CS 5523: Operating Systems (Spring 2012)

Project 2: The Math Client/Server – Socket Programming
(**Due: Oct. 23, 2012, Tuesday before class**)

- **Objectives**
  - Enhance the understanding of client-server architecture of distributed systems
  - Practice network and socket programming
  - Practice multi-thread programming
  - Learn to write scientific project report

- **Project Description** (this is an **INDIVIDUAL** project; you may discuss with your classmates on the usage of system calls, but you should work out your own codes)
  You will design and implement a **Math server,** which will provide the following **four** functions:
  - *magicAdd*( ): takes 2 **double** parameters and returns the **difference** between the 2 values; that is it actually does subtraction operation;
  - *magicSubtract*( ): takes 2 **double** parameters and returns the sum of the 2 values;
  - *magicFindMin*( ): takes 3 **int** values as parameters and returns the **largest** value; and
  - *magicFindMax*( ): takes 3 **int** values as parameters and returns the **smallest** values.

  The Math server should have a dispatcher (i.e., the main trhead) that waits for requests from some clients. Once get a request from the client, it should **create a new thread to process each request**. Moreover, the server should keep some counters to record the number of different operations it has performed, and the corresponding methods to read these numbers. Since more threads may access the same counter simultaneously, proper synchronization is needed when updating the counters.

  On the client side, a client will generate 1000 requests, where each request randomly choose one of the 4 operations as well as the corresponding required parameters. At the end, the client should retrieve the number of operations performed by the server.

  Your program should support running more than one (at least two) client concurrently.
  The server and client programs should be able to run on separate machines.
  You can program with either C++ or Java.

  Extra credit [20%]: Implement thread pool on the server sides.

  Report: Write a project report that should include the following materials and discussions.

  - The status and design of your project.
  - List the references (such as books and links) that help you finish this project.
  - Comments and suggestions for this project

- **Project submission (what and how):**
  - For program **codes** and **electronic copy of your report**: zip them to a single file and name them as XXX-proj-2.zip (for example, DakaiZhu-proj-2.zip) and email it as an attachment to me (dzhu@cs.utsa.edu) and TA (Rehana Begam: rehan.sheta@gmail.com)
  - For the report: print a **hardcopy** and hand in before the class **on the due day.**