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Distributed virtual machine allocation using DRR algorithm in cloud computing

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ABSTRACT

In private cloud during FFCS registration large amount of students are trying to register their subject at same time from different places so heavy load is departing to server due to this heavy load to resources the server unable to give where response to students which lead to the problem student can't register properly within given time or wait for long time until server recover from this problem. This problem can be solved by allocating the resources properly to server this comes under the infrastructure as a service (IaaS) we can use and allocate a various kind of resources. This paper proposed solved this problem efficiently according virtual machine is distributed in hierarchical architecture using dynamic round robin algorithm[DRR] , resources will be allocate efficiently so the load will be distributed to various virtual machine then student need not to wait for long time and they can register properly within a given time. Finally implemented on Simulator Cloudsim 3.0. Experiment result show DRR can achieved resource allocation efficiently in cloud computing.

Introduction

Cloud computing can be defined as "a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned, and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers" [11].

The main idea of cloud computing is scalability. The key technology need for this is virtualization. In simple terms, virtualization is the emulation of hardware within a software platform.

VM allocation (provisioning) [11] is the process of creating VM instances on hosts that match the critical characteristics (storage, memory), configurations (software environment), and requirements (availability zone) of the SaaS provider. Allocation of application-specific VMs to Hosts in a Cloud-based data center is the responsibility of a Virtual Machine Allocation controller component (called VmAllocationPolicy).

Dynamic Round-Robin is proposed as an extension to the Round-Robin method. Dynamic Round-Robin uses two rules to help merge virtual machines. The first rule is that if a virtual machine has completed and there are still other virtual machines hosting on the identical physical machine, this physical machine will accept no more new virtual machine. Such physical machines are referred to as is in "send-off" state, meaning that when the rest of the virtual machines finishes, this physical machine can be shutdown.

The second rule of *Dynamic Round-Robin* is that if a physical machine is in the "send-off" state for an adequately long period of time, instead of waiting for the hosting virtual machines to finish by itself, the physical machine will be compulsory to migrate the rest of virtual machines to other physical machines, and shutdown after the relocation finishes. This waiting time threshold is denoted as "retirement threshold". A physical machine is in the retirement state but could not finish all virtual machines after the retire threshold will be forced to migrate its virtual machines and shutdown.

The paper is organized as follows. Section 1 is the introduction. Section2 presents related work. Section 3 gives a system architecture .Section 4 presents algorithms and explanation. Section 5 gives implementation and results and section 6 presents conclusions.

Related Work

Jing Xiao et. el. [1] scheduling is based on priority algorithm in which based on size, request are divide in to three type small request, medium request, large request. The request queue contain all kind of request based on priority of the request it will allocate to virtual machine then it will assign to heterogeneous hosts in this kind of scheduling user can not feel that system is working for them alone and small request user need to wait until the large request complete. If it is large request then one host is allocate for that user alone then that host cannot reuse by other user.

Yi Zhao et. el. [2] it reduces network load balance by using adaptive distributed algorithm based on the virtual machine live migration. Here for each and every host they apply the distributed load balance algorithm which is unnecessary for all hosts since memory will be waste. Ahmed Amamou et. el. [3] they allocate bandwidth to virtual machine here they calculate the minimum and maximum bandwidth allocate for each virtual machine. They concentrate more on bandwidth then the Million Instruction Per Second (MIPS).

Kamran Zamanifar et. el. [4] Data rate allocation to the virtual machine using novel placement virtual machine algorithm it mainly used to store the files, records…etc. Jose Luis Lucas Simarro et.el. [5] based on the cloud offer provide by provider cost of cloud will be calculated but they didn't said about how to allocate virtual machine to host. Xiaoming Nan et. el. [6] Allocate the virtual machine based on Round Trip Time(RTT) and resource cost. They use the greedy algorithm to allocate the VM. But this allocation is work only multimedia application alone not for other application.

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System Architecture

This paper is based on client-server architecture where the students or user can send the request to server and then after processing the request server will response to the user. User will send their request to server that time broker who acts as an intermediate between user and server. Broker will bind the virtual machine to the host. N number of virtual machines can run on a single host but allocating these virtual machines properly to a host is very difficult using dynamic weighted round robin algorithm we can allocate the virtual machines to a host properly which create the user to feel that the host is working for them alone. Finally user data will be store in datacenter of private cloud and server will give response to user.

In the figure 1 it contain N number of user's and each user have one separate user broker. All broker bind the virtual machine with host and it will run in server and store user information to datacenter.

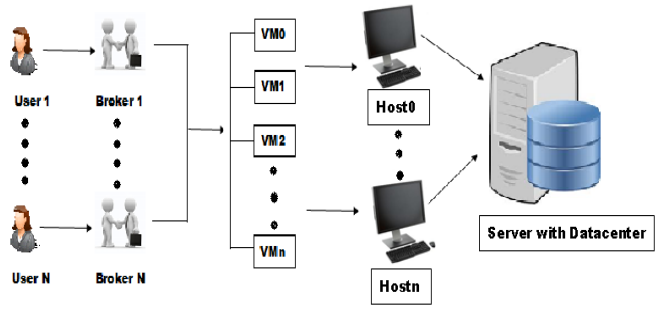


Fig.1 System architecture

Hierarchical Based Architecture:

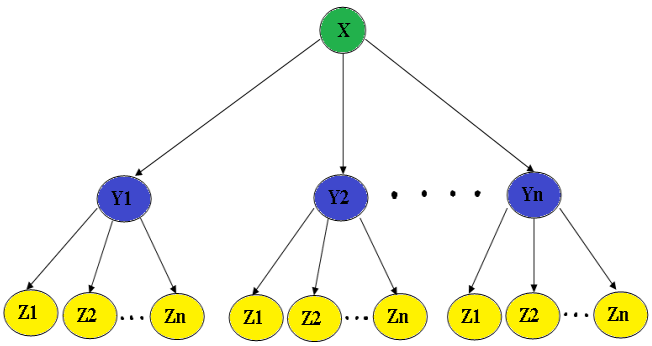


Fig.2 Hierarchical Based Architecture

Most of organization will have hierarchical based architecture based on our problem let us consider the X as university and Y1,Y2,…Yn is department or school of a university and Z1,Z2,…. Zn is courses provide by each department or school and each course will have finite number of students. Now we can allocate the virtual machine to this hierarchical based architecture based on the distributed manner which will avoid all the problems such as low response time, high waiting time, low cpu utilization.

Dynamic round robin algorithm

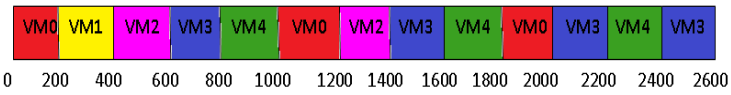
The DRR mostly focuses on allocates the load equally to all the nodes. Using this algorithm, the scheduler distributes one VM to a node in a cyclic manner. The dynamic round robin scheduling in the cloud is much related to the round robin scheduling used in the process scheduling. The scheduler starts with a node and moves on to the next node, after a VM is assigned to that node. This is repetitive until all the nodes have been allocated at least one VM and then the scheduler returns to the first node again. Hence, in this case, the scheduler does not wait for the exhaustion of the resources of a node before moving on to the next.

As an example, if there are five nodes and five VMs are to be scheduled, each node would be allocated one VM, provided all the nodes have enough available resources to run the VMs. The main advantage of this algorithm is that it utilizes all the resources in a balanced order. An equal number of VMs are allocated to all the nodes which ensure fairness. However, the major drawback of using this algorithm is that the power consumption will be high as many nodes will be kept turned on for a long time. If five resources can be run on a single node, all the five nodes will be turned on when Round Robin is used which will consume a significant amount of power.

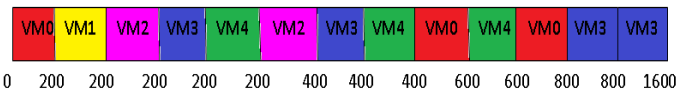
Dynamic Round Robin is more efficient than other scheduling algorithm it have average turnaround time and low waiting time then other scheduling algorithm. Consider an example the MIPS(Million Instruction Per Second) is used as a quantum MIPS to allocate the virtual machine.

VM0 MIPS=600
VM1 MIPS=200
VM2 MIPS=400
VM3 MIPS=800
VM4 MIPS=600
Quantum MIPS=200

Gantt chart for virtual machine allocation in normal Round Robin is



Gantt chart for virtual machine allocation in cloud computing using Dynamic Weighted Round Robin is more efficient which reduce the overall time taken by the all virtual machine will be reduced.



Mathematical formula

Waiting Time = Starting Time – Arrival Time

Average Waiting Time=Sum of Waiting time of all VM/ Number of VM

Turnaround time = Finished Time – Arrival Time

Average Turnaround time = Sum of Turnaround time of all VM/ Number of VM

Response Time = First response – arrival Time

Average Response time = Sum of Response time of all VM/ Number of VM

Implementation

Using Simulator Cloudsim 3.0 Distributed virtual machine allocation for a host using dynamic round robin scheduling algorithm. Here user should enter their name, register number to login in to their FFCS course registration. Then they have to choose their school or department then they choose the subjects they want study. Then FFCS course registration Virtual machine allocation will be start working in server.

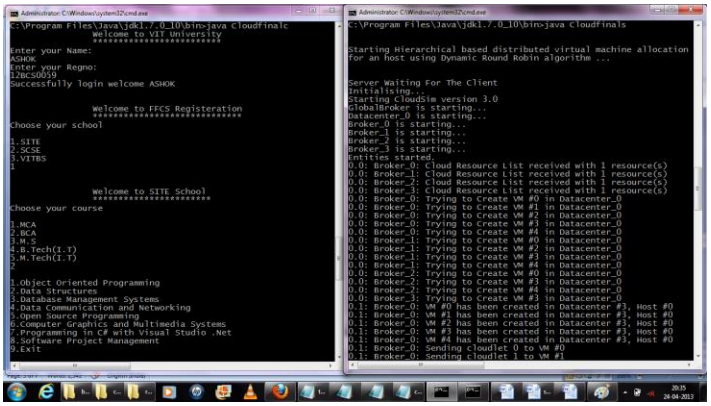


Fig 3 Login face

All virtual machine will be allocated finally server will display Cloudlet Id, Datacenter Id, status, Virtual machine Id, total time taken, starting time, finishing time of each virtual machine.

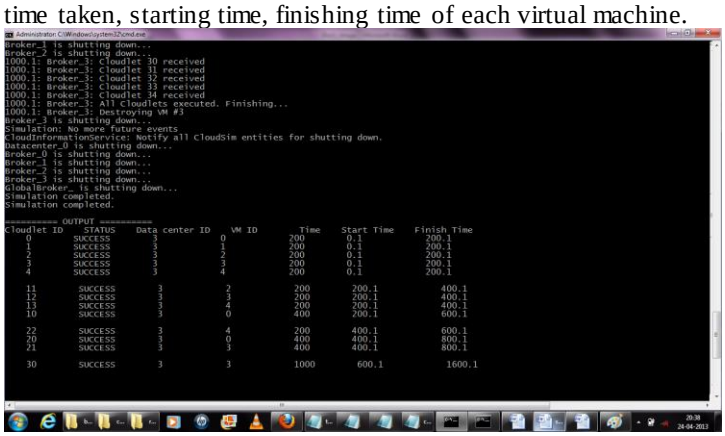


Fig 4 Virtual machine allocation

At last server show the result such as average waiting time, turnaround time, response time and CPU utilization.

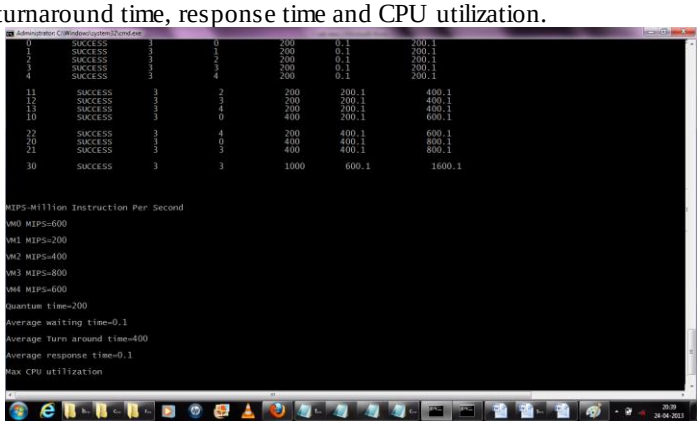


Fig 5

Server will send the information to the user that how many subject they register and for how many credits they register and it store in database.

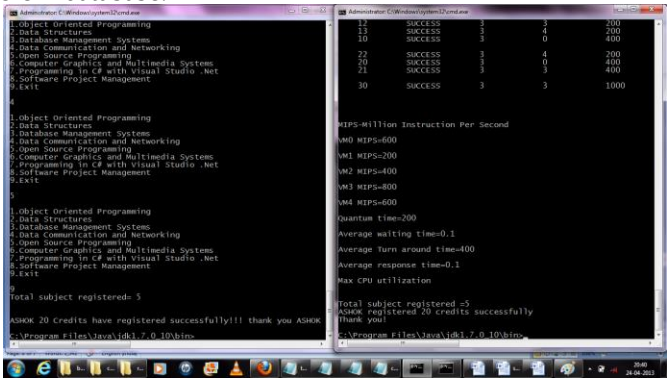


Fig 6 Final result

Conclusion:

In this paper we proposed Distributed virtual machine allocation for a host using dynamic round robin based scheduling algorithm for cloud computing environment. Results shows having high CPU utilization, minimum response time and waiting time. So students can register their FFCS registration properly within given time and no need to wait for long time and they can register properly within a given time. The Experimental results show that DRR algorithm achieves resource allocation efficiently and reduced the user usage cost thus the result gives reduced waiting time virtual server and also save power energy, CPU maximum utilization.

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