CS554 Project Ideas

Slurm:Bench: Benchmarking of the state-of-the-art Job Management.Systems for High Performance Computing

Overview

The goal of job management system (JMS) is to efficiently manage the distributed computing power of workstations, servers, and supercomputers in order to maximize job throughput and system utilization. A JMS is in charge of all the activities from submitting a job to returning a job after being executed, such as resource allocation, job scheduling, and job launching.

Over the past two decades, there are a lot of JMSs developed for the High Performance Computing (HPC) environment, where jobs require large number of compute nodes and tasks with a job are very tightly coupled. Representatives of these JMSs are SLURM developed in LLNL, Condor developed in UW-Madison, SGE developed in Sun Microsystems, PBS related projects (e.g. OpenPBS in NASA, TORQUE maintained by Adaptive Computing Enterprises, Inc. and the commercial PBS Pro offered by Altair Engineering), and Cobalt developed in ANL. All these JMSs have centralized architecture and have been deployed as resource managers on various clusters and supercomputers for years. This project is to benchmarking and comparing all of these JMSs with detailed profiling about their performance and resource consumption under the same workloads. The aim is to understand strengthens and weaknesses of the current HPC JMSs, which will guide us to develop the next generation distributed JMS towards exascale computing.

Relevant Systems and Reading Material

SLURM: http://www.schedmd.com/slurmdocs/overview.html

Condor: http://research.cs.wisc.edu/htcondor/

SGE: http://web.njit.edu/all_topics/HPC/sge.html

OpenPBS: http://www.nas.nasa.gov/Software/PBS/docs.html

TORQUE: http://www.adaptivecomputing.com/products/open-source/torque/

Cobalt: http://trac.mcs.anl.gov/projects/cobalt

Preferred/Required Skills

Required: Linux, scripting language

Preferred: HPC, C/C++, Java

Parameters

Different workloads, different scales

Metrics

Throughput, latency, efficiency, time and memory consumption

Project Mentor

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