CS3200: Computer Networks

Lab8 - TCP Based Experiments

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Introduction

I performed this experiment with CS14B034 - Balaji Naik. CS14B050's laptop was treated as a client and CS14B034's laptop was treated as a server, we used simple httpserver to test the networks connection. Here we present our findings.

Experiment Observations

Settings interpretation:

SACK is OFF=0 and ON=1, (lowermost bit)

Window Size is 16KB=0 and 32KB=1 (second bit from right)

TCP Reno=0 and Cubic=1 (third bit from right)

Link delay is 2ms=0 and 50ms=1 (fourth bit from right)

Link drop % is 0.5%=0 and 5%=1 (highest bit)

File size: 512 KB

Sr.No	Settings(in binary)	Throughput	Latency
0	00000	10.94	0.048

1	00001	10.96	0.042
2	00010	11.06	0.042
3	00011	11.28	0.04
4	00100	11.04	0.042
5	00101	11.08	0.044
6	00110	11.3	0.04
7	00111	9.404	0.072
8	01000	11.12	0.044
9	01001	11.24	0.04
10	01010	11.28	0.04
11	01011	11.26	0.04
12	01100	11.2	0.04
13	01101	11.28	0.04
14	01110	11.22	0.042
15	01111	11.24	0.04
16	10000	11.22	0.04
17	10001	11.22	0.04
18	10010	11.3	0.04

19	10011	11.24	0.04
20	10100	10.838	0.044
21	10101	11.24	0.04
22	10110	11.2	0.042
23	10111	11.12	0.044
24	11000	10.94	0.048
25	11001	11.26	0.04
26	11010	10.82	0.046
27	11011	9.366	0.074
28	11100	11.3	0.04
29	11101	11.28	0.04
30	11110	11.26	0.04
31	11111	11.28	0.04

File Size:1024KB

Sr.No	Settings(in binary)	Throughput	Latency
0	00000	10.9	0.09
1	00001	11.14	0.09

2	00010	11.18	0.09
3	00011	11.22	0.09
4	00100	10.88	0.09
5	00101	11.14	0.09
6	00110	11.22	0.09
7	00111	11.26	0.09
8	01000	11.26	0.09
9	01001	11.12	0.09
10	01010	11.28	0.09
11	01011	11.22	0.09
12	01100	11.24	0.09
13	01101	11.22	0.09
14	01110	11.22	0.09
15	01111	9.642	0.132
16	10000	11.26	0.09
17	10001	9.644	0.132
18	10010	10.72	0.094
19	10011	10.814	0.092

20	10100	11.22	0.09
21	10101	9.62	0.132
22	10110	11.1	0.09
23	10111	11.18	0.09
24	11000	11.08	0.09
25	11001	10.84	0.092
26	11010	11.16	0.09
27	11011	11.26	0.09
28	11100	11.26	0.09
29	11101	11.02	0.092
30	11110	11.22	0.09
31	11111	11.16	0.09

File size:2048KB

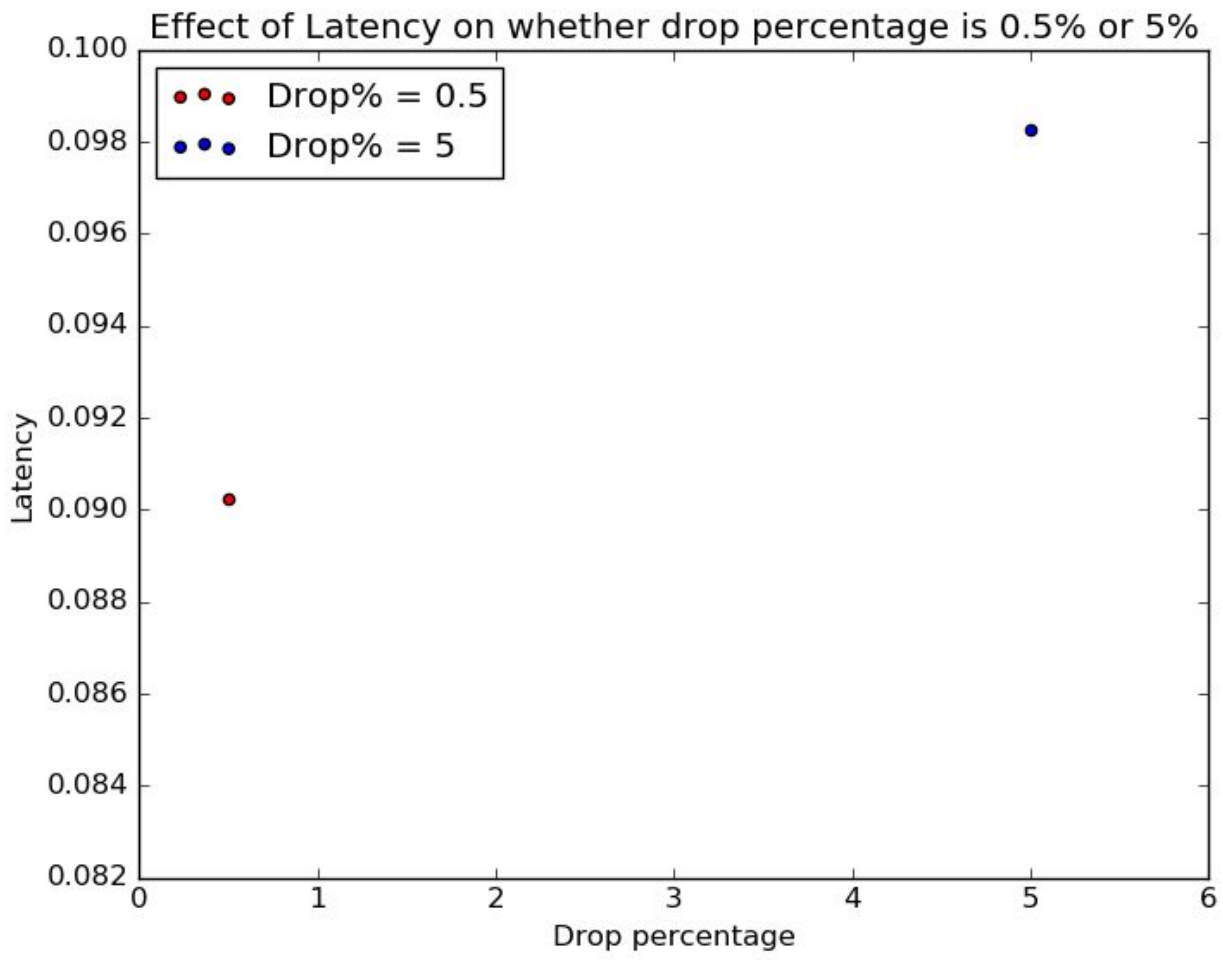
Sr.No	Settings(in binary)	Throughput	Latency
0	00000	11.2	0.2
1	00001	9.82	0.24
2	00010	11.22	0.2

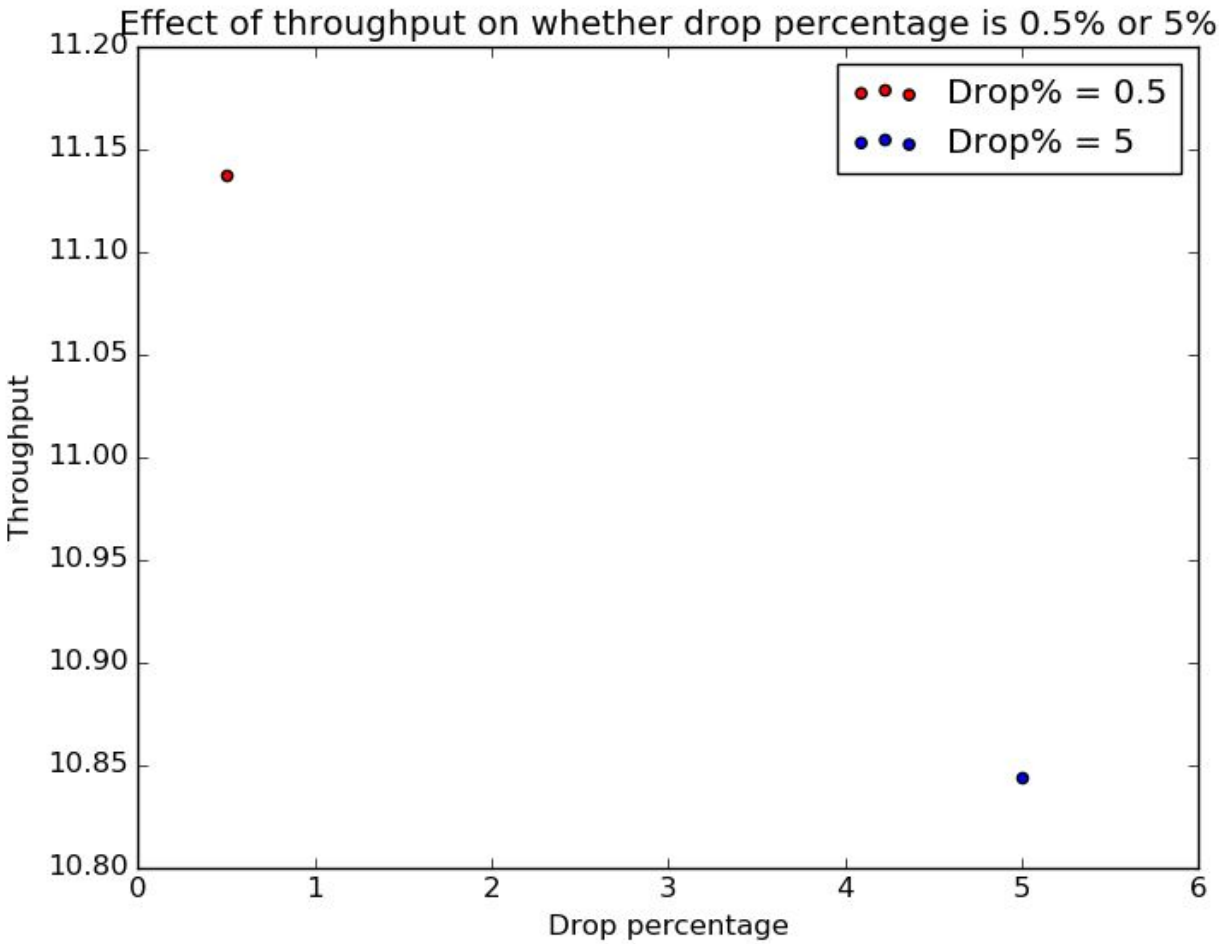
3	00011	11.2	0.2
4	00100	11.08	0.2
5	00101	11.08	0.2
6	00110	11.22	0.2
7	00111	11	0.2
8	01000	11.22	0.2
9	01001	11.16	0.2
10	01010	11.22	0.2
11	01011	11.1	0.2
12	01100	11.22	0.2
13	01101	11.2	0.2
14	01110	11.22	0.2
15	01111	34.76	0.82
16	10000	11.2	0.2
17	10001	11.22	0.2
18	10010	11.16	0.2
19	10011	11.04	0.2
20	10100	11.06	0.2

21	10101	11.22	0.2
22	10110	11.1	0.2
23	10111	10.86	0.2
24	11000	10.94	0.2
25	11001	10.692	0.2
26	11010	10.8	0.2
27	11011	9.842	0.24
28	11100	11.24	0.2
29	11101	9.93	0.24
30	11110	11.18	0.2
31	11111	11.22	0.2

Graphs and Inferences

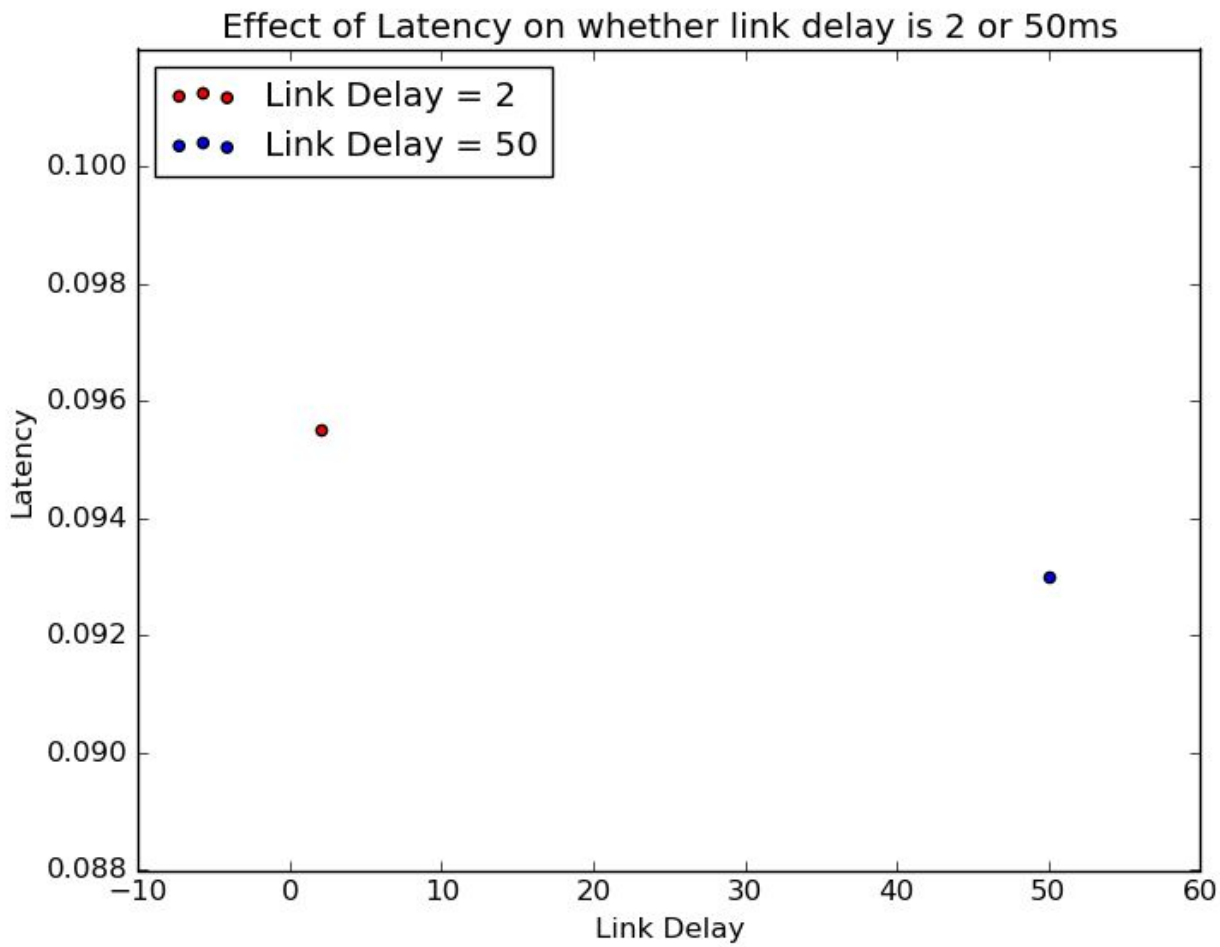
Effect of Drop Percentage

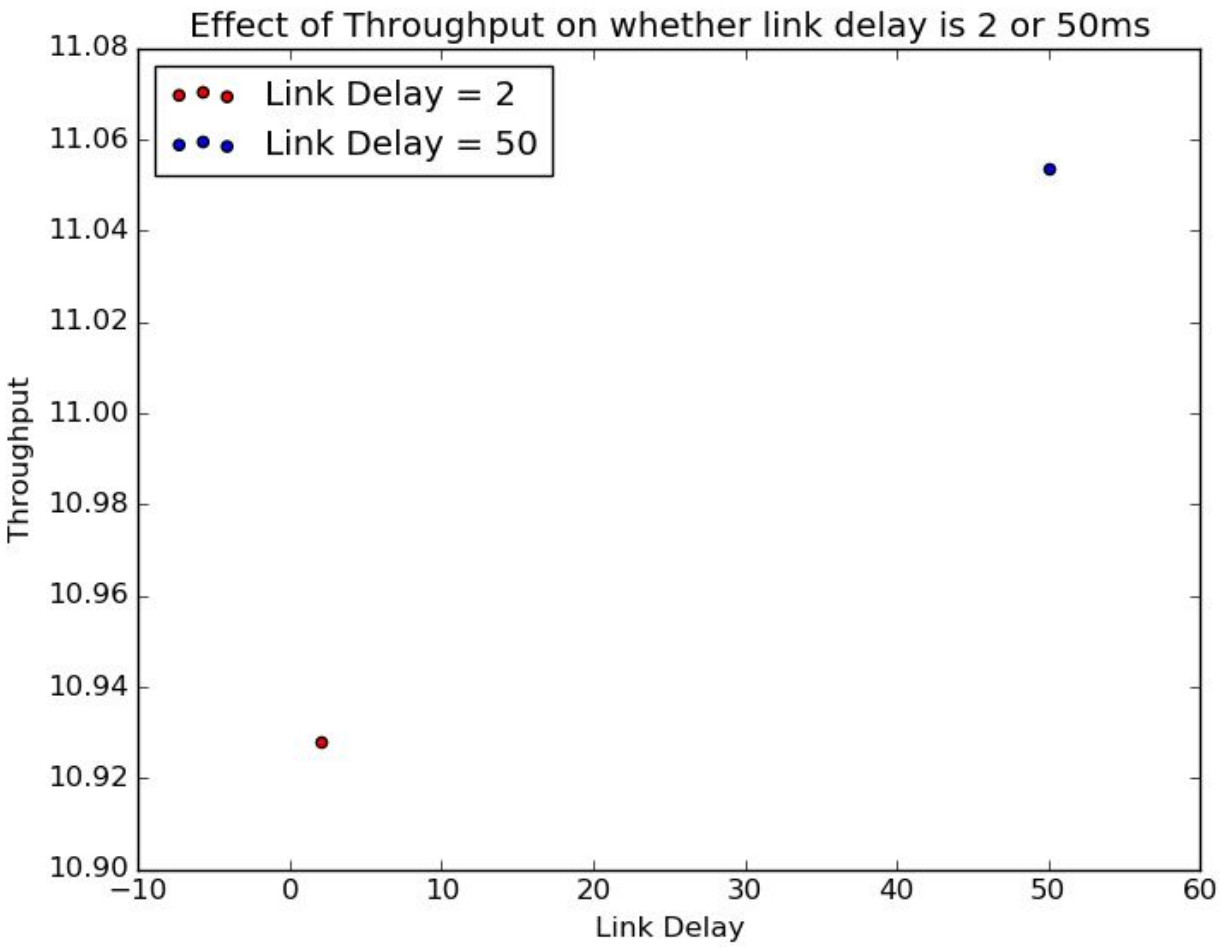

Effect of Latency on whether drop percentage is 0.5% or 5%
Drop% = 0.5
Drop% = 5
Latency
Drop percentage
0.100
0.098
0.096
0.094
0.092
0.090
0.088
0.086
0.084
0.082
0
1
2
3
4
5
6



Here we observe the change in latency and throughputs when drop percentage changes. The graph obeys what we observe theoretically as the throughput should be lower and latency should be higher when the drop percentage is high, high drop percentage means packets get dropped more often, the congestion control schemes are reset, and the window size also reduces to the minimum. Hence a lower throughput. This quantity affects the network capabilities a lot.

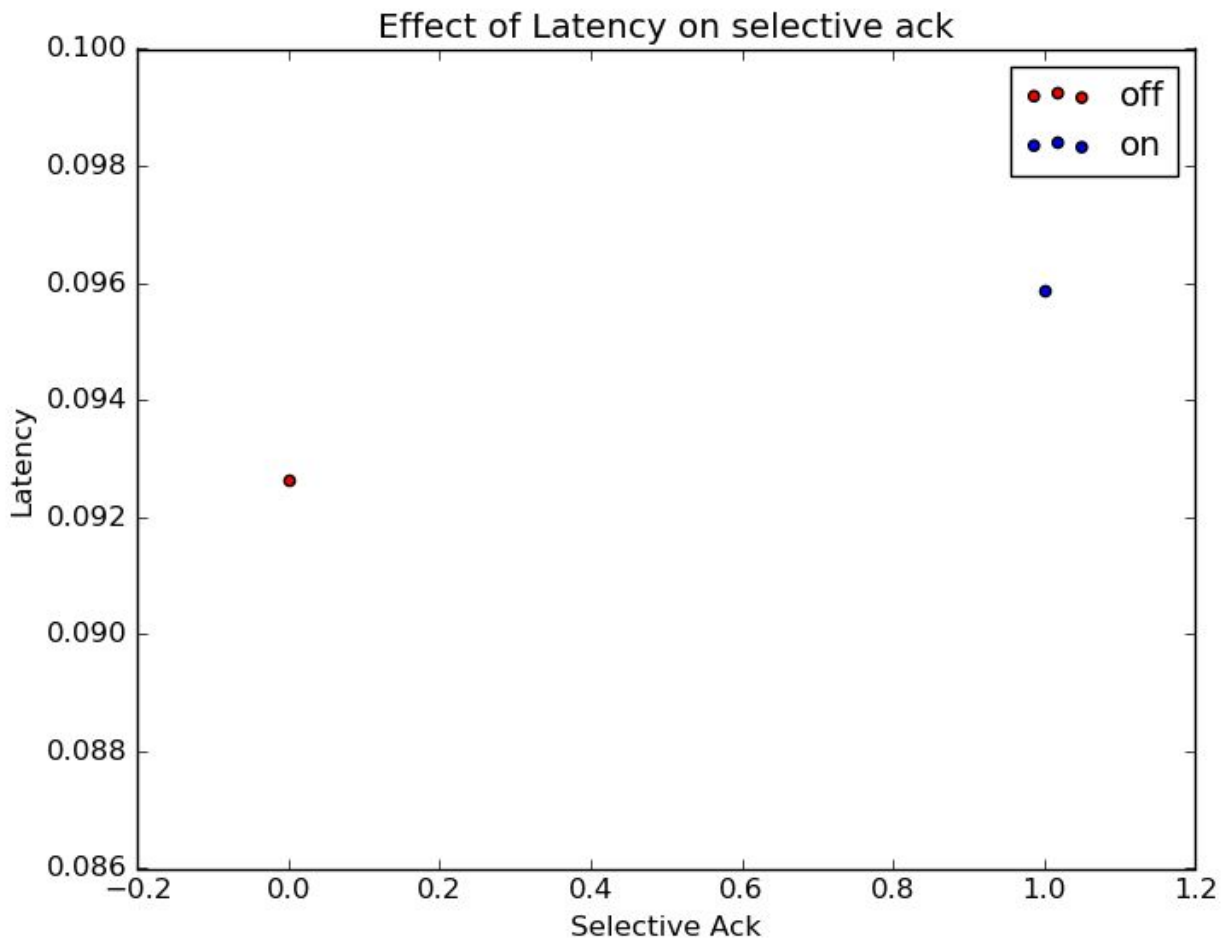
Effect of Link Delay

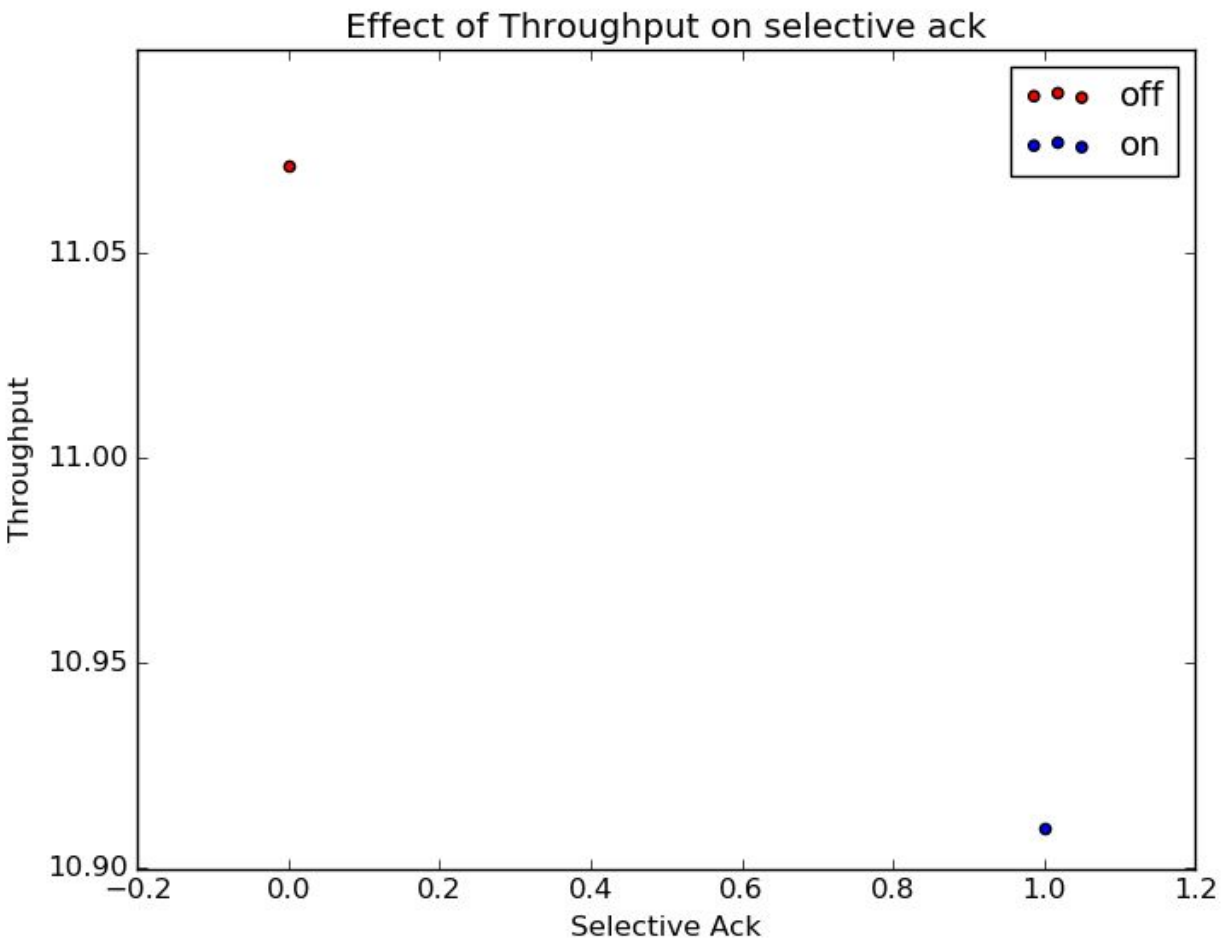

Effect of Latency on whether link delay is 2 or 50ms
Link Delay = 2
Link Delay = 50
0.100
0.098
0.096
0.094
0.092
0.090
0.088
Latency
−10
0
10
20
30
40
50
60
Link Delay



Effect of link delay is shown here, we note here that in case of latency and throughput, these values are very very close to each other, this means that the link delay parameter doesn't hold that much significance on both the throughput and the latency of the system.

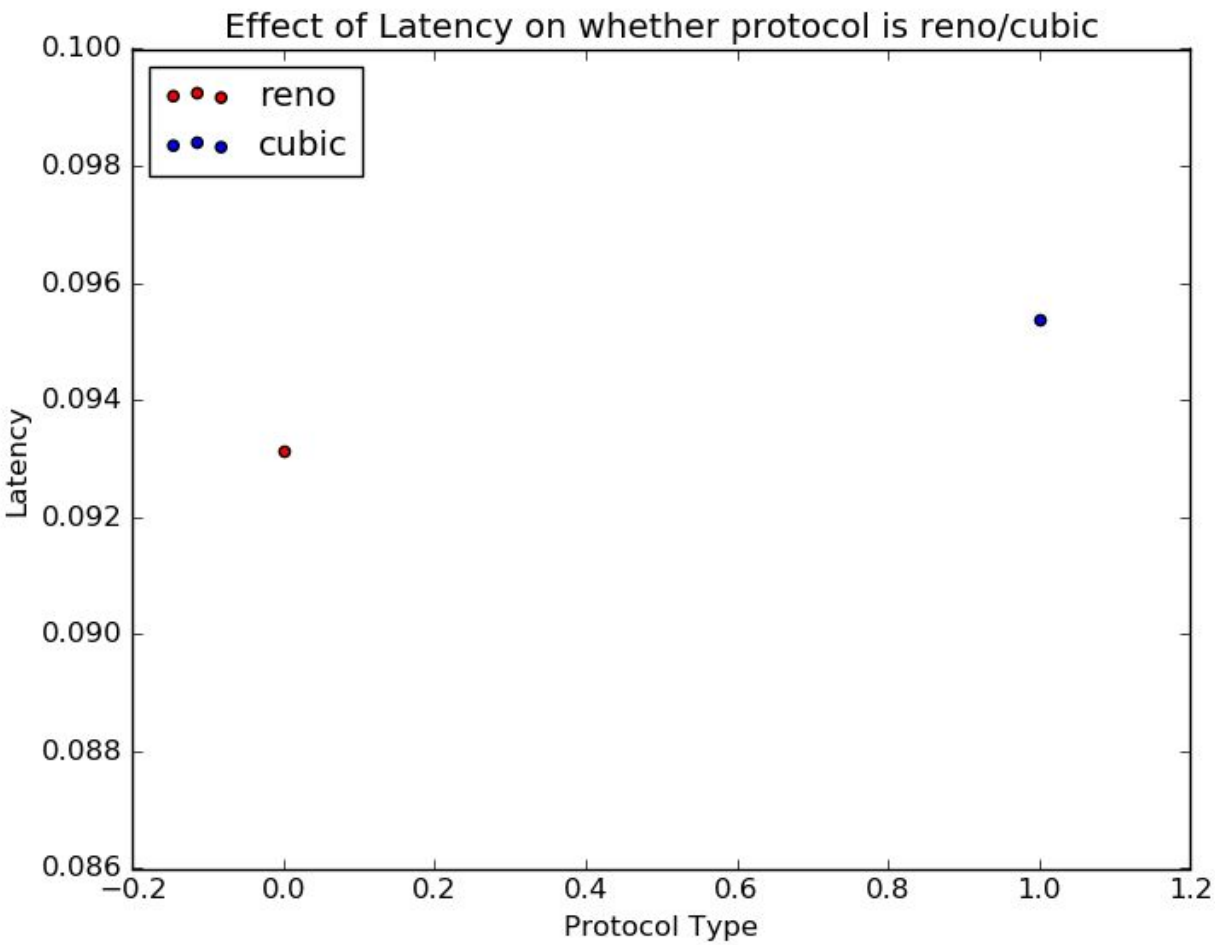
Effect of Selective Ack

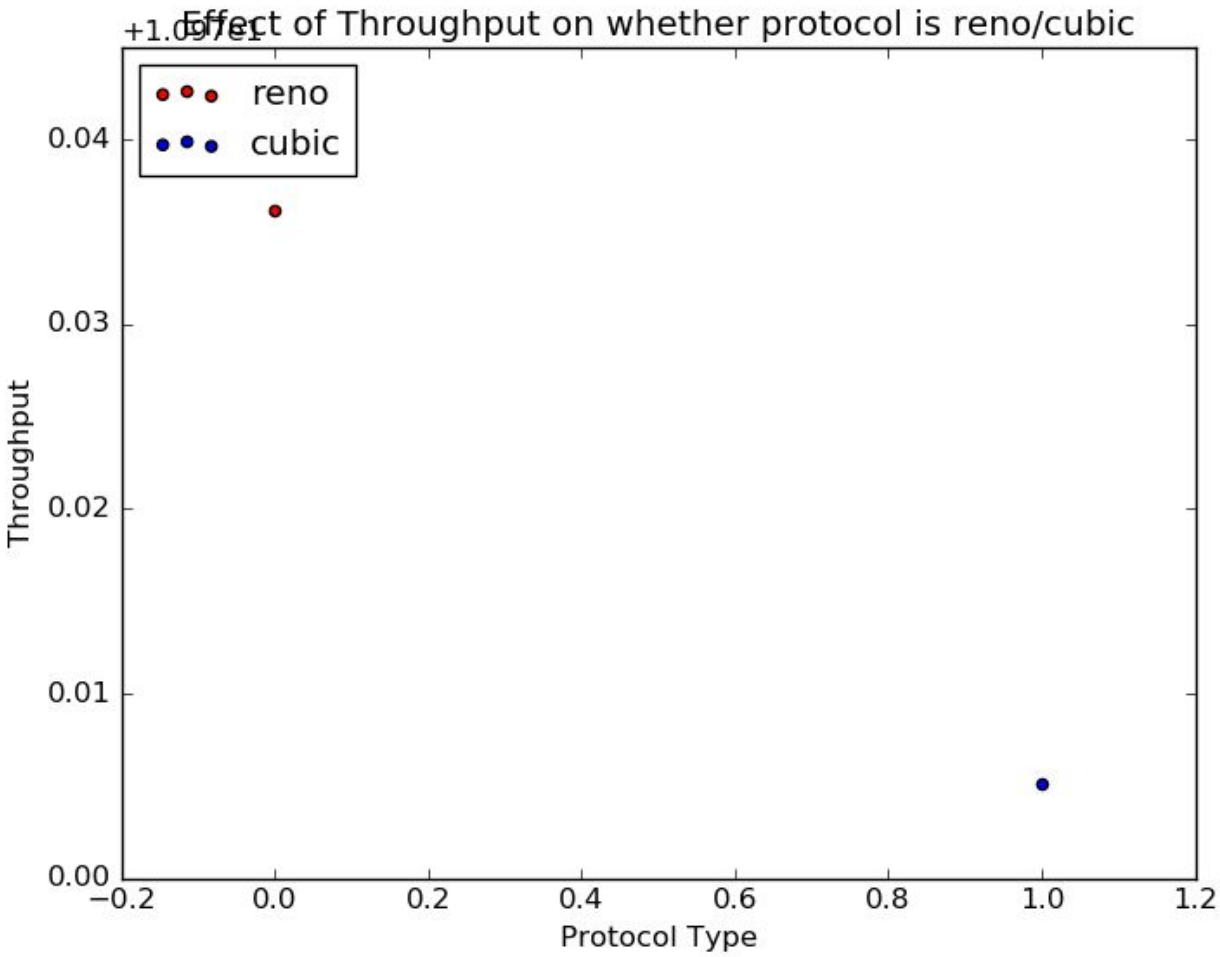

Effect of Latency on selective ack
0.100
0.098
0.096
0.094
0.092
0.090
0.088
0.086
Latency
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Selective Ack
off
on



When selective ack is switched on the network's throughput reduces and latency increases, this is because most of the tests on the system from which the mean latency and throughput were calculated used networks with almost negligible drop probability and adding a selective acknowledgement field to all messages is a useless overhead. We tried comparing the networks statistics with 15 percent drop probability and selective ack on and observed that selective ack being on gave better results.

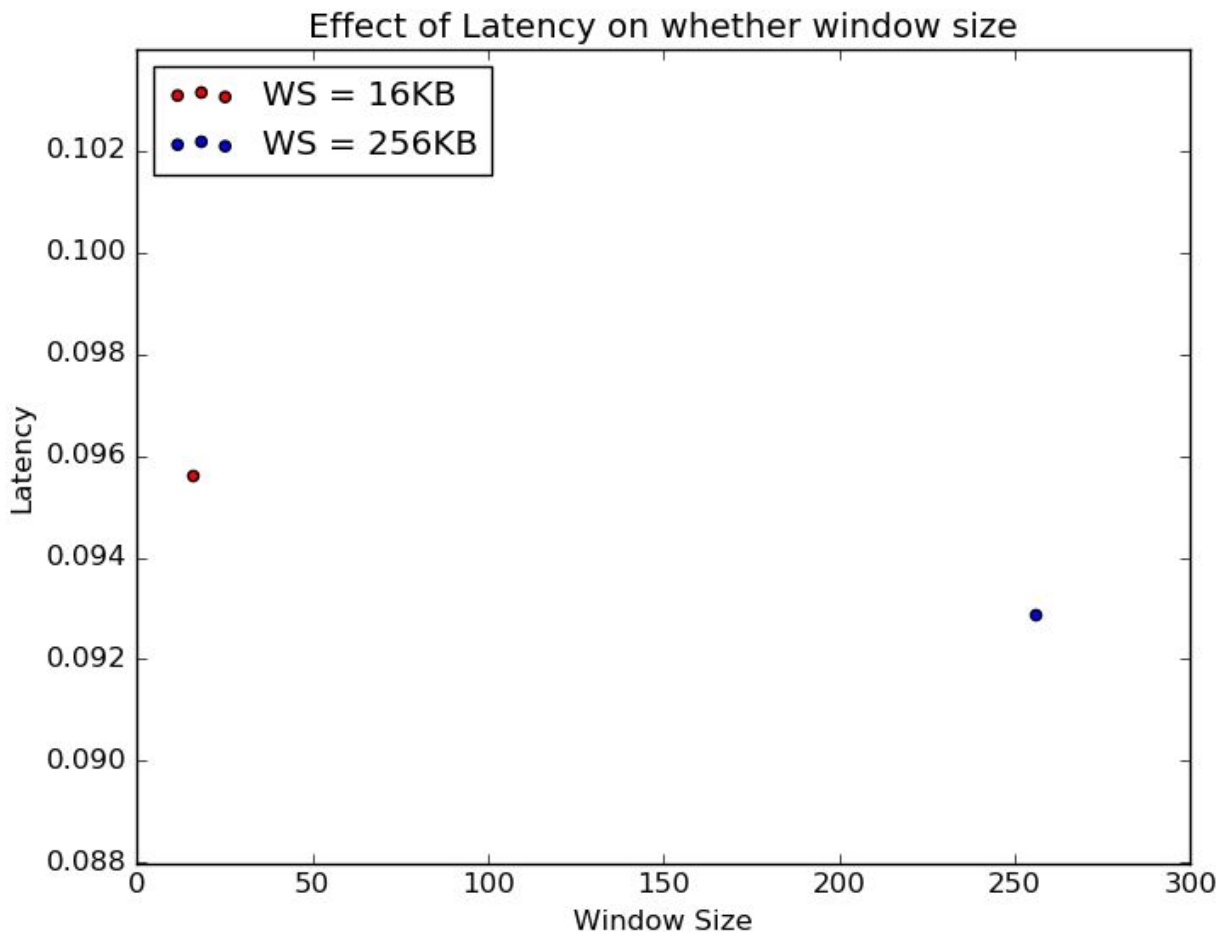
Effect of protocol being reno/cubic

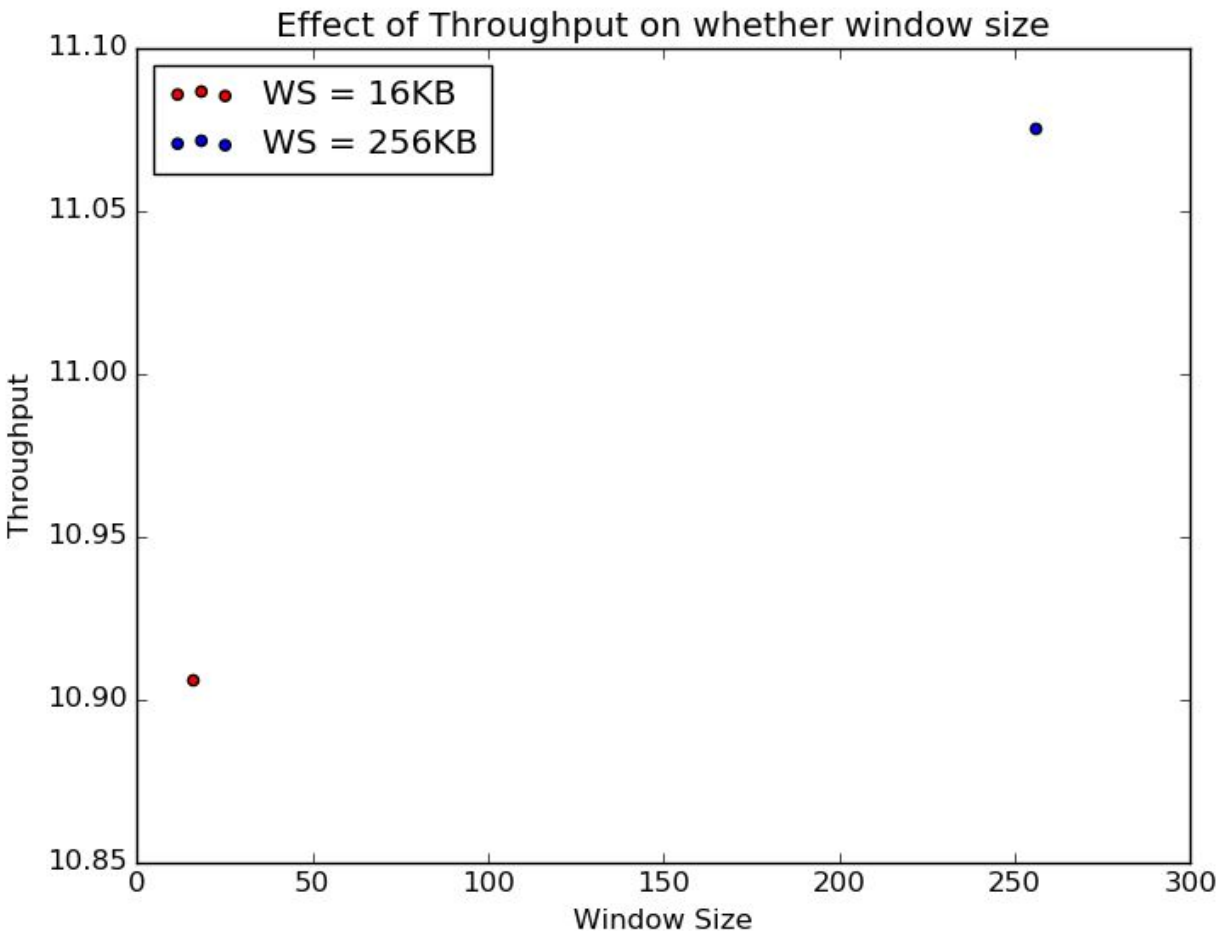

Effect of Latency on whether protocol is reno/cubic
reno
cubic
Latency
Protocol Type
0.100
0.098
0.096
0.094
0.092
0.090
0.088
0.086
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2



We note here that protocol reno performs better than protocol cubic in both latency and throughput. We haven't studied these protocols in detail in class, nevertheless this is the observation that we make here.

Effect of window size


Effect of Latency on whether window size
WS = 16KB
WS = 256KB
Latency
0.102
0.100
0.098
0.096
0.094
0.092
0.090
0.088
0
50
100
150
200
250
300
Window Size



We note that an increase in window size means a much higher throughput. We note that this is because the data that we transferred from the server was 1MB. 1MB data means a higher window size would allow us to send a lot more packets in one time out, hence a higher throughput and a minimal effect on latency.

Results

We observe that certain properties like drop percentage and window size affect the system lot more than choosing whether the protocol is reno/cubic. We also note the various ways in which a systems protocols have an effect on the network timings and get a realistic view of the whole process.