CPSC 479 Homework 2: Introduction to HPC

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Submission: Upload the program(s) and the answers on Canvas. Clearly labeling each file.

Exercise 1. [8 points] Write either a single program or separate C/C++/Python programs that use(s) MPI blocking and non-blocking commands `MPI_Send, MPI_Rcvd, MPI_Isend` and `MPI_Ircvd` to exchange one string value between process with rank 0 and process with rank 1. The string value should be either your name or your group name. The program(s) needs to calculate and display the communication time (using `MPI_Wtime)` for each of the four communications below. Also, complete the table below as well and submit it:

	Execution Time
A single transmission using blocking communication	0.00190134
A single transmission using non blocking communication	0.00786139
Two transmissions (round trip) using blocking communication	0.00178182
Two transmissions (round trip) using non blocking communication	0.0033497

Exercise 2. [4 points] Modify the ring example given in class to calculate the total communication time of sending the integer value 23 from process with rank 0 to process with rank 1, etc. until the value is received back at the process with rank 0. The program(s) needs to calculate and display the communication time (using `MPI_Wtime)` for each of the ring sizes stated below. Use only blocking communication. Launch the execution of the program with a varied number of parallel processes `(mpirun -n 10 ./a.out` to launch the executable `a.out` for 10 processes). Also, complete the table below as well and submit it:

	Execution Time
Ring with 3 nodes	0.0083231
Ring with 6 nodes	0.0684404
Ring with 9 nodes	0.0838053
Ring with 12 nodes	0.103489