Advances in Computer Science and Information Technology (ACSIT)
Print ISSN: 2393-9907; Online ISSN: 2393-9915; Volume 2, Number 8; April-June, 2015 pp. 10-13

http://www.krishisanskriti.org/acsit.html

Load Balancing in Cloud Computing Environment using Hybrid Approach (ESCEL and PSO) Algorithms

Anoop Yadav

JIIT Noida, Sec-62
E-mail: anoopyadav1992@gmail.com

Abstract—*Cloud computing, as of today is becoming the most demanding and emerging technology throughout the world as cloud computing focuses on maximizing the effectiveness of the shared resources as well as cloud resources are usually not only shared by multiple users but as dynamically re-allocated per demand. Cloud computing is an Internet based computer technology that maximizes the use of network services. Cloud load balancing is a type of load balancing that is performed in cloud computing which can be done individually as well as on grouped basis. It is the process of distributing workloads across multiple computing resources such as computers, a computer cluster, network links, central processing units or disk drives. Cloud load balancing aims to optimize resource use, maximize throughput, minimize response time, and avoid overload of any single resource. In the cloud computing environment load balancing has an important impact on the performance. Good load balancing makes cloud computing more efficient and improves user satisfaction. As Cloud Computing is growing rapidly and clients are demanding more services and better results, load balancing for the cloud has become a very interesting and important research area. Cloud load balancing helps to enhance the overall cloud performance. In this paper we present a hybrid approach and then give comparison of various algorithms utilized for load balancing using a tool cloudSim.*

Keywords*: Cloud computing, load balancing, virtual machine, data centers, CloudSim.*

1. INTRODUCTION

There are many definitions of cloud computing and the most comprehensive definition available is by Brendl (2010) who defined cloud computing as "collections of IT resources (servers, databases, and applications) which are available on an on-demand basis, provided by a service company, available through the internet, and provide resource pooling among multiple users." Cloud computing can also be defined as “a colloquial expression used to describe a variety of different types of computing concepts that involve a large number of computers connected through a real-time communication networks”. There are various algorithms designed for balancing the load among different tasks. After completing the literature survey we are able to conclude that most of the load balancing algorithms proposed so far are complex, and not able to implement.In Round robin scheduling algorithm method it considers only current load on each virtual machine. This is static method of load balancing static load balancing scheme provide easiest simulation and monitoring of environment but fail to model heterogeneous nature of cloud. Another algorithm called Throttled is completely based on virtual machine. In this client first requesting the load balancer to check the right virtual machine which access that load easily and perform the operations which is given by the client or user. In this algorithm the client first requests the load balancer to find a suitable Virtual Machine to perform the required operation. According to our research result of this algorithm in terms of response time and data center request servicing time is very low in comparison of ESCEL algorithm .Hence with these issues in mind here in this paper we proposed optimized load balancing system for cloud using PSO and ESCEL algorithm .In our proposed system cloud assign jobs or client request using ESCEL scheduling algorithm but before assign jobs to VMs, cloud server optimized these jobs using Particle Swarm Optimization. Using both these method, system will be less complex and time will be reduce for client request.

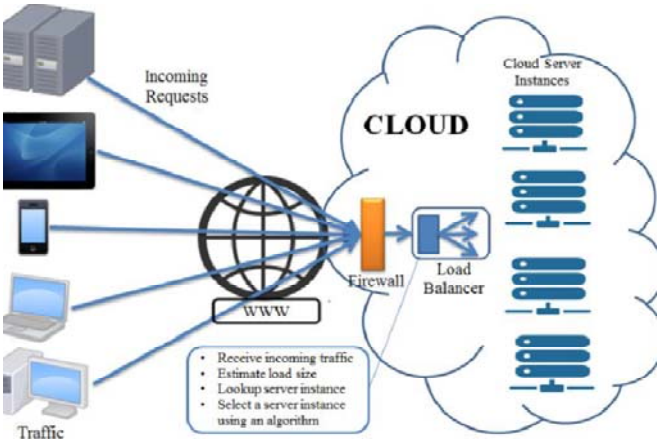


Fig. 1: Load Balancing in Cloud Architecture

2. ALGORITHMS USED

2.1 Round Robin

Round robin use the time slicing mechanism. The name of the algorithm suggests that it works in the round manner where each node is allotted with a time slice and has to wait for their turn. The time is divided and interval is allotted to each node. Each node is allotted with a time slice in which they have to perform their task. The complicity of this algorithm is less compared to the other two algorithms. It considers only current load on each virtual machine. This is static method of load balancing static load balancing scheme provide easiest simulation and monitoring of environment but fail to model heterogeneous nature of cloud.

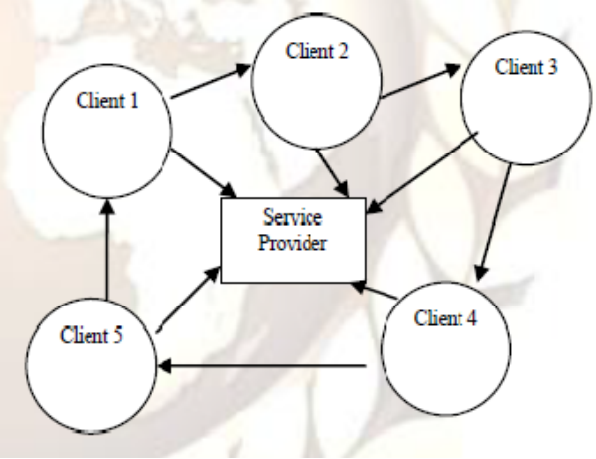


Fig. 2: Round Robin Algorithm

2.2 Throttled load balancing

This algorithm is completely based on virtual machine. In this client first requesting the load balancer to check the right virtual machine which access that load easily and perform the operations which is given by the client or user. In this algorithm the client first requests the load balancer to find a suitable Virtual Machine to perform the required operation.

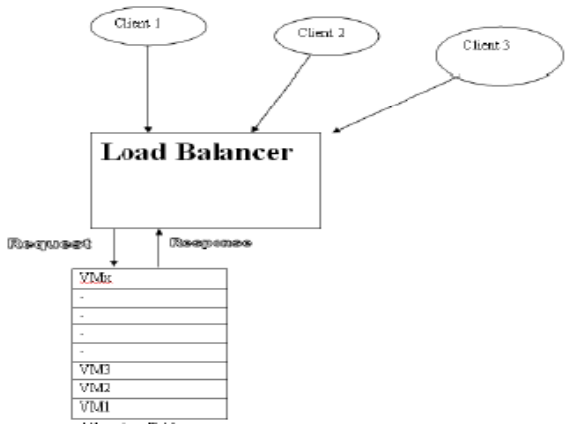


Fig. 3: Throttled Algorithm

2.3 Equally spread current execution load

The random arrival of load in such an environment can cause some server to be heavily loaded while other server is idle or only lightly loaded. Equally load distributing improves performance by transferring load from heavily loaded server to low loaded server. As the name suggests about this algorithm that it work on equally spreading the execution load on different virtual machine.

Load balancer is required for this algorithm which monitors the jobs that are asked for execution. The work of load balancer is to queue up the jobs and hand over them to different virtual machines. The balancer looks over the queue frequently for new jobs and then allots them to the list of free virtual server. It also maintains the list of task allotted to virtual servers, which helps them to identify that which virtual machines are free and need to be allotted with new jobs.

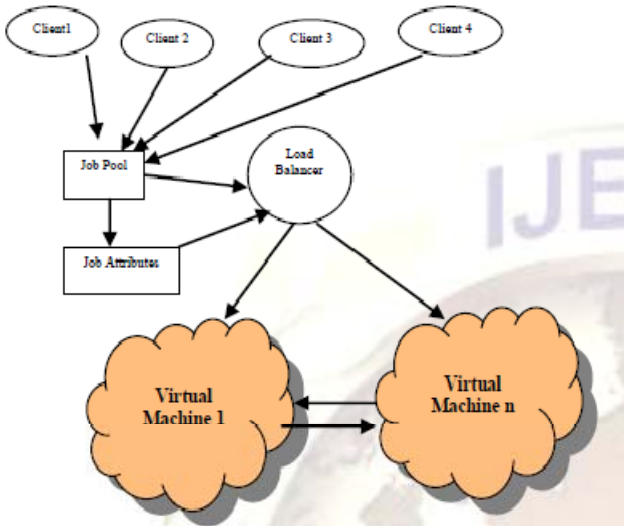


Fig. 4: ESCEL Algorithm

ESCEL Algorithm:

1. Find the next available VM
2. Check for all current allocationcount is less than max length of VM list allocate the VM
3. If available VM is not allocated create a new one
4. Count the active load on each VM
5. Return the id of those VM which is having least load.
6. The VMLoadBalancer will allocate the request to one of the VM.
7. 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.
8. The datacenter controller receives the response to the request sent and then allocate the waiting requests from the job pool/queue to the available VM & so on.
9. Continue from step-2.

2.4 Particle Swarm Optimization Algorithm

Particle Swarm Optimization (PSO) algorithm was developed by Eberhart and Kennedy which is based on the analogy of swarms of birds and fish schooling. Each individual exchanges previous experiences in PSO. These research efforts are called swarm intelligence. PSO has many advantages such as Insensitive to scaling of design variables, Simple implementation, Easily parallelized for concurrent processing, Derivative free, Very few algorithm parameters, and last but not the least Very efficient global search algorithm.

PSO Algorithm

In PSO algorithm, task will assign to the virtual machine in best fit manner i.e., task will check all the virtual machines and assign the task to proper virtual machine which will have least memory wastage. User sends their task request to the cloud server. And this cloud server will decide which virtual machine to store that task. Cloud server will select the virtual machine based on the particle swarm optimization algorithm.

3. RELATED WORK

There are various algorithms designed for balancing the load among different tasks. After completing the literature survey we are able to conclude that most of the load balancing algorithms proposed so far is complex, and not able to implement. In our research we have found that in Round robin scheduling algorithm method it considers only current load on each virtual machine. This is static method of load balancing static load balancing scheme provide easiest simulation and monitoring of environment but fail to model heterogeneous nature of cloud. On the other hand Throttled algorithm is completely based on virtual machine. In this algorithm client first requesting the load balancer to check the right virtual machine which access that load easily and perform the operations which is given by the client or user. In this algorithm the client first requests the load balancer to find a suitable Virtual Machine to perform the required operation. According to our research result of this algorithm in terms of response time and data center request servicing time is very low in comparison of ESCEL algorithm.

Hemant S. Mahalle, Parag R. Kaveri and Vinay Chavan [3] have developed Active monitoring load balancer algorithm which maintains information about each VMs and the number of requests currently allocated to which VM. When a request to allocate a new VM arrives, it identifies the least loaded VM. If there are more than one, the first identified is selected. Active VM Load Balancer returns the VM id to the Data Center Controller the data Center Controller sends the request to the VM identified by that id. Data Center Controller notifies the Active VM Load Balancer of the new allocation.

Shridhar G. Domanal and G. Ram Mohana Reddy [6] have developed Modified Throttled algorithm which maintains an index table of virtual machines and also the state of VMs similar to the Throttled algorithm. There has been an attempt made to improve the response time and achieve efficient usage of available virtual machines. Proposed algorithm employs a method for selecting a VM for processing client's request where, VM at first index is initially selected depending upon the state of the VM. If the VM is available, it is assigned with the request and id of VM is returned to Data Center, else -1 is returned. When the next request arrives, the VM at index next to already assigned VM is chosen depending on the state of VM and follows the above step, unlikely of the Throttled algorithm, where the index table is parsed from the first index every time the Data Center queries Load Balancer for allocation of VM.

4. PROPOSED METHOD

We proposed optimized load balancing system for cloud using PSO and ESCEL algorithm .In our proposed system cloud assign jobs or client request using ESCEL scheduling algorithm but before assign jobs to VMs cloud server optimized these jobs using Particle Swarm Optimization. Using both method, system will be less complex and time will be reduce for client request

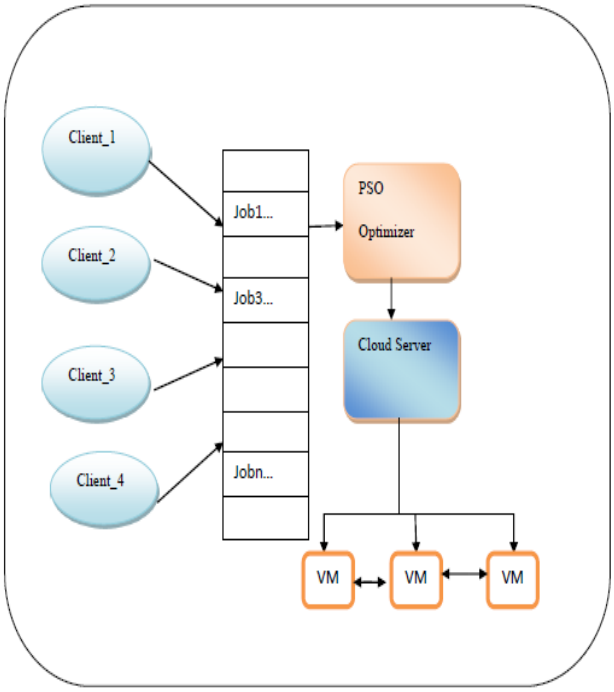


Fig. 5: Proposed System Architecture

4.1 Working Methodology

Step1: Client Request for resources to cloud server

Step2: These request take a form of queue of jobs taking time as constraints

Steps3: Apply PSO for optimized these task and send to the server as per green computing purpose

Step4: Server assigns jobs to VMs After applying ESCEL scheduling algorithm

Step5: Client gets optimized and fast response for completion of task.

4.2 Pseudo code

Begin

Calculate the load, capacity of a virtual

machine

Calculate pbest and gbest for each machine

Do

Update load and capacity of virtual machine

Calculate VM future resource need value of each machine. Update pbest for each machine.

Update gbest for each machine

Choose the low loaded machine and migrate task from overloaded machine

While

End

Termination criterion is not violated.

End

Termination criterion is not violated.

5. CLOUD SIM

CloudSim is a framework developed by the GRIDS laboratory of University of Melbourne which enables seamless modelling, simulation and experimenting on designing Cloud computing infrastructures. CloudSim is a self-contained platform which can be used to model data centers, service brokers, scheduling and allocation policies of a large scaled Cloud platform. It provides a virtualization engine with extensive features for modelling the creation and life cycle management of virtual engines in a data center. CloudSim framework is built on top of GridSim

Framework also developed by the GRIDS laboratory. The CloudAnalyst is built directly on top of CloudSim framework leveraging the features of the original framework and extending some of the capabilities of CloudSim.

5.1 GridSim

GridSim toolkit was developed by Buyya et al to address the problem of near impossibility of performance evaluation of real large scaled distributed environments (typically Grid systems but also P2P networks) in a repeatable and controlled manner. The GridSim toolkit is a Java based simulation toolkit that supports modelling and simulation of heterogeneous Grid resources and users spread across multiple organizations with their own policies. It supports multiple application models and provides primitives for creation of application tasks, mapping of tasks to resources and managing such tasks and resources.

5.2 simjava

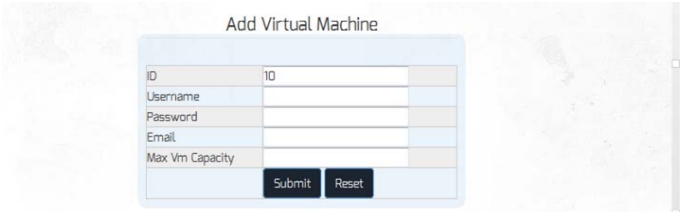
SimJava is the underlying event based simulation toolkit used in both CloudSim and GridSim.

6. RESULTS

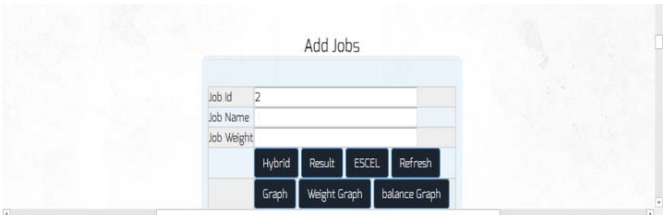
On the basis of parameter i.e., overall response time our proposed approach i.e., hybrid approach between PSO and ESCEL gives better result than the ESCEL algorithm as

Time will be reduced for client request as well as system will be less complex.

6.1 Add virtual machine



6.2 Add job

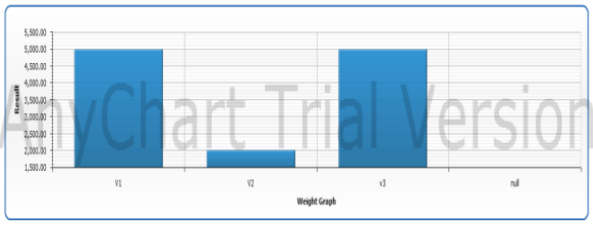


6.3 Stored Data

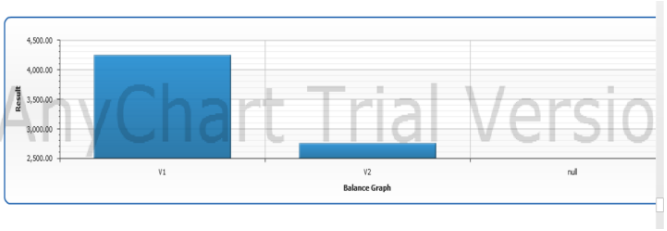
Job Id	Job weight	Virtual Id	Virtual Capacity
1	4250	5	5000
1	2750	4	3500

6.4 Comparison Of Exection Time

6.5 Weighted graph



6.6 Balance graph



7. CONCLUSION AND FUTURE WORK

In this thesis we proposed new algorithm for load balancing in cloud computing. We integrate algorithms PSO and ESCEL on the basis of proposed architecture is done. A study about the working of PSO algorithm in different research areas is also accomplished. Every time PSO gave better results so we used it with ESCEL for enhance accuracy in load balancing. This study focus our vision on the aspect that PSO can be used to optimize load balancing in cloud computing. Therefore, In future work, we are planning to optimize PSO to make it suitable for cloud environments and more efficient in terms of load balancing. Additionally, this research work can also be exaggerated by implementing the optimization of PSO on various cloud simulators and compare the proposed approach with previously tested soft computing techniques based on some fixed parameters.

REFERENCES

[1] Mazedur Rahman, Samira Iqbal, Jerry Gao, Load Balancer as a Service in Cloud Computing, IEEE 8th International Symposium on Service Oriented System Engineering, 978-1-4799-3616-8/14 $31.00 © 2014 IEEE, DOI 10.1109/SOSE.2014.31.

[2] http://www.cloudbus.org/students/MEDC_Project_Report_Bhathiya_318282.pdf

[3] Dr. Hemant S. Mahalle, Prof. Parag R.Kaveri, Dr.Vinay Chavan, International Journal of Advanced Research in Computer Science and Software Engineering,Volume 3, Issue 1, January 2013

[4] Tanveer Ahmed, Yogendra Singh, Analytic Study Of Load Balancing Techniques Using Tool Cloud Analyst, International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue 2,Mar-Apr 2012, pp.1027-1030

[5] B.SANTHOSH KUMAR, DR.LATHA PARTHIBAN, An Implementation of Load Balancing Policy for Virtual Machines Associated With a Data Center, International Journal of Computer Science & Engineering Technology (IJCSET), ISSN : 2229-3345, Vol. 5 No. 03 Mar 2014

[6] Shridhar G.Damanal and G. Ram Mahana Reddy, Optimal Load Balancing in Cloud Computing By Efficient Utilization of Virtual Machines, 978-1-4799-3635-9/14/$31.00 ©2014 IEEE

[7] Fundamentals of Particle Swarm Optimization Techniques [Online]