

Introduction to Parallel Processing

Dr. Guy Tel-Zur

Home assignment number 1

To be submitted within two weeks to `pp@ee.bgu.ac.il`

Target system: The VDWARF educational cluster

Programming language: C

Parallel Computing library: MPI

Part A

Write a parallel program that computes the inner (dot) product between two random¹ vectors of size $n=16384$.

$$c = \sum_{i=1}^n a_i b_i$$

Part B

Write a parallel program that computes a matrix-vector product between a random matrix ($n \times n$) and a vector of size $n=256$

Comments:

1. All inputs are generated by a master process.
2. The results are saved into output files by the master process.
3. The master process is also acting as a worker node.

¹ Uniformly distributed between 0 and 1 floating point precision pseudo random numbers

For each of the programs do:

1. Measure the execution time (not including I/O) using `MPI_Wtime()`
2. Run the program on 2, 4, 8 and 16 nodes (MPI tasks on different machines) and plot the speedup and efficiency.
3. Repeat each run 10 times in order to use average times and add on the plots the corresponding error bars.
4. What are your conclusions?