

# **ECE 573 – INTERNET PROTOCOLS**

## **PROJECT 2**

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### **Objective:**

- 1) Implementation of point to multi-point reliable data transfer.
- 2) Build reliability using an unreliable protocol(UDP).
- 3) Analyzing file transfer time under variation of Maximum segment size(MSS), probabilistic loss and number of servers.
- 4) Implementation of Stop and Wait protocol.

### **Implementation:**

The point to multi-point reliable data transfer protocol was implemented using a client server architecture model. When a segment is being transferred by client to multiple servers using an unreliable transport layer protocol, there is a probability that no all servers will receive the segment. In a point to multi point protocol new segment is transferred only after all the servers receive the previous segment correctly.

The project was intended to capture the effects on the time taken to transfer the file to all the servers under different conditions.

Point-to -MultiPoint protocol was developed using python 3 and tested with up-to 5 servers on variations in probabilistic loss, maximum segment size and number of servers.

### **Inputs:**

Server: Python p2mpserver.py 7735 [file\_name] [probabilistic loss]

Client: Python p2mpserver.py [Server IP 1] [Server IP 2]...[Server IP n] 7735 [file\_name] [MSS]

Probabilistic loss – It defines number between 0 and 1 which will define the probability with which the server will drop the received segment.

MSS – It defines maximum segment size which defines the maximum amount of data each segment can carry.

## Round Trip Time

System connected to LAN :

```
C:\Users\rdank>tracert 152.14.142.42

Tracing route to liblc-40250.lib.ncsu.edu [152.14.142.42]
over a maximum of 30 hops:

  1      1 ms      1 ms      1 ms  vl2400-smdf-csdis-aruba-c4k-1.ncstate.net [10.139.56.2]
  2      *        *        2 ms  wmdf-cscore-c6k-1-NCSU-1.ncstate.net [10.132.11.33]
  3      3 ms      2 ms      2 ms  liblc-40250.lib.ncsu.edu [152.14.142.42]
  4      4 ms      2 ms      2 ms  liblc-40250.lib.ncsu.edu [152.14.142.42]
  5      4 ms      2 ms      3 ms  liblc-40250.lib.ncsu.edu [152.14.142.42]
  6      4 ms      3 ms      4 ms  liblc-40250.lib.ncsu.edu [152.14.142.42]
  7      4 ms      3 ms      3 ms  liblc-40250.lib.ncsu.edu [152.14.142.42]

Trace complete.
```

System connected to Wifi :

```
C:\Users\rdank>tracert 10.139.56.113

Tracing route to LAPTOP-DG2UM7PK [10.139.56.113]
over a maximum of 30 hops:

  1      5 ms      6 ms      4 ms  LAPTOP-DG2UM7PK [10.139.56.113]

Trace complete.
```

Timeout was set to 5 times the round trip time.

## Task 1:

Effect of Receiver Size Set:

We see the effect on file transfer time when the number of receivers are increased while keeping the probabilistic loss factor and maximum segment size constant.

Probabilistic loss factor : 0.05

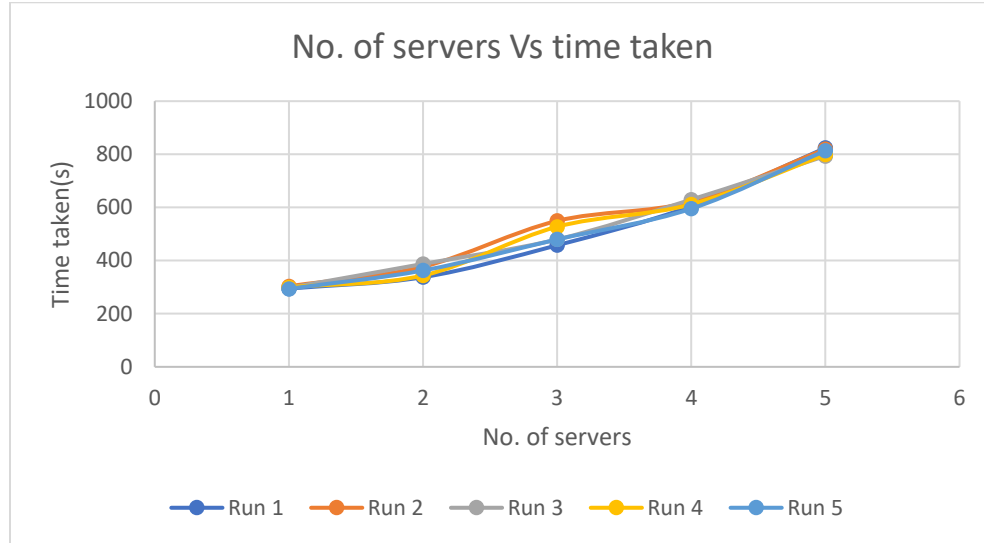
Maximum segment size : 500

No of Receivers : 1 to 5, in steps of 1

The experiment was run five times for different number of receives for accuracy. The captured results are as shown in the table. And the graph clearly demonstrates that the time taken to transfer the file increases with the increase in the number of receivers.

## File transfer times for Task 1

No. of servers	Run 1	Run 2	Run 3	Run 4	Run 5	Average
1	294.543	303.331	297.321	299.567	293.721	297.6966
2	337.45	376.908	387.413	343.803	362.718	361.6584
3	457.67	549.312	479.576	527.231	479.576	498.673
4	604.521	621.564	629.452	611.673	595.383	612.5186
5	823.749	819.482	793.576	798.524	813.526	809.7714



## Task 2:

### Effect of Maximum Segment Size:

We see the effect on file transfer time when the maximum segment size is increased in steps of 100 bytes while keeping the probabilistic loss factor and no of receivers constant.

Probabilistic loss factor : 0.05

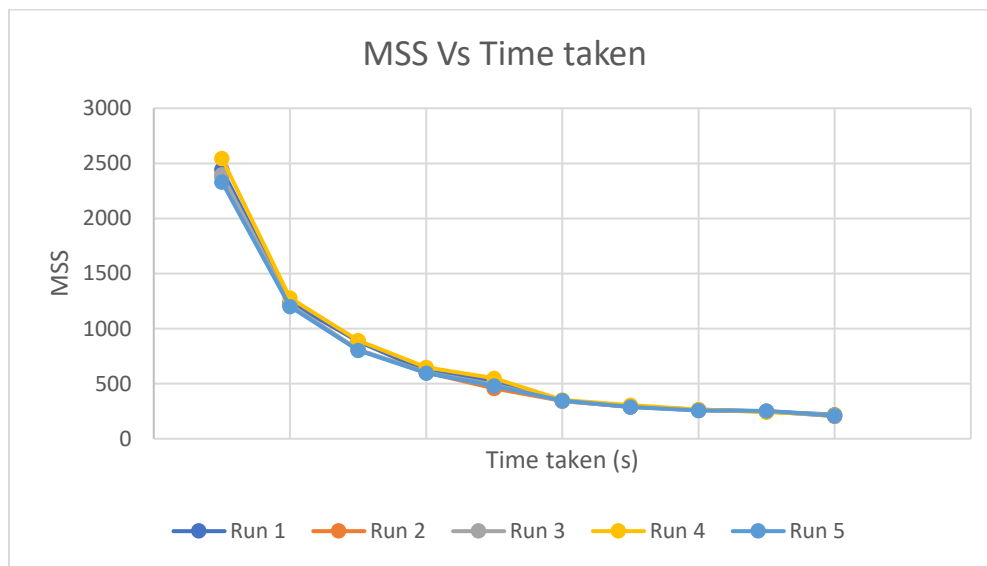
Maximum segment size : 100 to 1000, in steps 100

No of Receivers : 3

The experiment was conducted five time for different values of maximum segment size for accuracy. The results are tabulated in the table and the graph generated using the results demonstrate that the time taken to transfer the file reduces exponentially when the maximum segment size increases initially and flattens when maximum segment size is increased further.

File transfer times for Task 2:

MSS	Run 1	Run 2	Run 3	Run 4	Run 5	Average
100	2445.104	2381.831	2398.598	2546.21	2331.754	2420.6994
200	1238.241	1210.858	1218.706	1278.432	1201.534	1229.5542
300	883.523	808.356	808.634	892.412	803.681	839.3212
400	613.067	603.209	600.899	647.476	597.243	612.3788
500	527.231	457.67	492.8	549.312	479.576	501.3178
600	350.712	343.756	340.889	352.389	347.568	347.0628
700	290.544	289.723	290.424	305.697	288.906	293.0588
800	265.837	260.074	259.244	265.621	255.49	261.2532
900	248.107	251.606	248.727	241.789	253.341	248.714
1000	219.875	205.448	207.678	215.742	209.592	211.667



### Task 3:

Effect of Probabilistic loss factor:

We see the effect on file transfer time when the probabilistic loss factor is increased in steps of 0.01 while keeping the maximum segment size and no of receiver's constant.

Probabilistic loss factor : 0.01 to 0.1, in steps of 0.01

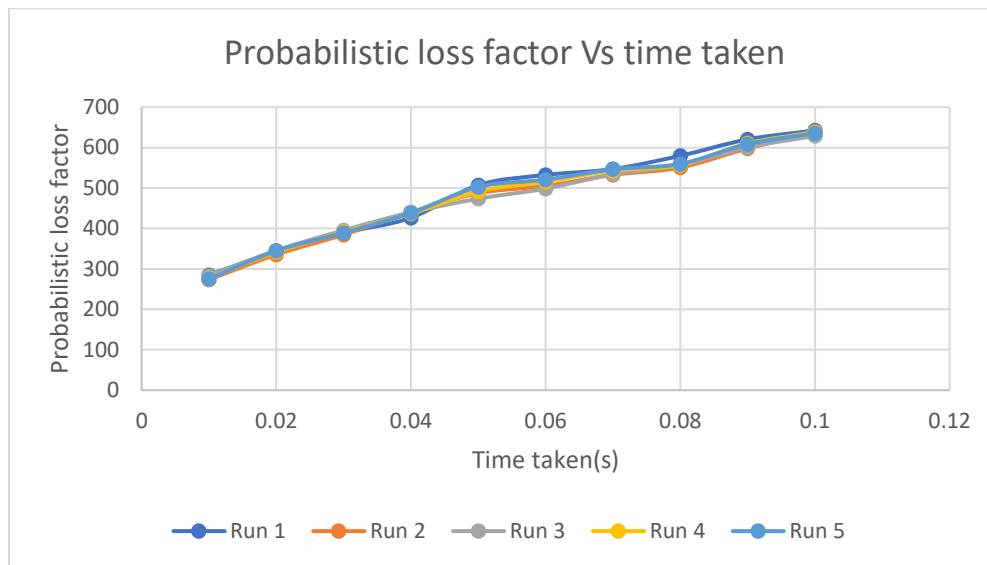
Maximum segment size : 500

No of Receivers : 3

The experiment was conducted five times for different values of probabilistic loss factor for accuracy. The captured results are as shown in the table. And the graph clearly demonstrates that the time taken to transfer the file increases with the increase almost linearly with increase in probabilistic loss factor.

### File transfer times for Task 3:

Probability factor	Run 1	Run 2	Run 3	Run 4	Run 5	Average
0.01	285.078	273.411	282.714	276.932	275.631	278.7532
0.02	343.047	335.598	345.61	341.683	344.903	342.1682
0.03	389.139	384.819	395.529	391.243	389.456	390.0372
0.04	426.649	440.288	440.013	436.702	438.366	436.4036
0.05	507.131	487.357	473.6	491.631	502.731	492.49
0.06	532.427	505.139	498.765	515.684	520.798	514.5626
0.07	547.04	532.619	533.937	543.189	546.431	540.6432
0.08	579.81	550.871	556.757	557.323	559.803	560.9128
0.09	620.423	598.068	600.644	610.481	608.672	607.6576
0.1	642.534	638.846	628.839	638.514	635.792	636.905



### Conclusion:

This project gave us an insight into building reliable application protocols on top of unreliable transport layer protocol(UDP). Performing experiments with varying parameters like maximum segment size, probabilistic loss factor and number of receivers demonstrated the effect of each factor on the time taken to transfer the file to all the requested server.

### Reference:

<https://stackoverflow.com/questions/3949726/calculate-ip-checksum-in-python>