* **http://www.netlib.org/benchmark/hpl/faqs.html**
* **http://www.netlib.org/benchmark/hpl/tuning.html**
* **Team** -
  + Bryan Secoy
  + Obi Chukwuezi
  + Danielle Bowser
  + Thomas Shattuck
* **Goal** - Expand on the performance variation project from 2017. We want to provide more in-depth testing on the cluster - this would look like expanding the project to facilitate communication between all node combinations and running the MPI version of the High Performance Linpack (HPL) benchmark on the cluster and analyzing the results. If possible, we would like to obtain physical access to the hardware of the cluster by working with Pete in order to broaden the performance variation analysis testing by having more fine-grain analysis abilities. For example, to determine why core 8 had far more below-average performance results across all nodes compared to core 1 who had above-average performance in the embarrassingly parallel (EP) tests. We also want to make the tests more robust and rerun them see the consistency of their data at different time periods as well as find other tests part of the NAS Parallel Benchmark Suite to compare and contrast with the results that they found to help improve the accuracy of the data overall.
* **Relevance** - We are analyzing how performance is affected by communication in a distributed system, and how the same hardware components in that distributed system can have variations in their performance.
* **Methods** - We will use the source code from the previous team’s project to test the communication between nodes and run the MPI version of the High Performance Linpack (HPL) benchmark on the cluster. We would like to expand the MPI functions used so that in addition to point-to-point communication, we can facilitate collective functions (Scatter, gather, etc.). Make the timing for the program more rigorous with the various MPI functions. The previous group ran their benchmarks 20 times and performed statistical analysis like mean and standard deviation on the runtime of the data collected. We plan to continue this pattern with new data that we collect to make comparisons most accurately.
* **Possible Roadblocks** - Time constraints, lack of permissions on the cluster, physical access to the cluster, general difficulties with the lack of knowledge in coding, availability of test suites (EP, UA, HPL). We will overcome these possible roadblocks by working incrementally, receiving constant feedback from Dr. Lam, and being proactive in obtaining any resources/software we may need.
* **Mid-Project Deliverable** - Finished running the HPL benchmark, providing an analysis of it, and creating graphs showing our results. We will show how we will implement and use other benchmarks and/or testing suites. The grading criteria for our mid-project deliverable should be based on the success of getting the MPI HPL benchmark compiled and running and showing some results. We should also be evaluated on how much more rigorous and robust we have made the previous team’s testing and inner node benchmarking to neighbor nodes like the previous project.
* **Showcase** - Poster board and a demo of how we tested the cluster with our various benchmarks and test suites. A JMU owned, Linux-based laptop may be needed in order to demo our project. The poster board will consists of the statistical average and/or standard deviation of all the tests thus far in formatted tables, explanations of the those results and, if possible, why such results occur.
* **Final Deliverable** - Our final deliverable will be the project code, spreadsheets containing all of our benchmark results, and graphics representing the results. We should be evaluated based on how well we have been able to use the MPI HPL benchmark and other benchmarking/testing suites. We should be evaluated on refining the previous team’s benchmark and timing for the program as well as the benchmarking results from multiple different node communications at different time periods. With low level access to the cluster, we should be evaluated on our theories or explanations on why results for a given benchmark are the way the are. We can also be evaluated on a discussion of how all the benchmarks we took relate to each other and what that means in regards to the cluster.

[**https://w3.cs.jmu.edu/lam2mo/cs470/cluster.html**](https://w3.cs.jmu.edu/lam2mo/cs470/cluster.html)

[**http://www.crc.nd.edu/~rich/CRC\_Summer\_Scholars\_2014/HPL-HowTo.pdf**](http://www.crc.nd.edu/~rich/CRC_Summer_Scholars_2014/HPL-HowTo.pdf)

[**https://ulhpc-tutorials.readthedocs.io/en/latest/advanced/HPL/**](https://ulhpc-tutorials.readthedocs.io/en/latest/advanced/HPL/)