School of Electrical and Electronic of Enginnering
EEE 4474-01 : Experiments on Communication Networks
2조 2016142096 조윤신, 2017142043 김재민

Result Report Week 2

wireshark(2) : TCP UDP IP protocols

1 Experiment 1 : TCP

1.a A first look at the captured trace

We used wireshark's given captured packet file 'TCP-ethreal-trace-1' for experiment 1 answering problem 1 to 12.

Problems

Problem 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? To answer this question, it's probably easiest to select an HTTP message and explore the details of the TCP packet used to carry this HTTP message, using the "details of the selected packet header window"
Answer Source IP address : 192. 168.1.102 / Souce port : 1161

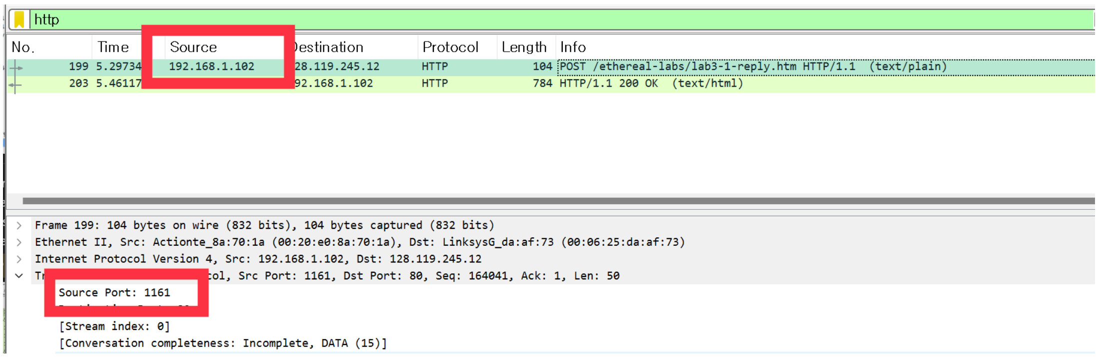


Figure 1: Problem 1-1's screenshot : Packet - POST / reply (text/plain)

Problem 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 Source IP address : 128. 119.245.12 / Souce port : 80

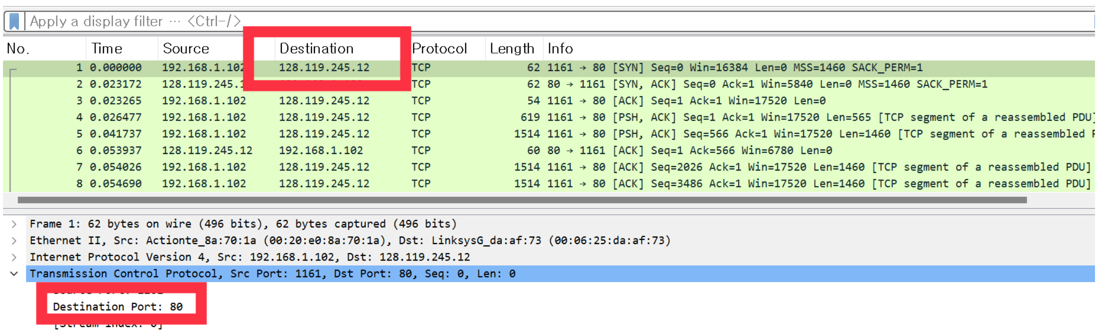


Figure 2: Problem 1-2's screenshot : Packet - [SYN] Seq = 0

1.b TCP Basics

Problems

Problem 3: 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 TCP SYN segment that is used to initate the TCP connection of that is the no.1 Segement in filtered packet list by keyword, 'TCP' is the value of 0.
We can figure out that segment is a SYN segment as that of TCP header contains Flags value.

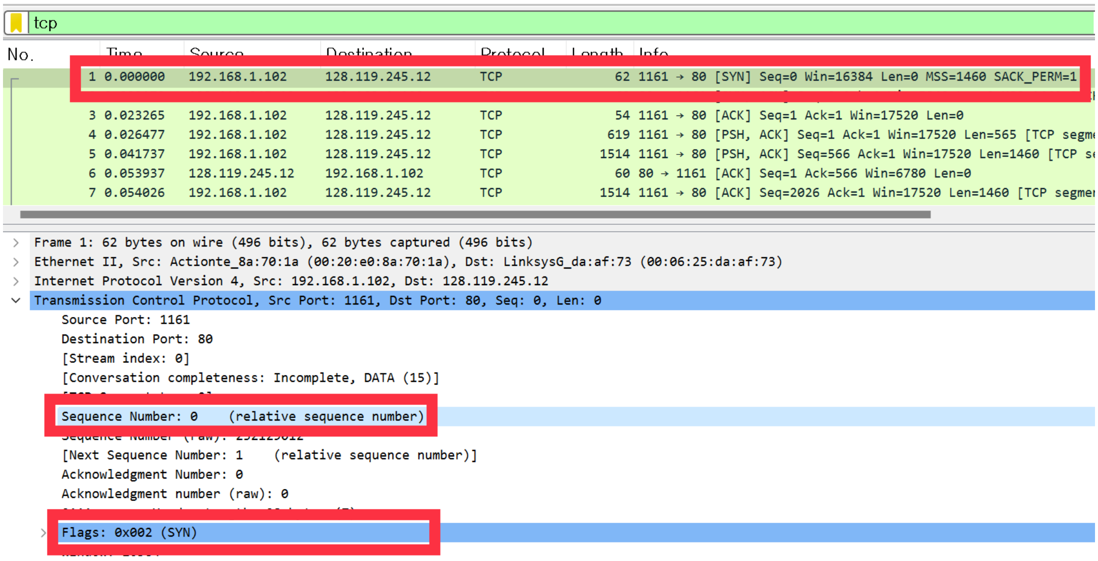


Figure 3: Problem 1-3's screenshot : Packet - [SYN] seq = 0's TCP header

Problem 4: 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 segment is 0.
Acknowledgement field is the value of sequence number plus 1, 1.
The message contains the information of this segment is the SYN,ACK segment as marked figure below.

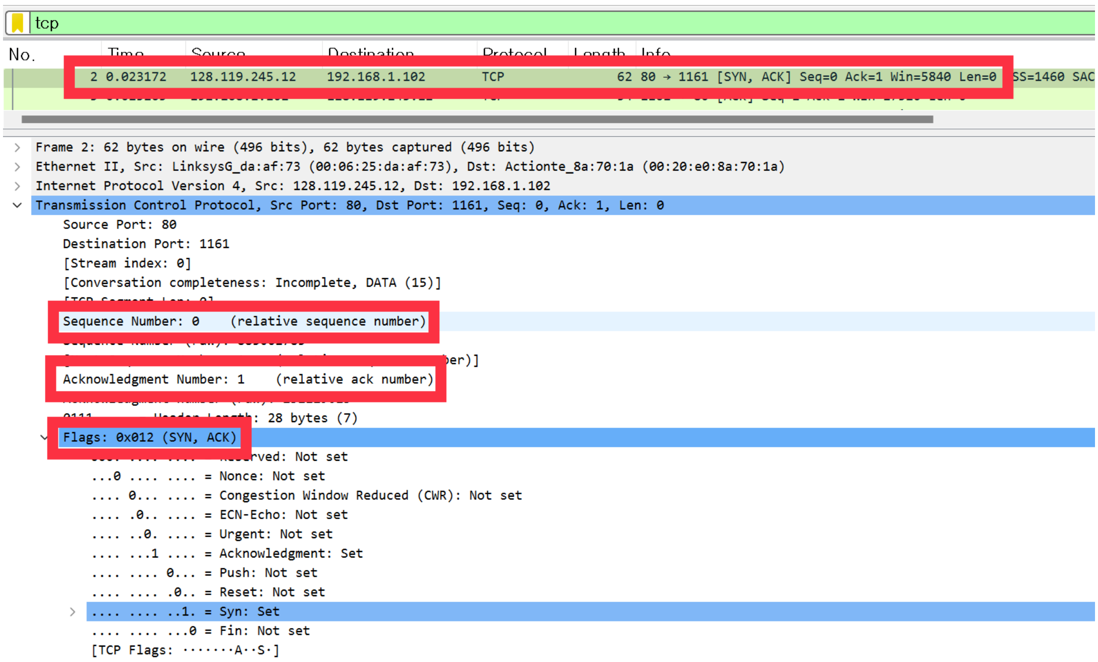


Figure 4: Problem 1-4's screenshot : Packet - HTTP POST's TCP Header

Problem 5: What is the sequence number of the TCP segment containing the HTTP POST command? Note that in order to find the POST command, you'll need to dig into the packet content field at the bottom of the Wireshark window, looking for a segment with a "POST" within its DATA field.

Answer The sequence number of the TCP segment containing the HTTP POST command is 164041.

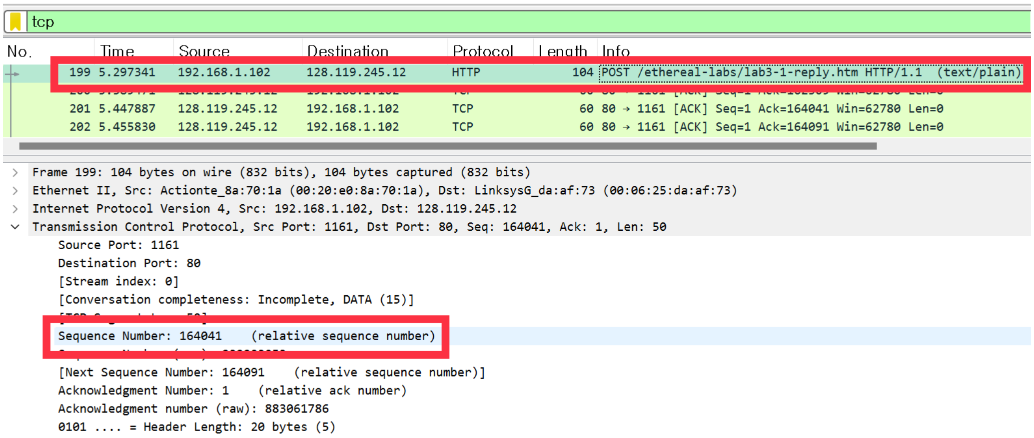


Figure 5: Problem 1-5's screenshot : Packet - HTTP POST's TCP Header

Problem 6: 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 after the receipt of each ACK?

Assume that the value of the EstimatedRTT is equal to the measured RTT for the first segment, and then is computed using the EstimatedRTT equation below for all subsequent segments.

$$\text{Estimated RTT} = 0.875 \times \text{Estimated RTT} + 0.125 \times \text{Sample RTT}$$

Answer The first six segements are No. 4,5,7,8,10,11. And those of sequence number are 1, 566, 2026, 3486, 4946, 6406.

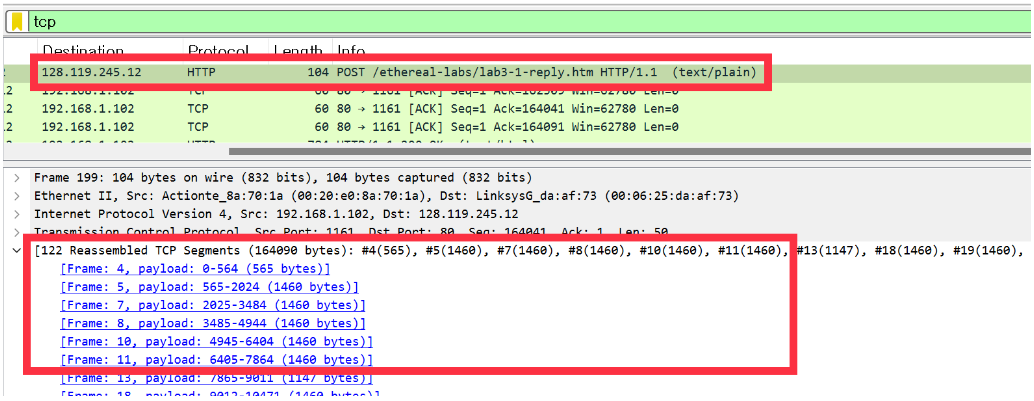
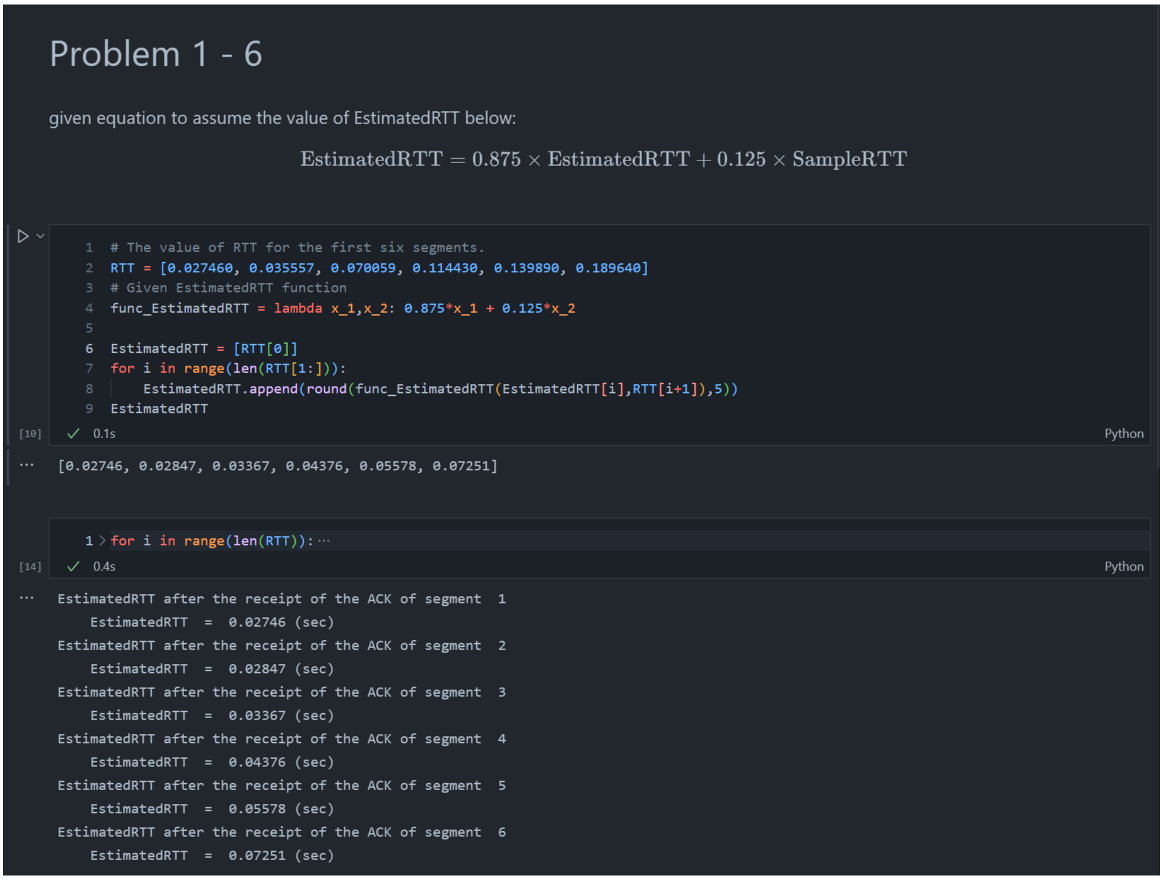


Figure 6: Problem 1-6-1's screenshot :

The time of segment sent, segment received the ACK, and the value of RTT are taken table below. To know each of six segment's ACK received time, the No. of ACKs that segemnts received are No. 6, 9,12,14,15,16.

	Sent Time	Ack Received Time	RTT (ACK Received TIme - Sent Time)
Segment 1	0.026477	0.053937	0.027460
Segment 2	0.041737	0.077294	0.035557
Segment 3	0.054026	0.124085	0.070059
Segment 4	0.054690	0.169118	0.114430
Segment 5	0.077405	0.217299	0.139890
Segment 6	0.078157	0.267802	0.189640

The estimated RTT is calculated by given equation.



Problem 1 - 6

given equation to assume the value of EstimatedRTT below:

$$\mathrm{EstimatedRTT} = 0.875 \times \mathrm{EstimatedRTT} + 0.125 \times \mathrm{SampleRTT}$$

```python
# The value of RTT for the first six segments.
RTT = [0.027460, 0.035557, 0.070059, 0.114430, 0.139890, 0.189640]
# Given EstimatedRTT function
func_EstimatedRTT = lambda x_1,x_2: 0.875*x_1 + 0.125*x_2

EstimatedRTT = [RTT[0]]
for i in range(len(RTT[1:])):
    EstimatedRTT.append(round(func_EstimatedRTT(EstimatedRTT[i],RTT[i+1]),5))
EstimatedRTT
```

[10] ✓ 0.1s Python

```
[0.02746, 0.02847, 0.03367, 0.04376, 0.05578, 0.07251]
```

```python
for i in range(len(RTT)): ...
```

[14] ✓ 0.4s Python

```
EstimatedRTT after the receipt of the ACK of segment  1
    EstimatedRTT  =  0.02746 (sec)
EstimatedRTT after the receipt of the ACK of segment  2
    EstimatedRTT  =  0.02847 (sec)
EstimatedRTT after the receipt of the ACK of segment  3
    EstimatedRTT  =  0.03367 (sec)
EstimatedRTT after the receipt of the ACK of segment  4
    EstimatedRTT  =  0.04376 (sec)
EstimatedRTT after the receipt of the ACK of segment  5
    EstimatedRTT  =  0.05578 (sec)
EstimatedRTT after the receipt of the ACK of segment  6
    EstimatedRTT  =  0.07251 (sec)
```

Figure 7: Problem 1-6-2's screenshot : The result of EstimatedRTT by jupyter notebook

The RTT plot for packet in

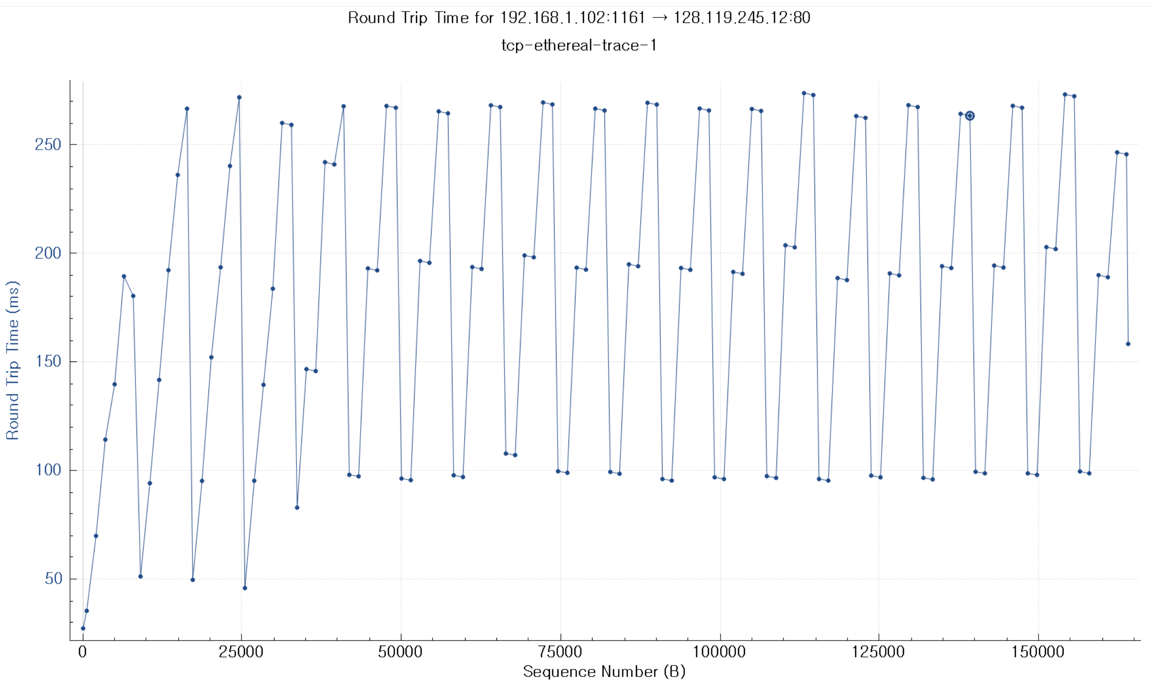
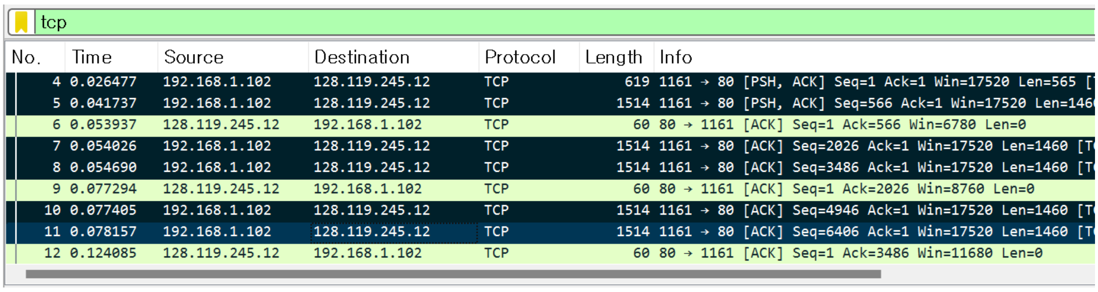


Figure 8: Problem 1-6-3's screenshot : RTT plot

Problem 7: What is the length of each of the first six TCP segments?
Answer The length [1] of the fitst TCP segments is 565, and the other TCP segments are 1460 as same.


tcp

No.	Time	Source	Destination	Protocol	Length	Info
4	0.026477	192.168.1.102	128.119.245.12	TCP	619	1161 → 80 [PSH, ACK] Seq=1 Ack=1 Win=17520 Len=565 [
5	0.041737	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [PSH, ACK] Seq=566 Ack=1 Win=17520 Len=146
6	0.053937	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=566 Win=6780 Len=0
7	0.054026	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=2026 Ack=1 Win=17520 Len=1460 [T
8	0.054690	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=3486 Ack=1 Win=17520 Len=1460 [T
9	0.077294	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=2026 Win=8760 Len=0
10	0.077405	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=4946 Ack=1 Win=17520 Len=1460 [T
11	0.078157	192.168.1.102	128.119.245.12	TCP	1514	1161 → 80 [ACK] Seq=6406 Ack=1 Win=17520 Len=1460 [T
12	0.124085	128.119.245.12	192.168.1.102	TCP	60	80 → 1161 [ACK] Seq=1 Ack=3486 Win=11680 Len=0

Figure 9: Problem 1-7's screenshot : Packet List - Marked the first six TCP segments, No.4, 5, 7, 8, 10, 11

Problem 8: 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

Problem 9: Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?
Answer

Problem 10: How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment.
Answer

Problem 11: What is the throughput for the TCP connection? Explain how you calculated this value.
Answer

[1] 'Len' in packet info in Figure 9

1.c TCP congestion control in action

Problems

Problem 12: 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

2 Experiment 2: UDP

Problems

Problem 1: Select one UDP packet from you r trace . From this packet, determine how many fields there are in the UDP header.
Answer

Problem 2: By consulting the displayed information in Wireshark's this packet packet content field for ,determine the length (in bytes) of each of the UDP header fields.
Answer

Problem 3: The value in the Length field is the length of what? this answer
Answer

Problem 4: What is the maximum number of bytes that c
Answer

Problem 5: What is the largest possible source port number?
Answer

Problem 6: What is the protocol number for UDP? Give your answer in both hex decimal notation. To answer this question, you'll need to loo adecimal and k into the field of the IP datagram containing this UDP segment.
Answer

3 Experiment 3 : IP

3.a Capturing packets from an execution of traceroute

Problems

Problem 1: Select the first ICMP Echo Request message sent by your computer, and expand the Internet Protocol part of the packet in the packet details window. What is the IP address of your computer?
Answer

Problem 2: Within the IP packet header, what is the value in the upper layer protocol field?
Answer

Problem 3: How many bytes are in the IP header?
Answer

Problem 4: How many bytes are in the payload of the IP datagram? Explain how you determined the number of payload bytes.
Answer

Problem 5: Has this IP datagram been fragmented? Explain how you determined whether or not the datagram has been fragmented.
Answer

3.b Basic IPv4

Problem 6: Which fields in the IP datagram always change from one datagram to the next within this series of UDP segments sent by your computer destined to 128.119.245.12, via traceroute? Why?
Answer

Problem 7: Which fields in this sequence of IP datagrams (containing UDP segments) stay constant? Why?
Answer

Problem 8: Describe the pattern you see in the values in the Identification field of the IP datagrams being sent by your computer.
Answer

3.c Fragmentation

Problems

Problem 9: Find the first IP datagram containing the first part of the segment sent to 128.119.245.12 sent by your computer via the traceroute command to gaia.cs.umass.edu, after you specified that the traceroute packet length should be 3000. Has that segment been fragmented across more than one IP datagram?
Answer

Problem 10: What information in the IP header indicates that this datagram been fragmented?
Answer

Problem 11: What information in the IP header for this packet indicates whether this is the first fragment versus a latter fragment?
Answer

Problem 12: How many bytes are there in is this IP datagram (header plus payload)?
Answer

Problem 13: Now inspect the datagram containing the second fragment of the fragmented UDP segment. What information in the IP header indicates that this is not the first datagram fragment?
Answer

Problem 14: What fields change in the IP header between the first and second fragment?
Answer