

## Assignment 2. Schedulability Analysis (100 points)

In this assignment, you are required to develop

1. An analysis program implementing various schedulability testing approaches for EDF, and fixed priority schedule algorithms.
2. A comparative analysis of the schedulability of EDF, RM, and DM algorithms using synthetic tasks sets.

The analysis program, running in Linux without any IDE environment, reads in task parameters iteratively from stdin and reports that each task set is schedulable or not. An example input is:

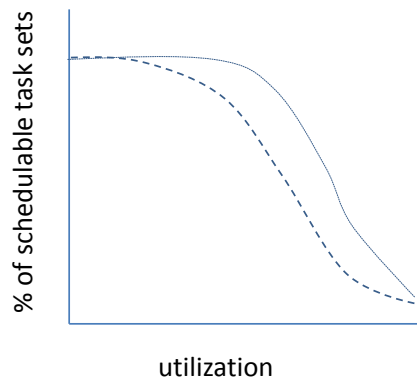
```

3           \\ the 1st task set consists of 3 tasks
3 1 2      \\ task priorities (1 is the highest)
10.5 20.8 50 \\ WCET, deadline, and period of 1st task
5.2 18.9 60  \\ WCET, deadline, and period of 2nd task
2.4 100 205  \\ WCET, deadline, and period of 3rd task
4           \\ the 2nd task set consists of 4 tasks
.....
0           \\ the last task set consists of no task
    
```

For each task set, the analysis program should consider EDF, RM, and DM algorithms, as well as the fixed priority scheduling with the given priority assignment. Your program should choose utilization based analysis first. If the attempt is inconclusive, the program should apply response time based test or loading factor approach.

For each input task set, the report should indicate a sequence of methods that have been applied and the analysis result from each method. If any response time-based analysis method is used, the computed worst-case response times should be included in the report.

For the comparative analysis, you should present XY plots, as shown below, to illustrate the percentage of random task sets of various utilizations that are schedulable under EDF, RM and DM algorithms. The analysis needs to generate synthetic tasks sets and test the schedulability. To generate



synthetic task set, you can adopt the same approach in [1, 2], and consider the following cases:

1. The task deadlines are uniformly distributed in  $[C_i, T_i]$ , and  $[C_i + (T_i - C_i)/2, T_i]$ .
2. Each task set consists of 10, 20, and 50 tasks.

## Reference

- [1] Robert I. Davis, Attila Zabus, Alan Burns, "Efficient Exact Schedulability Tests for Fixed Priority Real-Time Systems," IEEE Transactions on Computers, vol. 57, no. 9, pp. 1261-1276, September, 2008.
- [2] E. Bini and G.C. Buttazzo. "Measuring the Performance of Schedulability tests". *Real-Time Systems*, vol. 30, no. 1–2, pp. 129–154, May 2005.

## Due Date

This assignment is due at 11:59pm on Feb. 28.

## What to Turn in for Grading

- Create a working directory similar to Assignment 1 to include your source file(s), makefile, a test case of multiple task sets and the test result (in text), readme.txt, and the comparative analysis report (in pdf).
- Compress the directory into a zip file named *cse522-26805-2-firstname-lastname.zip* for online section and *cse522-15970-2-firstname-lastname.zip* for on-campus section. Please note that, for convenience, we only accept zip files. Points will be deducted if the name conversion and the directory structure are not followed.
- The comparative analysis report should be less than 2 pages (11-point font and single spaced). XY plots should be included to show the percentage of task sets that are schedulable under various scheduling algorithms.
- Comment your source files properly and write the readme file to describe how to use your software. Also, make sure there will be no warnings when compiling your source code.
- Submit the zip archive to Blackboard by the due date and time.