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Project 1 Report

Step 2 and 3

The plots of Total Time (nanoseconds) for each Mode and File Size for each scenario can be observed in the plots and figures below: [Furthermore, the client timeout was three seconds for all scenarios and modes.]

Part 2 (Packet size = 5000 bytes) (Same room)

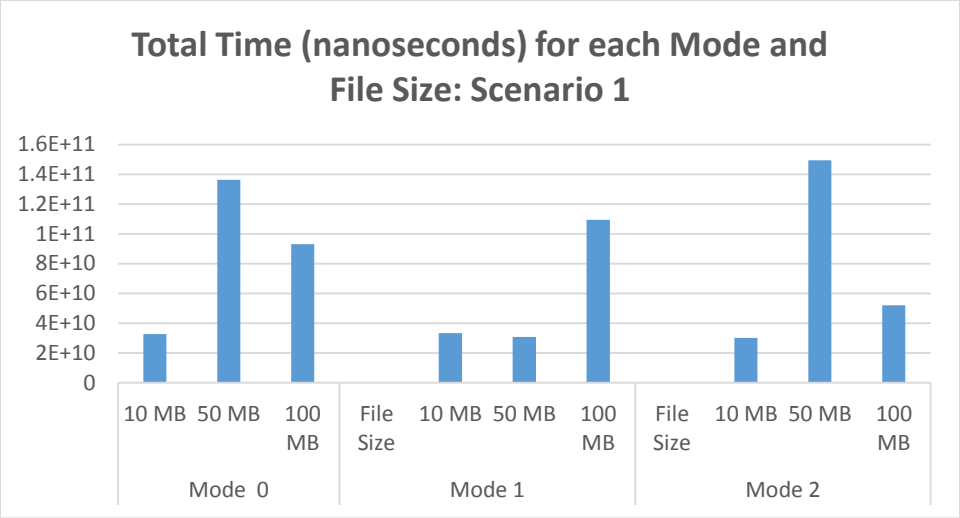
	File Size	Total Time (nano seconds)	Total Data Loss (bytes received)
Mode 0	10 MB	32604356600	9998499
	50 MB	1.36294E+11	49323757
	100 MB	93152504400	23029552
Mode 1	File Size		
	10 MB	33206647300	9560092
	50 MB	30816488600	8388322
	100 MB	1.0946E+11	32893420
Mode 2	File Size		
	10 MB	30060159600	9990392
	50 MB	1.49262E+11	49950315
	100 MB	52010085000	10743819

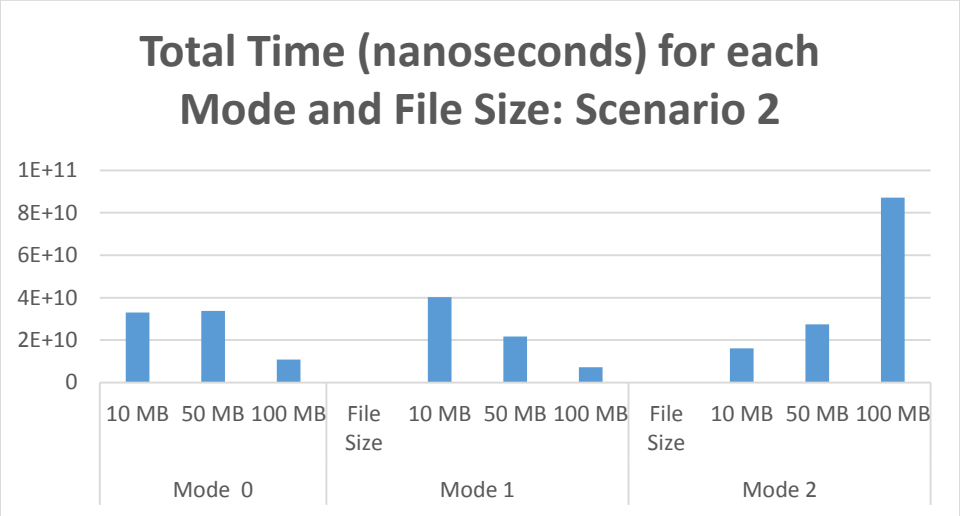
Part 2 (Packet size = 5000 bytes) (Server on campus and Client off campus)

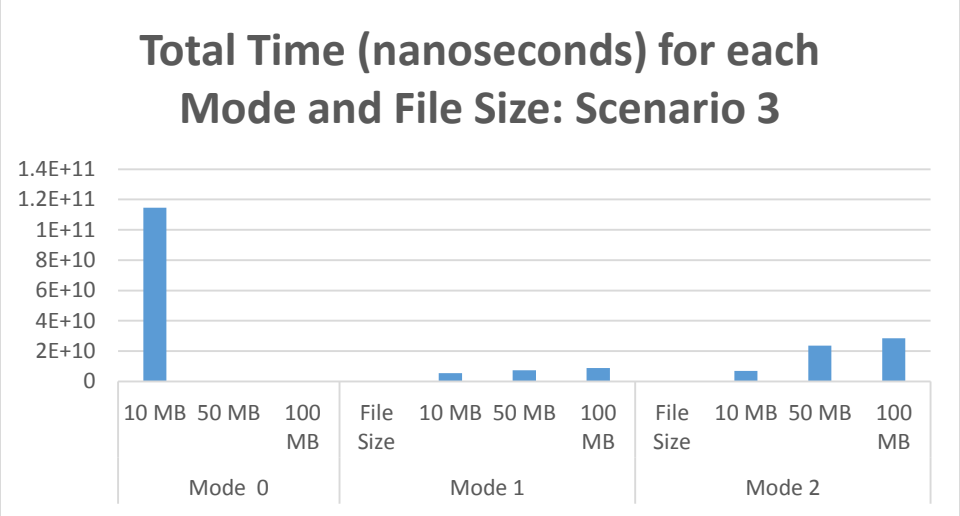
	File Size	Total Time (nano seconds)	Total Data Loss (bytes received)
Mode 0	10 MB	33021274800	2044728
	50 MB	33774676700	8054965
	100 MB	10764556600	1122812
Mode 1	File Size		
	10 MB	40172909000	1179764
	50 MB	21757067600	619876
	100 MB	7148818400	324935
Mode 2	File Size		
	10 MB	16146499000	624875
	50 MB	27459903300	839832
	100 MB	87074689900	6303763

Part 2 (Packet size = 5000 bytes) (Server on campus and client with weak signal)

	File Size	Total Time (nano seconds)	Total Data Loss (bytes received)
Mode 0	10 MB	1.14672E+11	8471045
	50 MB	NULL	NULL
	100 MB	NULL	NULL
Mode 1	File Size		
	10 MB	5330276600	249950
	50 MB	7413015800	289942
	100 MB	8857241400	159968
Mode 2	File Size		
	10 MB	6992371600	154983
	50 MB	23497955800	160028
	100 MB	28515226900	170198


Total Time (nanoseconds) for each Mode and File Size: Scenario 1
1.6E+11
1.4E+11
1.2E+11
1E+11
8E+10
6E+10
4E+10
2E+10
0
10 MB
50 MB
100 MB
File Size
Mode 0
Mode 1
Mode 2


Total Time (nanoseconds) for each Mode and File Size: Scenario 2
1E+11
8E+10
6E+10
4E+10
2E+10
0
10 MB
50 MB
100 MB
File Size
Mode 0
Mode 1
Mode 2


Total Time (nanoseconds) for each Mode and File Size: Scenario 3
1.4E+11
1.2E+11
1E+11
8E+10
6E+10
4E+10
2E+10
0
10 MB
50 MB
100 MB
File Size
Mode 0
Mode 1
Mode 2

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The percentage of data received for each mode and scenario can be observed in the table and plots below:

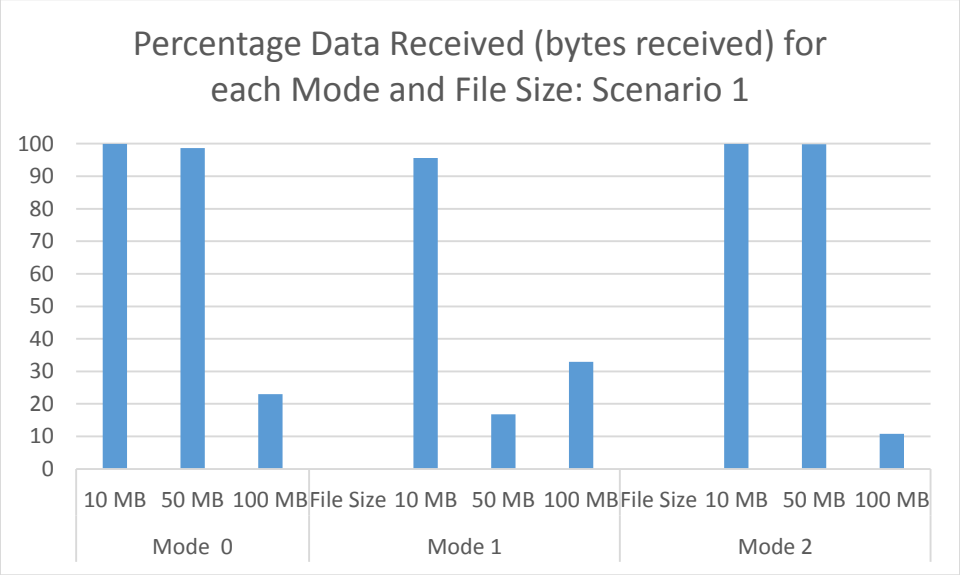
Part 2 (Packet size = 5000 bytes) (Same room)			
	File Size	**Percentage Data Received (bytes received)**	**Total Data Loss (bytes received)**
Mode 0	10 MB	99.98499	9998499
	50 MB	98.647514	49323757
	100 MB	23.029552	23029552
Mode 1	File Size		
	10 MB	95.60092	9560092
	50 MB	16.776644	8388322
	100 MB	32.89342	32893420
Mode 2	File Size		
	10 MB	99.90392	9990392
	50 MB	99.90063	49950315
	100 MB	10.743819	10743819

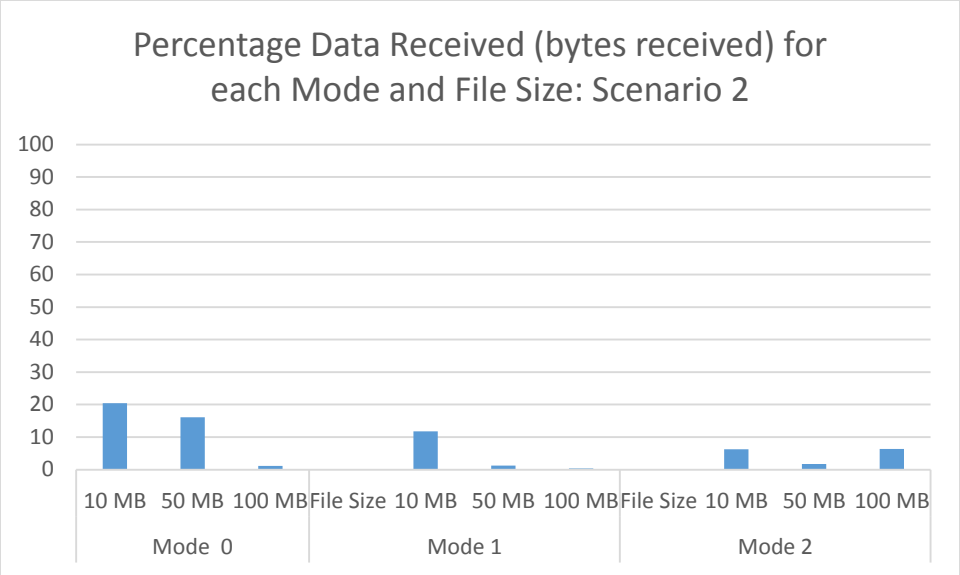
Part 2 (Packet size = 5000 bytes) (Server on campus and Client off)			
	File Size	**Percentage Data Received (bytes received)**	**Total Data Loss (bytes received)**
Mode 0	10 MB	20.44728	2044728
	50 MB	16.10993	8054965
	100 MB	1.122812	1122812
Mode 1	File Size		
	10 MB	11.79764	1179764
	50 MB	1.239752	619876
	100 MB	0.324935	324935
Mode 2	File Size		
	10 MB	6.24875	624875
	50 MB	1.679664	839832

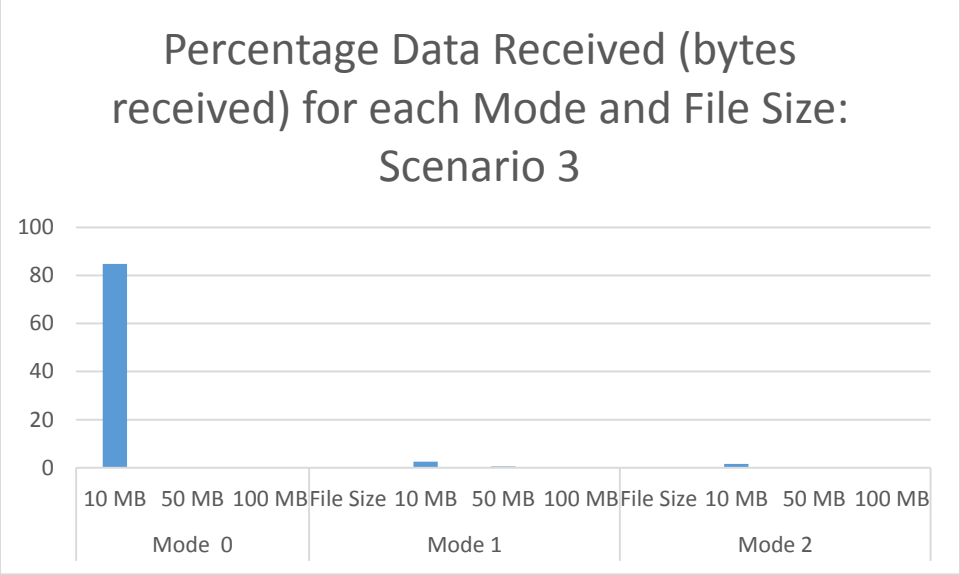
	100 MB	6.303763	6303763

Part 2 (Packet size = 5000 bytes) (Server on campus and client with weak signal)

	File Size	Percentage Data Received (bytes received)	Total Data Loss (bytes received)
Mode 0	10 MB	84.71045	8471045
	50 MB	NULL	NULL
	100 MB	NULL	NULL
Mode 1	File Size		
	10 MB	2.4995	249950
	50 MB	0.579884	289942
	100 MB	0.159968	159968
Mode 2	File Size		
	10 MB	1.54983	154983
	50 MB	0.320056	160028
	100 MB	0.170198	170198







The cells filled with "NULL" denote trials which were unsuccessful in transmitting data after 3 trials. Each trial involved restarting both the server and the client, and using a different port number. In addition, these connections lasted in multiple trials for more than seven minutes.

Experimenting with Packet Delay

The variance and Mean for Scenarios 1 and 3 is below:

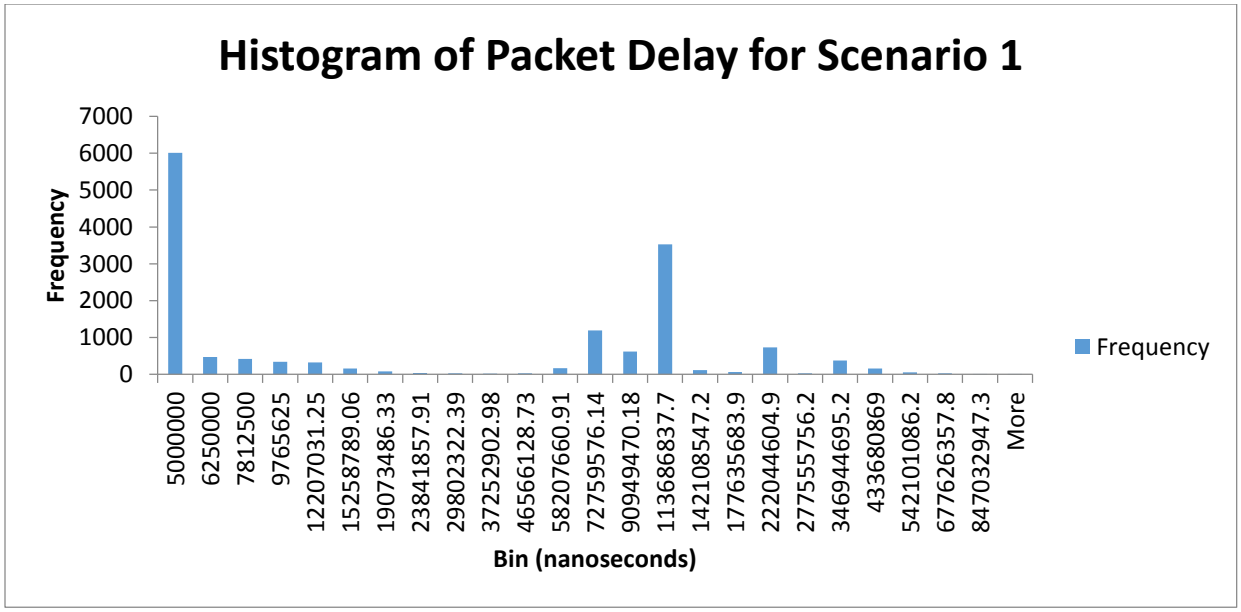
Scenario 1

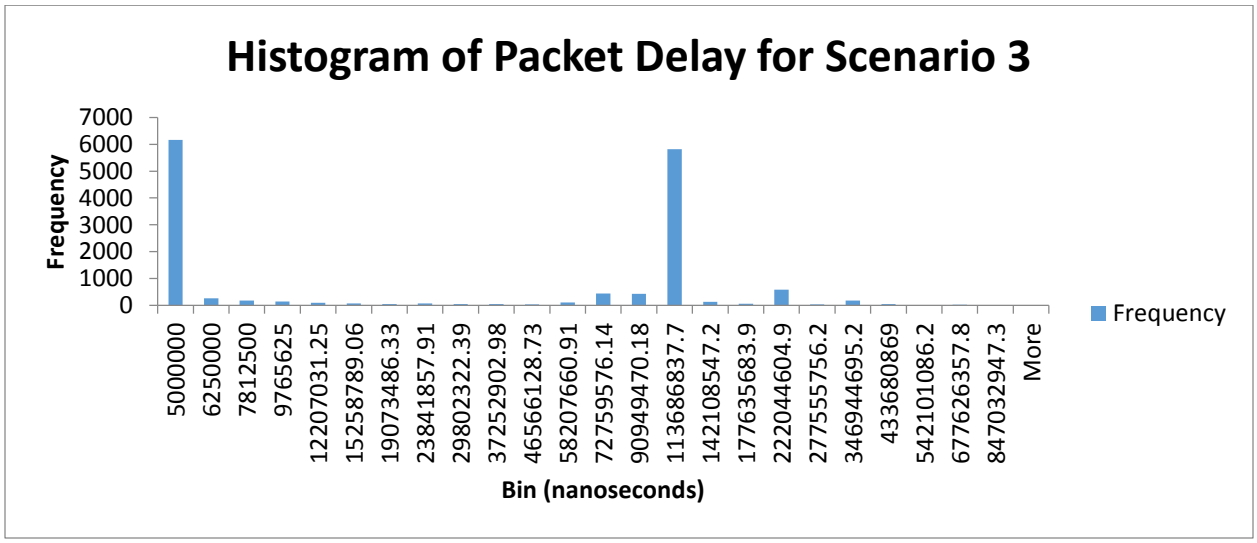
Variance (nanoseconds)	**8.0226E+15**
Mean (nanoseconds)	**62295162.58**

Scenario 3

Variance (nanoseconds)	**5.64076E+15**
Mean (nanoseconds)	**62279678.15**

The histograms of the packet delay for each scenario can be observed below.





The packet pair technique was used to compute the bottleneck capacity using the following equation:

$$bottleneck\ capacity = \frac{packet\ size}{delay\ between\ arrival\ times\ of\ two\ packets}$$

Using excel, the bottleneck capacity was computed over many values, and averaged, to find the following results:

	Scenario 1	**Scenario 3**
Mean bottleneck capacity	12458.62295	12455.46