutive ACKS.

**Question 8. What is the throughput for the TCP connection? Explain how you calculated this value.**

**Table

Description automatically generated**

**Graphical user interface, text, application

Description automatically generated**

**Exercise 2: TCP Connection Management**

**Table

Description automatically generated**

**Question 1 . What is the sequence number of the TCP SYN segment that is used to initiate the TCP connection between the client computer and server?**

The sequence number of the SYN: 2818463618

**Question 2. What is the sequence number of the SYNACK segment sent by the server to the client computer in reply to the SYN? What is the value of the Acknowledgement field in the SYNACK segment? How did the server determine that value?**

The sequence number of the SYN ACK: 1247095790

The ACK: 2818463619

The server determines the client’s ISN (2818463618) add 1.

**Question 3 . What is the sequence number of the ACK segment sent by the client computer in response to the SYNACK? What is the value of the Acknowledgment field in this ACK segment? Does this segment contain any data?**

The sequence number of the SYN ACK: 2818463619

The ACK: 1247095791

No, the next segment used the same sequence number.

**Question 4 . Who has done the active close? client or the server? how you have determined this? What type of closure has been performed? 3 Segment (FIN/FINACK/ACK), 4 Segment (FIN/ACK/FIN/ACK) or Simultaneous close?**

From checking the sequence number of segment 304 and 305, The client and the server both send the FIN to the other. The sequence number of first is 2818463652 and the second is 1247095831. The sequence of the first plus one does not equal the second. Therefore, client and server closed simultaneously.

**Question 5 . How many data bytes have been transferred from the client to the server and from the server to the client during the whole duration of the connection? What relationship does this have with the Initial Sequence Number and the final ACK received from the other side?**