SIMULATION TASK 3 RESULTS

Mean batch for RT and NonRT messages

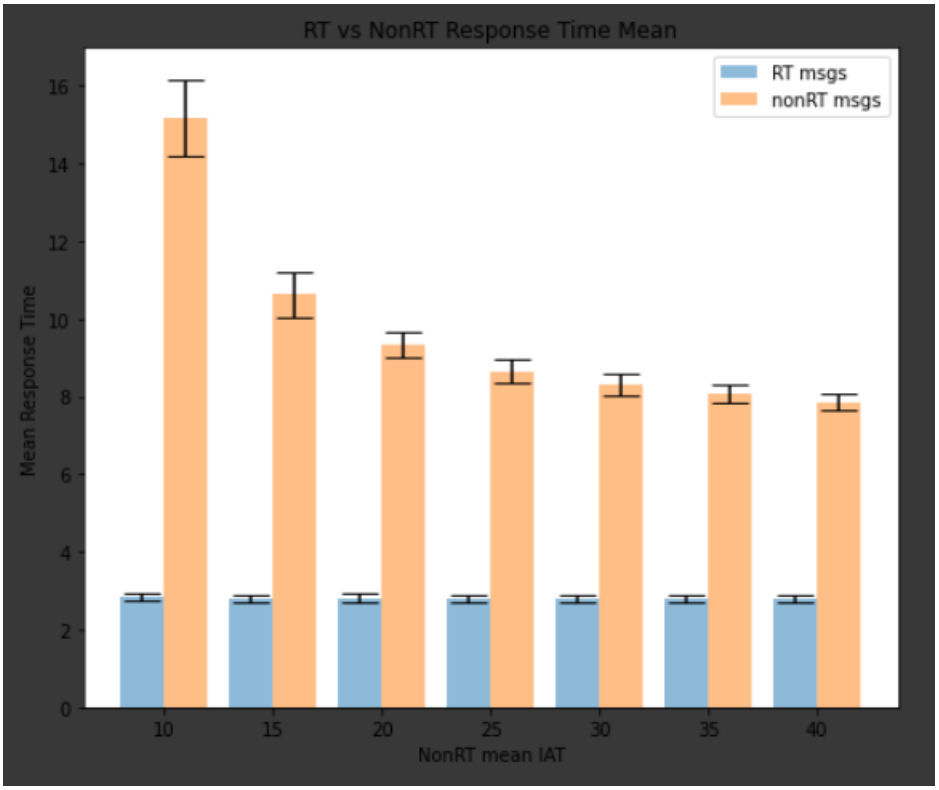
RT messages observations for varying $MIAT_{nonRT}$

	MIAT(nonRT)	mean	95th percentile	confidence interval	error
0	10	2.829758	3.067945	(2.7832135115238406, 2.8763034036468382)	0.093090
1	15	2.786555	3.067302	(2.7405042641121833, 2.832606667872164)	0.092102
2	20	2.811965	3.051499	(2.76280003850186, 2.8611308573698144)	0.098331
3	25	2.804773	3.078563	(2.761340338762462, 2.8482060488484677)	0.086866
4	30	2.789860	3.058510	(2.742401106907447, 2.8373187024965243)	0.094918
5	35	2.802315	3.097391	(2.7554392938154324, 2.8491903312022258)	0.093751
6	40	2.795852	3.084787	(2.7510058525738024, 2.840699124054646)	0.089693

NonRT messages observation for varying $MIAT_{nonRT}$

	MIAT(nonRT)	mean	95th percentile	confidence interval	error
0	10	15.168554	18.266402	(14.67014409877716, 15.666964736424125)	0.996821
1	15	10.632826	12.434036	(10.341827479811048, 10.923825249344755)	0.581998
2	20	9.324734	10.363398	(9.159402944626994, 9.490064549628503)	0.330662
3	25	8.643257	9.398435	(8.494138956615483, 8.79237453556944)	0.298236
4	30	8.309325	9.130086	(8.17277568322125, 8.445874389630106)	0.273099
5	35	8.074991	8.748080	(7.965048173526968, 8.184934083282384)	0.219886
6	40	7.852169	8.434106	(7.752139973681537, 7.952197998180152)	0.200058

Graphs:



Shown above are two graphs plotting the mean response time for RT and nonRT messages. The first plots the response time as a function of $MIAT_{nonRT}$ and the second plots it as a function of $1/MIAT_{nonRT}$

Since RT messages have the higher priority they are serviced as soon as they arrive (if an RT message is not being processed already). Thus, the mean response time of the RT messages is nearly the same as the mean service time for RT messages. That is the same reason why the mean response time of RT messages remains almost the same across varying $MIAT_{nonRT}$.
On the other hand, the mean response time for nonRT messages is much greater than the mean service time for the nonRT messages. This is because, every time a RT message arrive, the nonRT message is pre-empted and put back into the nonRT queue. With the increase in the $MIAT_{nonRT}$ the mean response time for nonRT messages decreases, along with the decrease in the width of confidence interval. The increase in $MIAT_{nonRT}$ results in nonRT message queue to have a smaller number of messages to process at a given time, thus a given nonRT message doesn't have to wait for other nonRT messages to get processed before itself. This results in a nonRT message being processed as soon as the server is idle (with the increase in $MIAT_{nonRT}$, less competition among nonRT messages to occupy the server). Smaller confidence interval indicates the mean value is closer to the 95^{th} percentile and the distribution is less "fat" tailed. This decrease starts to become stable around MIAT=30 and will probably stabilize at this value even if the MIAT is increased beyond 40. The value of the mean response time at this stage is near the mean service time of nonRT messages as compared to lower $MIAT_{nonRT}$ values. Increasing the MIAT beyond this point will not improve the response time by a significant amount, although the confidence interval might improve.

Percentile batch for RT and nonRT messages

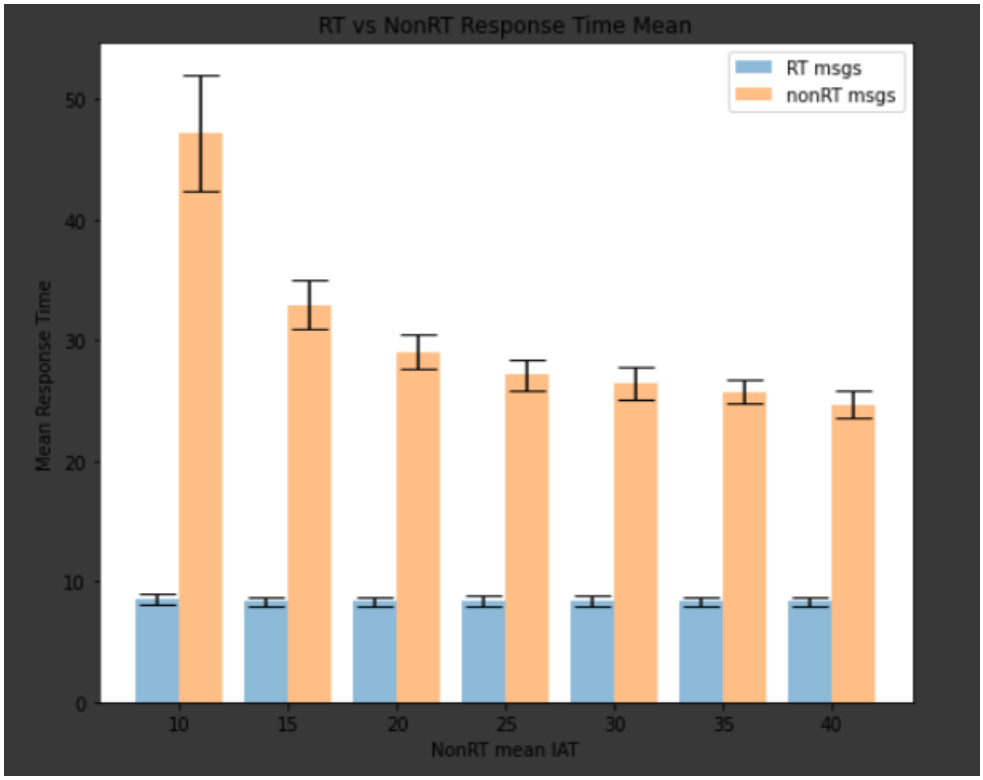
RT messages observation for varying $MIAT_{nonRT}$

	MIAT(nonRT)	mean	95th percentile	confidence interval	error
0	10	8.539918	9.740967	(8.342218077759801, 8.737617272186581)	0.395399
1	15	8.359715	9.583477	(8.157887649330803, 8.56154147572586)	0.403654
2	20	8.377672	9.430989	(8.186295728403962, 8.569047553170194)	0.382752
3	25	8.363018	9.753511	(8.144785393814136, 8.58125062989161)	0.436465
4	30	8.377240	9.370998	(8.166731160996045, 8.587748851242056)	0.421018
5	35	8.369524	9.404005	(8.172939615573465, 8.566107809771125)	0.393168
6	40	8.345661	9.723996	(8.143816217365226, 8.547506551345935)	0.403690

nonRT messages observation for varying $MIAT_{nonRT}$

	MIAT(nonRT)	mean	95th percentile	confidence interval	error
0	10	47.228131	63.681664	(44.80788522036695, 49.6483763543069)	4.840491
1	15	32.937117	38.850815	(31.913309797035026, 33.96092341313765)	2.047614
2	20	29.075521	33.702589	(28.33062926100649, 29.820412819214123)	1.489784
3	25	27.143973	31.270159	(26.499268210184503, 27.78867835268104)	1.289410
4	30	26.454375	30.252011	(25.793786672403535, 27.114964290799776)	1.321178
5	35	25.745471	29.067756	(25.244757224813014, 26.24618511575001)	1.001428
6	40	24.710971	27.966875	(24.176973930222154, 25.244968985727887)	1.067995

Graphs:



Shown above are two graphs plotting the mean response time for RT and nonRT messages. The first plots the response time as a function of $MIAT_{nonRT}$ and the second plots it as a function of $1/MIAT_{nonRT}$

The mean response time for both RT and nonRT messages is similar to the above graph which is expected. The RT message response time again remains almost constant with the varying $MIAT_{nonRT}$. The reason is that the RT messages have a higher priority and are processed as soon as possible. The mean response time value is higher than the mean service time because we are considering the 95^{th} percentile values from a given batch and RT messages can get delayed if other RT messages are present in the queue ahead of a given message.
Mean response time for nonRT messages again decrease with the increase in $MIAT_{nonRT}$. The decrease is again because of the decrease in the number of messages present in the nonRT queue at a given time due to the increase in MIAT. The stable response time is much greater than the mean service time for nonRT messages because we considered the 95^{th} percentile value from each batch. The mean response time again starts to stabilize around MIAT=30. The confidence interval again decreases as increase MIAT indicating that the mean value is getting closer to the 95^{th} percentile (“slim” tail distribution)