University of Dhaka
Computer Science and Engineering
4th Year 2nd Semester B.Sc.: 2022
CSE4269– Parallel and Distributed Systems

Assignment Code: A3
Assignment Title: PI calculation using the Master-Worker paradigm .

- ## Objectives
  The objective of this assignment is to build a cluster by yourself which combines multiple machine in a single cluster. In this assignment you will be solving an embarrassingly parallel problem, with minimal communication overhead and minimal I/O requirement. The main objectives are to make yourself familiar with MPI programming on your own machine and then on the cluster that will be configured by you and your peers.

- ## Programming Assignment
  PI calculation using the Master-Worker paradigm: The value of π (PI) can be calculated in different ways. An approximate algorithm for calculating PI and its parallel version are provided towards the end of the tutorial that we discussed in the first two classes. Here is a link to the tutorial:
  https://computing.llnl.gov/tutorials/parallel_comp
  The pseudo-code and C code that uses MPI are also provided in the tutorial. Here is what you are required to do:

  1. Write a sequential version of the algorithm and execute it on a single node of the cluster. Measure the execution time.
  2. Execute the parallel version of the given program with varying number of workers (e.g. 2, 4, 6, etc) and measure the parallel execution time in each case. Ideally workers should be mapped to distinct nodes of the cluster.
  3. In the given program, the master and the worker processes are spawned simultaneously. Another way to implement the program is to first create the Master process, which subsequently spawns the workers through explicitly calling MPI_Comm_Spawn. Modify the given program accordingly to use this dynamic spawning mechanism available in the current versions of MPI. Repeat the same experiments as in (b) above.
  4. Plot a speedup versus number of workers curve based on your experiments in (a) and (b) or (c) above. Explain any unusual behavior, e.g., slow down, super-liear or sub-linear speedup, etc

- ## Your Task

  – Complete the programming part and run the experiment in your own machine. See the performance and plot that accordingly.
  – Repeat the same in the cluster.

- **Submission**

  - Submit "makefile" for assignment1.
  - Put proper comments on the program where you incorporate or modify the code. Please use standard comment style.
  - Submit all the source file (serial, parallel, parallel_spawn) and the makefile.
  - The report containg:
    1. A detailed documentation of cluster configuration
    2. Speed-up plot and expalnation in two different configuration (i) own machine, (ii) cluster.
    4. Marker will compile and run your program

- **Submission Deadline**

  - Programming assignment: 30.09.2023
  - Cluster Configuration: 03.10.2023

Thank You