

Homework 3

Due Wednesday, January 23, 2019

These should be run on the scholar queue or your own machine. Note that timings will only be accurate if running on the Scholar queue or a machine you have where this is the only job running on it.

Each problem A, B and C should be done its own sub-directory (A, B and C would be good names for the sub-directories) that are contained in a directory <username>, and you should turn in a .zip file of this directory called <username>.zip. The sub-directories should contain program code (e.g., .c and .h files) but no binaries. As part of the sub-directory for a question, turn in a .txt file if you are asked to answer questions, and turn in files containing the output from your program.

A. Write and run an OpenMP program that:

1. Determines the number of processors available to run the program on a scholar node.
2. Prints out a unique threadId for each thread using an OpenMP built-in function
3. Determines which thread executes a *master* and *single* statement of in a parallel region.

B. **Write and time 3 programs**, two of which will be parallel. Initialize within the program a single-dimensioned array with 10,000,000 elements.

- a. Perform a sequential reduction on it.
- b. Perform a reduction such as:

```
int nt = numberofthreads
int res[nt];
#pragma omp parallel for
for (i=0; i < 1,000,000; i++) {
    res[mythread] += a[i];
}
```

- c. use the OpenMP reduction

C. **Write a sequential loop** that sums the sequence $1.0 / (\text{float}) i$, where i takes on values in the range of 1 ... 10,000,000. Do this using a loop running from 1 ... 10,000,000, from 10,000,000 to 1, and one using an OpenMP reduction. Compare the answers and briefly explain why they differ.