A New Real-time Kernel development on an embedded platform

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Features

- A new real-time kernel developed from scratch
- Supports Periodic & Aperiodic tasks, Semaphores & Mutex
- EDF based scheduling for periodic tasks (deadlines <= period)
- The scheduler is capable of creating tasks based on \((\phi, p, e, D)\) parameters.
- 1 uSec granularity for all timing parameters \((\phi, p, e, D)\)
- Aperiodic tasks are scheduled using static priority based preemptive scheduling.
- The scheduler can also keep track of the current CPU utilization.
Design

Timer 0

Timer 1

Ready Q

Priority Queue based on the next DEADLINE

Wait Q

Priority Queue based on the next RELEASE Time

Aperiodic Q

Priority Queue based on task PRIORITY

Res. Block Q

Priority Queue based on Deadline / PRIORITY
Current Status

- **Completed**
  - Implemented on C6713 DSK
    - TMS320C6713 DSP Processor
    - VLIW Architecture (with 8 instructions / cycle)
  - Tested for all parameters $(\phi, p, e, D)$
  - Keeps track of Deadline miss & TBE counts for every thread
  - Also keeps track of thread wise execution time upto 1ms res.
  - About 2400 SLOCs of source code (1000 lines assembly)

- **Things to do**
  - Overall CPU utilization to be maintained
  - Test aperiodic tasks with resources
  - Implement Sleep
  - Fix few bugs
  - Test with some real benchmarks