INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY
WINGS TO YOUR THOUGHTS.....

An Effective VM scheduling using Hybrid Throttled algorithm for handling resource starvation in Heterogeneous Cloud Environment

Er. Navdeep Kaur[1] Er. Pooja Nagpal[2] Dr.Vinay Guatum[3]

[1]M.Tech Student, [2]Assistant Professor, [3]Professor
[1,2]Department of Computer Sc.&Engg. Rayat Colleage of Engg. & IT, Ropar,Punjab,India
[3]Department of Computer Sc,&Engg.,Ludhiana Colleage of Egg.&Tech. Katani Kalan

Abstract- *Internet has become most essential part of life in today's world. It has totally changed the face of world. Cloud computing is related with internet computing, that's why the demand of cloud computing increasing constantly. The concept of cloud computing is getting progress constantly as a new style of computing. Cloud computing provides a way to access distributed, virtualized, hardware and software infrastructure over the internet to a wide range of users. It has benefited for both clients as well as service providers to a great extend. The main aim of the cloud computing is to provide satisfactory level of performance to clients. Load balancing is one of the most important issue in cloud computing. Load balancing is a technique to distribute the work load between various systems to improve the utilization of resources, minimizing job response time, achieve high performance and avoid overload. Load balancing can be maintained by a few existing scheduling algorithms which also provide strategies through resource allocation and efficient job scheduling techniques.*

Keywords: *Cloud computing, Load Balancing, Throttled Algorithm.*

1. CLOUD COMPUTING

Cloud computing is getting progress constantly as a next generation of computation. In simple words we can define cloud computing as delivery of computing services over the internet. Cloud computing is a set of distributed servers which helps to provide services to clients on demand [1]. The services can be hardware or software resources, depending upon the client need. Cloud computing is cost effective in accordance with the changing needs of the business and it makes IT management easier and more responsive [3]. Generally, there are three main components of cloud computing [2].Client, to manage information related to the cloud end users. Mobile device, thick clients and thin clients are the main categories of client. Second component is datacenter, it is a collection of servers which hosting various application. To subscribe different applications, end user connects to the datacenter. The third component is distributed servers: distributed servers actively check the services of their hosts. These are part of cloud which is present at the time of internet hosting various applications.

a. Types of cloud computing

The types of cloud computing can be viewed in two categories: Capability based and Accessibility based.

a) Types based on capability: Cloud computing provides three types of services Infrastructure as a Service, Platform as a Service and Software as a Service based on capability which are briefly explained as follow;

- **Infrastructure as a Service (IaaS):** IaaS provides access to fundamental resources within the cloud i.e. virtual machines, storage etc. In this service users need not spend money to buy required servers or network resources. The users need to pay only for the time duration they use the service. Amazon Elastic Compute Cloud (EC2), Simple Storage Service (S3) is the examples of IaaS providers [7].
- **Platform as a Service (PaaS):** PaaS helps to provide runtime environment to build an application. It is a service model of cloud computing which provides a way where resources are available and users can create the required applications by themselves. Google App Engine and Microsoft Azure is some of the examples of PaaS providers on which clients run their applications [8].
- **Software as a Service (SaaS):** SaaS allows the users to use software applications as a service from various cloud providers through the internet [9]. Google online office, Email cloud, virtual desktop etc. are the examples of software as a service. In this type elasticity makes a cloud application different from another application.

b) Types based on accessibility: On the basis of this category clouds are of four types, as mentioned below;[7]

- **Public Cloud:** In public cloud services (such as computing, storage, application etc.) can be access by general public from anywhere over the internet. In this users need to pay only for the time they use the service. Examples of public cloud are Amazon, Google and Microsoft.
- **Private Cloud:** In this type of cloud services are accessible within an organization and resources are deployed and managed by the client's organization inside a firewall. Private cloud is not available for general public.
- **Community Cloud:** In community cloud systems and services are accessible by a limited number of individuals or organizations. It is controlled and used by a group of organizations which have shared interests with each other like security issue, jurisdiction, compliance etc.

INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY

WINGS TO YOUR THOUGHTS…..

- **Hybrid Cloud:** This type is a combination of both public cloud as well as private cloud. The main aim of hybrid cloud is to provide an automated and well managed computing environment from various cloud models by combine services and data.

The rest of this paper is organized in following manner: section 2 defines the basic concept of load balancing, types and existing algorithms in load balancing. Related work is explained in section 3. In section 4 an introduction of cloud analyst and components are explained. Experimental results are shown in section 5 and finally section 6 concludes this paper.

2. LOAD BALANCING

Load balancing provides internet services to users from various servers. Load balancing is used to distribute equal amount of processing load among multiple nodes at any time to improve the overall performance of system [5]. At present load balancing has become most challenging concept of cloud computing. Load balancing has a main controller and balancer to analyze the information. Load balancer is used to improve the performance of data center and it manage traffic online by distributing equal workload among multiple servers and resources automatically [6].

To improve the resource utilization and ensure good overall system performance load balancing mechanism is required in cloud. The main objectives of load balancing are [1][7]:

- To distribute work load across all the nodes.
- To improve the overall performance of system.
- To reduce response time and achieve user satisfaction.
- To accommodate future changes in system.

a. Types of Load Balancing Algorithms

In load balancing there are various scheduling algorithms to determine which server handle and forward the request to the selected server. Load balancing algorithms can be divided mainly into two groups which are i) static load balancing and ii) dynamic load balancing.

I. Static Load Balancing Algorithms:

In static load balancing algorithm load is distributed equally across all nodes. This load balancing approach is easy to design and implement. To process new requests static load balancing algorithms assign the tasks to the nodes based on the ability of the node and this process is based on prior knowledge of the node's properties and capabilities [10]. Round Robin Algorithm, Central Manager Algorithm, Randomized algorithm and Threshold Algorithm are different type of static load balancing techniques [9].

II. Dynamic Load Balancing Algorithm:

Dynamic load balancing algorithm depends on the current state of the system. It doesn't need any prior knowledge about the system [11] and is more flexible than static algorithm. Dynamic algorithm distributes the load randomly and transferring the lightly load to a virtual machine by first checking the size of process. The dynamic load balancer is distribute the work load to an under loaded node if any node is overloaded. Dynamic load balancing can be divide in two different ways; distributed and non-distributed system [10].

2.3 Existing Algorithms in Load Balancing

There are various load balancing algorithms which helps to improve the resource utilization, response time and achieve better throughput in cloud computing. Some of these algorithms are briefly explained as following:

Round Robin:

In this algorithm time is divided into various slices and a particular time interval is given to each node [12]. This is a static load balancing algorithm which is used by the Central Processing Unit (CPU) during execution of process in round robin order. In round robin schedule the role of time quantum is important. The time is distributed and interval is allotted to each node. Within the time slice each node has to complete their task [4]. This cause the situation where some nodes are heavily loaded and other remain idle or moderately loaded. So the major limitation of round robin algorithm is that it imbalance the load of the system [13].

Honeybee Foraging:

This algorithm is totally based on the behavior of honeybees for finding and reaping food. Forager bees search for food sources and if they find out food resources then they come back to beehive and start dancing. This dance indicates the distance of food source from beehive and gives an idea about the quantity of food [10]. Like food of bees the server processes the request of clients, if the server is heavily loaded then clients are moved to another virtual machine [8]. It is a nature inspired algorithm for self organization which achieves global load balancing through local server. The main problem in this algorithm is that with increase in system size, the throughput is not increased [5].

Equally spread current execution load:

In this algorithm load balancer is required to manage the jobs which are asked for execution. The main function of load balancer is to queue up the jobs and assign them to different virtual machines (VMs). To find that which virtual machines are free, the balancer maintains a list of tasks which allotted to virtual servers. The balancer instantly looks over the queue for new tasks and then assigns them to list of free virtual server. [4]

Active Clustering Algorithm:

Active clustering algorithm is used in large scale cloud system and it is method of random sampling.. It works on the basis of grouping similar nodes and increase the performance of system and high resource utilization. The concept of match maker is important in the process of grouping. In this algorithm same type of nodes of systems are grouped together and they work together into groups. [6]

3. RELATED WORK

Rajwinder Kaur and Pawan Luthra have explained about cloud computing which mainly deals with software, data access and

INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY

WINGS TO YOUR THOUGHTS.....

storage. Load balancing is a key issue in cloud comput9ing which helps to improve the performance of system and proper utilization of resources. In this paper they discussed about a few existing algorithms of load balancing which provide better strategies through efficient scheduling and which consist many factors i.e. high performance, scalability, security, better resource utilization, virtualization, minimum response time.[5]

Vikas Kumar and Shiva Parakash [2014] has explained the concept of load balancing in cloud computing and compare various techniques which are used in load balancing. To achieve resource utilization ratio and high user satisfaction it ensure the efficiently and fairy distribution of cloud computing resources. In this paper the author presents various approaches which are given by researchers and make a comparison between strategies for balancing the load in cloud computing. [4]

In the research of Veerawali Behal and Anil Kumar [2014] they have analyzed the behavior of two scheduling algorithms in cloud computing. In both algorithms parameter like data center request service time, average response time and total cost are verified. The authors conclude in this paper after simulating the algorithm on cloud analyst. The simulation result shows the overall performance of the system and response time of load balancing algorithms and finds that throttled load balancing algorithm provide better results as compared to round robin algorithm. [13]

Jaspreet Kaur et al. [2012] defined the problems arise due to random arrival of load which can cause some server to be heavily loaded and other server remain idle or moderately loaded. Thus the author has proposed scheduling algorithms like round robin and equally spread current execution (ESCE) which helps to distribute equally load and improve the performance of system by transferring work load from heavily loaded server to under loaded and compared the performance of result ESCE algorithm with round robin to find the estimate processing time and response time. [3]

4. CLOUD ANALST

The analysis of simulation of problem, result and performance is carried out by using this simulator cloud analyst tool.

a. Cloud Analyst

Cloud Analyst is the GUI based tool [13]. It is an open source toolkit which allows simulating and evaluating the performance of various cloud services. It is an extended version of CloudSim. It is built on the top of CloudSim. Response time and data centre request processing time are the parameters for evaluating performance. Response time is considered to be time taken by an internet application and is defined as delay time between sending of a request and receiving of a response. [9] Cloud Analyst separates the simulation experimentation from a complex programming.

b. Components of Cloud Analyst

The main components of cloud analyst are as under:

- **GUI Package** – This component provides the graphical user interface.
- **Simulation** - This component is for running the simulation.
- **User Base** - This component models a group of users and its main responsibility is to generate traffic for the simulation.
- **Datacenter Controller** – This is the most important entity in the Cloud Analyst. It controls the data center activities.
- **Internet** - This component models the Internet Characteristics.
- **VmLoadBalancer** - This component models the load balance policies that are used by data centers when serving allocation requests of users.
- **CloudAppServiceBroker** - This component models the service broker policies that handle traffic between user bases and data centers.

5. EXPERIMENTAL RESULTS

The cloud analyst tool has been used to evaluate the algorithms such as round robin, throttled algorithm and enhanced algorithm for the simulation organization. Simulation organization is done by using four different data centers recognized as DC1, DC2, DC3 and DC4 having numbers of virtual machines respectively. Each data center is located to different region. Six user bases recognized as USB1, USB2, USB3, USB4, USB5 and UB6 are also included. Each user base is located to different region. The optimize response time service broker policy is used as a service broker policy. Simulation duration taken for 60 minutes i.e. 1 hour. Whole simulation setup done in a heterogeneous environment of cloud computing. In our proposed work two parameters have been considered for performance evaluation:

a) Response Time

Response time is considered to be time taken by an internet application and is defined as delay time between sending of a request and receiving of a response. Table below shows the average response time of Load balancing algorithms.

Table 1: Average Response Time

USER BASE	ROUND ROBIN	THROTTLED	HYBRID
UB1	74.21	63.44	63.18
UB2	64.83	60.85	60.37
UB3	56.04	55.02	54.74
UB4	53.12	52.84	52.66
UB5	306.66	305.66	305.26
UB6	226.05	217.38	215.89

The graph below shows the comparison of different load balancing algorithms. It is evident from graphs that Hybrid

INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY
WINGS TO YOUR THOUGHTS.....

throttled algorithm performs better as compared to other algorithms

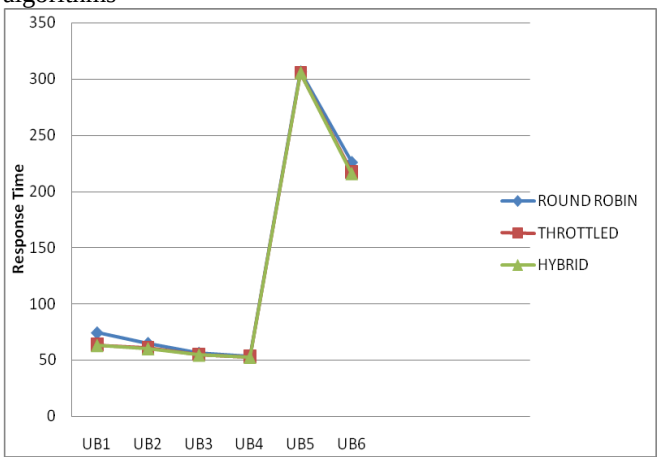

Figure 2: Average Response time

b) Data Center Request Processing Time

It is the time taken by data centre to process the user requests efficiently. It is measured in milliseconds. The table below shows the data centre request processing time by different algorithms.

Table 2: Data centre request processing time

DC	ROUND ROBIN	THROTTLED	HYBRID
DC1	25.3	15.69	14.76
DC2	15.14	11.17	10.69
DC3	6.63	5.64	5.28
DC4	3.48	3.2	3.02

The graph below shows the comparison of different load balancing algorithms. It is evident from graphs that Hybrid throttled algorithm performs better as compared to other algorithms in terms of data centre request processing time.

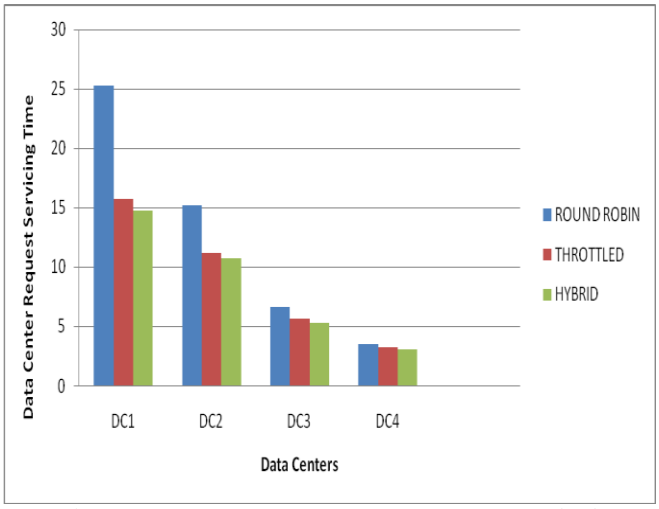

Figure 3: Data centre request processing time (ms)

6. CONCLUSION

Load balancing is one of the important and challenging issues in cloud computing. The current load balancing scheduling algorithms in cloud computing environment have some deficiency and this would affect the performance. Therefore we proposed a hybrid algorithm to enhance the cloud computing performance. The hybrid algorithm based on Throttled and Round Robin algorithm, take the advantages of both throttled and round robin algorithms and consider the response time and processing time as evaluation parameters to achieve the objectives. The experiments were implemented in the Cloud Analyst Simulator. From the simulation results, we have found that hybrid throttled takes less processing time and respond in less time span as compare to throttled-RR algorithm.

REFFRENCES

[1] **Samarsinh Prakash Jadhav, Priya R. Deshpande. "Load Balancing in Cloud Computing", International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 (2012)**

[2] **Soumya Ray and Ajanta De Sarkar "Execution analysis of Load Balancing Algorithms in Cloud Computing Environment" International Journal on Cloud Computing: Services and Architecture (IJCCSA),Vol.2, No.5, October 2012.**

[3] **Jaspreet Kaur et al. "Comparison of load balancing algorithms in a Cloud", International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue 3,May-Jun 2012, pp.1169-1173.**

[4] **Vikas Kumar and Shiva Prakash "A Load Balancing Based Cloud Computing Techniques and Challenges" International Journal of scientific research and management Vol. 2, Issue 5, 2014**

[5] **Rajwinder Kaur and Pawan Luthra, "Load Balancing in Cloud Computing", Association of Computer Electronics and Electrical Engineers, (ACEEE) 02. ITC 2014**

[6] **Alok singh, Vikas Kumar Tiwari, Dr. Bhupesh Gour, "A Survey on Load Balancing in Cloud Computing Using Soft Computing Technique's" International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 9, September 2014**

[7] **Shiny "Load Balancing In Cloud Computing: A Review" IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p- ISSN: 2278-8727Volume 15, Issue 2 (Nov. - Dec. 2013)**

[8] **Ruhi Gupta "Review on Existing Load Balancing Techniques of Cloud Computing", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE)**

INTERNATIONAL JOURNAL FOR ADVANCE RESEARCH IN ENGINEERING AND TECHNOLOGY

WINGS TO YOUR THOUGHTS.....

Volume 4, Issue 2, February 2014.

[9] **Reena Panwar "A Comparative Study of Load Balancing Algorithms in Cloud Computing", International Journal of Computer Applications (0975 – 8887) Volume 117 – No. 24, May 2015.**

[10] **Asitha Micheal and Jalpa Mehta "Load Balancing Techniques in Cloud Computing", International Journal on Recent and Innovation Trends in Computing and Communication (IJRITCC) Volume: 2 Issue: 10 October 2014.**

[11] **N. S. Raghava and Deepti Singh "Comparative Study on Load Balancing Techniques in Cloud Computing" Open Journal of Mobile Computing and Cloud Computing Vol 1, Number1, Aug 2014.**

[12] **Tanveer Ahmed and 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.**

[13] **Veerawali Behal and Anil Kumar "Comparative Study of Load Balancing Algorithms in Cloud Environment using Cloud Analyst" International Journal of Computer Applications (IJCA) (0975 – 8887) Volume 97– No.1, July 2014.**