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 CIS3207 - Project 1 - Giorgio's Discrete Event Simulator
 RUN file

Trial	1	2	3	4	5	6	7	8	9	10	11	12
SEED	0	0	0	0	0	0	0	0	0	0	1	2
INIT_TIME	0	0	0	0	0	0	0	0	0	0	0	0
FIN_TIME	10000	10000	10000	10000	10000	10000	10000	10000	10000	20000	20000	20000
ARRIVE_MIN	10	30	10	10	10	15	1	1	1	1	1	1
ARRIVE_MAX	20	40	20	20	20	25	40	40	40	40	40	40
QUIT_PROB	2	2	2	2	2	2	2	2	2	2	2	2
CPU_MIN	10	10	5	2	2	2	2	5	3	3	3	3
CPU_MAX	20	20	10	5	5	5	5	7	5	5	5	5
DISK1_MIN	10	10	10	10	5	5	5	5	5	5	5	5
DISK1_MAX	20	20	20	20	10	10	10	10	10	10	10	10
DISK2_MIN	10	10	10	10	5	5	5	5	5	5	5	5
DISK2_MAX	20	20	20	20	10	10	10	10	10	10	10	10
	1	2	3	4	5	6	7	8	9	10	11	12
M_EVENT_Qlen	5	5	5	5	5	5	5	5	5	5	5	5
M_CPU_Qlen	527	139	395	3	119	23	11	16	16	25	33	17
M_D1_Qlen	1	1	2	145	4	3	3	1	2	2	2	2
M_D2_Qlen	1	1	2	145	3	3	2	1	2	2	2	2
AVG_EVENT_Qlen	3.03	3.03	3.82	4.04	3.96	3.88	3.70	3.28	3.68	3.71	3.66	3.64
AVG_CPU_Qlen	263.72	67.52	188.07	0.29	61.72	5.88	2.10	77.63	4.83	8.50	8.79	5.43
AVG_D1_Qlen	0.03	0.03	0.27	73.78	0.45	0.40	0.30	0.06	0.19	0.20	0.19	0.18
AVG_D2_Qlen	0.03	0.04	0.29	73.78	0.46	0.42	0.30	0.07	0.22	0.23	0.19	0.18
CPU_Util	1.00	1.00	1.00	0.70	1.00	0.95	0.85	1.00	0.97	0.97	0.95	0.95
D1_Util	0.41	0.38	0.80	1.00	0.85	0.83	0.74	0.50	0.72	0.72	0.71	0.71
D2_Util	0.39	0.39	0.80	1.00	0.86	0.82	0.73	0.51	0.74	0.75	0.71	0.70
CPU jobs/unitTime	0.07	0.07	0.13	0.20	0.28	0.27	0.24	0.17	0.24	0.24	0.24	0.24
D1 jobs/unitTime	0.03	0.02	0.05	0.07	0.11	0.11	0.10	0.07	0.10	0.10	0.10	0.10
D2 jobs/unitTime	0.03	0.03	0.05	0.07	0.11	0.11	0.10	0.07	0.10	0.10	0.09	0.09
M_CPU_Response	4441	1744	2292	10	425	81	39	86	67	100	128	67
M_D1_Response	13	12	29	1754	24	21	19	10	10	17	10	12
M_D2_Response	15	13	26	1727	22	21	18	9	10	15	10	10
AVG_CPU_Response	2250.89	854.92	1069.52	1.23	209.62	20.94	7.74	426.30	19.79	34.34	35.60	22.27
AVG_D1_Response	0.93	1.00	5.27	909.03	4.34	3.80	3.14	1.04	2.25	2.38	2.25	2.19
AVG_D2_Response	0.95	0.81	5.99	912.53	4.47	4.11	3.28	1.03	2.60	2.69	2.29	2.22

These group of trials lead to finding what I believe to be a good simulation for an actual computer system, although I know how tough this is with how generalized the simulation is.

The first trial is a baseline with MINs and MAXs all equal to each other at 10 and 20 respectively. The immediate clue that this is a bad configuration is that the average CPU response time is about 2000x greater than the disks' response times. The CPU queue also was not able to keep up with the oncoming process arrivals.

The second trial, I only increased the arrival times of processes, so the cpu had some time to process. This did help, but ultimately it was still backed up. For the third trial, I reset the arrival times and lowered the CPU process times. This had a similar result to the second trial as expected. I further lowered the CPU process times for the fourth trial, and the configuration took the simulation too far in the other direction. Disk utilizations rose to 100% and CPU utilization dropped to 70%. Especially in a single thread machine, the CPU should always have something to work on, so I consider this a bad configuration.

On the fifth trial, I lowered the disk processing times to lower disk utilization and give more processes back to the CPU. Utilizations looked good (1.00 CPU, 0.80 DISKS), but the CPU response time returned to being kind of high, around 200 units of average response time.

Trial six turned out to be pretty good. The components had good response time, the CPU queue stayed steady around 5 events, and only maxed out at 23. I considered this to be acceptable, but I thought it would be more realistic if two events could arrive immediately after one another. So, for trial seven, I kept the average of arrival times the same (~20), but lowered the MIN to 1, and the MAX to 40. Trial eight and nine were very minor tweaks to CPU processing times. The ninth trial had good results, but the simulation only fully processed around 500 jobs (exited the system). I doubled the FIN_TIME to account for this in trial ten.

The tenth trial is what I consider to be the “best” configuration for the simulation. Trial eleven and twelve are the same with different seeds to show consistency. CPU queue length and response times do not get out of hand. Length averages below 10 and response times average around 30 units of time. CPU utilization is high at 97% and the disks are busy around 70% of the time.

A general trend:

- Decrease arrival times, CPU response time goes up. Disk queues will only go up if their process times are considerably higher than the CPU's.
 - This will also increase CPU utilization, but this does mean the CPU is being effective.