Jordan University of Science & Technology
Department of Network Engineering and Security
NES416- Network Programming
Programming Assignment 5

Due Date: see course website

Description:

You are required to implement a multithreaded TCP client server program that detects whether a given integer numbers is a prime or not. If the input is NOT a prime, the first found factor is reported.

Conceptually, to check if a number "n" is prime (or to find a factor of a number), you have to see if all numbers between 2 and `sqrt(n)` are a factor of `n`. Furthermore, your code should measure the time the detection process takes.

For the sake of this assignment, your client is supposed to be multithreaded. The client's main thread will be responsible for reading user input, and for each entered number, two threads are created: the first one will ask the server to check the same entered number, and the second one will ask the server to check the entered number plus one. For example, if the user entered the number 100, the first thread will send the server the number 100, and the second thread will send the number 101 for checking. The client waits for both replies before displaying the results and exits.

The server receives a request containing some integer number that need to be checked. For each number, the server creates a core thread. However, instead of doing all calculations and checking in this core thread, and in order to enhance the performance, the functionality is distributed multiple threads. That is, the core thread should create `MAX_THREAD` number of threads and divide the work amongst those threads. Simply, you can divide the work equally such that each thread gets `sqrt(n)/MAX_THREADS` number of potential factors to check against. Each of the threads should either return the first factor or -1 if no factor is found. In addition to waiting for the threads to finish, the core thread should calculates/measure how much time was elapsed until a decision was made whether a given number is prime or not, and report the decision and the time to the client. after that, all associated threads with the client request terminates, but the server continue running waiting for more request.

The client will expect a hostname that represents the server. Use the name ***nes416_prime_server***. Make sure to setup things correctly as done in HW4, but note that port numbers are used instead of service names. The server expects the port number on which it will listen for requests.

Make sure to output meaningful messages for the user indicating the communication taking place between the client and server such as IP address and port number associated with requests and replies. Also, messages indicating threads are created and finished with their thread ID's

Hints:

- ☐ Ask questions as early as possible.
- ☐ DO NOT use the header file "unp.h" from the book
- ☐ Submit your source code for both the client and the server, and some running sample of your code as one zipped file whose name is your student ID number
- ☐ Your programs should be compiled and run without any single error or warning.
- ☐ Comment and **error-check** you code
- ☐ NO CHEATING/COPYING is allowed
- ☐ Your program for the client needs to take two arguments that specify the **hostname** and the **port number** of the server. Your program for server needs to take an argument that specifies the **port number** to work on
- ☐ Don't use the bind() function on the clients
- ☐ **All calculations should be done using `long` types (8-bytes on 64-bit machines).**
- ☐ **Set MAX_THREAD= 3 in your code.**