

Cloud Strategy Writeup for Georgia Tech

Cloud Orchestration

One of the early decisions we made in preparation of the competition is to use chef to manage the configuration of our cluster. Naturally, this also extends to the cloud.

Although cyclecloud uses chef underneath for initial configuration of the cloud clusters, our chef setup can run side-by-side without compatibility issues. With this setup, we're able to version-control our servers' configuration and have better reproducibility for our software stack.

Architectural Considerations

For our cluster, we're using ppc64le architecture. Although portability is rarely an issue, for certain applications, Power specific toolchains *may* fail to produce binaries in a compatible manner. Consequently, we have dedicated the Mystery Application to the cloud, where the x86 based toolchain is easier to work with.

Performance Optimizations

One of the less obvious implications of running application in the cloud (or any virtualized environment) is that certain low-level statistics used for optimizations won't be available. In a bare-metal machine, using perf, we can access performance counters (PMC). Using PMCs, we can determine CPU-specific characteristics for applications, such as L1 Cache miss rate, branch-prediction miss rate, and adjust our optimization based on those statistics. For this reason, we only performed optimizations of this nature on local boxes.

Application Specifics

Born

Because without modification Born only runs on CPU, cloud is naturally a good fit for Born workloads. Since Born only runs on a single-node, we don't need the RDMA related benefits from the H-series instance types. Therefore, we chose one of the most high-CPU instances (D64s) for born. We utilized vectorization as well as Link Time Optimizations available on the Intel Platform.

Mystery (MPAS)

The toolchains we have on Power 8 servers have compatibility issues with the library need by MPAS. Therefore, we dedicated MPAS to a H16r cluster. We were able to compile MPAS successfully on cloud and the experiments are ongoing.

MrBayes

With MrBayes, although GPUs generally run faster, we can also obtain speedups using more chains with higher numbers of processes in CPU. Therefore, we created a H16r cluster to the advantage of the high speed networking provided by H-series instances.