CSYE7374 HW1

Instructor: Dr. Handan Liu

2020-01-30

Part I: 34 points

Login Discovery, operate the following steps and show them to your TA step by step:

1. In $HOME, create a new directory: csye7374-yourusername (or alias, or abbreviation); then go to this directory, create a sub-directory: homework1 [4 points]
2. Be sure you completed the 5 C files (*.c) which I assigned to you to practice. Copy these 5 files from other place to $HOME/csye7374-xxx/homework1 [2 points]
3. Compile these 3 OpenMP files and 2 MPI files with gcc compiler. [compiling 5 files: 10 points]
4. Move to any compute node (general or reservation) [2 points]
5. On 1 compute node, run OpenMP: (a) set the environmental variable as number of threads equals to 8 [2 points]; (b) correctly run your 3 OpenMP executables respectively [6 points].
6. On 1 compute node, run MPI: your 2 MPI executables respectively: you can set any number of MPI processes. [load module 2 points; run MPI correctly each 3 points, total 6 points].

Submission: you don't have to submit this part. TA will check it with you in person.

Part II: 20 points

Write a Slurm script for submitting jobs, require:

1. define jobname, output and error in the script; [each 2 points, total 6 points]
2. define the running time as 5 minutes; [2 points]
3. request one compute node from the reservation nodes; [each 2 points, total 4 points]
4. define your work directory, and go to this work directory; [2 points]
5. load module of openmpi (recommend the default version 3.1.2); [2 points]
6. commands to run your compiled executables in serial, MPI and OpenMP modes. [4 points]

Submission: save this script as a batch file and submit it on BB.

Part III: 24 points

Three files of C code are given for matrix multiplication in serial, MPI and OpenMP.

1. Please set timers in the 3 files. It requires to use the timer to calculate the wall-clock time of the entire code. [each 6 points, total 18 points]
   Tips: time() in serial, omp_get_time() in OpenMP, and MPI_Wtime() in MPI.
2. Please compile them using correct compilers. [6 points]
   Note: you can comment some lines for the output to save calculation time.

Submission: save your modification in the original files and submit these 3 C files.

Part IV: 22 points

Run the executables which completed in Part III:

1. Run the serial executable on 1 core, and print/output the running time. [2 points].
2. Run the OpenMP executable on 2, 4, 8 cores, and print/output the running time respectively. [6 points]
3. Run the MPI executable on 2, 4, 8 cores, and print/output the running time respectively. [6 points]. You can operate the above 3 tasks in interactive mode or in batch mode.
4. Tabulate all the results of running time [4 points]; plot them in one figure and save as an image (jpg or png). [4 points]. You can plot by using python matplotlib or other tools.

Submission: submit the table in excel or word and the image file.

Review and Grade:

TA will schedule the homework review time. You should operate all above contents to your TA. TA will grade for my reference.