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ScienceDirect

Procedia Computer Science 48 (2015) 107 – 113

Procedia Computer Science

International Conference on Intelligent Computing, Communication & Convergence

(ICCC-2015)

Conference Organized by Interscience Institute of Management and Technology,

Bhubaneswar, Odisha, India

Multi-Objective Tasks Scheduling Algorithm for Cloud Computing Throughput Optimization

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Abstract

In cloud computing datacentersexert server unification to enhance the efficiency of resources. Many Vms (virtual machine) are running on each datacenter to utilize the resources efficiently. Most of the time cloud resources are underutilized due to poor scheduling of task (or application) in datacenter. In this paper, we propose a multi-objective task scheduling algorithm formappingtasks to a Vms in order to improve the throughput of the datacenter and reduce the cost without violating the SLA (Service Level Agreement) for an application in cloud SaaS environment. The proposed algorithm provides an optimal scheduling method. Most of the algorithms schedule tasks based on single criteria (i.e execution time). But in cloud environment it is required to consider various criteria like execution time, cost, bandwidth of user etc. This algorithm is simulated using CloudSim simulator and the result shows better performance and improved throughput.

Peer-review under responsibility of scientific committee of International Conference on Computer, Communication and Convergence (ICCC 2015)

Keywords: cloud computing; priority; non-dominated sorting; QoS; VM(Virtual machine).

1. INTRODUCTION

Within few years cloud computing grab the IT market very fast and most of the IT industry start using the cloud computing. In cloud computing the word cloud refers as internet, so the meaning of cloud computing is Internet Based Computing. In other words it's a kind of server based computing. Cloud computing provide on demand services to the client. The services includes SaaS (Software as a service) where application software and database access provided to the user pay per use basis, IaaS (infrastructure as a Service) where virtual machine provided to the user using virtualization of physical machine which includes processing power, storage and other resources, PaaS (Platform as a Service) where cloud provider provides a computing platform which includes OS, programming language execution platform and web server. Cloud computing serves on demand requests of the users with self-managed virtual infra-structure and with efficient resources utilization. Growth of cloud computing slower down the efficiency, throughput and utilization of resources for which cloud computing need to be evolved. Apart from many ways to enhance the throughput and efficient resource utilization one way is the cloud task scheduling. Through task scheduling we can manage the resource utilization which in turn increases the throughput of the system. Scheduling refers to the mapping or assigning a task to a specific Vm , such that resource utilization increase. An efficient task scheduling algorithm improves the overall system performance and helpsservice provider to provide good quality of services (QoS). In cloud computing broker plays an important role. Brokers have the list of Vms and its QoS.

A high performance Vm assign with the high QoS. Broker takes the requests from the user and sends the request

Peer-review under responsibility of scientific committee of International Conference on Computer, Communication and Convergence (ICCC 2015)
doi:10.1016/j.procs.2015.04.158

to the one of the Vm which meets the user requirement and the service level argument (SLA). At the time of assigning the request to a particular Vm the quality of service (QoS) for the request or task should not decrease. Sometimes a good QoS task is assign to a low QoSVmwhich leads to the poor utilization of resources and this violates the SLA. So an efficient task scheduling algorithm should be implemented at the broker.

Rest of the paper is organized asfollows. The section 2, describe some of the works related in the area of task scheduling. Thesection 3, describe the proposed work. The section 4, describe the experiment setup and simulation results. The section 5, conclude the proposed algorithm.

2. Related Work

Cloud computing is a new technology and still is in the developing stage. Cloud computing enhances its performance and throughput by using an efficient task scheduling algorithm. Most of the task scheduling algorithm, for cloud computing have been proposed in the last few years are based on QoS. QoS parameters include execution time, deadline, cost, bandwidth of communication; make span, reliability, scalability and many others. Based on QoS parameters a task is selected for the execution on a selected VM, which increases the resource utilization and the throughput of the overall system.

One of the traditional methods for selecting a task from a group of tasks has been done by priority scheduling. Priority of a task can be assigned dynamically using the QoS parameter at runtime. Static priority assignment for tasks faces many difficulties. QoS has the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level performance data flow. In [6, 10] authors assigns priority to different tasks by taking QoS parameter such as execution time and cost of application and QoS value.

In [1, 11] authors proposed an algorithm for task scheduling based on multiple criteria and multiple decision to choose a task to be executed in a particular VM. Multiple criteria include the various QoS parameters. These algorithm helps to reduce the make span of the system.

Optimized task scheduling algorithms using genetic algorithms put system into an optimal stage without trapping the system to a local optimal stage. In [5] authors proposed an algorithm based on NSGA-II for load balancing of CPU, memory and bandwidth in cloud computing and [4] author uses the combination of genetic algorithm along with fuzzy optimization theory. Nature inspired algorithm is also used, such as ant colony optimization. In ant colony optimization ant moves in random direction for the search of food source around the colony. Here the ants are tasks and the food sources are VMs. In [14, 15] authors implements modified ant colony optimization to minimizing the execution time and cost by considering execution time , arrival time and other QoS parameter as a criteria for searching a best VM for the execution of tasks such that the make span of the system is reduced.

The main job of broker is to allocate the VM to a task. At runtime broker decides mapping of task to a VM. Sometimes single tasks with multiple users [3] are mapped to VM and sometimes from a group of task a particular task is picked up for the allocation of VM depending upon the execution time and arrival time [6, 7, 9, 12, 16]. The tasks in the group is selected sequentially and submitted to the Virtual Machine. The process of allocation is done repeatedly until the entire tasks in the queue finish its execution. This leads to a minimized make span of the VMs and reduces completion time or execution time of task. Main goal of all tasks scheduling algorithm is to minimize the execution time, cost, make span but few algorithm has been proposed to increase the scalability [13] and reliability [15] of the whole system. These task scheduling algorithms increase the QoS of the system.

3. Proposed Work

3.1 Introduction

Cloud computing service providers have several datacentres in order to optimally serve customer needs around the world. However, existing system does not provide the proper scheduling of customer requested application among the VMs in datacenters to achieve reasonable QoS levels. Every datacenter in cloud computing consist of numerous servers and each server runs numerous VMs. Each VMs have different capability to execute different QoS's tasks requested by the customer.