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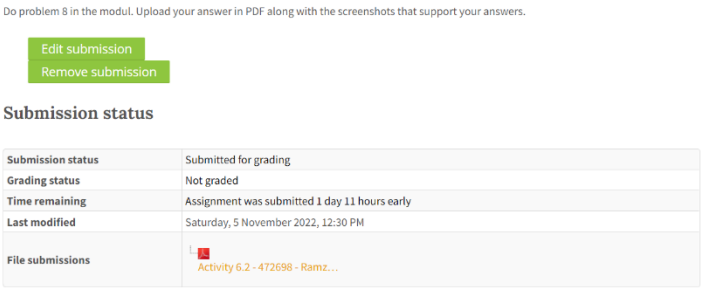
21/472698/PA/20322
IUP CS B

Assignment 6 – Computer System and Networking Lab

1. Do Activity 6.2. Submit it directly to Activity 6.2

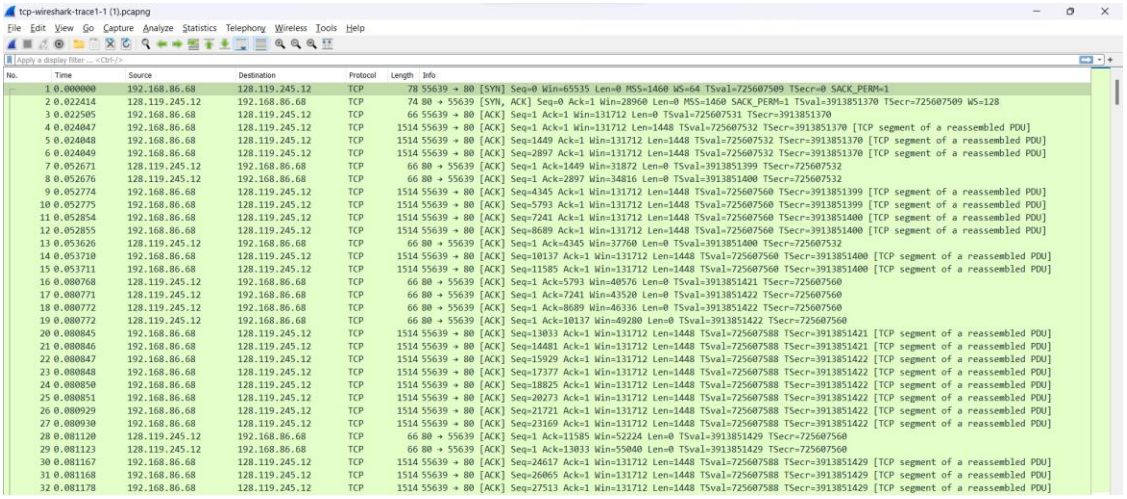


2. Read how to calculate Estimated RTT from the supplementary material in Elok. Count Estimated RTT up to the last TCP segment that contains the data in the tracefile. Similar with Activity 6.2, the first TCP segment is the first segment that contains data (ignore the segments involved in the three-way handshake). Plot the graphic showing the relationship between Sample RTT and Estimated RTT as shown in Figure 3.32 in the supplementary material. *Use alpha=0.125.

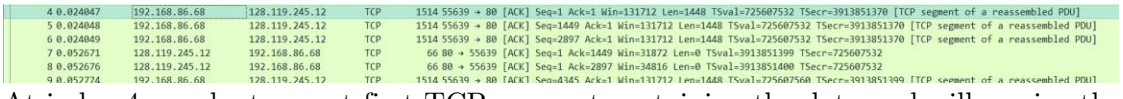
Answer:

In order to calculate *EstimatedRTT*, we will implement the formula:
EstimatedRTT = (1-α).EstimatedRTT+α.SampleRTT, where $\alpha = 0.125$

Step 1: Open the tracefile into wireshark

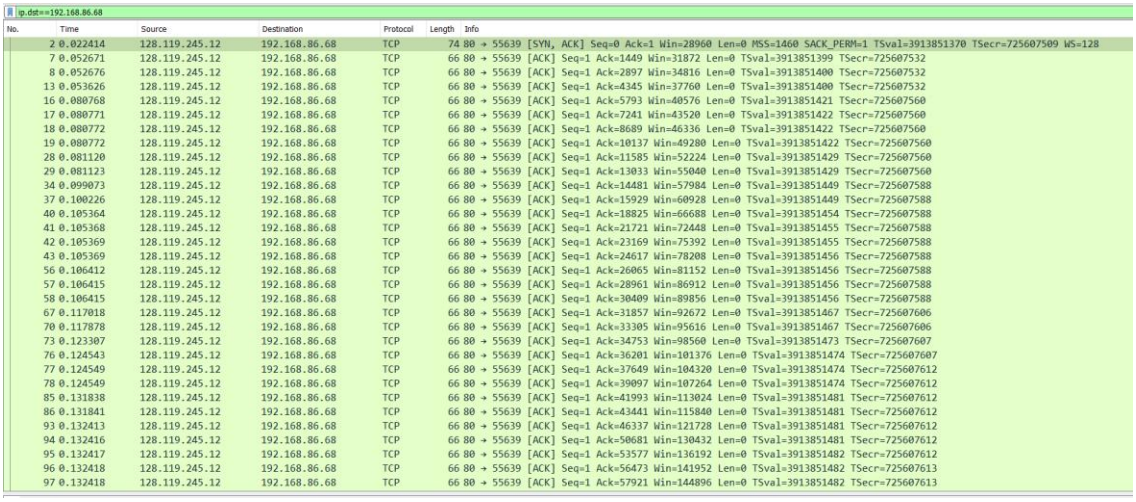


Step 2: Determine first TCP segment after 3-way-handshake



At index 4, our laptop sent first TCP segment containing the data and will receive the first ACK at index 7. From there, we can start calculating our first SampleRTT which is the delta time of time ACK and time sent.

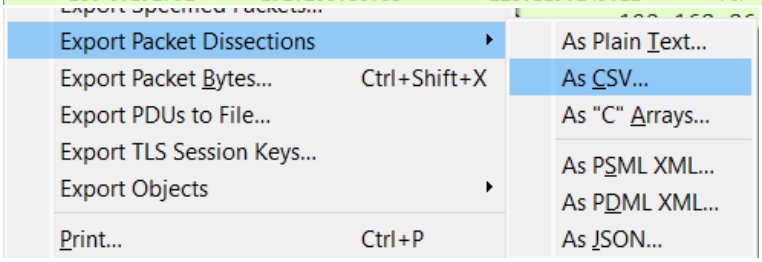
Step 3: Filter only the connections between gaia server with our laptop.
Note that, to avoid TCP segment data that are not belong to our current calculation (from other IP Addresses), it is important to filter only the specified IP address that we would like to dig in, i.e 192.168.86.68.



No.	Time	Source	Destination	Protocol	Length	Info
2	0.022414	128.119.245.12	192.168.86.68	TCP	74	80 → 55639 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len=0 MSS=1460 SACK_PERM=1 TSval=3913851370 TSecr=725607509 WS=128
7	0.052671	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=1449 Win=31872 Len=0 TSval=3913851399 TSecr=725607532
8	0.052676	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=2897 Win=34816 Len=0 TSval=3913851400 TSecr=725607532
13	0.053626	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=4345 Win=37760 Len=0 TSval=3913851400 TSecr=725607532
16	0.080768	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=5793 Win=40576 Len=0 TSval=3913851421 TSecr=725607560
17	0.080771	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=7241 Win=43520 Len=0 TSval=3913851422 TSecr=725607560
18	0.080772	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=8689 Win=46336 Len=0 TSval=3913851422 TSecr=725607560
19	0.080772	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=10137 Win=49280 Len=0 TSval=3913851422 TSecr=725607560
28	0.081120	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=11585 Win=52224 Len=0 TSval=3913851429 TSecr=725607560
29	0.081123	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=13033 Win=55040 Len=0 TSval=3913851429 TSecr=725607560
34	0.099073	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=14481 Win=57984 Len=0 TSval=3913851449 TSecr=725607588
37	0.100226	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=15929 Win=60928 Len=0 TSval=3913851449 TSecr=725607588
40	0.105364	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=18825 Win=66688 Len=0 TSval=3913851454 TSecr=725607588
41	0.105368	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=21721 Win=72448 Len=0 TSval=3913851455 TSecr=725607588
42	0.105369	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=23169 Win=75392 Len=0 TSval=3913851455 TSecr=725607588
43	0.105369	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=24617 Win=78208 Len=0 TSval=3913851456 TSecr=725607588
56	0.106412	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=26065 Win=81152 Len=0 TSval=3913851456 TSecr=725607588
57	0.106415	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=28961 Win=86912 Len=0 TSval=3913851456 TSecr=725607588
58	0.106415	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=30409 Win=89856 Len=0 TSval=3913851456 TSecr=725607588
67	0.117018	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=31857 Win=92672 Len=0 TSval=3913851467 TSecr=725607606
70	0.117878	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=33305 Win=95616 Len=0 TSval=3913851467 TSecr=725607606
73	0.123307	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=34753 Win=98560 Len=0 TSval=3913851473 TSecr=725607607
76	0.124543	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=36201 Win=101376 Len=0 TSval=3913851474 TSecr=725607607
77	0.124549	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=37649 Win=104320 Len=0 TSval=3913851474 TSecr=725607612
78	0.124549	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=39097 Win=107264 Len=0 TSval=3913851474 TSecr=725607612
85	0.131838	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=41993 Win=113024 Len=0 TSval=3913851481 TSecr=725607612
86	0.131841	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=43441 Win=115840 Len=0 TSval=3913851481 TSecr=725607612
93	0.132413	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=46337 Win=121728 Len=0 TSval=3913851481 TSecr=725607612
94	0.132416	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=50681 Win=130432 Len=0 TSval=3913851481 TSecr=725607612
95	0.132417	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=53577 Win=136192 Len=0 TSval=3913851482 TSecr=725607612
96	0.132418	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=56473 Win=141952 Len=0 TSval=3913851482 TSecr=725607613
97	0.132418	128.119.245.12	192.168.86.68	TCP	66	80 → 55639 [ACK] Seq=1 Ack=57921 Win=144896 Len=0 TSval=3913851482 TSecr=725607613

Step 4: Apply RTT to column and export it to .csv file

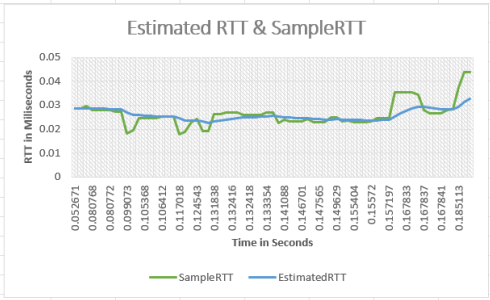
No.	Time	Source	Destination	Protocol	Length	The RTT to ACK the segment was
160	0.155405	128.119.245.12	192.168.86.68	TCP	66	0.022869000
161	0.155720	128.119.245.12	192.168.86.68	TCP	66	0.023183000
162	0.157192	128.119.245.12	192.168.86.68	TCP	66	0.024653000
163	0.157196	128.119.245.12	192.168.86.68	TCP	66	0.024633000
164	0.157197	128.119.245.12	192.168.86.68	TCP	66	0.024632000
165	0.167827	128.119.245.12	192.168.86.68	TCP	66	0.035242000
166	0.167832	128.119.245.12	192.168.86.68	TCP	66	0.035245000
167	0.167833	128.119.245.12	192.168.86.68	TCP	66	0.035243000
168	0.167835	128.119.245.12	192.168.86.68	TCP	66	0.035214000
169	0.167836	128.119.245.12	192.168.86.68	TCP	66	0.034407000
170	0.167837	128.119.245.12	192.168.86.68	TCP	66	0.028075000
171	0.167839	128.119.245.12	192.168.86.68	TCP	66	0.026672000
172	0.167840	128.119.245.12	192.168.86.68	TCP	66	0.026672000
173	0.167841	128.119.245.12	192.168.86.68	TCP	66	0.026606000
174	0.174624	128.119.245.12	192.168.86.68	TCP	66	0.027855000
175	0.175804	128.119.245.12	192.168.86.68	TCP	66	0.028184000
176	0.185113	128.119.245.12	192.168.86.68	TCP	66	0.037492000
177	0.191491	128.119.245.12	192.168.86.68	TCP	66	0.043811000
178	0.191496	128.119.245.12	192.168.86.68	TCP	66	0.043814000
179	0.192625	128.119.245.12	192.168.86.68	HTTP	843	
180	0.192732	192.168.86.68	128.119.245.12	TCP	66	0.000107000



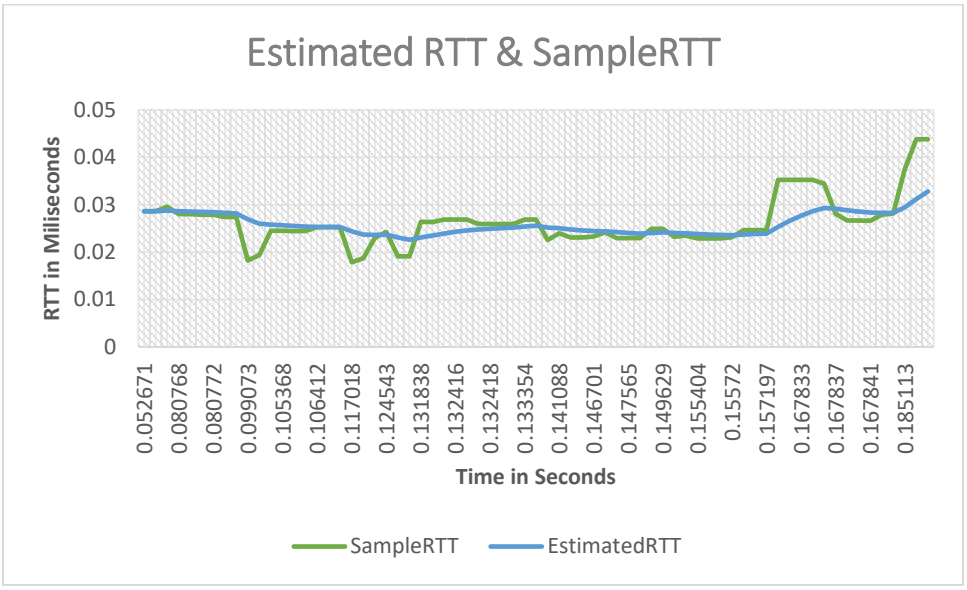
Step 5: Open, Manipulate, and Constuct the graph with Excel

No.	Time	Source	Destination	Protocol	Length	SampleRTT	EstimatedRTT
7	0.052671	128.119.245.12	192.168.86.68	TCP	66	0.028624	0.028624
8	0.052676	128.119.245.12	192.168.86.68	TCP	66	0.028628	0.0286245
13	0.053626	128.119.245.12	192.168.86.68	TCP	66	0.029577	0.028743563
16	0.080768	128.119.245.12	192.168.86.68	TCP	66	0.027994	0.028649867
17	0.080771	128.119.245.12	192.168.86.68	TCP	66	0.027996	0.028568134
18	0.080772	128.119.245.12	192.168.86.68	TCP	66	0.027918	0.028486867
19	0.080772	128.119.245.12	192.168.86.68	TCP	66	0.027917	0.028415634
28	0.08112	128.119.245.12	192.168.86.68	TCP	66	0.02741	0.028289929
29	0.081123	128.119.245.12	192.168.86.68	TCP	66	0.027412	0.028180188
34	0.099073	128.119.245.12	192.168.86.68	TCP	66	0.018228	0.026936165
37	0.100226	128.119.245.12	192.168.86.68	TCP	66	0.01938	0.025991644
40	0.105364	128.119.245.12	192.168.86.68	TCP	66	0.024516	0.025807189
41	0.105368	128.119.245.12	192.168.86.68	TCP	66	0.024517	0.025645915
42	0.105369	128.119.245.12	192.168.86.68	TCP	66	0.02444	0.025495176
43	0.105369	128.119.245.12	192.168.86.68	TCP	66	0.024439	0.025363154
56	0.106412	128.119.245.12	192.168.86.68	TCP	66	0.025245	0.025348385
57	0.106415	128.119.245.12	192.168.86.68	TCP	66	0.025237	0.025334461
58	0.106415	128.119.245.12	192.168.86.68	TCP	66	0.025235	0.025322029
67	0.117018	128.119.245.12	192.168.86.68	TCP	66	0.017877	0.0243914
70	0.117878	128.119.245.12	192.168.86.68	TCP	66	0.018736	0.023684475
73	0.123307	128.119.245.12	192.168.86.68	TCP	66	0.023011	0.023600291
76	0.124543	128.119.245.12	192.168.86.68	TCP	66	0.024246	0.023681004
77	0.124549	128.119.245.12	192.168.86.68	TCP	66	0.019104	0.023108879
78	0.124549	128.119.245.12	192.168.86.68	TCP	66	0.019103	0.022608144
85	0.131838	128.119.245.12	192.168.86.68	TCP	66	0.026391	0.023081001
86	0.131841	128.119.245.12	192.168.86.68	TCP	66	0.026322	0.023486126
93	0.132413	128.119.245.12	192.168.86.68	TCP	66	0.026893	0.023911985
94	0.132416	128.119.245.12	192.168.86.68	TCP	66	0.026894	0.024284737

Ramzy Izza Wardhana - 21/472698/PA/20322 - Assignment 6 Number 1



Final Output:



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3. Read how to calculate the timeout in the supplement material and plot the timeout value on the same graph as the graph from number 2. Analyze the graph you get and see if there are segments that are timed out based on the timeout calculation? If so, what segment/packet number? Assume the timeout values for the first and second segments are 1s (1,000ms). After the ACK for the second segment is received, the timeout value is calculated according to the formula on page 237 of the supplement material and is set as the timeout for the third segment and so on. *Use beta=0.25.

Answer:

Suppose that $\beta = 0.25$ and the formula to determine the deviation of SampleRTT to our EstimatedRTT is given as:

$$DevRTT = 0.75.DevRTT + 0.25.|SampleRTT\text{-}EstimatedRTT|$$

Once we obtained the deviation value, we can proceed to compute the TimeoutInterval with the given formula:

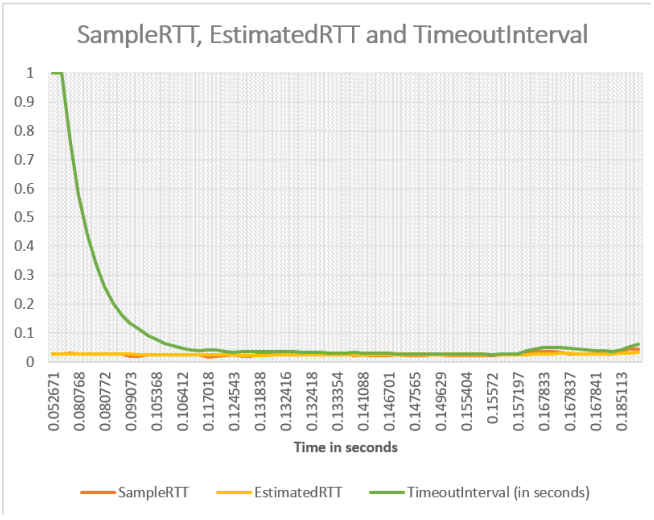
$$TimeoutInterval = EstimatedRTT + 4 * DevRTT$$

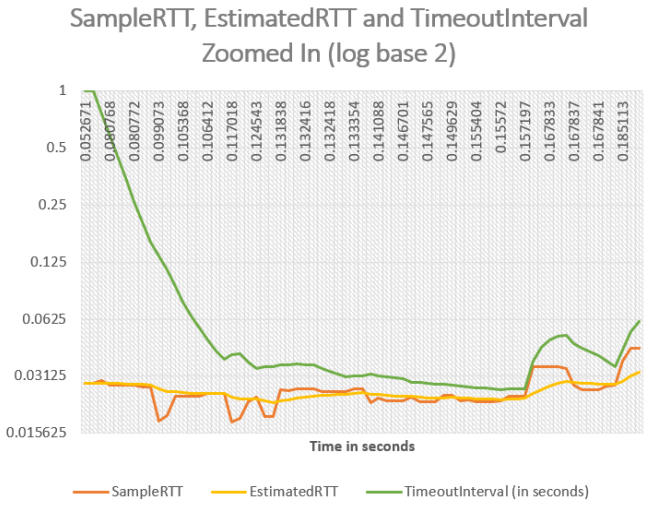
Step 1: Since we have already created the previous .csv data in the excel, we can directly compute the deviation (DevRTT). It should be noted that, at initial state, the TimeoutInterval is given as 1000ms (1s) and the DevRTT is $DevRTT = (EstimatedRTT\text{-}TimeInterval)/4$.

Step 2: Once we calculated all the DevRTT, we can then compute TimeoutInterval for all rows of TCPs

Step 3: Next, we create a Boolean conditional checker to check whether the RTT exceed the timeout interval or not. If yes, this will denote as timeout and needs to be retransmitted, otherwise if all RTT is smaller than timeout, then no re-transmission occurs.

Step 4: For the final step, we can construct a graph representing SampleRTT, EstimatedRTT and TimeoutInterval which drawn in the figure below





A brief screenshot of the data that has been computed:

No.	Time	Source	Destination	Protocol	Length	SampleRTT	EstimatedRTT	DevRTT	TimeoutInterval (in seconds)	Is Timeout?
7	0.052671	128.119.245.12	192.168.86.68	TCP	66	0.028624	0.028624	0.242844	1	FALSE
8	0.052676	128.119.245.12	192.168.86.68	TCP	66	0.028628	0.0286245	0.242844	1	FALSE
13	0.053626	128.119.245.12	192.168.86.68	TCP	66	0.029577	0.028743563	0.182341	0.758108625	FALSE
16	0.080768	128.119.245.12	192.168.86.68	TCP	66	0.027994	0.028649867	0.13692	0.576329531	FALSE
17	0.080771	128.119.245.12	192.168.86.68	TCP	66	0.027996	0.028568134	0.102833	0.439900016	FALSE
18	0.080772	128.119.245.12	192.168.86.68	TCP	66	0.027918	0.028486867	0.077267	0.337554646	FALSE
19	0.080772	128.119.245.12	192.168.86.68	TCP	66	0.027917	0.028415634	0.058075	0.260715101	FALSE
28	0.08112	128.119.245.12	192.168.86.68	TCP	66	0.02741	0.028289929	0.043776	0.20339446	FALSE
29	0.081123	128.119.245.12	192.168.86.68	TCP	66	0.027412	0.028180188	0.033024	0.160276774	FALSE
34	0.099073	128.119.245.12	192.168.86.68	TCP	66	0.018228	0.026936165	0.026945	0.134716769	FALSE
37	0.100226	128.119.245.12	192.168.86.68	TCP	66	0.01938	0.025991644	0.021862	0.113438741	FALSE
40	0.105364	128.119.245.12	192.168.86.68	TCP	66	0.024516	0.025807189	0.016719	0.0926837	FALSE
41	0.105368	128.119.245.12	192.168.86.68	TCP	66	0.024517	0.025645915	0.012822	0.076932214	FALSE
42	0.105369	128.119.245.12	192.168.86.68	TCP	66	0.02444	0.025495176	0.00988	0.065015075	FALSE
43	0.105369	128.119.245.12	192.168.86.68	TCP	66	0.024439	0.025363154	0.007641	0.055927232	FALSE
56	0.106412	128.119.245.12	192.168.86.68	TCP	66	0.025245	0.025348385	0.005757	0.048374828	FALSE
57	0.106415	128.119.245.12	192.168.86.68	TCP	66	0.025237	0.025334461	0.004342	0.042701755	FALSE
58	0.106415	128.119.245.12	192.168.86.68	TCP	66	0.025235	0.025322029	0.003278	0.038434528	FALSE
67	0.117018	128.119.245.12	192.168.86.68	TCP	66	0.017877	0.0243914	0.004087	0.040740175	FALSE
70	0.117878	128.119.245.12	192.168.86.68	TCP	66	0.018736	0.023684475	0.004303	0.040894531	FALSE
73	0.123307	128.119.245.12	192.168.86.68	TCP	66	0.023011	0.023600291	0.003374	0.037097124	FALSE
76	0.124543	128.119.245.12	192.168.86.68	TCP	66	0.024246	0.023681004	0.002672	0.034368625	FALSE
77	0.124549	128.119.245.12	192.168.86.68	TCP	66	0.019104	0.023108879	0.003005	0.035129473	FALSE
78	0.124549	128.119.245.12	192.168.86.68	TCP	66	0.019103	0.022608144	0.00313	0.035128734	FALSE
85	0.131838	128.119.245.12	192.168.86.68	TCP	66	0.026391	0.023081001	0.003175	0.035781442	FALSE
86	0.131841	128.119.245.12	192.168.86.68	TCP	66	0.026322	0.023486126	0.00309	0.035847331	FALSE
93	0.132413	128.119.245.12	192.168.86.68	TCP	66	0.026893	0.023911985	0.003063	0.036163904	FALSE
94	0.132416	128.119.245.12	192.168.86.68	TCP	66	0.026894	0.024284737	0.00295	0.036082939	FALSE
95	0.132417	128.119.245.12	192.168.86.68	TCP	66	0.026894	0.024610895	0.002783	0.035742651	FALSE
96	0.132418	128.119.245.12	192.168.86.68	TCP	66	0.025951	0.024778408	0.00238	0.034299817	FALSE
97	0.132418	128.119.245.12	192.168.86.68	TCP	66	0.025937	0.024923232	0.002039	0.033078057	FALSE
98	0.132419	128.119.245.12	192.168.86.68	TCP	66	0.025937	0.025049953	0.001751	0.032053119	FALSE
99	0.132419	128.119.245.12	192.168.86.68	TCP	66	0.025936	0.025160709	0.001507	0.031188374	FALSE

Taking a closer look at the drawn graph above, we may observe that the orange line which depicted as SampleRTT are below the green line denoting timeout. This can be summarized that in this particular case, no timeout occurs.

Spreadsheets Link can be accessed by clicking here