

The George Washington University
School of Engineering & Applied Science
Electrical & Computer Engineering Department

Instructor: Prof. Tarek El Ghazawi

Semester: Fall 2019

Course: ECE-6105 Introduction to HPC

Deadline: 12:00pm (Noon) 11/18/2014

Homework 5

1. Write an MPI program that computes the mean and variance of all elements in an array of a general size, larger or smaller than the number of processes. The array is initially stored at process 0. Process 0 should *scatter* the array equally among the processes. Each process will then calculate a local partial sum. At the end, process 0 will need to *reduce* all partial sums, compute the mean and variance, and print the result.
2. Write a program that generates the image histogram using MPI. Imagine that the image is an $n \times n$ matrix filled with random integers that have values ranging from 0 to 255. Your program should *scatter* to each process a part of image to work on. When all processes finish their part of work, process 0 needs to *reduce* the results generated by all of them.
3. Compare your MPI program with your UPC program you wrote for homework assignment 3. The comparison should include:
 - a. Source lines of code
 - b. Number of keywords used (eg. in UPC the keywords will be THREADS, MYTHREAD, upc_forall, upc_XXXXX,... and in MPI the keywords will be MPI_XXXXXX calls)
 - c. Number of parameters passed to function calls.
 - d. Size of the binary file
 - e. Comment on your experience writing using PGAS and Message Passing models.