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A Petri–Net Based Model for PBS System on Linux Enterprise Server

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Abstract

A typical batch queuing system can schedule jobs for execution by using of a set of queue controls, these queuing controls decide the queue from which jobs will be selected. Typically Jobs are selected within each queue in a first –in –first –out order which limits the set of scheduling policies. The use of the Portable Batch System (PBS) is a suitable solution to this limitation. We present a robust and intelligent Portable Batch System (PBS) implemented with petri-net segmentation and firing squad model with the integration of an external scheduling module that employs the Maui Scheduler which has full knowledge of the available queued jobs, running jobs and usable system resource.

Keyword: Petri-net, Queue system, Portable Batch System, Scheduler, Linux Enterprise Server

1. Introduction

Batch Processing is the execution of a series of programs or jobs on a computer without manual intervention (Sahota and Maozhen, 2009). A Batch System provides the mechanism for submitting, launching and tracking jobs on a shared resource. These services satisfy one of the key responsibilities of a batch system, providing centralized access to distributed resources.

Multiple queuing systems have been tried out and several are presently in wide use. Among these are the Distributed Queuing System (DQS), Load Sharing Facility (LSF), IBM's Load Leveler, and most recently the Portable Batch System (PBS) (Bode et al, 2009). The Portable Batch System is software that performs job scheduling. Its primary task is to allocate computational tasks, i.e., batch jobs, among the available computing resources. It is often used in conjunction with UNIX cluster environments.

The design modelled in this work is the Torque Resource manager (Terascale Open –source resource and QUEue Manager), which provides control over batch jobs and distributed computing resources. We design a limited scheduling intelligence built in, which is why it used with the Maui Scheduler. Maui Scheduler is an open source job scheduler that gives extensive control over which jobs are considered eligible for scheduling, how the jobs are prioritized, where and when the jobs are run. The Maui scheduler is ported to act as a plug-in scheduler to the PBS system. This combination is proving successful at scheduling jobs on parallel systems.

It can be extremely difficult for administrators to pull together detailed, precise usage data, or to set system-wide resource priorities in this distributed heterogeneous environment. As a result, many computing resources are left under-utilized, as others are over-utilized. At the same time, users are challenged with an ever expanding array of operating systems and platforms. The PBS addresses