

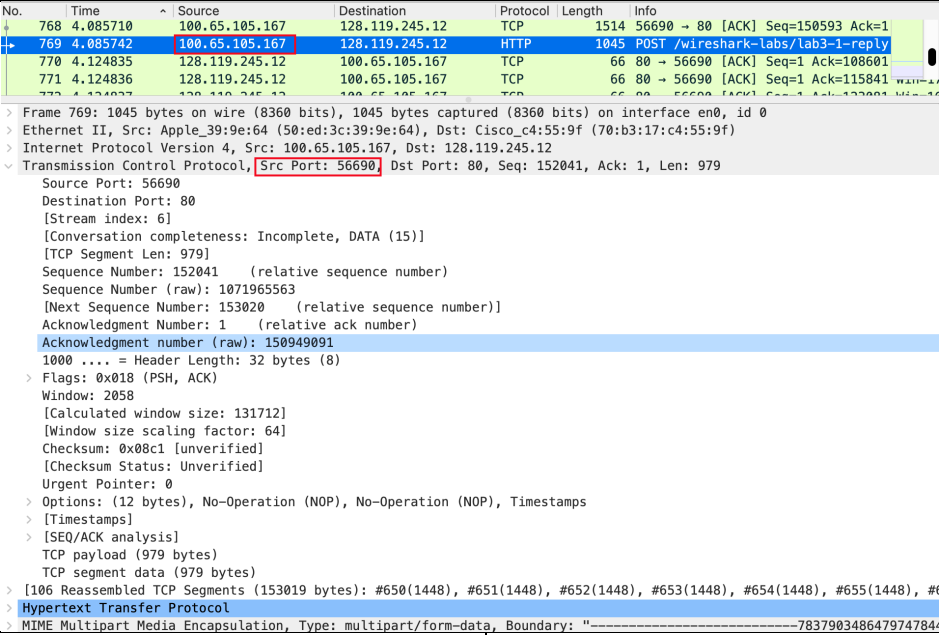
Wireshark Lab 3: TCP

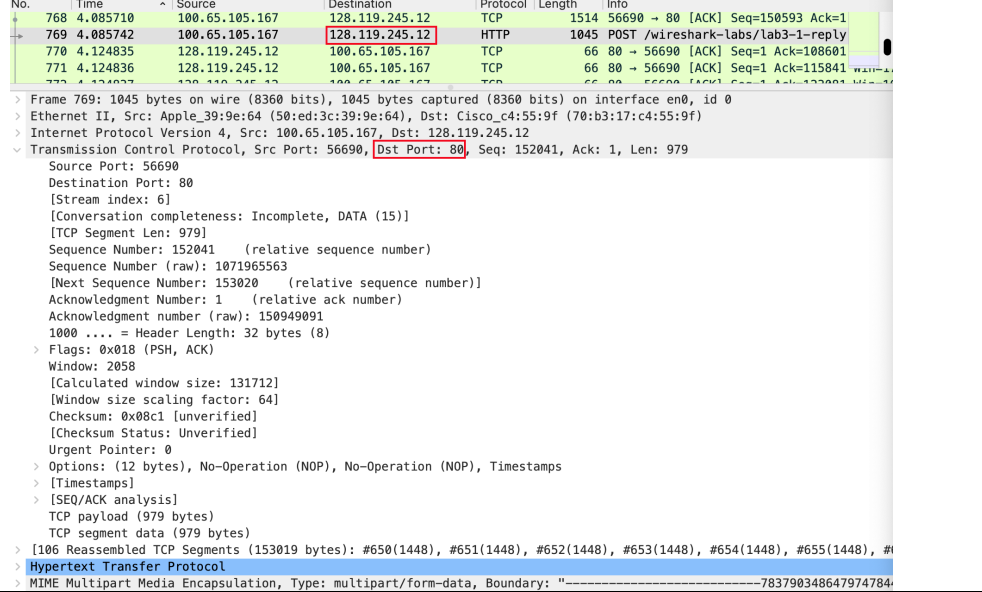
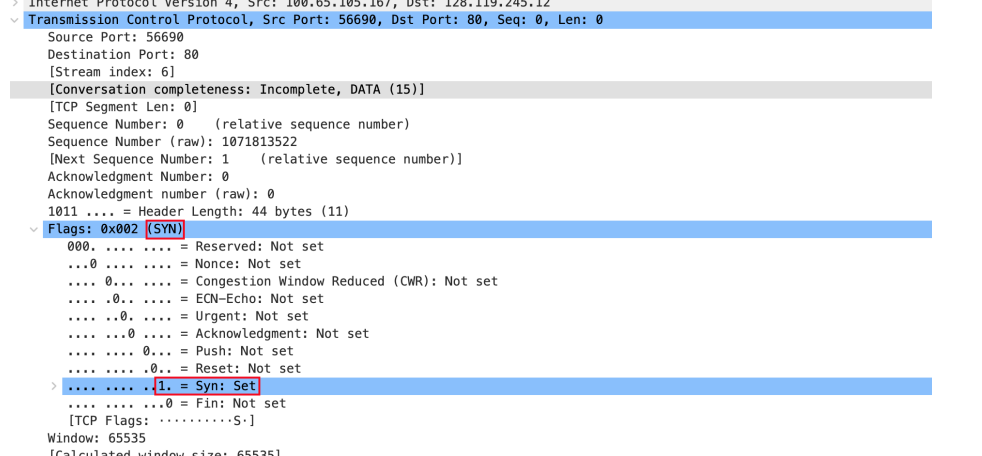
Group Details:

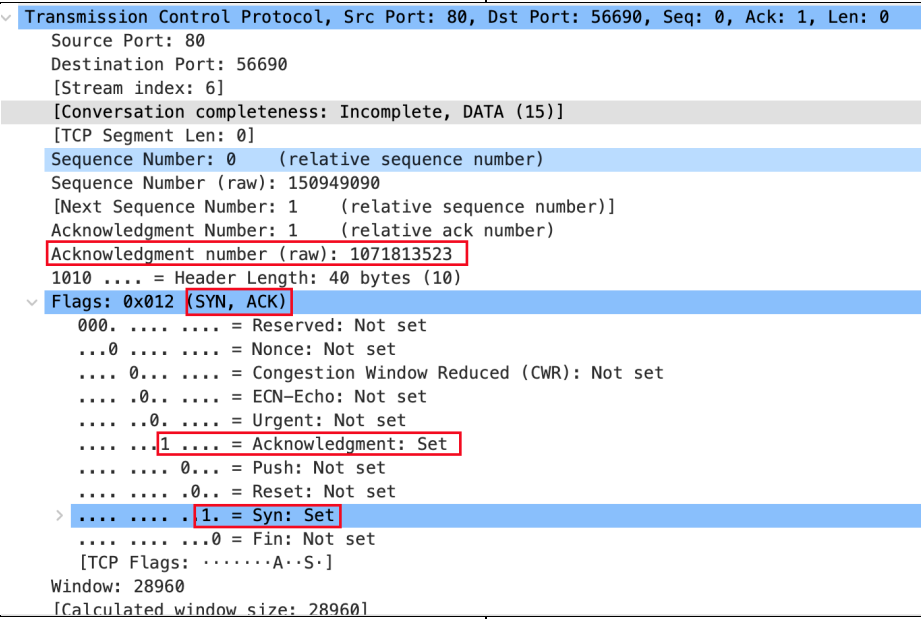
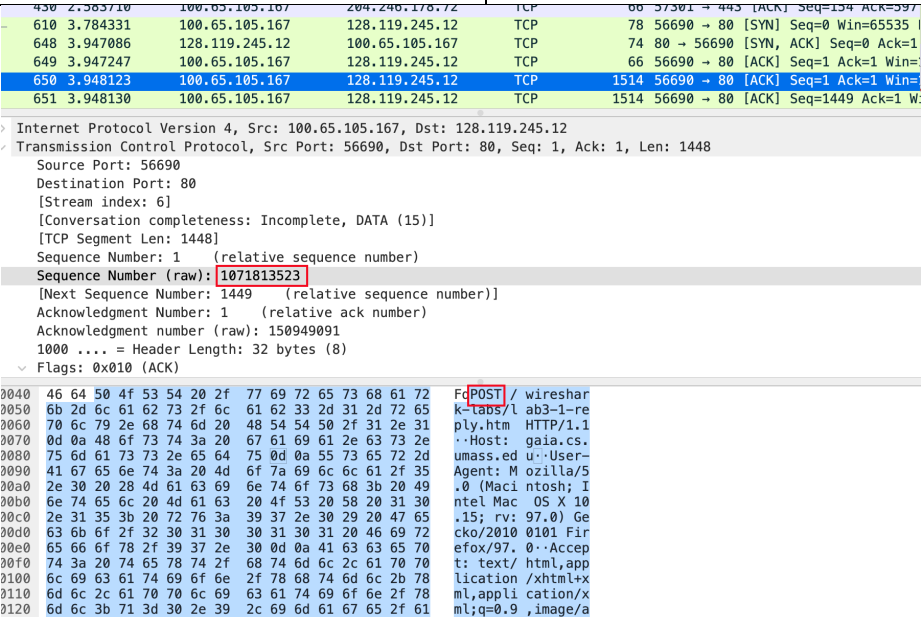
Yuhe Chen

Leting Ni

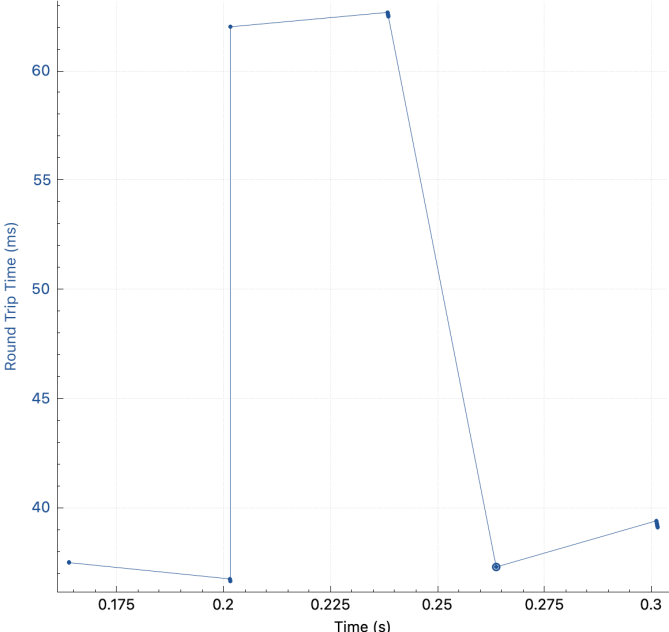
Mark:

	Question	Answer
1	What is the IP address and TCP port number used by your client computer (source) that is transferring the file to gaia.cs.umass.edu?	IP address is: 100.05.105.167 Port Number is 56690
Annotated Screenshots (if needed)	 <p> No. Time Source Destination Protocol Length Info 768 4.085710 100.05.105.167 128.119.245.12 TCP 1514 56690 → 80 [ACK] Seq=150593 Ack=1 769 4.085742 100.05.105.167 128.119.245.12 HTTP 1045 POST /wireshark-labs/lab3-1-reply 770 4.124835 128.119.245.12 100.05.105.167 TCP 66 80 → 56690 [ACK] Seq=1 Ack=108601 771 4.124836 128.119.245.12 100.05.105.167 TCP 66 80 → 56690 [ACK] Seq=1 Ack=115841 772 4.124837 100.05.105.167 128.119.245.12 TCP 66 56690 → 80 [ACK] Seq=1 Ack=122001 Win=14 </p> <p> > Frame 769: 1045 bytes on wire (8360 bits), 1045 bytes captured (8360 bits) on interface en0, id 0 > Ethernet II, Src: Apple_39:9e:64 (50:ed:3c:39:9e:64), Dst: Cisco_c4:55:9f (70:b3:17:c4:55:9f) > Internet Protocol Version 4, Src: 100.05.105.167, Dst: 128.119.245.12 > Transmission Control Protocol, Src Port: 56690, Dst Port: 80, Seq: 152041, Ack: 1, Len: 979 Source Port: 56690 Destination Port: 80 [Stream index: 6] [Conversation completeness: Incomplete, DATA (15)] [TCP Segment Len: 979] Sequence Number: 152041 (relative sequence number) Sequence Number (raw): 1071965563 [Next Sequence Number: 153020 (relative sequence number)] Acknowledgment Number: 1 (relative ack number) Acknowledgment number (raw): 150949091 1000 ... = Header Length: 32 bytes (8) > Flags: 0x018 (PSH, ACK) Window: 2058 [Calculated window size: 131712] [Window size scaling factor: 64] Checksum: 0x08c1 [unverified] [Checksum Status: Unverified] Urgent Pointer: 0 > Options: (12 bytes), No-Operation (NOP), No-Operation (NOP), Timestamps > [Timestamps] > [SEQ/ACK analysis] TCP payload (979 bytes) TCP segment data (979 bytes) > [106 Reassembled TCP Segments (153019 bytes): #650(1448), #651(1448), #652(1448), #653(1448), #654(1448), #655(1448), #656(1448), #657(1448), #658(1448), #659(1448), #660(1448), #661(1448), #662(1448), #663(1448), #664(1448), #665(1448), #666(1448), #667(1448), #668(1448), #669(1448), #670(1448), #671(1448), #672(1448), #673(1448), #674(1448), #675(1448), 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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?	IP address: 128.119.245.12 Port number: 80

Annotated Screenshots (if needed)		
4	<p>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?</p>	<p>Sequence number: 1071813522 What identifies this as SYN segment: The Flags in this TCP segment is SYN. And it's set to 1 at last.</p>
Annotated Screenshots (if needed)		
5	<p>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</p>	<p>Sequence number: 150949090 Acknowledgement number: 1071813523 How determine ACK value: ACK is always set to sequence number from the received packet + 1 What identifies as a SYNACK</p>

	gaia.cs.umass.edu determine that value? What is it in the segment that identifies the segment as a SYNACK segment?	segment: the flag contains SYNACK, and the value of SYN and ACK are both set to 1.
Annotated Screenshots (if needed)		
6	What is the sequence number of the TCP segment containing the HTTP POST command?	Sequence number: 1071813523
Annotated Screenshots (if needed)		
7	Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection.	The sequence number for the first 6 segments are: 1, 1449, 2897, 4345, 5793, 7241.

	<p>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?</p> <p>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?</p>	<p>The first 6 segments are sent at 3.948123 3.948130 3.948133 3.948136 3.948139 3.948141 seconds after the recording begins.</p> <p>The ACK for 7241, which is the last segment number of the first 6 segments sent, arrives at 3.985639 after the recording begins. No other ACKs for former segments are received. Since a cumulative ACK is used, we know that former package has been received.</p> <p>Since we only have the last segment's ACK, we can't calculate the RTT value for each. However, each segment takes $(3.985639 - 3.948123) / 6 = 6.252 \text{ ms}$</p> <p>The EstimatedRTT should be $(1 - \alpha) * \text{EstimatedRTT} + \alpha * \text{SampleRTT}$, where $\alpha = 0.125$ for each segment. As we only know the ACK for the last of the first 6 segments, we can't calculate the EstimatedRTT after the receipt of each ACK.</p>																																																																																																																															
Annotated Screenshots (if needed)	<table><thead><tr><th>No.</th><th>Time</th><th>Source</th><th>Destination</th><th>Protocol</th><th>Length</th><th>Info</th></tr></thead><tbody><tr><td>618</td><td>3.784331</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>78</td><td>56690 → 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=3239587579 TSecr=0 SACK_PERM</td></tr><tr><td>648</td><td>3.947886</td><td>128.119.245.12</td><td>100.65.105.167</td><td>TCP</td><td>74</td><td>80 → 56690 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=2372290148</td></tr><tr><td>649</td><td>3.947247</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>66</td><td>56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=0 TSval=3239587742 TSecr=2372290148</td></tr><tr><td>650</td><td>3.948123</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=1448 TSval=3239587742 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657	3.948144	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=10137 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372290148																																																																																																																											
658	3.948147	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=11585 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372290148																																																																																																																											
659	3.948149	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=13033 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372290148																																																																																																																											
660	3.985639	128.119.245.12	100.65.105.167	TCP	66	80 → 56690 [ACK] Seq=1 Ack=7241 Win=43520 Len=0 TSval=2372290198 TSecr=3239587742																																																																																																																											
661	3.985640	128.119.245.12	100.65.105.167	TCP	66	80 → 56690 [ACK] Seq=1 Ack=14481 Win=57984 Len=0 TSval=2372290198 TSecr=3239587742																																																																																																																											
662	3.985744	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=14481 Ack=1 Win=131712 Len=1448 TSval=3239587781 TSecr=2372290198																																																																																																																											
663	3.985748	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=15929 Ack=1 Win=131712 Len=1448 TSval=3239587781 TSecr=2372290198																																																																																																																											

	Round Trip Time for 100.65.105.167:56690 → 128.119.245.12:80 Wi-Fi: en0																																																																																					
																																																																																						
8	What is the length of each of the first six TCP segments?	All 6 has length of 1448.																																																																																				
Annotated Screenshots (if needed)	<table><tr><th>No.</th><th>Time</th><th>Source</th><th>Destination</th><th>Protocol</th><th>Length</th><th>Info</th></tr><tr><td>618</td><td>3.784331</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>78</td><td>56690 → 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=3239587579 TSecr=0 SACK_PERM=0</td></tr><tr><td>648</td><td>3.947886</td><td>128.119.245.12</td><td>100.65.105.167</td><td>TCP</td><td>74</td><td>80 → 56690 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=2372298148 TSecr=0</td></tr><tr><td>649</td><td>3.947247</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>66</td><td>56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=0 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>650</td><td>3.948123</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>651</td><td>3.948130</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=1449 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>652</td><td>3.948133</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=2897 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>653</td><td>3.948136</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=4345 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>654</td><td>3.948139</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=5793 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>655</td><td>3.948141</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=7241 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>656</td><td>3.948142</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=8689 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr><tr><td>657</td><td>3.948144</td><td>100.65.105.167</td><td>128.119.245.12</td><td>TCP</td><td>1514</td><td>56690 → 80 [ACK] Seq=10137 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148</td></tr></table>		No.	Time	Source	Destination	Protocol	Length	Info	618	3.784331	100.65.105.167	128.119.245.12	TCP	78	56690 → 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=64 TSval=3239587579 TSecr=0 SACK_PERM=0	648	3.947886	128.119.245.12	100.65.105.167	TCP	74	80 → 56690 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=2372298148 TSecr=0	649	3.947247	100.65.105.167	128.119.245.12	TCP	66	56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=0 TSval=3239587742 TSecr=2372298148	650	3.948123	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=1 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	651	3.948130	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=1449 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	652	3.948133	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=2897 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	653	3.948136	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=4345 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	654	3.948139	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=5793 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	655	3.948141	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=7241 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	656	3.948142	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=8689 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148	657	3.948144	100.65.105.167	128.119.245.12	TCP	1514	56690 → 80 [ACK] Seq=10137 Ack=1 Win=131712 Len=1448 TSval=3239587742 TSecr=2372298148
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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?	Minimum amount of the available buffer space: 1731712 The lack of receiver buffer did not throttle the sender.																																																																																				
Annotated Screenshots (if needed)	<pre>Win=131712 Len= Win=131712 Len= =1 Win=131712 L =1 Win=131712 L =1 Win=131712 L =1 Win=131712 L =1 Win=131712 L =1 Win=131712 L k=1 Win=131712 k=1 Win=131712</pre>																																																																																					
10	Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?	No. Should check for segment in the same direction with the same sequence number.																																																																																				

Annotated Screenshots (if needed)		
11	<p>How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment</p>	<p>7240 bytes When in-order segment arrive with expected sequence number and all segment before this sequence number are already acknowledged, TCP sends ACK for every other packet. When there are some segments before this segment number waiting for ACK, TCP send single cumulative ACK for this segment.</p>
Annotated Screenshots (if needed)	<pre> 648 3.947886 128.119.245.12 100.65.105.167 TCP 74 80 - 56690 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 M 660 3.985639 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=7241 Win=43520 Len=0 TSv 661 3.985640 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=14481 Win=57984 Len=0 TS 682 4.022489 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=21721 Win=72448 Len=0 TS 683 4.022490 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=28961 Win=86912 Len=0 TS 684 4.022490 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=36201 Win=101376 Len=0 T 715 4.047887 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=43441 Win=115840 Len=0 T 726 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=50681 Win=130432 Len=0 T 727 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=57921 Win=144896 Len=0 T 728 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=65161 Win=159360 Len=0 T 729 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=72401 Win=164608 Len=0 T 730 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=79641 Win=159616 Len=0 T 731 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=86881 Win=164608 Len=0 T 732 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=94121 Win=179584 Len=0 T 733 4.085288 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=101361 Win=179584 Len=0 770 4.124835 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=108601 Win=179584 Len=0 771 4.124836 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=115841 Win=174592 Len=0 772 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=123081 Win=169728 Len=0 773 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=130321 Win=164608 Len=0 774 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=137561 Win=159616 Len=0 </pre>	
12	<p>What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.</p>	<p>Use the time interval between the first and last ACK, divided by the final ACK number, which is the total number of bytes transmitted. Throughput = $153020 * 8 / (4.124839 - 3.947086) = 6.8 \text{ Mbit/s}$</p>
Annotated Screenshots (if needed)	<pre> No. Time Source Destination Protocol Length Info 648 3.947886 128.119.245.12 100.65.105.167 TCP 74 80 - 56690 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=2372298148 TSec 660 3.985639 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=7241 Win=43520 Len=0 TSval=2372298148 TSecr=3239587781 661 3.985640 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=14481 Win=57984 Len=0 TSval=2372298148 TSecr=3239587781 682 4.022489 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=21721 Win=72448 Len=0 TSval=2372298148 TSecr=3239587781 683 4.022490 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=28961 Win=86912 Len=0 TSval=2372298148 TSecr=3239587781 684 4.022490 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=36201 Win=101376 Len=0 TSval=2372298148 TSecr=3239587781 715 4.047887 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=43441 Win=115840 Len=0 TSval=2372298148 TSecr=3239587781 726 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=50681 Win=130432 Len=0 TSval=2372298148 TSecr=3239587781 727 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=57921 Win=144896 Len=0 TSval=2372298148 TSecr=3239587781 728 4.085286 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=65161 Win=159360 Len=0 TSval=2372298148 TSecr=3239587781 729 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=72401 Win=164608 Len=0 TSval=2372298148 TSecr=3239587781 730 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=79641 Win=159616 Len=0 TSval=2372298148 TSecr=3239587781 731 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=86881 Win=164608 Len=0 TSval=2372298148 TSecr=3239587781 732 4.085287 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=94121 Win=179584 Len=0 TSval=2372298148 TSecr=3239587781 733 4.085288 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=101361 Win=179584 Len=0 TSval=2372298148 TSecr=3239587781 770 4.124835 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=108601 Win=179584 Len=0 TSval=2372298148 TSecr=3239587781 771 4.124836 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=115841 Win=174592 Len=0 TSval=2372298148 TSecr=3239587781 772 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=123081 Win=169728 Len=0 TSval=2372298148 TSecr=3239587781 773 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=130321 Win=164608 Len=0 TSval=2372298148 TSecr=3239587781 774 4.124837 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=137561 Win=159616 Len=0 TSval=2372298148 TSecr=3239587781 775 4.124838 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=144801 Win=174464 Len=0 TSval=2372298148 TSecr=3239587781 776 4.124838 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=152041 Win=179584 Len=0 TSval=2372298148 TSecr=3239587781 777 4.124838 128.119.245.12 100.65.105.167 TCP 66 80 - 56690 [ACK] Seq=1 Ack=159200 Win=183296 Len=0 TSval=2372298148 TSecr=3239587781 778 4.124839 128.119.245.12 100.65.105.167 TCP 843 80 - 56690 [PSH, ACK] Seq=1 Ack=153020 Win=183296 Len=777 TSval=2372298148 TSecr=3239587781 </pre>	
13	<p>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 slowstart phase begins and ends, and where congestion avoidance takes over? Comment on</p>	<p>The time is labeled in the graph. The segment size increases not linearly when enters congestion avoidance, which should be, as we mentioned in class.</p>

	<p>ways in which the measured data differs from the idealized behavior of TCP that we’ve studied in the text.</p> <p>Tip: if your time sequence doesn’t look like the one in the handout, try pressing the Switch Direction button.</p>															
Annotated Screenshots (if needed)	<p>Sequence Numbers (Stevens) for 100.65.105.167:56690 → 128.119.245.12:80</p> <p>Wi-Fi: en0</p> <p>The graph displays the sequence number of bytes received over time. The data shows a series of steps, indicating successful data reception. The first step occurs at approximately 0.16 seconds, labeled 'slow start begins'. Subsequent steps occur at approximately 0.20, 0.24, 0.26, and 0.30 seconds. The step at 0.26 seconds is labeled 'Congestion Avoidance Take Over'. A final, large jump occurs at approximately 0.30 seconds, reaching a sequence number of 150,000.</p> <table><caption>Approximate data points from the TCP sequence number graph</caption><tr><th>Time (s)</th><th>Sequence Number (B)</th></tr><tr><td>0.00</td><td>0</td></tr><tr><td>0.16</td><td>~10,000</td></tr><tr><td>0.20</td><td>~40,000</td></tr><tr><td>0.24</td><td>~85,000</td></tr><tr><td>0.26</td><td>~100,000</td></tr><tr><td>0.30</td><td>150,000</td></tr></table>	Time (s)	Sequence Number (B)	0.00	0	0.16	~10,000	0.20	~40,000	0.24	~85,000	0.26	~100,000	0.30	150,000	
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0.20	~40,000															
0.24	~85,000															
0.26	~100,000															
0.30	150,000															
<p><i>Question 14 omitted</i></p>																