Programming Assignment 3

Early Due Date: submission ends Tue., 3/16, 11:59pm, Carmen Time Zone
Due Date: submission ends Fri, 3/19, 11:59pm, Carmen Time Zone
Final Due Date: submission ends Sun, 3/21, 11:59pm, Carmen Time Zone

Please read all instructions carefully. You will be graded based upon meeting all requirements stated in this assignment.

Background and Problem Statement

Congratulations on your successful creation of both serial and parallel transform producer-consumer programs. In this lab, we will compare the results of our labors with what compilers can, or cannot, do for us.

For lab 3, create an OMP-parallel program which is as close to your lab 1 program as possible.

Program Requirements

All relevant requirements from labs 1 and 2 (e.g. stdio requirements, makefiles, etc.), unless otherwise noted, apply to this program.

For this lab:

- Using OpenMP, create one or more parallel regions within your program.
- Do not specify thread numbers. Allow OpenMP to select the number of threads.
- You final results sent to standard output should be identical to your serial program – printed on stdout in the same format as lab 1, order of output the same as the order of the input file.
- Do not use any program-global variables for this assignment.
- As with lab 1, your program should execute without any input parameters.

Testing and Instrumentation

- Measure the overall run-time of your program using the Unix time(1) utility to report elapsed clock, user and system times.
- Using data file PC_data_t05000, run your program 5 times. For each execution, determine the number of threads allocated by Open MP for each parallel region.
- Determine the workload distribution implemented by OpenMP. This should be in terms of which loop iterators were assigned to which threads.
- You may use file I/O to stderr (standard error) to report your instrumentation and other debugging information.
  - You may but need not remove these statements from your program.
  - Your program will be tested with stderr redirected to /dev/null.
  - If you are not familiar with using standard error, please educate yourself and come to office hours with any questions.
- As with previous labs, programs which do not follow stdio guidelines will receive a 0 for this assignment. If you don't know, ask.

Program Output

Your program should generate the exact output as your lab 1.

Report Requirements

Run your parallel program against all of the test files provided. Provide a short (~2 page) report wchich includes the following:

- the number of threads created in each parallel region of your OpenMP parallel program.
- your final runtimes of your serial, pthreads parallel (using your optimal number of threads) and OMP parallel programs (using the number of threads determined by OMP).
- a chart or graph which illustrates the scalability (or lack thereof) of your parallel solutions.
- the assignment of work to threads (workload distribution) used by OpenMP,
- Summarize your results and describe how they agreed with or contradicted your intuition.

Program Creation &Testing

Follow the guidelines from lab 2.

Note that you may (or may not) need to use the -fopenmp compiler flag. Note that you may need to include a header file. Please research these items during your program development.

Submission

- Submit your program files from an Owens login node using the OSC submit system as was done in prior labs.
  - In your home directory, create a sub-directory named “cse5441_lab3” and place all of your program files, makefile and report for submission in that sub-directory. Submit that sub-directory.
  - Submit your source code (.c, .h). Do not submit binary files (.o), test data, or results of your program runs.
  - Provide a makefile for your program that runs without parameters (i.e. typing “make” alone will successfully build your program.
  - Name your executable file “lab3_<osc id>_<osu id>.”
  - Use the Intel compiler (“icc”) only. Your program should compile without warnings.
  - Include your report in .pdf format.
  - submit this assignment to “lab3”