

University of Texas at Dallas--Computer Science Program
CS 5348 Operating Systems Concepts Fall 2018
Project 1

Large Scale Matrix Multiplication

In this **group** project, you will write two programs that solve the same problem: prog1.c is single threaded and prog2.c is multi-threaded. We would like to know the elapsed time (on the computer) for each of the two programs to run.

We have two very large matrices A and B. Both A and B are 10000 by 10000 matrices and we would like to find the product of the two matrices C. Thus $C = A \times B$. Note that $C[i, j] = \text{sum}(A[i, k] * B[k, j])$ for all k from 1 to 10000.

In a real life scenario, these two matrices are built by an elaborate method that takes a lot of time. In your programs, you will simulate this by introducing a delay of 10 microseconds between computing the value of one element of array C and computing the value of the next element of array C. You will introduce this delay in both prog1.c and prog2.c

Prog1.c will solve the matrix multiplication program using a single thread and prog2.c will solve the same problem using 25 threads with each thread computing $1/25^{\text{th}}$ of the elements of matrix C. In both cases, after computing one element of matrix C, have a delay of 10 microseconds.

Matrices A and B are generated using independent random numbers in the range 1 to 2000. Make sure that the result produced by prog1 and prog2 are identical.

Measure the time taken by each of the two programs and report the result. It can be as simple as capturing the dialogue using script as shown below:

```
$ script output
$ date
$ prog1
$ date
$ prog2
$ date
$ exit
```

Upload a single tar file called project1.tar (containing the well-documented source files, header files, if any, README file if any and file output captured for a sample run of your programs) by the due date of October 11, 2018 11:55 pm. No late submission will be honored and do not send your deliverables by e-mail.

Form your own group; each group is to have three persons. Use elearning to each out to others if you have difficulty finding group members. Upload the group membership info on elearning by Sunday 9/23/18. One report per group (listing member names and net id of the members of the group) is to be uploaded.