

Example Proposal - Embedded Operating System

Team

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Project Idea

We are going to create an embedded operating system to run on a ARM TIVA microcontroller. The operating system will at a minimum contain the following components:

- A task library with a clear and simple API.
- A scheduler system and context switch allowing for preemptive switching of the running task at regular intervals.
- Mutual exclusion and semaphores to protect memory accessed by multiple tasks.
- A example program which will blink an LED, read from an analog in pin, and transmit via serial to a computer.
- Extra Credit: A loadable driver system for peripheral with at least one example driver.

Topics From Class

The following class topics will be included in this project:

- Mutual Exclusion
- Scheduling
- Mutli-threaded programming
- Loadable Drivers (extra credit)

Timeline

- Week 1:
 - Install needed developement software and learn TIVA libraries
 - Start development of the task library
- Week 2:
 - Continue development of task library
 - Add scheduler and context switching
- Week 3:
 - Finish task library and scheduler
 - Add mutual exclusion
 - Write example program
 - Present

Rubric

The Grading rubric is shown on the next page.

Part	Unsatisfactory	Satisfactory	Beyond Satisfactory
Task Library	A simple task library that can create and switch tasks [0-25pts]	Tasks can have priority and have their life cycles controlled [26-50pts]	Tasks have owners, parents, and other POSIX ideas [51-75pts]
Mutual Exclusion	Mutual exclusion by disabling interrupts [0-25pts]	Mutual exclusion based on an algorithm from class [26-50pts]	Mutual exclusion based on a more efficient new algorithm found through research [51-75pts]
Example Program	Simple test bench program [0-25pts]	Interesting multi-task program which shows the capabilities of the OS [26-50]	Useful program that is interactive and can create and end tasks based on user interactions [51-75pts]
Extra Cedit	N/A	Working loadable peripheral driver system with one driver [20pts]	Additional peripheral drivers [10pts / driver]
Demo & Report	Rushed report, very little information. Boring presentation [0-20pts]	Good presentation and report [21-50pts]	Amazing presentation with interactive demo [51-60pts]