CS2510 Fall 2011
Project 3 – Your Choice

Due Date/Time:
Part 1 – Monday, November 28\textsuperscript{th}, 11:59:59 PM
Part 2 – Wednesday, December 14\textsuperscript{th}, 9:00:00 AM

Project Overview
This project is completely your choice. You can implement an add-on to a research project from another class, implement an add-on to your personal research, or you can start a new project from scratch. The bare minimum requirements are:

• The project must have something to do with distributed systems.
• The project must include some aspect of power management.
• The project must include some aspect of real-time computing.
• The project must include some aspect of one (or more) of the following topics:
  o Fault tolerance
  o Load balancing
  o Replication

Similar to the first project, you may either implement a distributed system, or you may simulate the operation of a distributed system. It may be a good idea to implement and evaluate your system in comparison to a technique or algorithm which already exists and is in wide use.

Project Proposal & Design Document
As part of the design document you are required to describe the project that you intend to implement. This 2-3 page report should contain a problem statement and motivation for why the project is interesting/useful, a high-level description of the system you intend to implement, design and implementation issues you may encounter, and the justification of each decision you have made.

For example, should you choose to implement an aspect of fault tolerance, you could discuss the fault model and its advantages and disadvantages. Another example is to discuss how to implement the protocol for a member to join/leave the group and the messages exchanged to enable this. Another example is your conjecture of what is each part of the project good for: is it good for high/low load (of reads, writes, both, neither), what type of faults is it good for (transient, permanent, etc), etc.

Careful consideration should be given to the design, since the design choices will directly affect implementation. Each group may make an appointment with the TA to discuss the choices and explain the design. All members of the group should be able to discuss all the aspects of the project.

This component of the project is due on Monday, November 28\textsuperscript{th}, 11:59:59 PM, and is worth 15\% of the final grade for the project.


**Report**
Along with the final source code, you will submit a 4-5 page, single-spaced report (with no penalty for going over, should it be necessary, unless it is too much over). This report will contain:

- (1 page) A discussion on the issues that you encountered while implementing your project, both unexpected issues and issues which were already discussed in the design document, and how you handled the challenges that these issues presented.

- (3-4 pages) An analysis of the performance of your system, on a variable number of processes. At a minimum, you should run experiments on 10, 25, 50, and 100 processes. If running on 100 processes is infeasible, you may run experiments on 10, 25, 40, and 50 processes. The metrics by which you evaluate your system are entirely your choice, but should reflect the challenges and motivation of your project (for example, if you aim to reduce the number of messages passed for CS access in a full mesh network, then average wait time would be a secondary metric to message count, and lines of code would be a terrible metric). You are also required to include metrics reflecting the performance of your system with respect to the power management, real-time computing, and third (load balancing, fault tolerance, or replication) requirements of the project.

**Demonstration**
You will be allotted 45-60 minutes for a live demonstration of your project/implementation. The location of the demonstrations is your choice (so long as it is in the CS building) and your responsibility – if you wish to use a computer lab, be sure that you have access at the time you demonstrate; if you wish to use the machines in your office or your personal machines, have them set up and ready for when your demonstration time begins.

All demonstrations will take place between Wednesday, December 14th and Friday, December 16th, except for emergency cases. “Our system doesn’t work yet” is not an emergency consideration. Your group’s individual demonstration time will be determined at a later date, on a first-come-first-served basis. Bidding for these demonstration times will begin on Monday, December 12th at 9:00 PM.

**Grading**
Grading will be broken down as follows:

- Project Proposal & Design Document: 15%
- System Implementation: 50%, broken down as follows:
  - System implementation reflects the goals of the project: 20%
  - Power management component: 10%
  - Real-time computing component: 10%
  - {Load balancing / fault tolerance / replication} component: 10%
- Report: 20%
- Demonstration: 15%

The demonstration score will be an individual grade; the system implementation and report segments will be a collective group grade.
Submission Details
By the deadline (again, that is Wednesday, December 14\textsuperscript{th} at 9:00:00 AM EST), you must submit the following:

- The source code for both systems your group has implemented
- Your report

Your submission must be added to a compressed file or tarball, and emailed to the TA at jew51@pitt.edu no later than the deadline above. As usual, the report will be accepted late with a 10\% penalty on the grade of the full project. The late deadline for the report will be Friday, December 16\textsuperscript{th} at 12:00 noon.

Questions
Any additional questions about the details of this assignment should be directed to the course TA, either by email or in office hours.