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Encumbrance Collating in Cloud Data Center Using Modified Active Monitoring Load Balancer

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***Abstract*—** Virtualization and automation is used to provide the user with self-service computing experience available at infinite scale at very low cost, with the tremendous growth of communications, connectivity and Internet technology cloud computing have become a principal reference of computing for IT industry. Major challenge for data centers is to streamline the requests, as cloud data centers and the users of the cloud-computing are globally situated, Present research provides environment that equally distributes workload across all the nodes. It also provides a way of achieving the proper utilization of resources and better user satisfaction. Current research is focused on the load-balancing algorithm, which distributes the incoming jobs among virtual machine optimally in cloud data centers. The proposed algorithm in this paper has been executed using Cloud Analyst Simulator and the performance of the suggested algorithm is compared with the three algorithms which are pre-exists based on response time. The experiment result shows that the recommended algorithm performs better than the existing algorithms.

***Keywords*—** Virtual Machine, Load Balancing, Cloud Analyst, Cloud Data Center, Virtualization, User Base

I. Introduction

Cloud computing became the new era of computing these days. Using the cloud computing environment users can pool various IT resources as per their requirements in an efficient manner. With its different services cloud computing is capable of providing an easy way to store and access the stored data and files from data canters, which are located at various geographical locations. The basic services of cloud computing are, Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), these services provide pay per use model to its users. Cloud computing is also having different deployment models.

The deployment models categorized into four parts such as Private Cloud, Public Cloud, Community Cloud and Hybrid Cloud. Cloud computing possesses some unique characteristics such as on-demand self service, elasticity, resource pooling etc.

Virtualization is having an important role in cloud computing since it gives the virtual version of IT resources to the users, these resources include hardware, operating system and storage device or network resources. Virtualization creates an illusion of using the actual version of any IT resources. One of the big issues in cloud computing environment is how to allocate the coming request to the appropriate virtual machines with minimum response time so that proper utilization of resources can be done. To achieve the ability to allocate the incoming load among the different virtual machines in cloud computing environment so that the overall cloud performance can be increased. For this purpose, researchers have proposed several load-balancing algorithms such Round Robin, Active Monitoring Load Balancer, Throttled load balancer etc. and these algorithms broadly used for executing the user's requests within the minimum response time. Load balancing algorithms classified into two types that are static and dynamic algorithms. The static algorithm is used in an environment where dynamic changes are not made at runtime e.g. Round Robin. Dynamic load-balancing algorithms are used where the changes are made at runtime e.g. weighted the least connection (WLC). This research work presents Modified Active Monitoring Load Balancer algorithm for efficiently distributing the jobs among the available VMs.

Rest of the paper is organized as follows, Section I contains the Introduction of the paper , Section II contain the related work on Load balancing algorithms, Section III contain the Methodology used and experimental setup, Section IV contain the Obtained results, Section VI concludes research work with future directions

II. Related Work

Bhathiya et al. [1] Proposed and discussed the new cloud simulating tool called CloudAnalyst. The simulator is use for analysis of the large-scale applications, which are running on cloud. It provides a GUI base simulation to the users so that easy understanding of the simulation environment. They also gave a case study of how the CloudAnalyst can be used to model and evaluate a real world problem.

Domanal et al. [2] have given an algorithm for load balancing which can distribute the requests among the VMs uniformly. The proposed algorithm by the authors focuses on two objectives first is response time and second is load distributions among the VMs.

Sundaram et al. [4] evaluated two well-known dynamic load balancing algorithms namely, shortest queue routing (SQR) and shortest expected delay routing (SEDR). They used a hybrid performance model that combines general stochastic Petri nets and product form queuing networks.

Bhadani et al. [6] presented modified throttled load balancing algorithm which is used to handle the load in a distributed environment of cloud computing.

III. Methodology

A. Proposed Modified Active Monitoring Load Balancer

The main purpose of "Modified Active Monitoring Load Balancer" is to assign the upcoming request to the available VMs wisely. The proposed technique based on Active Monitoring Load Balancer, which assigns the incoming request to the least loaded virtual machine without checking the memory utilization. The Modified Active Monitoring Load Balancer maintains a table of virtual machines along with state of virtual machines. In the proposed work, a new method of distributing the load among the virtual machine has been introduced through which a better load balancing and proper utilization of resources in cloud computing environment can be achieved.

In this proposed method, whenever the request arrives from the user base at the DCC, then the DCC asks the Modified Active Monitoring Load balancers to assign the upcoming request among the VMs. Modified Active Monitoring Load Balancers contains a table that have the different parameters of VMs i.e. ids, load, state etc. The Modified Active Monitoring Load Balancer scans the table and find out the least loaded VM whose state is available, if there are more than one then it finds the memory utilization of VMs and select the highest priority VM, then it returns VMid to DCC. Finally, the DCC assigns the request to the virtual machine based on VMid, which is given by the Modified Active Monitoring Load Balancer algorithm.

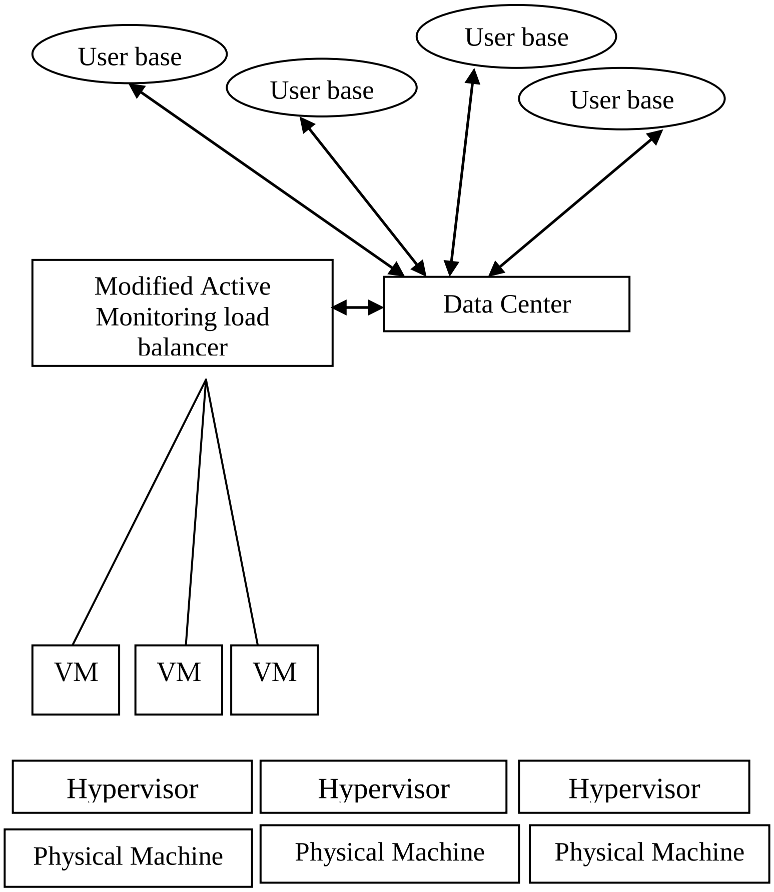


Figure1. Modified Active Monitoring Load Balancer

1. The "Modified Active Monitoring Load Balancer" contains a table of virtual machine id (VMid), state (BUSY/AVAILABLE) and the number of requests currently allocated to the VMs. Initially all VMs are in available state.
2. The DCC (Data Center Controller) receives a new request then it queries the Modified Active Monitoring Load Balancer to allocate the upcoming request.
3. Modified Active Monitoring Load Balancer parses the table from the top and finds least loaded VM whose state is available.
4. If there are more than one

a. The Modified Active Monitoring Load Balancer checks memory utilization of each VM and finds highest priority virtual machine.

b. The Modified Active Monitoring Load Balancer returns the VMid of highest priority VM to Data Center Controller.

c. DCC notifies the Modified Active Monitoring Load Balancer of new allocation. Modified Active Monitoring

Load Balancer updates the information of the table accordingly.

5. Return VMid to Data Center Controller.

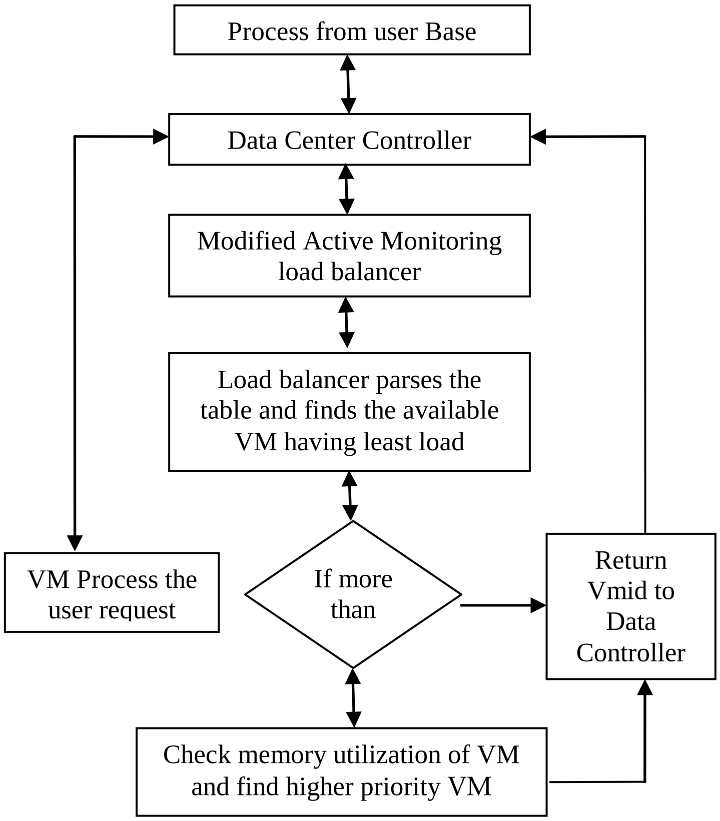

Process from user Base
Data Center Controller
Modified Active Monitoring load balancer
Load balancer parses the table and finds the available VM having least load
VM Process the user request
If more than
Return Vmid to Data Controller
Check memory utilization of VM and find higher priority VM

Figure2. Flow Chart of Proposed Algorithm

6. DCC sends the request to the Chosen VM
7. After finishing the request by the VM, the DCC receives the response cloudlet and notifies the Modified Active Monitoring Load Balancer for the de-allocation of the VM.
8. Whenever the request of the VM is processed the allocation table of VM is decremented by one by the Modified Active Monitoring Load Balancer.
9. If there are more requests, go to step 3 else continue from the step 2.

B. Experimental Setup

The algorithm, which proposed in this research work, has been implemented and integrated in Cloud Analyst simulator. The Cloud Analyst simulator is a Cloud Sim based tool for simulating large scaled applications in a cloud environment. Cloud Analyst has extended Cloud Sim functionality having the features of original framework and visualization capability.

Table 1 Parameter Used

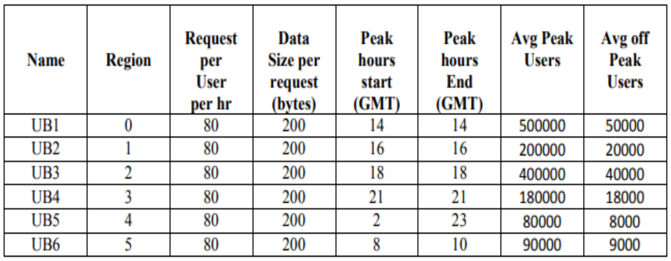
Parameters	Value Used
VM Image Size	1000
VM Memory	1024 Mb
VM Bandwidth	1000
Data Center Architecture	X86
Data Center OS	Linux
Data Center Numbers of Machines	5
Data Center VMM	Xen
Data Center – Memory per Machine	2048 Mb
Data Center – Storage per Machine	100000000 Mb
Data Center – Processors Speed	10000 MIPS
Data Center – No. of processors per Machines	4
Data Center – Available BW per Machine	1000000
Data Center – VM Policy	Time Shared
User Grouping Factor	1000
Request Grouping Factor	100
Executable Instruction Length	250

User Base Table: For the implementation purpose, we defined user bases in 6 regions globally with the above mention parameters:

Simulation Duration: 60 min

The Deployment Configuration of Application Service Broker Policy: Closest Data Center.

Table 2 Region represented by 6 user bases



Name	Region	Request per User per hr	Data Size per request (bytes)	Peak hours start (GMT)	Peak hours End (GMT)	Avg Peak Users	Avg off Peak Users
UB1	0	80	200	14	14	500000	50000
UB2	1	80	200	16	16	200000	20000
UB3	2	80	200	18	18	400000	40000
UB4	3	80	200	21	21	180000	18000
UB5	4	80	200	2	23	80000	8000
UB6	5	80	200	8	10	90000	9000

All other parameters like Latency Matrix (in millisecond) and Bandwidth Matrix values (in Mbps) tables taken same as provided in Cloud Analyst simulator.

IV. Results and Discussion

In our experiment for evaluating the performance of the Proposed algorithm we have considered two test cases. In the first case, the load are kept constant and we have increased the number of virtual machines and in the second case the numbers of virtual machines are kept constant and load is increased according to data size per request.

Case 1:
Load Constant and Number of VMs varied from 5 to 30

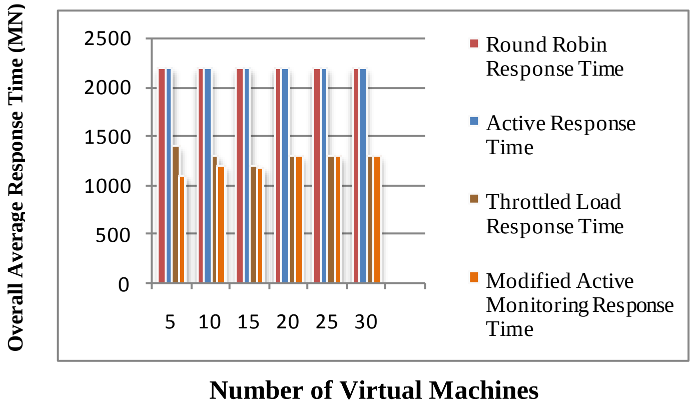


Figure3. Comparison of load balancing algorithm when load constant

Figure 3 shows the graphical representation of comparison of four algorithms and the achieved results.
After performing the experiment, the proposed algorithm “Modified Active Monitoring Load Balancer” gives better response time as compared to the Round Robin, Active Monitoring and Throttled Algorithms.

Case 2:
Number of VMs is constant, load is increase based on data size per request while considering the second case that is keeping the number of virtual machines constant, and increasing the load of data per size, our proposed algorithm performs better than the rest three algorithms based on response time. Figure 4 shows the achieved results.
The graphical representation of comparison as given below:

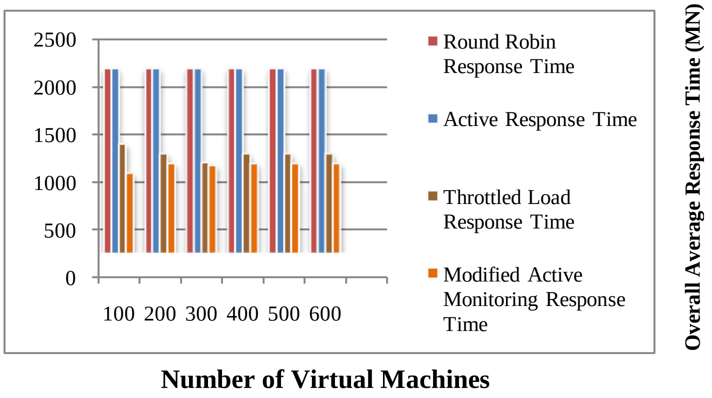


Figure4. Comparison of load balancing algorithm when no. of VMs is constant

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V. Conclusion

The cloud data center may suffer from two situations i.e. over loading of virtual machines and under loading of virtual machines, if the proper load distribution among the virtual machines is not done. These two situations occur in a cloud data center due to unequal distribution of load in cloud environment. In proposed algorithm, we tried to avoid these two situations by distributing the load among the virtual machines in an appropriate manner based on their priority, state and memory utilization. With the help of the proposed algorithm the load of the user requests can be distributed among the virtual machines efficiently. However, the proposed algorithm is efficient for user requests load distribution among the virtual machines but it does not consider the virtual machines reliability and energy awareness therefore the future work focuses on load distribution of users request along with VM Reliability and VM energy awareness.

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