

CS 5334/4390 Spring 2015
Shirley Moore, Instructor
Lab 5
Due Wednesday, April 8

Name(s) _____

Modeling Communication Costs

Please do this lab with a partner (one group may have three people if we have an uneven number of students). For this lab, you will develop an analytical model for the communication time for one of the collective communication operations and validate this model with experimental results on Stampede. Each group will give a brief presentation (< 10 minutes) to the class on the due date explaining their model and analyzing the experimental results.

1. All groups should do this part. For this part of the lab, use regression modeling to determine the communication parameters t_s (startup time, or latency) and t_w (time per “word” transferred, or bandwidth) for a) communication between two processors on the same node, and b) communication between two processes on different nodes). You can use the ping-pong benchmark from Assignment 1.4 to collect the necessary data. Explain your results.
2. For the collective communication operation(s) assigned to your group:
 - a) Develop in detail the cost model for the algorithm(s) given in the video.
 - b) Carry out the relevant experiment for your assigned operation(s):
 - 1) One-to-all broadcast (Assignment 3.1)
 - 2) All-to-one reduction (Assignment 3.1)
 - 3) All-to-all broadcast (Assignment 3.2)
 - 4) All-reduce (Assignment 3.2)
 - 5) Gather and scatter (Assignment 3.3)
 - 6) All-to-all personalized communication (Assignment 3.4)
 - 7) Different implementations of one-to-all broadcast (Assignment 3.5)
 - c) Compare the experiment results with the communication time predicted by your model. Try to explain any discrepancies and, if possible, modify your model to more closely match your experimental results.

Please upload your spreadsheets if you use Excel, or data files and analysis code if you use R for example, to your SVN repository. You should also upload a report with your answers to the questions above. For your presentation to the class, you can either write on the board or use the projector.