

Project #2

CSC/ECE – 573

Internet Protocols

Submitted by:

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Traceroute:

Traceroute to remote server **152.46.17.169**

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traceroute to 152.46.17.169 (152.46.17.169), 64 hops max, 52 byte packets
 1  router.belkin (192.168.2.1)  2.016 ms  1.106 ms  1.763 ms
 2  smdf-bbdis-c6k-1-vl2385.ncstate.net (152.7.74.1)  9.679 ms  8.384 ms  2.817
ms
 3  vl2935-itcore.ncstate.net (152.1.6.137)  3.157 ms  4.409 ms  3.612 ms
 4  ncsugw2-x-itcore.ncstate.net (152.1.6.250)  22.093 ms  48.017 ms  50.029 ms
 5  rlasr-gw-to-ncsu-gw-2.ncren.net (128.109.248.61)  9.498 ms  10.572 ms  8.324
ms
 6  rtp7600-gw-to-rlasr-gw-link1.ncren.net (128.109.9.18)  11.366 ms
   rtp7600-gw-to-rlasr-link2-gw.ncren.net (128.109.9.133)  11.790 ms  11.098 ms
 7  dc6500-1-10g.dcs.mcnc.org (128.109.191.118)  11.765 ms  13.849 ms  13.562 ms
 8  bn17-169.dcs.mcnc.org (152.46.17.169)  11.978 ms  11.302 ms  12.053 ms

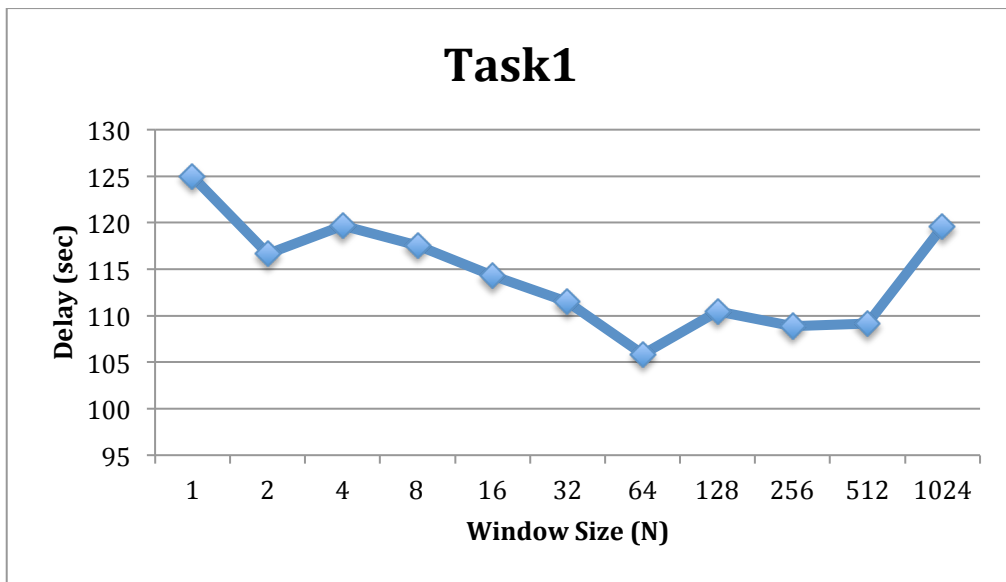
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Task: 1

Changing N with **MSS = 500** and **p = 0.05** (File Size: 1089590)

N	Transmission #	Delay (s)
1	1	132.667
	2	125.413
	3	117.853
	4	124.553
	5	124.364
		Average: 124.97
2	1	121.304
	2	131.967
	3	121.148
	4	107.136
	5	101.550
		Average: 116.621
4	1	127.303
	2	128.401
	3	116.075
	4	104.639
	5	121.990
		Average: 119.682
8	1	113.398
	2	125.244
	3	124.769
	4	99.872
	5	124.325
		Average: 117.522
16	1	124.680

	2	111.657
	3	104.003
	4	127.110
	5	104.105
		Average: 114.311
32	1	124.239
	2	96.504
	3	120.661
	4	103.495
	5	112.615
		Average: 111.503
64	1	99.831
	2	104.228
	3	106.498
	4	116.460
	5	102.081
		Average: 105.820
128	1	133.017
	2	127.388
	3	108.001
	4	99.214
	5	104.658
		Average: 110.456
256	1	105.123
	2	99.067
	3	96.416
	4	125.229
	5	118.412
		Average: 108.850
512	1	113.264
	2	94.280
	3	111.716
	4	106.324
	5	120.252
		Average: 109.168
1024	1	122.191
	2	120.391
	3	114.357
	4	122.686
	5	118.009
		Average: 119.527



Observations: After varying N (window size), keeping other factors constant, we can observe that the delay first start to decrease but after a value of N = 64 it again start to increase. The above observation can be explained by the fact that as we are increasing window size, the amount of data which we are transmitting is increasing therefore delay for transmitting the file is decreasing in the initial phase. But as the window size increases, we have to transmit more data whenever the packet is lost which result in increase in delay in later phase.

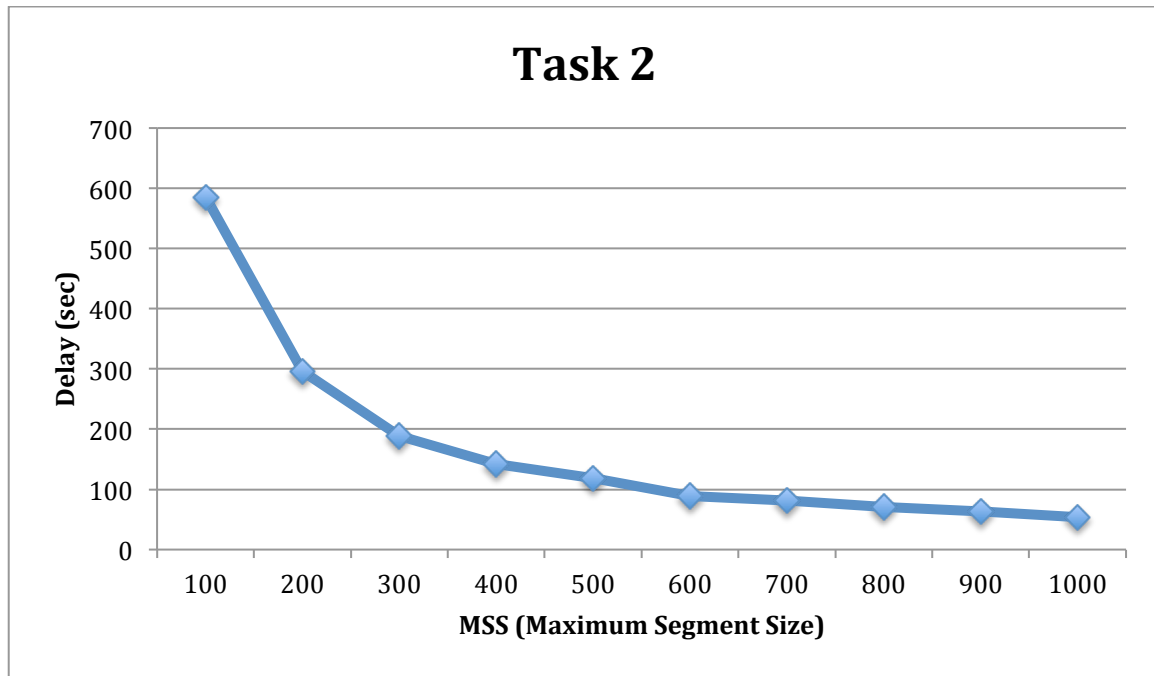
Task: 2

Changing MSS with N = 64 and p = 0.05 (File Size: 1089590)

N	Transmission #	Delay (s)
100	1	583.570
	2	590.801
	3	578.187
	4	580.324
	5	591.321
		Average: 584.841
200	1	291.147
	2	295.933
	3	302.985
	4	292.218
	5	297.012
		Average: 295.860
300	1	189.006

	2	182.837
	3	206.417
	4	180.264
	5	185.763
		Average: 188.858
400	1	154.929
	2	146.601
	3	131.217
	4	140.757
	5	135.632
		Average: 141.827
500	1	125.353
	2	116.786
	3	105.187
	4	118.972
	5	125.988
		Average: 118.457
600	1	72.810
	2	98.835
	3	93.207
	4	89.150
	5	89.775
		Average: 88.755
700	1	84.987
	2	76.667
	3	77.091
	4	86.536
	5	79.942
		Average: 81.045
800	1	89.444
	2	67.317
	3	63.524
	4	70.708
	5	64.658
		Average: 71.130
900	1	70.090
	2	63.868
	3	49.216
	4	79.135
	5	53.486
		Average: 63.159
1000	1	55.797
	2	62.285
	3	44.542

	4	59.874
	5	46.587
		Average: 53.817

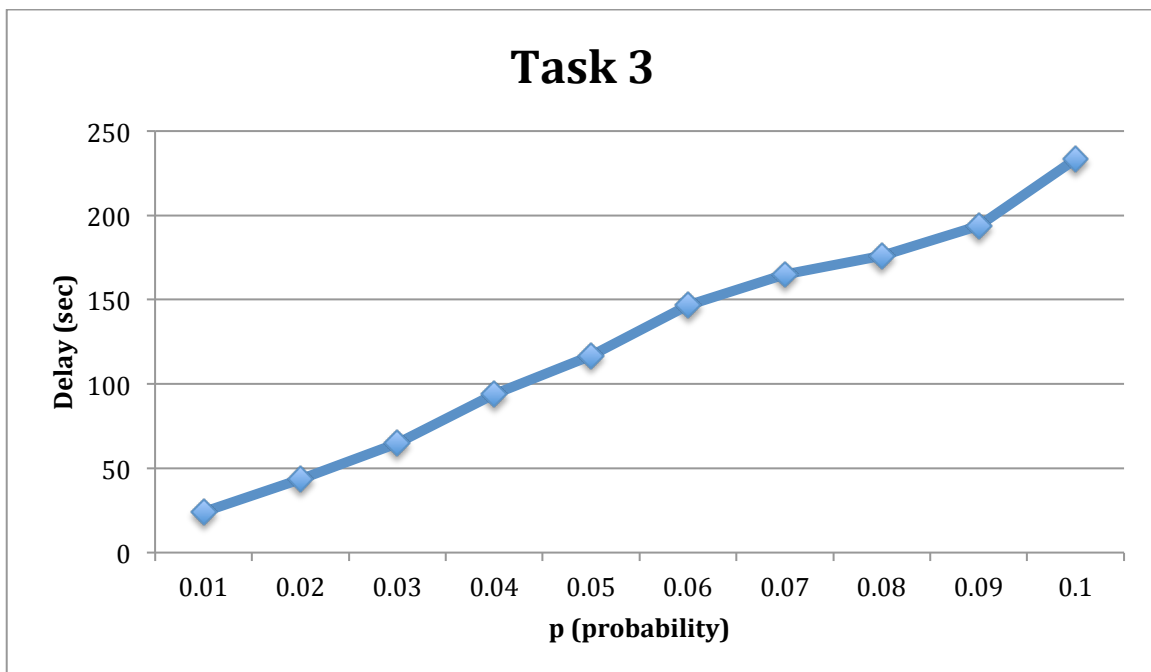


Observation: After varying MSS and keeping other factors constant, we can observe from the graph that the delay to transfer the file decreases as we increase the value of MSS. The reason for this is that we are transmitting more data by increasing MSS which in turn results in a decrease in delay. Moreover, MSS should not be increased above the value of Maximum Transfer Unit to avoid fragmentation of data.

Task: 3Changing p with **N = 64** and **MSS = 500** (File Size: 1089590)

p	Transmission #	Delay (s)
0.01	1	22.3
	2	25.165
	3	26.051
	4	22.044
	5	25.043
		Average: 24.120
0.02	1	34.154
	2	49.011
	3	42.711
	4	41.205
	5	50.547
		Average: 43.525
0.03	1	65.159
	2	63.741
	3	63.346
	4	68.087
	5	64.067
		Average: 64.88
0.04	1	93.929
	2	108.545
	3	89.646
	4	83.698
	5	93.389
		Average: 93.814
0.05	1	136.517
	2	114.628
	3	109.479
	4	111.280
	5	112.453
		Average: 116.871
0.06	1	141.560
	2	148.339
	3	145.367
	4	147.373

	5	151.632
		Average: 146.854
0.07	1	171.183
	2	162.190
	3	162.111
	4	164.562
	5	165.628
		Average: 165.135
0.08	1	192.335
	2	181.907
	3	161.846
	4	173.812
	5	169.992
		Average: 175.978
0.09	1	218.164
	2	189.390
	3	185.164
	4	189.80
	5	187.587
		Average: 193.98
0.1	1	221.888
	2	220.364
	3	242.913
	4	234.228
	5	247.012
		Average: 233.281



Observation: After varying error rate or probability of dropping a packet, keeping other factors constant we can observe from the graph that as the error rate increases the delay to transmit the packets also increases. The reason behind this is pretty straightforward as we are increasing the error rate the number of retransmission increases which in turn increases the amount of delay to transfer the whole file.