Simulation Project Task 3 - Conclusion

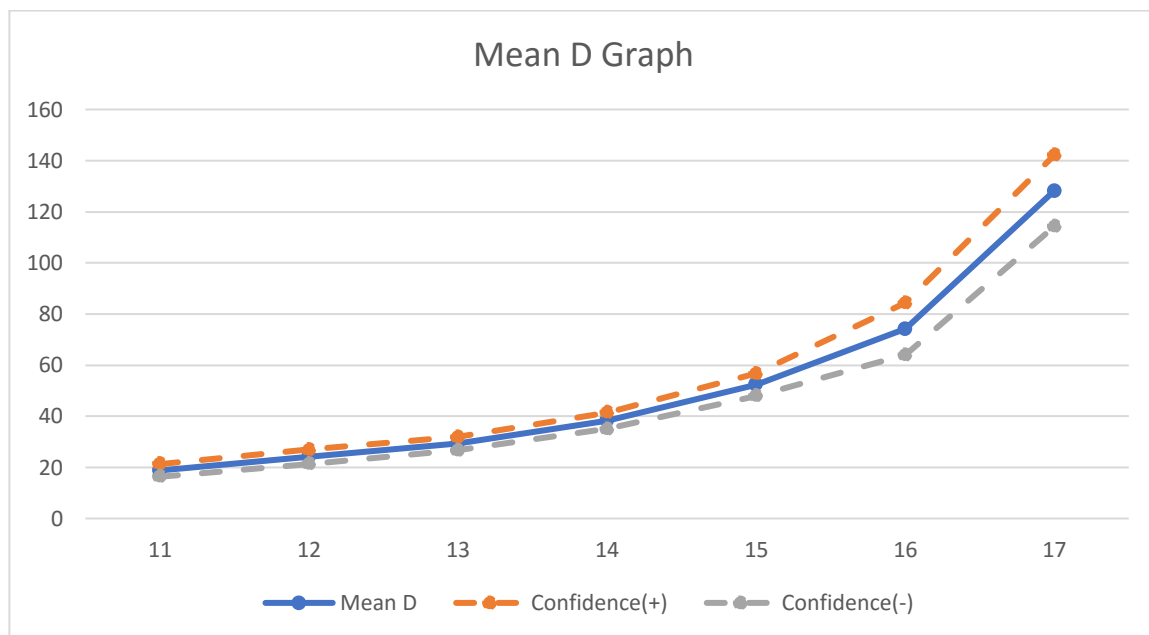**Name: Aditya Bhardwaj**   **Unity ID: ABHARDW2**
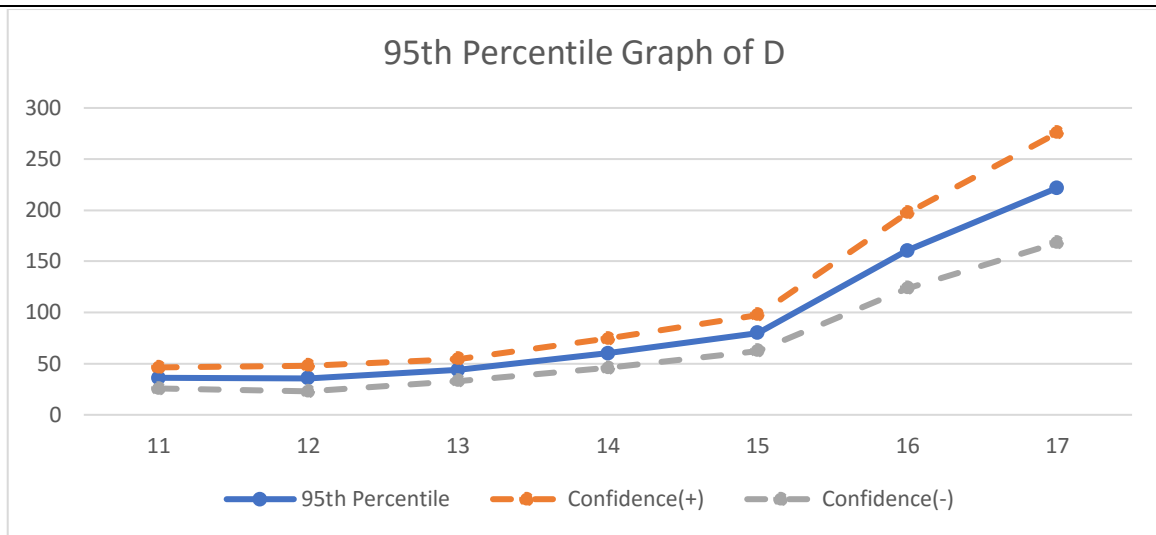
Service Time

Mean D and 95th Percentile of D for the Service Time:

Service Time	Mean D	Confidence of Mean Value		95th Percentile	Confidence of 95th Percentile	
		Confidence(+)	Confidence(-)		Confidence(+)	Confidence(-)
11	18.81	21.28	16.34	35.91	46.36	25.46
12	24.17	26.97	21.37	35.57	48.18	22.96
13	29.29	31.93	26.65	43.89	54.58	33.2
14	38.27	41.49	35.05	60.11	74.4	45.82
15	52.32	56.68	47.96	79.95	97.55	62.35
16	74.19	84.36	64.02	160.41	197.26	123.56
17	128.18	142.12	114.24	221.82	275.49	168.15

In the graph below, we can observe that the Mean D value increases exponentially as the Service time is increased which indicates the number of devices going into the buffer queue while the Current device is serviced increased with the service time.


In the graph below for the 95th percentile of D, we can observe the similar trend with some fluctuations which are due to using 95th percentile value. This is because as the mean value changes similarly the 95th Percentile values will change for every iteration.

95th Percentile Graph of D

Mean D and 95ᵗʰ Percentile of T for the Service Time:

Service Time	Mean T	Confidence of Mean Value		95th Percentile	Confidence of 95ᵗʰ Percentile	
		Confidence(+)	Confidence(-)		Confidence(+)	Confidence(-)
11	13.95	14.26	13.64	16.03	17.28	14.78
12	17.81	18.37	17.25	21.99	23.82	20.16
13	23.17	24.04	22.3	27.92	30.29	25.55
14	30.24	31.45	29.03	37.84	42	33.68
15	46.09	48.56	43.62	66.5	76.02	56.98
16	69.26	77.33	61.19	142.49	173.71	111.27
17	126.75	138.83	114.67	200.14	243.86	156.42

In the graph below, we can observe that the Mean T value increases as the Service time is increased which indicates the number of devices going into the buffer queue while the Current device is serviced increased with the service time. An exponential level increase can be observed from Service time 15 to Service time 17 which can be related to time spent by each device in the retransmission.

Mean T Graph

95th Percentile Graph for T
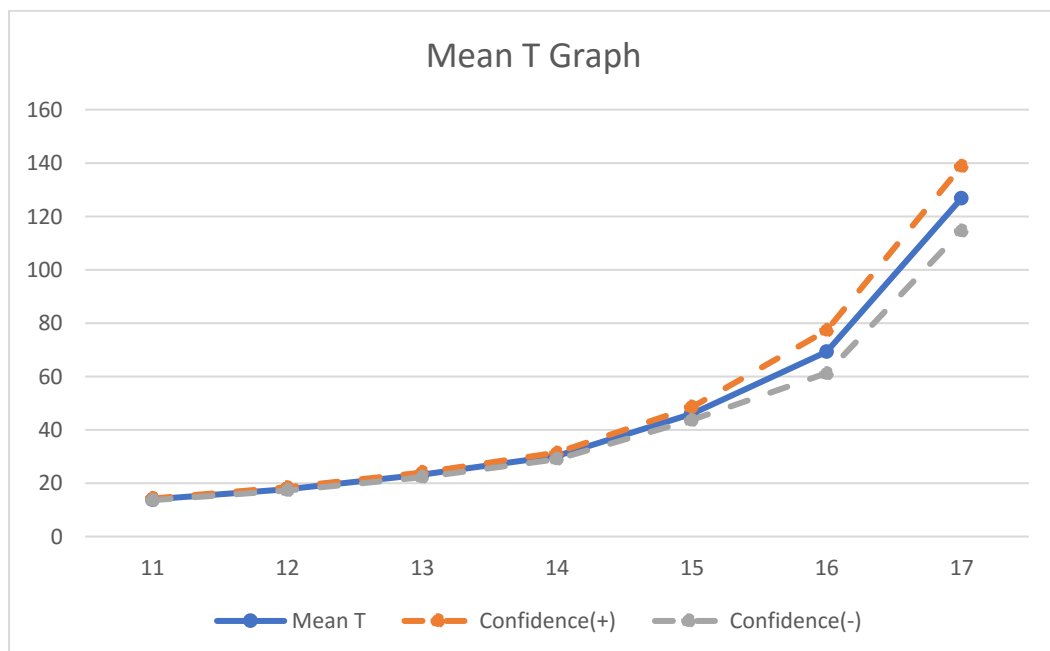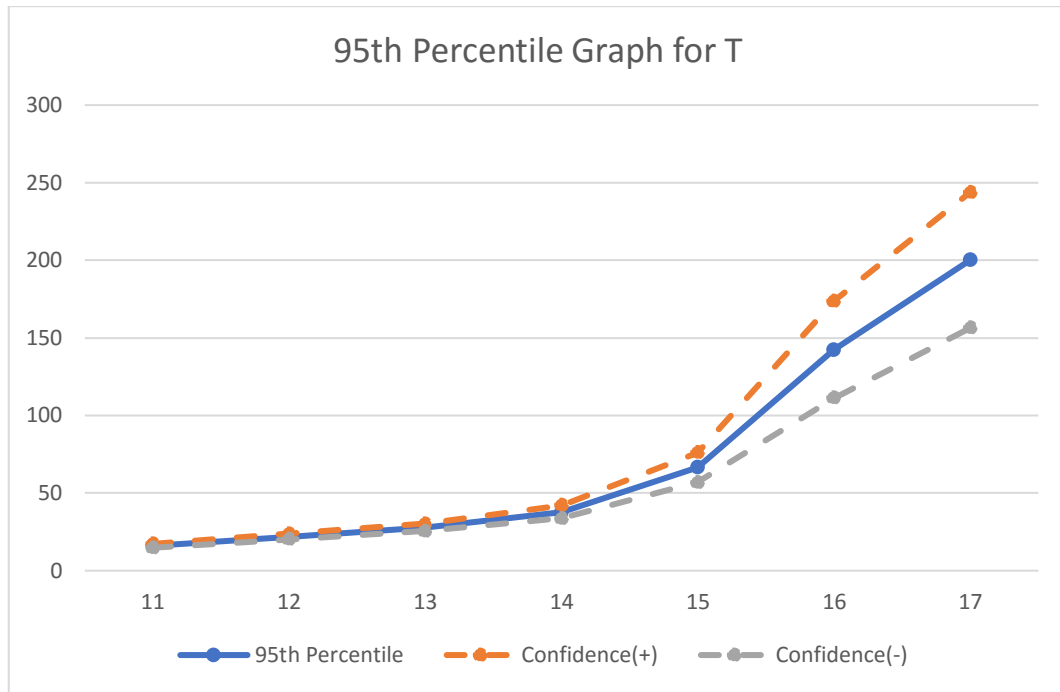
In the graph above, the similar trend continues as that observed in the Mean T graph. Though there is some difference in pattern which is due to the percentile value in the graph.

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Mean of P for the Service Time:

| Service Time	Mean P	Confidence(+)	Confidence(-)
11	18139.12	18288.79	17989.45
12	18131.78	18306.56	17957
13	18104.77	18264.62	17944.92
14	18180.1	18329.47	18030.73
15	18059.22	18209.8	17908.64
16	18147.86	18324.32	17971.4
17	18146.14	18268.09	18024.19

In the graph below, we can observe that the Mean P value varies with little fluctuations which means that the total execution time doesn't vary much with the increase in service time. This confirms that the average total execution time changes very little even upon varying the service time.
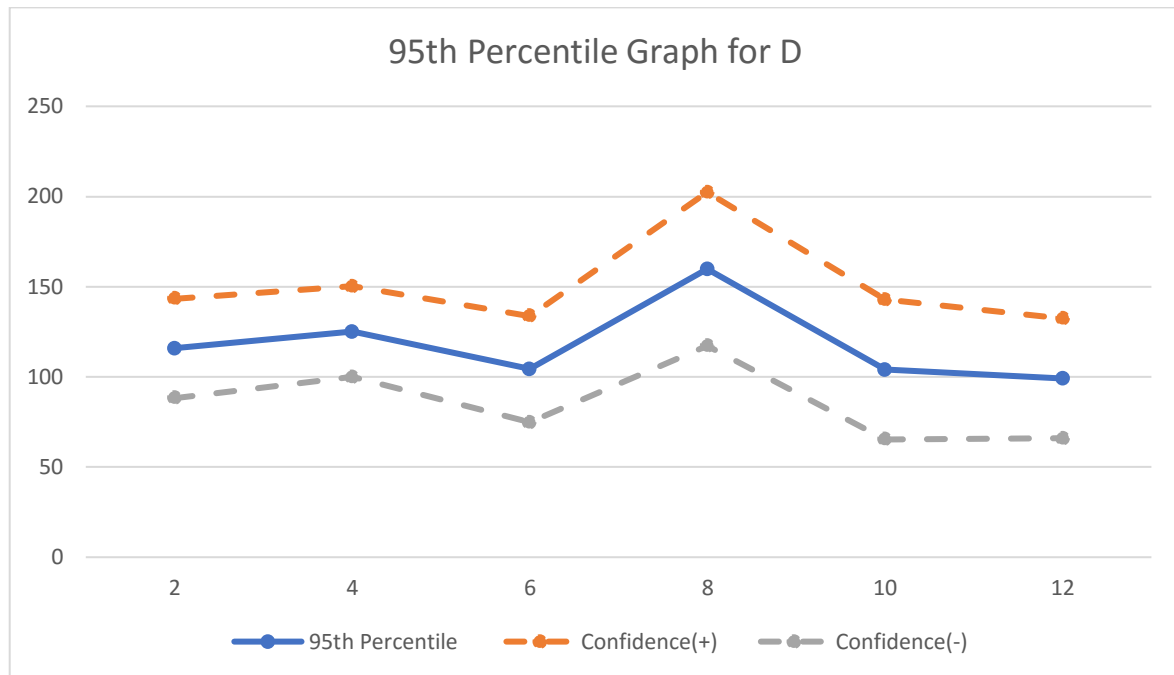
Mean P Graph
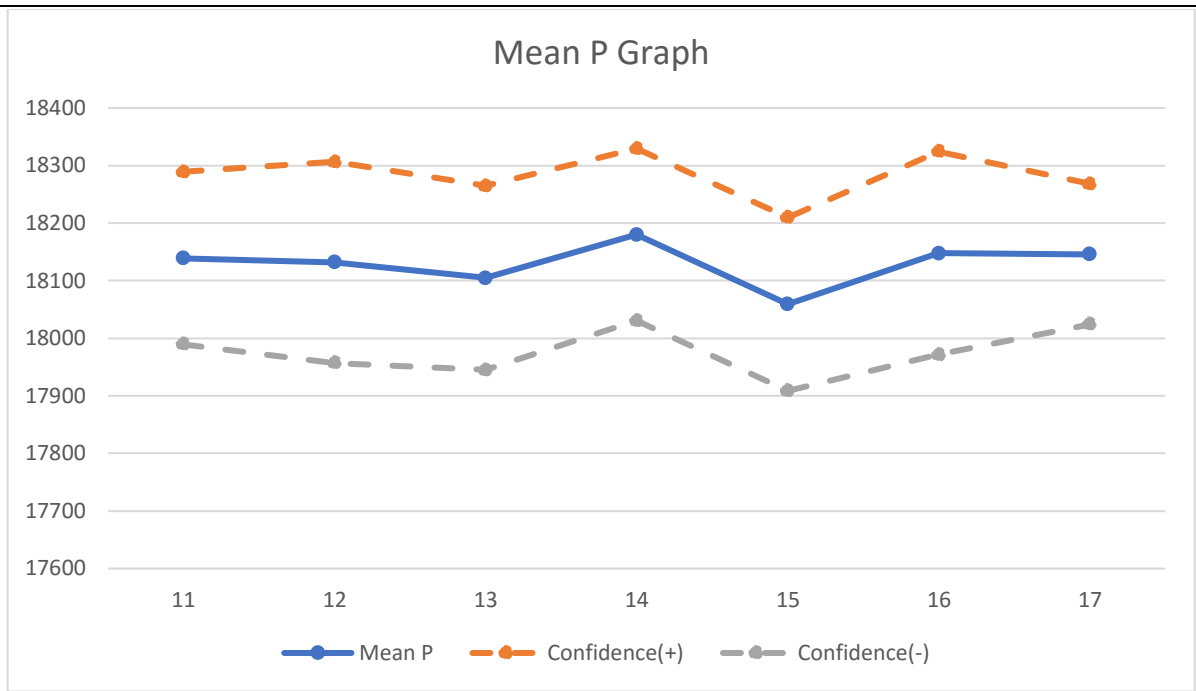
Buffer Size:

Mean D and 95th Percentile of D for the Buffer Size:

| Buffer Data	Mean D	Confidence of Mean Value		95th Percentile	Confidence of 95th Percentile	
		Confidence(+)	Confidence(-)		Confidence(+)	Confidence(-)
2	75.73	82.38	69.08	115.83	143.4	88.26
4	73.92	80.39	67.45	125.1	150.2	100
6	62.5	70.57	54.43	104.26	133.67	74.85
8	78.84	91.5	66.18	159.8	202.39	117.21
10	49.48	59.44	39.52	104.04	142.8	65.28
12	39.49	48.43	30.55	99.1	132.37	65.83

Mean D Chart
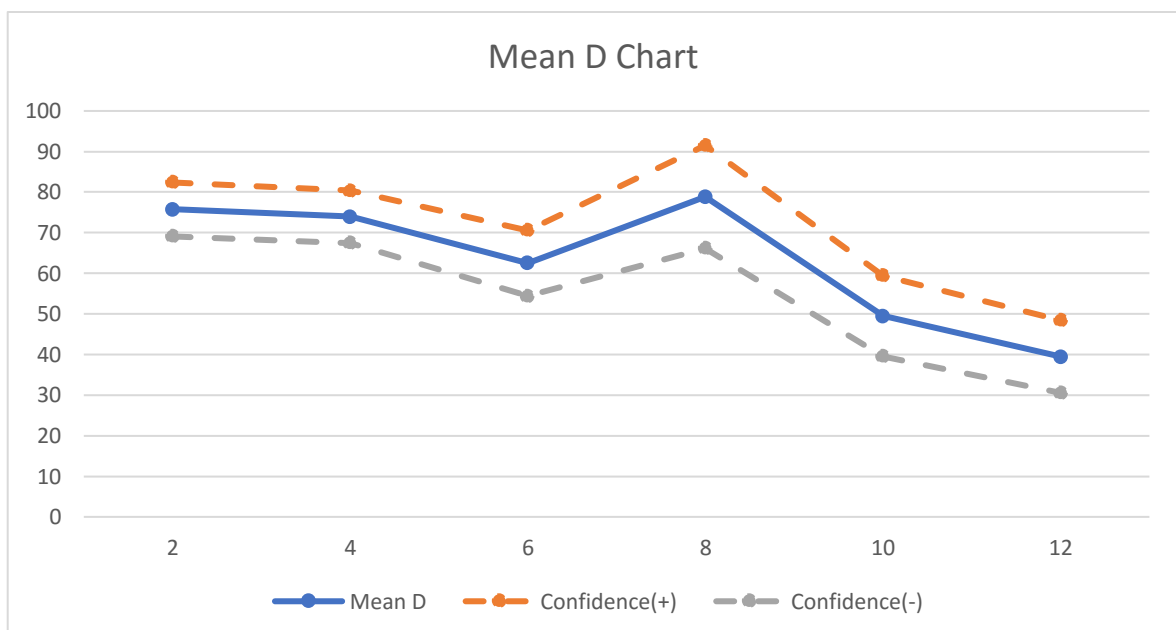
In the graph above, the Mean D value decrease gradually as the Buffer Size is increased which indicates the average delay time is inversely proportional to the Buffer Size. The similar trend can be observed in the 95th percentile graph of D with a sudden spike at Buffer Size = 8; this can be observed in the T value graph too.

95th Percentile Graph for D

Mean T and 95th Percentile of T for the Buffer Size:

Buffer Data	Mean T	Confidence of Mean Value		95th Percentile	Confidence of 95th Percentile	
		Confidence(+)	Confidence(-)		Confidence(+)	Confidence(-)
2	66.4	72.34	60.46	99.37	123.52	75.22
4	69.2	74.56	63.84	109.79	129.65	89.93
6	64.6	69.74	59.46	94.64	114	75.28
8	76.37	85.16	67.58	152.27	183.97	120.57
10	63.78	69.63	57.93	94.2	115.78	72.62
12	69.47	75.67	63.27	108.44	124.83	92.05

Mean T Graph
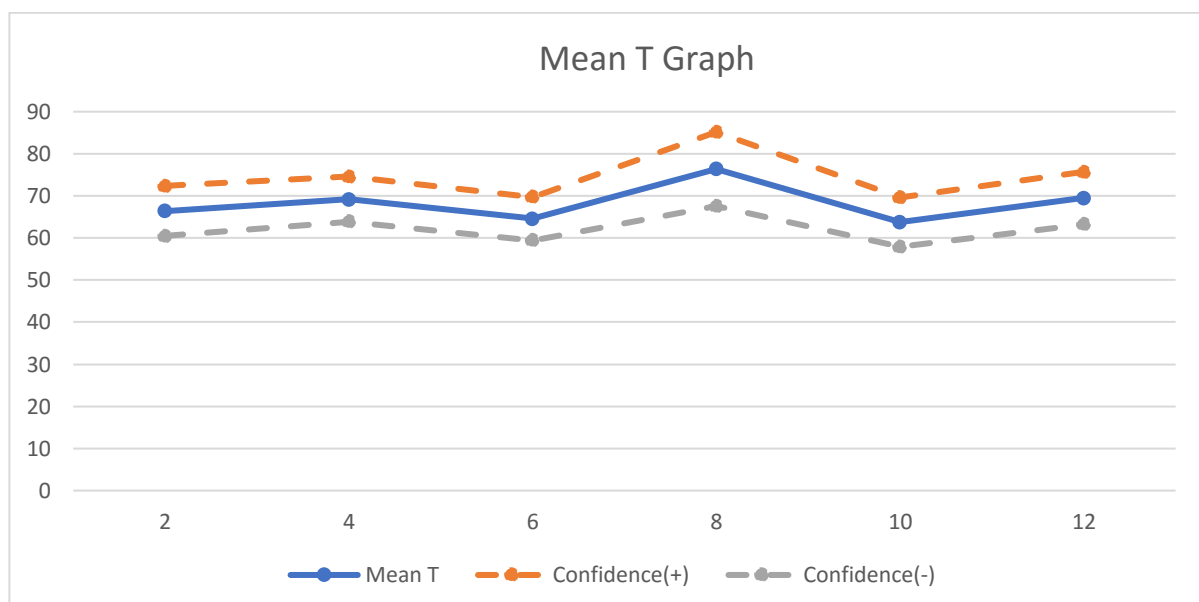
In the graph above, the Mean T value doesn't vary much as the Buffer Size increases. This indicates the service time doesn't get affected much when the buffer size is increased.

The similar trend can be seen in the graph below which is for the 95th Percentile for the Graph. There is one observation noted in this case that the value increases around Buffer Size = 8; this was also visible in the Mean D graph for the Buffer Size variation.
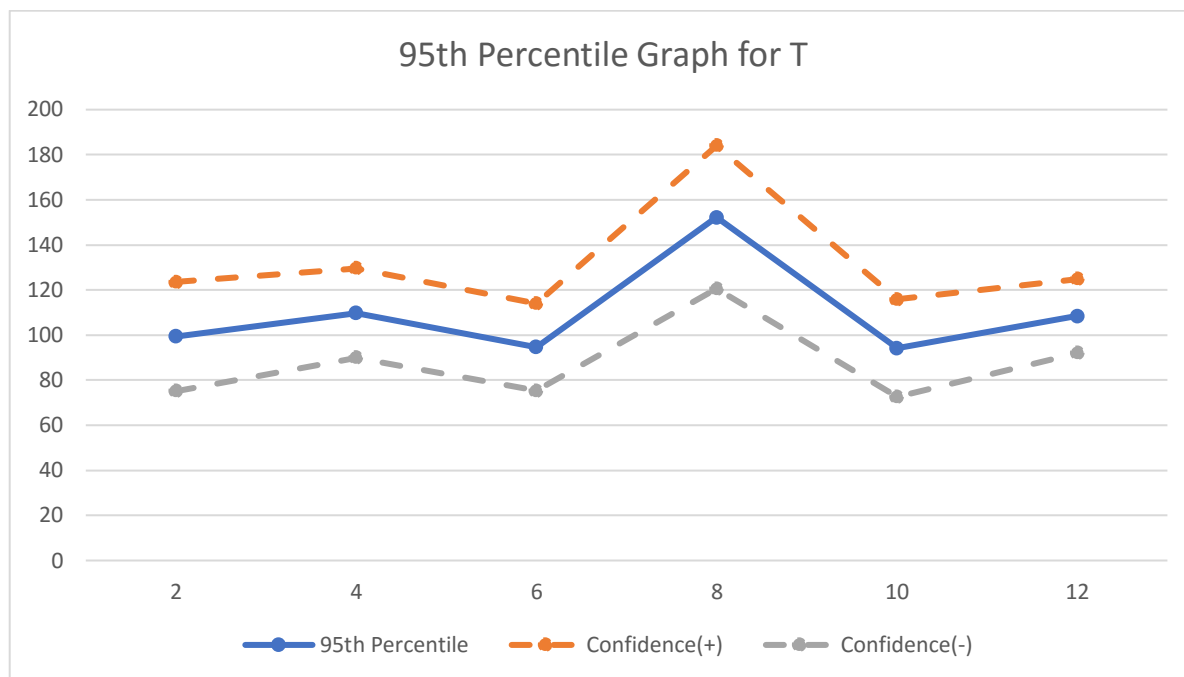
Mean P for the Buffer Size:

Buffer Data	Mean P	Confidence(+)	Confidence(-)
2	18092.28	18250.6	17933.96
4	18069.54	18227.54	17911.54
6	18139.1	18310.82	17967.38
8	18076.14	18241.29	17910.99
10	18127.95	18278.59	17977.31
12	17991.75	18168.08	17815.42

The variation in mean P value is not much in the case of Buffer Size too which is similar to the P Value Graph in Service time which means the total execution time doesn't vary much with the change in buffer size but as we can see for Buffer Size = 12; the P value is lowest which could be due to larger buffer size and hence more devices in the queue.

Mean P Graph