Volume 7, Issue 2, February 2017 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

A Novel Approach in Cloud Computing for Load Balancing Using Composite Algorithms

Rajesh Sachdeva
Assistant Professor, P.G Deptt of Computer Science,
Dev Samaj College for Women, Ferozepur,
Punjab, India

Sanjeev Kakkar
Assistant Prof. and Head, P.G Deptt of Computer Science
Dev Samaj College of Women, Ferozepur,
Punjab, India

DOI: 10.23956/ijarcsse/V7I2/0119

Abstract—Cloud computing is next generation of computing and a developing computing paradigm in the modern industry, either may be government organizations or the public organizations. In simple words we can say that Cloud Computing is set of different servers that cater to need of different clients based on their demands. Clouds have very powerful data centers to handle large number of user's requests. Cloud platform provides dynamic pool of resources and virtualization. Load Balancing is required to properly manage the resources of the service contributor. Load balancing is a technique to distribute the workload among many virtual machines in a Server over the network to achieve optimal resource consumption, decrease in data processing time, decrease in average response time, and avoid overload. Through better load balancing in cloud, performance can be improved and better services are provided to user. Here in this paper we have discussed many different load balancing techniques used to solve the issue in cloud computing environment.

Keywords—Cloud computing; Load balancing; Simulation; Virtual Machine; Cloudsim; Cloud;

I. INTRODUCTION

Cloud computing is a internet based service provider in which users are allowed to access services on demand.Cloud computing is relatively a new software system technology, which allows dynamic resource allocation on consolidated resources using a combination of different techniques from parallel computing, distributed computing, as well as platform virtualization technologies [1].. Cloud computing has been a primary focus in both the research community and the industry over recent years because of its flexibility in software deployments, and of its elasticity capability on resource consolidation. The latest trends show that a large number of medium and large scale businesses are shifting to cloud. The service providers are increasing day by day and provides services at lower costs.

The main Objective of Cloud Computing is to shift the computational services from desktop to the internet that is moving computation, services offered by them and data off-site to an external, internal, location that is not visible to main contractor. Cloud Computing model is often referred as "pay-per-use model" because we pay amount as per our usage of resources [3].

Cloud computing implements virtualization technique in which a single system can be virtualized into number of virtual systems [6]. On receiving a request from a client Load balancing helps to decides which client will use the virtual machine and which virtual machines wait or will be assigned to different virtual machine. Load balancing of can be handled dynamically by using virtualization technology where we can remap Virtual Machines (VMs) and physical resources according to the change in load. Due to these benefits, virtualization technology is most oftenly implemented in Cloud computing. In load balancing there are different challenges that needs to be handled like scalability, throughput, availability ,Virtual machine relocation, , fault tolerance, but main issue is the load balancing , it is the process of distributing the load among various nodes of a distributed system in order to minimize the communication delay and to minimize the resource utilization and also avoiding a situation when some of the machines have large amount of data and consuming excess time while others have huge amount of load while other nodes are doing nothing or idle with very little work.

A. Types of cloud computing

Cloud computing provides three types of services :

- **Infrastructure as a Service (IaaS):** It provides access to fundamental resources within the cloud i.e. virtual machines, storage etc. In this users need not to buy required servers or network resources of their own. The users pay only for the time duration they are using the service. [7].
- **Platform as a Service (PaaS):** It helps to provide runtime environment to build an application. In this model,Cloud computing provides a way where resources are available and users can create the required applications by themselves.

- **Software as a Service (SaaS):** It allows the users to use software applications as a service from various cloud providers through the internet [9]. In this type elasticity makes a cloud application different from another application.

II. LOAD BALANCING

Cloud computing is one of the fastest adopted and implemented technology in various sectors. Many organizations these days are implementing and setting up clouds, due to flexible architecture of cloud which always results in the increase in number of users reaching cloud and ultimately improving performance. Although clouds are categorized as public, private and hybrid models but still there may be problem of reliability in these clouds [4][5]. Cloud computing has been used by most of the organization such as, social networking websites, online applications design by Google doc and Several clouds are also used for online software testing [14].

Load balancing is one of the most important aspect in cloud computing environment that can purposeful improve resource utilization, performance and save energy by properly assigning/reassigning computing resources to the incoming requests from users.

III. EXISTING LOAD BALANCING ALGORITHMS FOR CLOUD COMPUTING

To distribute workload among multiple network links among multiple virtual machines and to achieve maximum throughput, minimize response time. We use two algorithms to distribute the load.

A. Equally Spread Current Execution Algorithm(ESCE):

The load balancer tries to preserve equal load to all the virtual machines connected with the data centre. In Equally spread current execution algorithm, the processes are handled with load priorities. It distributes the load to virtual machine by checking the load at current time and transfer of the load to that virtual machine which is lightly loaded and handles that request easily and result in less time taken , and give maximum possible throughput. In this technique the load balancer tries to divide the load into multiple virtual machines. It maintain a index table containing list of virtual machine with current load. When all the virtual machines are currently loaded and when there is a request to the data centre to allocate the new VM, it scans the table for VM which is least loaded. If in case there are more than one VM is found than first come first serve algorithm is used and first identified VM is selected for handling the request of the client/node, the load balancer returns VM id to datacenterbroker. The data centre communicates the request to the VM identified by that id. After each allocation the index table is updated and When task is completed, it is informed to data centre which is further notified by the load balancer. The load balancer again updates the index table and result in decreasing the allocation count by one but in this there is an additional overhead of scanning the queue again and again.

METHODOLOGY

1. Initially all Vms are available
2. When a job is requested to datacenterbroker.
3. Count the active load on each VM
4. Return the id of those VM which is having least load.
5. The VMLoadBalancer will allocate the request to one of the VM.
6. If a VM is overloaded then the VMLoadBalancer will distribute some of its work to the VM having least work so that every VM is equally loaded.
7. The datacentercontroller receives the response to the request sent and then allocate the waiting requests from the job pool/queue to the available VM & so on.

B. Throttled Load Balancing Algorithm(TLB)

In TLB algorithm, an index table is maintained by load balancer which contains virtual machines as well as their states (Available or Busy). On receiving a request from client data centre firstly tries to find a suitable virtual machine (VM) to perform the requested task. The data centre broker queries the load balancer for allocation of the VM. The index table is scanned from top by the load balancer until the first available VM is found or the index table is scanned fully. If the status of any VM is Available, then VM id is send to the data centre. The data centre then allocates the request to the VM identified using the throttled algorithm. Also, the data centre updates the index table and set the state of VM to Busy. But during processing the request of client, if no VM is found, the load balancer returns -1 to the data centre [7][8]. The data centre queues the request of the client with it. When a certain VM completes its task, a request is sent to data centre to update its index table. The total execution time can be estimated in three phases. During first phase there is formation of the virtual machines and they will be idle waiting for tasks, once tasks are allocated, the virtual machines in the cloud will start processing their assigned tasks, which is considered as the second phase, and finally during the third phase after completion of their dedicated tasks the virtual machines are de-allocated. The throughput can be considered as the total number of jobs executed within a time span without considering the virtual machine formation time.

METHODOLOGY

1. ThrottledVmLoadBalancer maintains an index table of VMs and the state of the VM (BUSY/AVAILABLE). At the start all VM's are available.

2. DataCenterBroker receives a new request.
3. DataCenterBroker queries the ThrottledVmLoadBalancer for the next allocation.
4. ThrottledVmLoadBalancer check the table from top until the first available VM is found.
5.If VM is found available then ThrottledVmLoadBalancer returns the VM id to the DataCenterBroker.
6. The DataCenterBroker sends the request to the VM identified by that id.
7.DataCenterBroker notifies the ThrottledVmLoadBalancer of the new allocation.
8.If all Vm's are busy then ThrottledVmLoadBalancer returns -1.
9. When the VM finishes processing the request, and the DataCenterBroker receives the response cloudlet, it notifies the ThrottledVmLoadBalancer of the VM de-allocation.
6. The DataCenerBroker checks if there are any waiting requests in the queue. If there are, it continues from step 3.

IV. PROPOSED WORK

The composite algorithm is combination of two algorithms i.e. ESCE and throttled. The algorithm contains the advantages of both the algorithms.

Firstly a Hashmap is maintained which contains the number of virtual machines with their states(BUSY or AVAILABLE). Then throttled algorithm is used as when some request of client comes to data centre the load balancer scans the entire hashmap list from top to bottom until first available virtual machine is found,if some virtually machine has state AVAILABLE then the request is allocated to that machine. If there is no virtual machine available then the request is queued.

Now we utilize ESCE algorithm. In ESCE technique load balancer makes attempt to preserve equal load to all the virtual machines connected with the data center. In this technique load balancer gets number of virtual machines by maintaining an index table and queue of number of requests currently assigned to the virtual machine. If currently no virtual machine is available then Esce algorithm it looks for machine with minimum load and allocates the load to that virtual machine

A. Hybrid Algorithm

- ***Step1***.Set all of the Virtual machines allocation status to AVAILABLE in the VM state list.
- ***Step2***.Initially the hashmap contain no entries.
- ***Step3***.DataCenterController then receives a new request from the client.
- ***Step4***.DataCenterController ask Load Balancer for next allocation.
- ***Step5***.If hashmap list size < VM state list size, Then Allocate the VM. Else wait for the VM to get free.
- ***Step6***.When the VM finish processing the request and the DataCenterController receives the cloudlet response, it notices the load balancer of the VM de-allocation.
- ***Step7***.The load balancer update the status of VM in VMs state list and hashmap list.
- ***Step8***.When all the virtual machine get busy if new request received then load balancer using ESCE check for virtual machine with minimum load and assign request to that machine

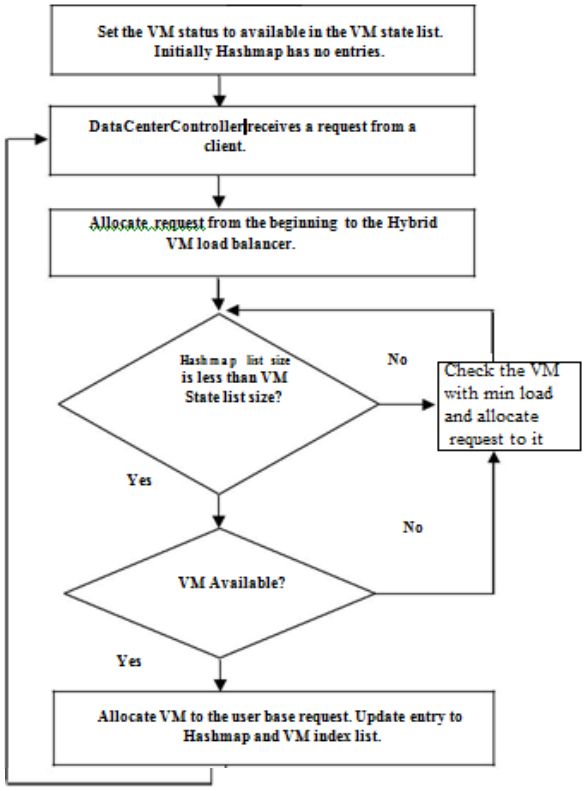

Fig.1 Flowchart for Hybrid VM load balancer

V. SIMULATION AND RESULT ANALYSIS

The Simulation and Result Analysis will be done by using the cloud Sim.

A. Cloud Sim

CloudSim goal is to provide a generalized and extensible simulation framework that enables modeling, simulation, and experimentation of emerging Cloud computing infrastructures and application services, allowing its users to focus on specific system design issues that they want to investigate, without getting concerned about the low level details related to Cloud-based infrastructures and services.

In order to analyze various load balancing policies, configuration of the various components need to be set [13]. We can set the parameters for the application deployment configuration, data center configuration and user base configuration.

By using CloudSim, researchers and industry-based developers can focus on specific system design issues that they want to investigate, without getting concerned about the low level details related to Cloud-based infrastructures and services.

Features and Advantages of Cloud Sim

Features:

- Discrete Time Event-Driven
- Support modeling and simulation of large scale Cloud computing environments, including data centers
- Support simulation of network connections among simulated elements

Advantages:

- Time effectiveness
- Flexibility and applicability

B. Netbeans (software)

NetBeans is an integrated development environment (IDE) for developing primarily with Java, but also with other languages, in particular PHP, C/C++, and HTML5.[2] It is also an application platform framework for Java desktop applications and others. The NetBeans IDE is written in Java and can run on Windows, OS X, Linux, Solaris and other platforms supporting a compatible JVM. The NetBeans Platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans Platform (including the NetBeans IDE itself) can be extended by third party developers.[3]

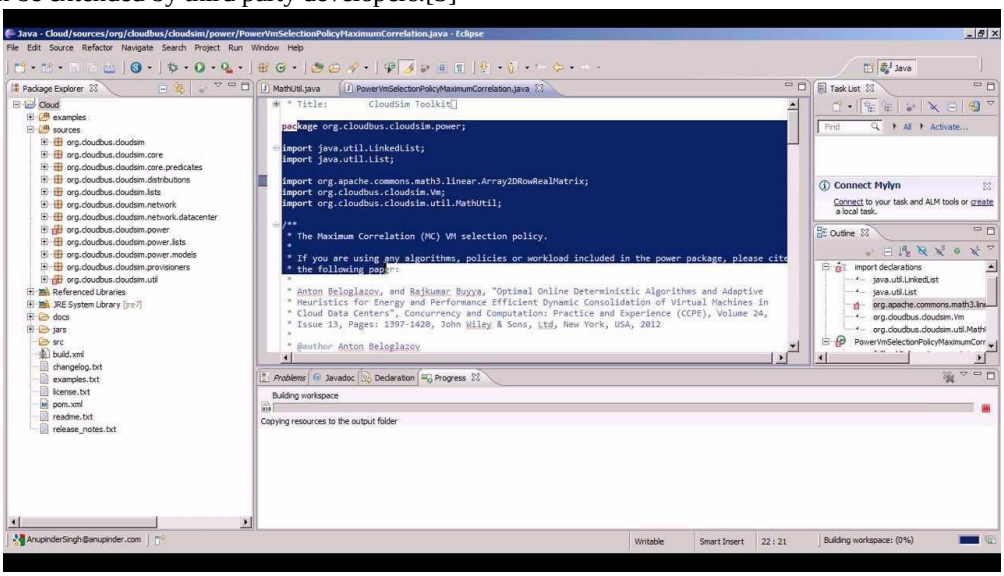

Fig.2 CloudSim

C. Comparative Study of Response Time and Data center Processing Time

S.No.	No of Cloudlets	Turn Around Time	Total Response Time	Average Response Time
1	100	9940	13680	145
2	500	52700	75484	154
3	1000	101213	146056	147
4	1500	168243	233632	155
5	2000	222551	299476	149
6	3000	316910	447199	150
7	5000	549175	7311291	148
8	10000	1101456	1513733	151

Average response time of Throttled , ESCE and Composite(Throttled+ESCE)

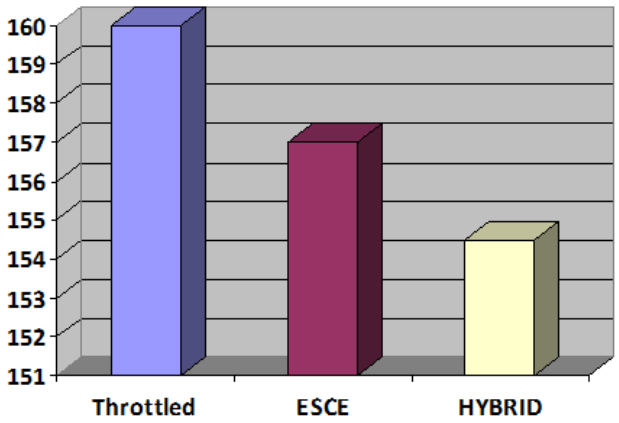

Fig.3 Comparison Of Hybrid, Esce And Throttled

VI. CONCLUSION AND FUTURE WORK

In this paper, a hybrid scheduling algorithm is proposed and then implemented in cloud computing environment using CloudSim toolkit, in java language. The hybrid algorithm based on Equally Spread concurrent Execution and Throttled. It takes the advantages of both the algorithms and consider the average response time and earliest finish time as evaluation parameters to achieve the objectives. The experiments were implemented in the Cloud Simulation environment. From the simulation results, we have found that hybrid algorithm takes less processing time and response time. But the algorithm works good when no fault occurs in VM. In future an algorithm will be developed which automatically create the migration of VM in case of failure of a virtual machine. The algorithm assumed the homogeneous VM memory. In future,we will try to develop an algorithm with heterogeneous VM memory

REFERENCES

[1] Ajith, S.N., Hemalatha, M., "An Approach on Semi-Distributed Load Balancing Algorithm for Cloud Computing System", International Journal of Computer Applications, 2012.

[2] Mishra , Ratan , Jaiswal, Anant,P"Ant Colony Optimiza tion: A Solution Of Load Balancing In Cloud",April 2012, International Journal Of Web & Semantic Technology;Apr2012, Vol. 3 Issue 2, P33

[3] Eddy Caron , Luis Rodero-Merino "Auto-Scaling , Load Balancing And Monitoring In Commercial And Open-Source Clouds " Research Report, January2012

[4] Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing A Practical Approach, TATA McGRAW-HILL Edition 2010.

[5] Anthony T. Velte ,Toby J. Velte, Robert Elsenpeter, " Cloud Computing: A Practical Approach ", The McGraw-Hill Companies(2010), [Book]

[6] Saroj Hiranwal , Dr. K.C. Roy, "Adaptive Round Robin Scheduling Using Shortest Burst Approach Based On Smart Time Slice" International Journal Of Computer Science And Communication July-December 2011 ,Vol. 2, No. 2 , Pp. 319-323

[7] Bhathiya Wickremasinghe " Cloud Analyst: A Cloud-Sim-Based Tool For Modeling And Analysis Of Large Scale Cloud Computing Environments. MEDC Project", Report 2010.

[8] Bhathiya Wickremasinghe ,Roderigo N. Calherios "Cloud Analyst: A Cloud-Sim-Based Visual Modeler For Analyzing Cloud Computing Environments And Applications". Proc Of IEEE International Conference On Advance Information Networking And Applications ,2010.

[9] R. Buyya, R. Ranjan, and R. N. Calheiros, "Modeling And Simulation Of Scalable Cloud Computing Environments And The Cloudsim Toolkit: Challenges And Opportunities," Proc. Of The 7th High Performance Computing And Simulation Conference (HPCS 09), IEEE Computer Society, June 2009.

[10] www.cloudbus.org/cloudsim.

[11] M. Randles, D. Lamb, and A. Taleb-Bendiab, A Comparative Study into Distributed Load Balancing Algorithms for Cloud Computing, IEEE 24th International Conference on Advanced Information Networking and Applications Workshops, 2010, pp. 551–556.

[12] Foster, I; Yong Zhao; Raicu, I.; Lu, S. "Cloud Computing and Grid Computing 360-Degree Compared", published in Grid Computing Environments Workshop, 2008. GCE '08 IEEE DOI 12-16 Nov. 2008.

[13] R. Buyya, C. S. Yeo, and S. Venugopal, "Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering IT Services as Computing Utilities", Proceedings of the 10th IEEE International Conference on High Performance Computing and Communications (HPCC 2008, IEEE CS Press, Los Alamitos, CA, USA), Sept. 25-27, 2008, Dalian, China.

[14] Sun Microsystems, Inc."Introduction to Cloud Computing Architecture" Whitepaper, Ist Edition, June 2009.

[15] F. Howell and R. Macnab, "SimJava: a discrete event simulation library for Java," Proc. of the 1st International

Conference on Web based Modeling and Simulation, SCS, Jan. 2008.

[16] R. Buyya, and M. Murshed, "GridSim: a toolkit for the modeling and simulation of distributed resource management and scheduling for Grid computing," Concurrency and Computation: Practice and Experience, vol. 14, Nov. 2002, pp. 1175-1220.

[17] M. Armbrust , A. Fox, R. Griffith, A. D. Joseph, R. Katz, A.Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, And M. Zaharia, "Above The Clouds: A Berkeley View Of Cloud Computing", Eecs Department, University Of California , Berkeley,, February 2009,Technical Report No., Ucb/Eecs-2009-28, Pages 1-23.

[18] Rich Lee, Bingchiang Jeng "Load Balancing Tactics In Cloud" International Conference On Cyber Enabled Distributed Computing And Knowledge Discovery, 2011

[19] A Survey on Open-source Cloud Computing Solutions Patrícia Takako Endo, Glauco Estácio Gonçalves, Judith Kelner.

[20] Panagiotis Kalagiakos, Panagiotis Karampelas, "Cloud Computing Learning" in the Proceeding of IEEE International Conference on Application of Information and Communication Technologies, Baku,Oct. 2011, pp. 1-4.

