PROJECT - 2 REPORT(Go-back-N ARQ)

Team Members :

Aditya Joshi (ajoshi6)

Karthikeyan Vaideswaran (kvaides)

Size of the File Transferred :1687KB

Round Trip Time (RTT) between Client and Server: 23 ms (Average)

```
C:\Users\Aditya>tracert 152.46.17.151

Tracing route to bn17-151.dcs.mcnc.org [152.46.17.151]
over a maximum of 30 hops:

  1      3 ms      7 ms     29 ms  192.168.0.1
  2      *        79 ms     32 ms  cpe-76-182-64-1.nc.res.rr.com [76.182.64.1]
  3     41 ms      *        111 ms  cpe-174-111-115-185.triad.res.rr.com [174.111.115.185]
  4    141 ms     15 ms     26 ms  cpe-024-025-063-142.ec.res.rr.com [24.25.63.142]
  5     94 ms     28 ms     64 ms  24.93.67.200
  6    113 ms     23 ms     23 ms  gig10-0-0.chrlncsa-rtr1.carolina.rr.com [24.93.64.27]
  7     40 ms     15 ms     25 ms  cpe-024-074-247-065.carolina.res.rr.com [24.74.247.65]
  8     57 ms    279 ms     41 ms  rrcs-24-172-68-245.midsouth.biz.rr.com [24.172.68.245]
  9     24 ms    231 ms    276 ms  rrcs-98-101-20-135.midsouth.biz.rr.com [98.101.20.135]
 10     60 ms     15 ms     34 ms  rrcs-24-172-64-46.midsouth.biz.rr.com [24.172.64.46]
 11    364 ms     22 ms     22 ms  rtp-ip-asr-gw-to-hntvl-ip-asr-gw.ncren.net [128.109.9.217]
 12    206 ms     35 ms     24 ms  mcnc-dcs-to-rtp-ip-asr-gw.ncren.net [128.109.191.98]
 13     20 ms     18 ms     25 ms  152.46.46.18
 14     24 ms     20 ms     25 ms  bn17-151.dcs.mcnc.org [152.46.17.151]

Trace complete.
```
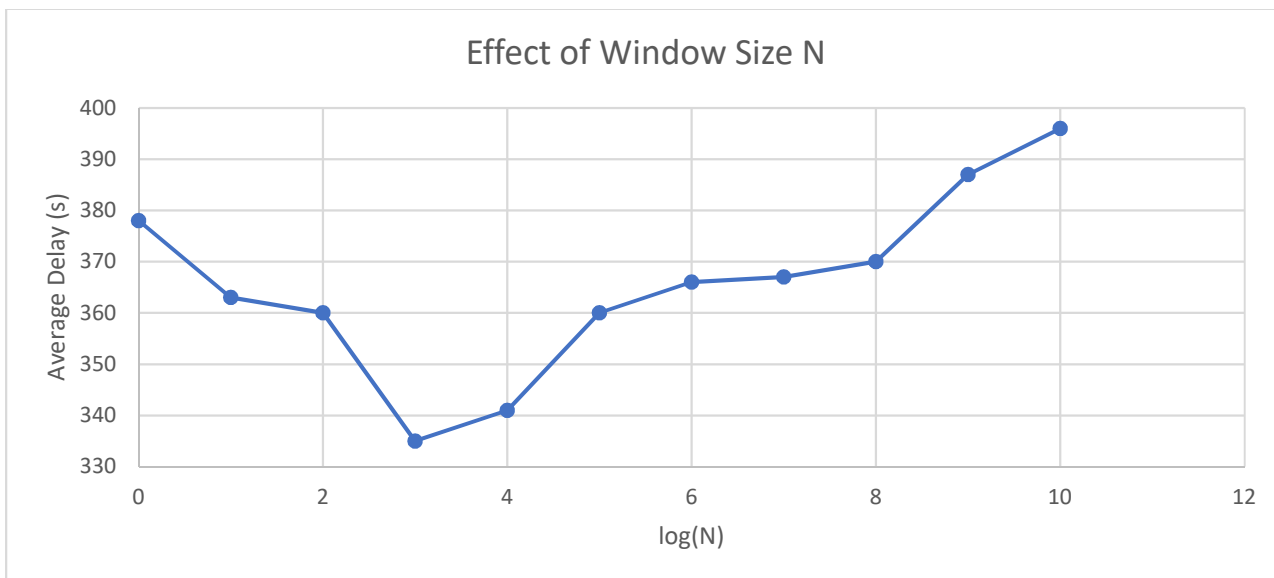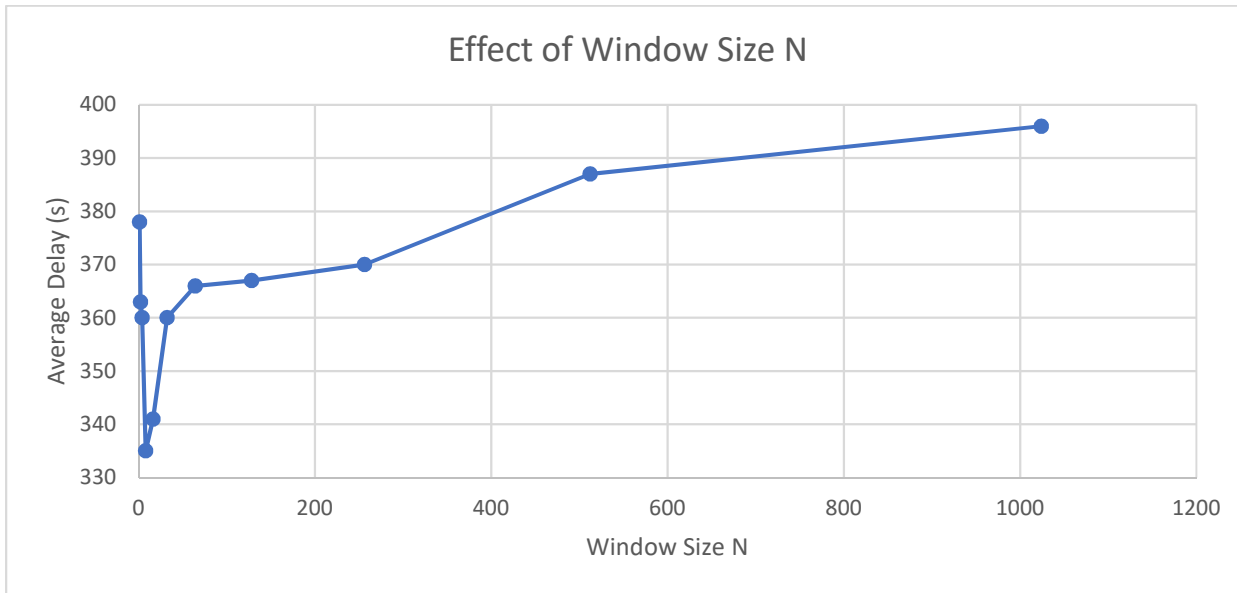
Task 1: Effect of Window Size N

In this task we kept the MSS as 500 Bytes and loss probability, p = 0.05 and varied the window size from, N =1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024.

N	Average Delay (s)
1	378
2	363
4	360
8	335
16	341
32	360
64	366
128	367
256	370
512	387
1024	396

Effect of Window Size N


Effect of Window Size N

Results:

We see from the graph, that, initially as the window increases, average delay of file transfer decreases (phase I) and eventually after hitting a minima, it starts increasing (phase II). Phase I can be attributed to the fact that small size of N does not efficiently use the sliding window protocol as it underutilizes the bandwidth. Phase II is explained by the fact that the larger window size would lead to retransmission of more packets in case of error, hence increase in the delay. Therefore, an ideal window size should be chosen between phase I and phase II. From our graph, we can choose a window size of either 8 or 16.

Task 2: Effect of MSS

In this task we kept the window size, N as 64 and loss probability, p = 0.05 and varied MSS from 100 Bytes to 1000 Bytes in increments of 100 Bytes.

| MSS (Bytes)	Average Delay (s)
100	1124
200	617
300	370
400	283
500	239
600	197
700	167
800	140
900	136
1000	98
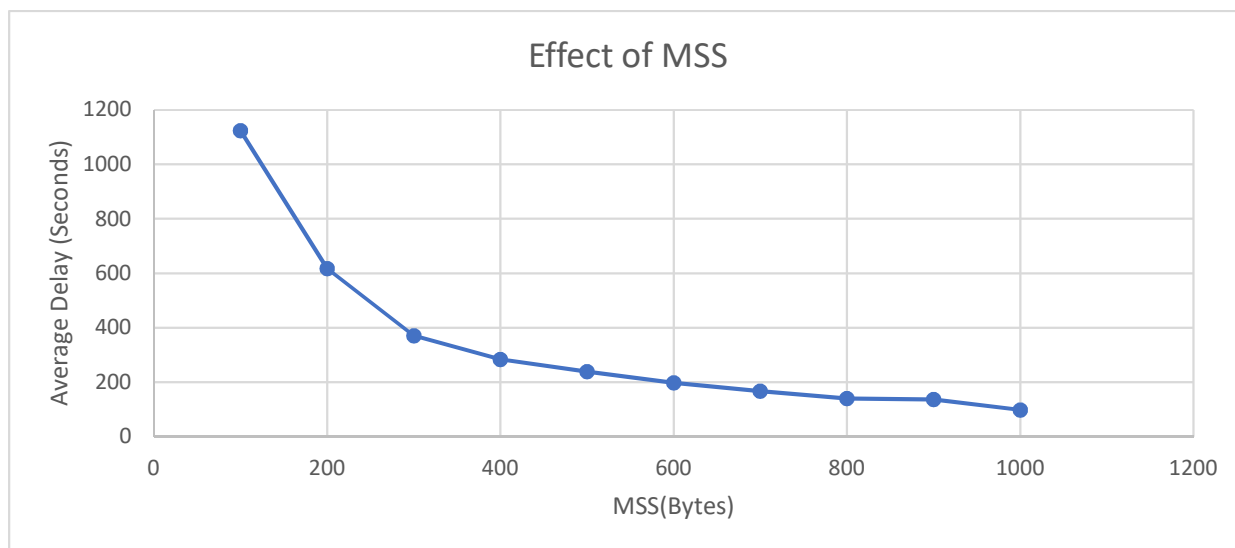
Results:

From the graph, we see that there is an exponential decrease in delay of file transfer as the maximum segment size (MSS) increases. This is because the amount of data transferred in one segment increases as the segment size increases, thus a reduction in the number of segments, keeping the file size and error probability (p) constant. The MSS is chosen in accordance with the bandwidth available for efficient bandwidth utilization.

Task 3: Effect of Loss Probability p

In this task we kept the window size, N as 64 and MSS= 500 Bytes and varied the loss probability from p=0.01 to 0.10 in increments of 0.01.

Loss Probability (p)	Average Delay (s)
0.01	230
0.02	278
0.03	293
0.04	321
0.05	353
0.06	398
0.07	482
0.08	528
0.09	579
0.1	680
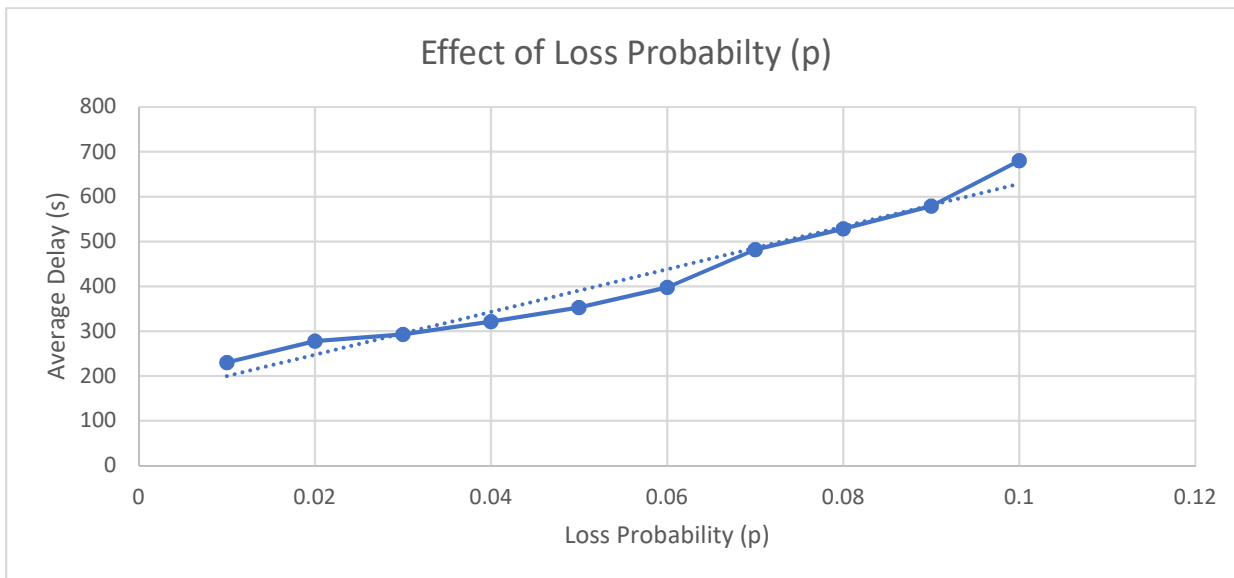
Results:

We can see from the graph that as the error probability increases, the average delay also increases linearly. This can be explained from the fact that in case of packet loss, retransmission takes place and thus, average delay increases.