David Nguyen
Doina Bein
CPSC 479-01
19/02/2020

Homework 2

NOTE: ALL EXECUTION TIMES ARE AN AVERAGE OF 10x RUNS DUE TO THE VARIABILITY OF PROCESSING. SEE PAGE 2 FOR DETAILED DATA.

Exercise 1. [8 points] Write either a single program or two separate C/C++ programs that use(s) MPI blocking and non-blocking commands `MPI_Send, MPI_Rcvd, MPI_Isend` and `MPI_Ircvd` to exchange one double value between process with rank 0 and process with rank 1. Calculate the execution time using `MPI_Wtime` to compute the execution time and write it down in the table below as follows:

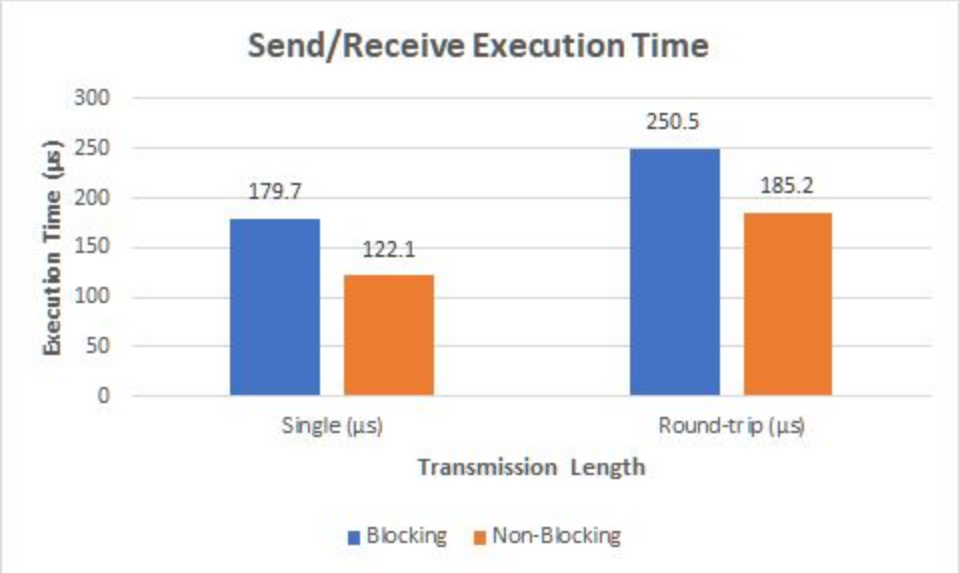
	Execution Time
A single transmission using blocking communication	~180 μs
A single transmission using non blocking communication	~122 μs
Two transmissions (round trip) using blocking communication	~251 μs
Two transmissions (round trip) using non blocking communication	~186 μs

Exercise 2. [4 points] Modify the ring example given in class to calculate the execution time using MPI_Wtime of the transmission of the value 5 from process with rank 0 to process with rank 1, etc. until the value 5 is received back at the process with rank 0. 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) and write down the execution time of the ring example as follows:

	Execution Time
Ring with 4 nodes	~297 μs
Ring with 8 nodes	~486 μs
Ring with 10 nodes	~554 μs
Ring with 12 nodes	~657 μs

All data is from processing on Titan-V.

	Send/Receive Execution Time			
	Blocking		Non-Blocking	
Run No.	**Single (µs)**	**Round-trip (µs)**	**Single (µs)**	**Round-trip (µs)**
1	418	490	280	352
2	224	294	67	136
3	289	361	261	321
4	263	344	182	247
5	61	135	54	113
6	195	271	62	129
7	163	233	152	207
8	60	130	54	119
9	69	134	56	115
10	55	113	53	113
Average	**179.7**	**250.5**	**122.1**	**185.2**



	Ring Mod Execution Time			
Run No.	**4 Nodes (µs)**	**8 Nodes (µs)**	**10 Nodes (µs)**	**12 Nodes (µs)**
1	361	341	376	717
2	316	487	631	499
3	472	655	407	656
4	258	516	560	853
5	205	469	695	679
6	391	315	619	666
7	214	610	576	483
8	266	490	372	659
9	268	654	662	710
10	217	314	633	644
Average	**296.8 µs**	**485.1 µs**	**553.1 µs**	**656.6 µs**