

Extending Scheduler: Earliest Deadline First

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1 Current Scheduler

Extensive analysis carried out in task 1 allowed us to easily identify the changes needed to extend the scheduler to support earliest deadline first policy. Prior to any modifications, the scheduler implements a priority based scheduling with priority ceiling in task.c (as outlined in Understanding the NanoRK Scheduler: General Task Management).

Earliest Deadline First: The task with the earliest deadline has highest priority. In this task, it is assumed that the deadline is equal to the period. Hence, the order of task execution is from smallest next period to largest next period.

2 Modified Scheduler

Required outcome from this task: extend the scheduler to support EDF

Based on the requirements, a new sorting criteria was needed to support EDF. Sorting occurs in the function *nrk_add_to_readyQ* of *nrk_task.c*. We were able to make the appropriate changes by observing the sorting algorithm and extending the function to sort by the tasks next period. This is done by realizing the fact that each TCB holds the next period of the task, denoted by *nrk_task_TCB[i].next_period*, where i is the task ID of a task.

3 Testing

The main function as part of main.c, is responsible for setting up and initialization of the system. It also holds the task set required to verify the accuracy of the scheduler. Two task sets were used to simulate two different scheduling behaviours:

1. EDF with preemption
2. EDF without preemption

Table 1: Task Set for preemption modelling

Task	e_i	P_i
1	2	4
2	3	7

Table 2: Task Set for non-preemption modelling

Task	e_i	P_i
1	1	4
2	2	6
3	3	8

4 Expected Results

4.1 EDF with preemption

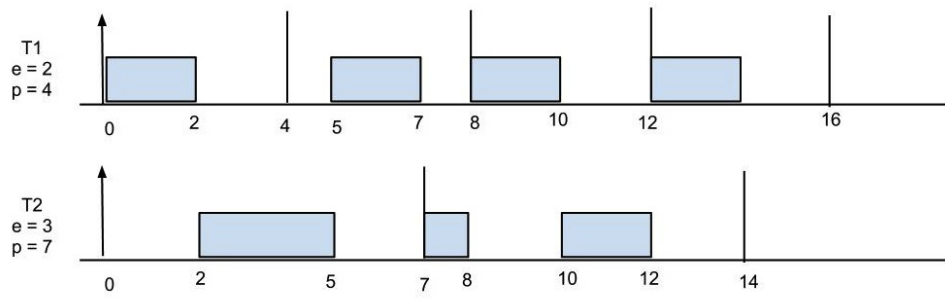


Figure 1: EDF with preemption

T1 → T2 → T1 → T2 → T1 → T1

4.2 EDF without preemption

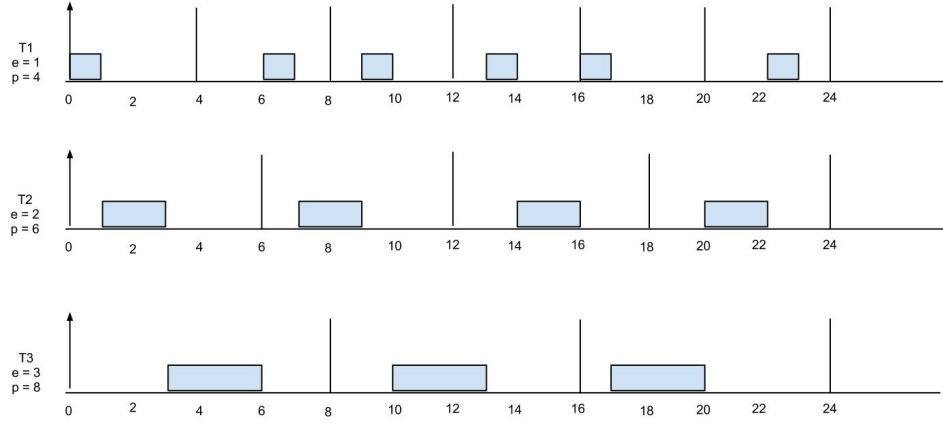


Figure 2: EDF without preemption

T1 → T2 → T3 → T1 → T2 → T1 →
T3 → T1 → T2 → T1 → T3 → T2 → T1

5.1 EDF with preemption

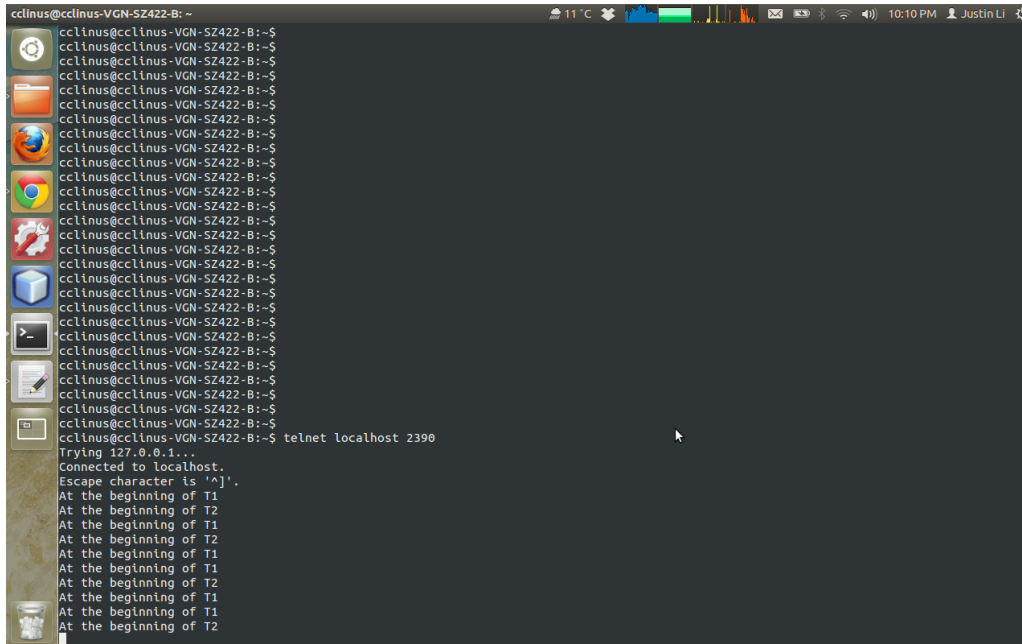


Figure 3: EDF with preemption screencap

$$T1 \rightarrow T2 \rightarrow T1 \rightarrow T2 \rightarrow T1 \rightarrow T1$$

5.2 EDF without preemption

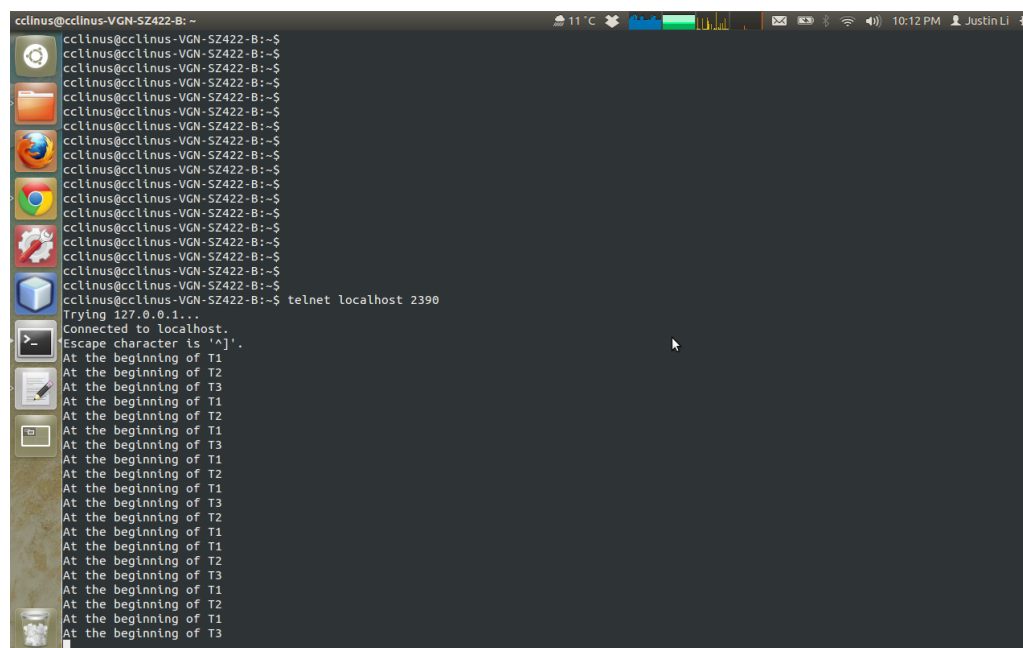


Figure 4: EDF without preemption screencap

$$\begin{array}{cccccccc} \text{T1} & \rightarrow & \text{T2} & \rightarrow & \text{T3} & \rightarrow & \text{T1} & \rightarrow & \text{T2} & \rightarrow & \text{T1} & \rightarrow \\ \text{T3} & \rightarrow & \text{T1} & \rightarrow & \text{T2} & \rightarrow & \text{T1} & \rightarrow & \text{T3} & \rightarrow & \text{T2} & \rightarrow & \text{T1} \end{array}$$