Indian Statistical Institute

Operating Systems

Lab 3: Pthreads

Make sure man pages for system calls are installed. If you are using a Fedora based distribution, you will need to install `man-pages`; for an Ubuntu based distribution, please install `manpages-dev`.

Man pages: `pthreads(7)`, `pthread_create(3)`, `pthread_join(3)`, `pthread_mutex(3)`

1. Write a multi-threaded file copying program. It should run as follows:

   `./a.out -t <number of threads> <source file> <destination file>`

   The option `-t` specifies the number of threads that your program should create. Run your program using $n = 1, 2, 3, \ldots 10$ threads. For each value of n, run the program 10 times, and record the average and standard deviation of the time taken. You can use the `time` command for this purpose. Do you observe any advantage when using multiple threads?

2. Matrix multiplication: generate 2 random 1000x1000 matrices A and B and multiply them. Compare the times taken by single-threaded and multi-threaded programs if the matrices are stored in memory / file.

3. Write a multi-threaded program to simulate the Dining Philosophers Problem. Your program should take the number of philosophers as the only (compulsory) command line argument. Design your program so that it is possible to easily turn off the use of synchronisation and demonstrate race conditions (i.e., violation of the mutual exclusion property).