Performance Isolation Framework for Virtualized Server Applications

Hlaing May Tin

University of Computer Studies, Yangon, Myanmar

hlaingmaytin1982@gmail.com

Abstract

Recently, most IT organizations are transforming their data centers to smaller virtualized ones with the help of server virtualization. In virtualized servers, multiple applications are consolidated into a physical server by sharing and multiplexing their physical resources. For such environment, performance isolation among consolidated applications is the desirable thing to meet Service Level Agreements (SLAs) of those applications. This paper describes the way to control the total amount of CPU resource consumption in privileged and driver domains of each virtual machine (VM). By limiting the CPU resource usage of each VM in both domains, performance isolation among co-hosted application can be achieved. To accomplish this purpose, state space representation of Multi-Input Multi-Output (MIMO) controller is designed. The proposed framework is implemented and tested on a testbed which used Xen virtualization environment as an ongoing work.

1. Introduction

Today's data centers host a variety of business-critical applications such as web hosting, e-commerce sites and enterprise systems. Such application owner pay for renting server resources, and in return, the data center provider pays guarantees on resources availability and performance by means of SLAs. To meet these SLAs, data center must provision sufficient resources to applications as their need. Such provisioning can be based either on a dedicated or a shared platform. In a dedicated environment, some numbers of cluster nodes are dedicated to each application and provisioning technique must determine how many nodes to allocate to the application. In a shared environment, an application can share resources of physical node or server with other applications and the provisioning technique needs to determine how to partition resources on each physical server among competing applications. Since physical resources are shared, providing guarantees and isolation to the performance of applications in the shared data center model is more complex.

Several issues need to be addressed for virtualized servers such as mapping of resource requirements from physical to virtual environment, placement policies for virtual machines, dynamic resource provisioning, workload monitoring, and migration among VMs. Performance isolation of co-hosted applications in virtual execution environment, is another important goal [10]. Performance isolation means ensuring the performance requirement of one application should not impact the performance of another applications running in the same host.

The key contribution of this paper is to effectively control the total CPU consumption of each VM in both privileged and driver domains. Firstly, the system relates the desired performance of each application request or workloads to the required amount of resource to handle that workload. Next, the system accurately measures the resource consumption, including work done on behalf of a particular VM in Xen's driver domains. Finally, by using aggregate VM resource consumption in