LEBANESE AMERICAN UNIVERSITY
Department of Computer Science and Mathematics
CSC 447: Parallel Programing
Spring 2021

Lab V (MPI)

Problem 1: Parallel Bucket Sort

Write an MPI C program that takes as command line argument the name of a text file containing first integers **a**, **b,** and integer **n** followed by an array of n integers. Integers **a** and **b** define the range of the numbers in the input file. Your program should first read from the text file the array elements then apply a parallel implementation of the bucket sort algorithm. The final sorted array elements should be printed out into an output text file. Save your program with the name *YourName*_Prob1.c.

Compile and run this MPI program and verify its output by following these steps:

- Use an IDE of your choice to create and save your program with *YourName*_Prob1.c.
- Compile your program within the IDE or from terminal window by using the command: mpicc –o Problem1 YourName_Prob1.c
- Then, run your MPI program by typing the command in a terminal widow: mpirun -n <NumCores> <compiledProgram>
- Verify that your program gives the correct output for 1, 2, and 4 cores

Measure the execution time in your program using the function $MPI\_Wtime()$. This can be done as follows:

```
Double start_time = MPI_Wtime();
//Insert your parallel code here
if(rank==0) {
double end_time=MPI_Wtime();
printf("Wallclock time elapsed: %.8lf seconds\n",end_time-
start_time);
}
```

- Report in a tabular form the execution time of your program when using 1, 2, and 4 processors.
- Draw your conclusions on the speedups obtained.

Submission Instructions:

You are required to submit your solutions **by Tuesday March 23 at 8:00 am**. Place your code and report in one zipped folder and submit on the provided submission link on Blackboard.