CSI 5/7343 Operating Systems And System Software

Fall 2021

Programming Homework 1

Due date: 9/28 (Tue) 11:59pm

You are to write this program in C.

Program 1: Threads

Consider the following a problem.

"Find all non-prime numbers between 2 and n (n is input by the user)"

The straightforward algorithm is the following:

- Initialize array P[1..n] to be true
- For q = 2 to n
    - If P[q] = true
        - ***Set all P[x] to false where x is a multiple of q***
- Return all q such that P[q] is false

Notice that the program can be parallelized by running the step in italics concurrently -- i.e. every time you need to set entries in P to be false, then you create a set of process/threads, and each process takes a subset of numbers and set the correspond P entries to false.

Write a program to implement the algorithm using multiple threads. Your program should do the following:

- Ask the user for two numbers: n and t.
- Generate a Boolean array P[1..n] and set the values to true
- Create t threads.
- Divide up the numbers in the for-loop among the threads, and ask each thread to process the line in italics
- The main process should wait till all threads to finish
- It will then print out the list of all prime numbers in increasing order. (BTW, 1 is not considered a prime number)
  Each line should contain only one number (and nothing else).

What to hand in

You should upload your program to Canvas. You should only upload ONE file that contain your source code in C.