

CSC415 OPERATING SYSTEM PRINCIPLES

Assignment 4 ASCII Character Count 2.0

For this assignment, you will implement a multi-threaded ASCII character count program and compare the results with and without synchronization. First, update the code you submitted for Assignment 3 and use a one-dimensional global `int` array to hold all of the character counts. All the threads increment the same array entries without using any synchronization. Then, create a second version of the program that protects the increment of the global `int` array using a mutex. Run both versions on the same file and compare the character counts.

In order to observe the differences in the results of the two programs, we need to use a Ubuntu virtual machine with multiple CPUs. Below are the steps to change the number of CPUs in virtualbox:

1. Shut down the Ubuntu virtual machine;
2. Go to "Setting" -> "Systems" -> "Processors".
3. Change the number of CPUs.

Hints:

1. Use the functions `pthread_mutex_init()`, `pthread_mutex_lock()` and `pthread_mutex_unlock()` to create, acquire, and release the mutex, respectively.

Name your C program without synchronization as "ASCIICount2", and name your C program with synchronization as "ASCIICountS". Compare the character counts of both programs on the same text file. Submit the source code files to the regular submission link on iLearn.