Simulation-Based Approaches For Evaluating Load Balancing In Cloud Computing With Most Significant Broker Policy

Kush Garg
Department of Computer science and Engineering
SRM University, NCR Campus
kushgarg015@gmail.com

Sachi Pandey
Department of Computer science and Engineering
SRM University, NCR Campus
sachipandey08@gmail.com

Abstract—Cloud computing is an attracting technology in the field of computer science. In today era of cloud computing the most important process is load balancing which leads to faster response to requests of cloud users. Load balancing is dividing the amount of work that a computer has to do between two or more computers so that more work gets done in the same amount of time and in general, all users get served faster. Some of the algorithm will developed by using certain newer approaches that can be used to get a measurable improvement in the system response time The optimization of load balancing policies along with the service broker strategies such as overall response time, total cost of data center is also reduced. This paper provide a better experimental scenarios where the on-peak and off-peak hours of two or more data centers coincides and the data center configurations are also different can be considered by using the broker policy relevant to the load balancing policy in cloud computing using cloud analyst simulation toolkit.

Keywords— Load balancing, cloud analyst, response time, cost, virtual machines, data center and broker policy.

I. INTRODUCTION

Cloud computing is a general term for the delivery of hosted services over the Internet. Cloud computing enables companies to consume compute as a utility as similar to electricity or a telephone service rather than building and maintaining computing infrastructures. Cloud computing provides a major shift in the way companies see the IT infrastructure[1]. Cloud Computing is the internet-based storage for files, applications and infrastructure. One can say cloud computing has been around for many years. But now a company may buy or rent space for their daily operations. Cloud computing has adopted by organization that includes social networking sites ,online application design by Google app managers and by Google doc which are some of the important implementation and the step ahead in cloud computing. Benefits of cloud computing are:

The following are some of the possible benefits of cloud computing:

- Cost savings: companies may reduce their capital expenditures and use operational expenditures for increasing the computing capabilities. This is the lower barrier to entry and also requires fewer in-house IT resources to provide system support [3].
- Resource Utilization: The cloud service provider that delivers some or all of the services required to the organization can also share infrastructure between multiple clients. This helps to improve utilization rates by eliminating a lot of wasted server idle time. The shared use of very high speed bandwidth distributes costs, enables easier peak load management, often improves response times, and increases the pace of application development.
- No need of Maintenance Infrastructure: The organizations employing the cloud services do not have to worry about hardware, software or environment maintenance as the user does not have to manage and control the underlying configuration setting of the applications it uses.
- Scalability: companies can start with a small deployment and grow to large deployment fairly and rapidly and then scale back if necessary.
- Flexibility: The flexibility of cloud computing allows companies to use extra resources at peak times to get enable to satisfying the consumer demands.

- Reliability: The services using by the multiple redundant sites can support business continuity and disaster recovery.

II. Architecture Of Cloud

The cloud system is divided into two sections- the front end and the back end. They connect to each other through the network usually the internet .The front end is the computer user or client .The back end is the "cloud" section of the system. The front end includes the client's computer and the application required to access the cloud computing system. On the back end of the system, there are various computers, servers, and data storage that create the "cloud" of computing services [2]. A central server administers the system, monitoring traffic and client demands to ensure everything runs smoothly .It follows a set of rules called protocols and use a special type of software called middleware. Middleware allows networked computers to communicate with each other.

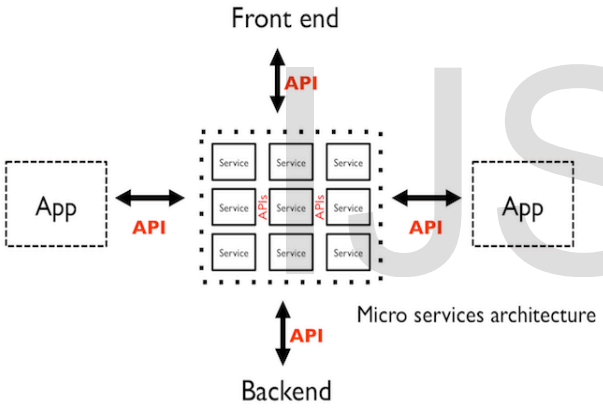

Figure :1 Cloud Architecture

III. Load balancing

In the era of cloud computing, load balancing is the main issue in cloud computing. Load balancing means the adjustment of load across the nodes or computers that forms the cloud that can be the CPUs, networks links or other resources. Load balancing is the method of distributing the load among various resources in any system. Hence load has to be distributed over the resources in cloud based architecture so that each resources does approximately equal amount of task at any point of time. Load balancing is the pre requirements to increasing the load performance and for completely utilization of the resources [5][10].

IV. Different load balancing Policy

Distributing the load among various resources in anysystem with some of the different load balancing policy:

Round robin - It is one of the simplest scheduling techniques that utilize the principle of time slices. Here the time is divided into multiple slices and each node is given a particular time slice or time interval i.e. it utilizes the principle of time scheduling. Each node is given a quantum and its operation [4]. The resources of the service provider are provided to the requesting client on the basis of time slice.

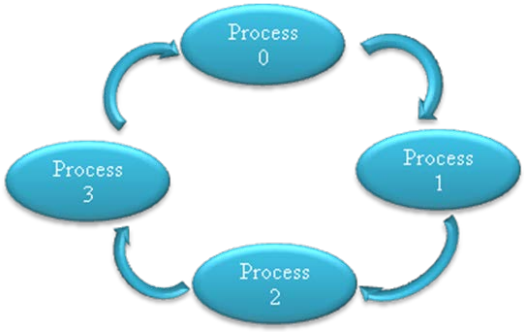

Figure: 2 Round Robin

Equally Spread Current Execution- It distribute the load randomly by checking the size and transfer the load to that virtual machine which is lightly loaded or handle that task easily and take less time , and give maximize throughput. It is spread spectrum technique in which the load balancer spread the load of the job in hand into multiple virtual machines.

Throttled Load Balancing- 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 [8].

V. PROPOSED WORK

The distribution of load among several virtual machines given by checking the size of machine. Equally spread current execution algorithm states that the load is randomly transfer to that virtual machines which is handle that task easy and take less time and give maximize throughput that are available in index list[6][9]. In this algorithm the load balancer spread the load of the job in hands into multiple VMs.

Equally Spread Current Execution Algorithm

1. Initialization spread load balancer.

2. Find the VM.
3. Check the current allocation count is less then max length of VM list allocates the VM.
4. If VM available not allocated then create new VM.
5. Count the active load on each VM.
6. Return the id of those VM which is having least load.
7. The VM load Balancer will allocate the request to one of the VM.
8. If a VM is overloaded then loader distribute some of the load to another VM which is having least load.
9. Every VM is equally loaded.
10. Datacenter controller receives the response to the request sent and then allocate the waiting request from the job queue to the available VM .
11. Repeat from step: 2.

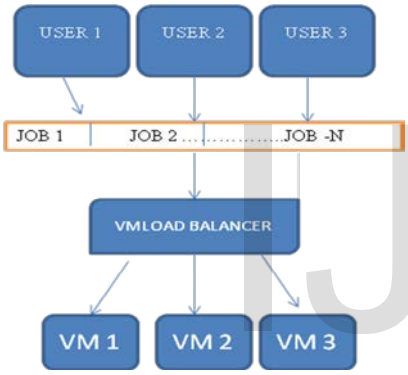

Figure: 3 Equally Spread Current Execution

VI. SIMULATION SETUP AND RESULT DISCUSSION

In this experimental work we used cloud analytic simulator to evaluate the performance of equally spread current execution algorithm with closest data center service broker policy.

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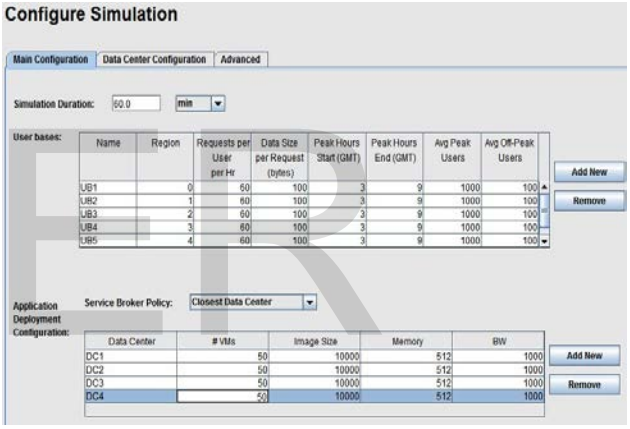
Snapshot- 1 Cloud analyst interface

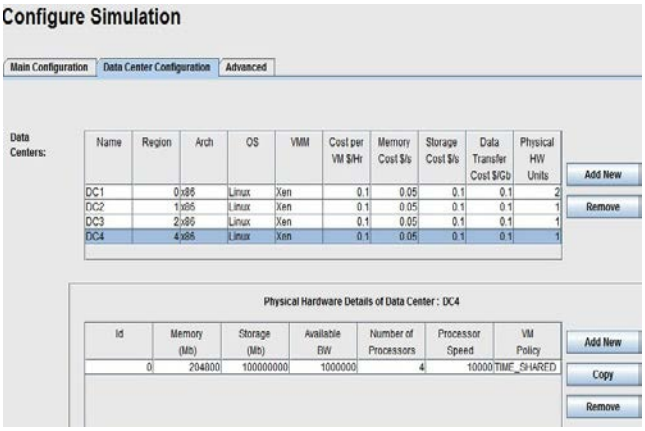
1) *Configure simulation* – cloud analyst simulator toolkit define configure simulation in which main configuration define the simulation duration, user bases, and service broker policy.



Snapshot- 2 Configuring Simulation

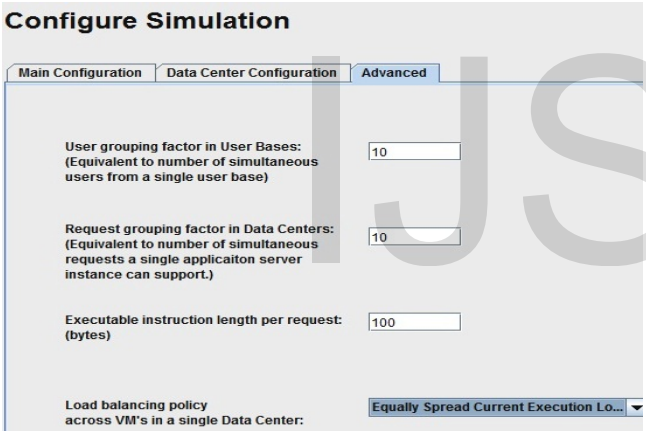
This simulation define the simulation duration is 60.0 min with six user bases in different different regions by using closest data center service broker policy.

2) *Data center configuration* - This configuration of data center define the data center name, region, arch. OS, VMM.



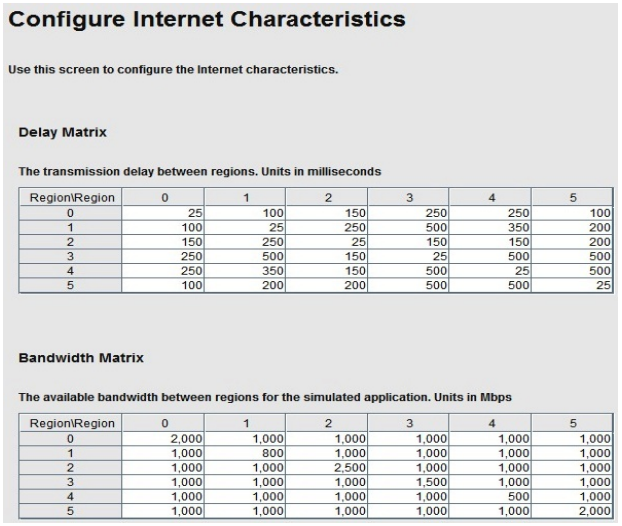
Snapshot- 3 Configuring Simulation

3) *Advance-* cloud analyst define the advanced characteristic of user grouping factor in user bases, request grouping factor in data centers, executable instruction length per request in(bytes) and load balancing policy across VM's in a single data center. This experiment use equally spread current execution.



Snapshot- 4 Configuring Simulation

4) *Internet characteristic-*



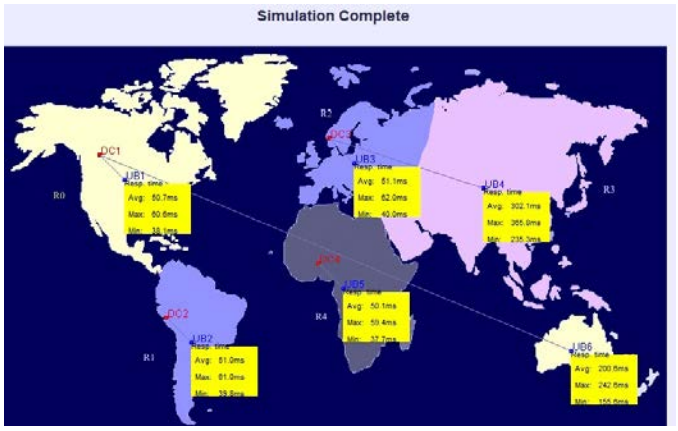
Snapshot- 5 Configuring Internet Characteristics

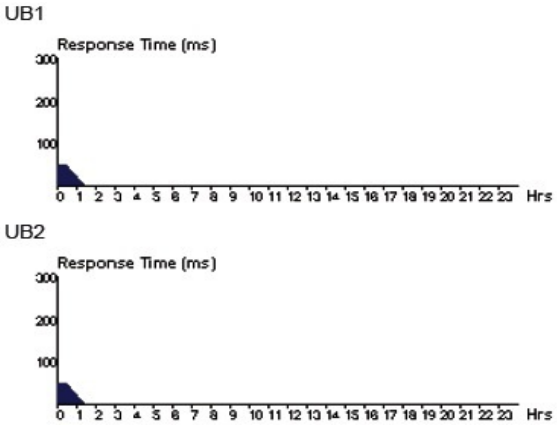
To configure the internet characteristic define the delay matrix (millisecond) in which the transmission delay between regions and also define the bandwidth matrix (Mbps) between regions for the simulated application.

5) *Simulation Running* – In this simulation there are six user bases and four datacenter with different different regions.

Snapshot- 6 Simulation

6) *Final Simulation-* This fig shows the complete simulation in which the avg, min, max time are display wth different datacenter in different regions. The user bases are connected with the datacenter.





Snapshot- 7 Simulation

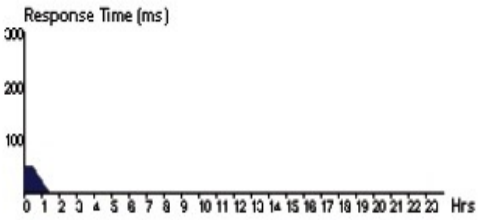
Overall Response Time Summary

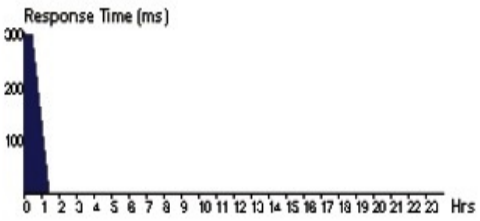
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	117.01	37.66	365.77
Data Center processing time:	1.10	0.03	2.02

Response Time by Region

Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.68	38.13	60.63
UB2	51.05	39.77	61.02
UB3	51.09	40.01	62.00
UB4	302.14	235.27	365.77
UB5	50.09	37.66	59.41
UB6	200.59	155.64	242.64

User Base Hourly Response Times





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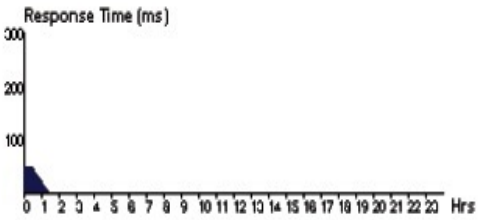

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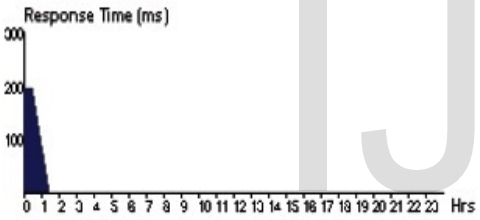

Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.79	0.07	1.38
DC2	1.58	0.14	2.02
DC3	1.50	0.13	2.00
DC4	0.50	0.03	0.90

Cost

Total Virtual Machine Cost ($):	15.56
Total Data Transfer Cost ($):	0.38
Grand Total: ($)	15.94

Data Center	VM Cost $	Data Transfer Cost $	Total $
DC2	5.02	0.07	5.08
DC1	5.02	0.13	5.15
DC4	0.50	0.07	0.57
DC3	5.02	0.13	5.14

On the basis of simulation parameter the result shows that the overall response time and data center processing time is improved. It is also define that VM cost and data transfer time in equally spread current execution is much better by using closest data center broker policy.

VII. CONCLUSION

Load balancing is a challenging task in cloud computing or every cloud engineer to build up the product that can increase the business performance in cloud industry. Several new strategies lack efficient scheduling and load balancing algorithms are used to give better result for customer. The paper give the better result in overall response time and data center processing time. Also give the good result in total virtual machine cost, total data transfer cost and the grand total cost also reduce by using equally spread current execution algorithm with closest data center broker policy in compare to other load balancing algorithms.

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