

Lab 5 Scheduling – ECE 5780

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For this lab we implemented the RMA, EDF and LST scheduling algorithms. With each of these algorithms we saw different but similar schedules created at varying levels of efficiency. Overall, our EDF algorithm performed the best, then LST and lastly RMA but relatively close in efficiency.

For the RMA algorithm, we implemented a scheduler that sets the priority of the tasks before the simulation time begins and prioritizes periodic tasks over aperiodic tasks. Then once the simulation begins, we calculate what task should be running based on their fixed priorities and will always run the highest priority unblocked task. If there are no periodic tasks unblocked, then it will run the highest priority unblocked aperiodic task. In terms of efficiency based on different inputs, we saw that if a set of tasks had a lower utilization, the RMA algorithm would have the same number of preemptions as the EDF or LST algorithms and its aperiodic tasks would have a similar response time.

However, when we ran the RMA algorithm with a task set that was not schedulable without deadline misses, the RMA performed worse than EDF and LST. Using task set 1 (as shown in the table below), RMA had 5 more preemptions than EDF and none of the aperiodic tasks finished before their deadlines. This task showed that the weakness of the RMA algorithm is how it treats aperiodic tasks as second-class tasks and therefore takes longer for them to respond and finish executing. Overall, our RMA algorithm performed as explained in class and was implemented using the rules that outline the algorithm.

The EDF algorithm is an ideal algorithm and is used often due to its lower overhead when compared to the other ideal algorithm LST. This is reflected in the results displayed in Table 1. In each simulation the EDF algorithm had less misses or an equal number of misses compared to the non-ideal RMA algorithm. This is predominantly reflected in the schedule with >100% utilization rate where the non-ideal RMA algorithm had 14 misses compared to the EDF algorithm's 9 misses. It is also interesting to note that in the >100% utilization schedule RMA was unable to run any aperiodic task while EDF was able to complete some of them.

The LST algorithm that we chose to implement was the non-strict version. This is because while LST has greater overhead than EDF in most cases, the non-strict version reduces that overhead. However, by looking at the results of the three test schedules we can see that LST still had higher overhead than EDF with equal or more preemptions in every test schedule. We can also see that while LST had more preemptions than EDF, it still had the same amount of missed in every test schedule. This shows the ideal nature of both the LST and EDF scheduler. RMA on the other hand had more misses in the schedule with a >100% utilization rate because of its non-ideal nature.

In conclusion, we were able to successfully implement and use the three scheduling algorithms to schedule various task sets and compare the differences between schedules they produced. Overall, EDF produced the schedules with the least number of preemptions and deadline misses as well as the shortest response times for aperiodic tasks. While testing task sets with lower utilization the RMA and LST algorithms produced very similar schedules to EDF. However, when using task sets that had higher

utilization or were over 100%, we found that EDF produced less preemptions and misses than the other algorithms. Overall, we learned the importance of implementing an optimal scheduling algorithm and to make sure to account for all edge cases of the scheduler to produce the optimal schedule for various task sets.

Table 1. Schedule Summaries for Scheduling Algorithms based on Different Task Sets

	Utilization	Sim Time	Preemptions	Misses	Aperiodic Avg Response	Idle Time
RMA 0	96%	600	2	0	110	35
EDF 0	96%	600	2	0	110	35
LST 0	96%	600	2	0	110	35
RMA 1	128.30%	1000	16	14	N/A	0
EDF 1	128.30%	1000	11	9	486	0
LST 1	128.30%	1000	14	9	485	5
RMA 2	98.80%	700	3	0	203	50
EDF 2	98.80%	700	3	0	203	50
LST 2	98.80%	700	5	0	211	50