

Project Progress Report

Implementing Preemption Threshold aware simulator, with support for RM, DM and EDF priority assignment policies

CSC 714: Real Time Computer Systems, Spring 2009

<http://www4.ncsu.edu/~sykang/>

Prof: F. Mueller

Sangyeol Kang (sykang@ncsu.edu)

Kinjal Bhavsar (kabhavs@ncsu.edu)

Progress:

1. Frontend for simulator input
 - Parsing the input files which describes the simulator parameters as well we task set information
 - E. g) Sample Input file with 99 of simulation time, preemptive scheduling with 3 tasks

```
Simulation Time= 99
Preemptive= Yes
```

TaskID	Name	Phase	Period	WCET	BCET	Deadline
0	A	0	10	4	3	7
1	B	0	8	1	1	4
2	C	0	14	1	1	11
 - Implemented by Sangyeol Kang
2. Calculator of real-time scheduling parameters
 - Calculating hyper period and priority for RM and DM scheduling
 - Implemented by Sangyeol Kang
3. Time-based task scheduling simulator for fixed priority scheduling
 - Supporting non-preemptive, preemptive, and preemption threshold
 - For non-preemptive scheduling, preempting decision is skipped
 - For preemptive scheduling, the system priority is compared to the ready task's highest priority
 - For normal preemptive scheduling, the system priority is set by the task's original priority
 - For preemption threshold scheduling, the system priority is set by the task's preemption threshold value

- **Pseudo Code**

```
While(within simulation time) {  
  
    If(PTS_MODE==ON) {  
        systemPriority=getRunningTasksPreemptionThreshold();  
    }  
    Else {  
        systemPriority=getCurrentRunningTasksPriority();  
    }  
  
    readyPriority=getHighestReadyTasksPriority();  
  
    If (preemptive) {  
        If(systemPriority<readyPriority) {  
            Preempting();  
        }  
    }  
    Else {  
        checkCurrentRunningTasksJobProgress();  
        doSchedulingNextJob();  
    }  
  
    MakingSchedulingLog();  
}
```

- Designed by Kinjal Bhavsar and Sangyeol Kang
- Implemented by Kinjal Bhavsar

4. Dynamic Priority (EDF) scheduling support

- Not yet implemented
- Will be implemented by Kinjal Bhavsar

5. Algorithm for determining preemption threshold value

- Using MPTA algorithm by Yun Wang, et. al's paper
- Outlined by Sangyeol Kang and Kinjal Bhavsar
- Not yet implemented
- Will be implemented by Sangyeol Kang
- Will be integrated to the simulator by Kinjal Bhavsar

6. Output generator

- Not yet implemented
- Will be implemented by Sangyeol Kang

7. Test and Verification of simulator

- Test case generation
- Test strategy
- Will be done by Sangyeol Kang and Kinjal Bhavsar

Initially Proposed Project Plan:

1. Project Proposal: March 16, 2009
2. Develop the simulator for the RM, DM and EDF: March 25, 2009
3. Develop the preemption threshold finding algorithm: March 25, 2009
4. Integration of preemption threshold algorithm in simulator: April 2, 2009
5. Testing by doing Timing analysis for the different test benchmarks: April 16, 2009
6. Final Project Report: April 21, 2009

Changes of the Plan:

- Schedule for implementing MPTA (Step 3 in the initial plan)
To compute maximum preemption threshold values by MPTA algorithm, the whole simulator which supports preemption threshold scheduling is required. The simulator will be called repeatedly to compute the threshold value. Hence unlikely from the initial proposal of this project, implementing MPTA cannot be implemented in parallel with the implementation of the main simulator. But MPTA was outlined by a dummy function, which will be implemented to cooperate with the main simulator.
- Graphical Output Format (Output part of project outline in the initial plan)
While prototyping graphical representation of simulation output, the proposed DOT format is not appropriate for the purpose of this project. Therefore, GNUPLOT will be used as the graphical output generator. And the simulator will generate the script containing the simulation result for GNUPLOT. Then GNUPLOT will convert the simulation output into PostScript documents.

Updated Project Plan:

- EDF scheduling support: April. 4. 2009
- Calculation algorithms for preemption threshold value: April. 11. 2009
- Output generator: April. 16. 2009
- Test and Verification of simulator: April. 16. 2009
- Final Project Report: April 21, 2009