© 2018 IJSRSET | Volume 4 | Issue 2 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
National Conference on Advanced Research Trends in Information and Computing Technologies (NCARTICT-2018), Department of IT, L. D. College of Engineering, Ahmedabad, Gujarat, India In association with International Journal of Scientific Research in Science, Engineering and Technology

Review Paper on Throttled Load Balancing Algorithm in Cloud Computing Environment

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ABSTRACT

The popularity of cloud computing is increasing day by day. It is a platform for providing dynamic pool of resources and virtualization to the cloud users. To properly handle user requests and utilize cloud resources, load balancing plays a vital role. For load balancing many algorithms have been designed to carry out the client's request towards the resources in order to maintain balance. Load balancing plays a vital role which can improve the Quality of Service (QoS) metrics, including resource utilization, performance, response time, cost and throughput. There are various algorithms are there to balance the load in cloud computing environment, such static and dynamic types. In this survey paper the focus is given to various throttled algorithms used for load balancing in cloud computing environment.

Keywords: Cloud Computing, Load Balancing, Throttled load balancing Algorithm.

I. INTRODUCTION

Cloud computing technology is an emerging technology, the computing power and storage technology sharing through the Internet. Cloud computing, fulfils user needs in pay as per the use basis, aiming in maximum resource utilization to prevent the waste of resources, to achieve maximum efficiency. Its features include on-demand service, extensive network access, resource pooling, brisk elasticity and measurement service.

However, the main issue in cloud computing is load balancing means assigning resources to the incoming requests efficiently with less response time. For executing the client's request with a minimal response time many algorithms are there like RR, Throttled, Stochastic Hill Climb etc [1]. In this paper focus is given on various throttled algorithm proposed by several researchers.

The organization of this document is as follows. In Section II,load balancing types are discussed, in section III' various proposed throttled algorithms are discussed. In section IV concludes the paper.

II. LOAD BALANCING TYPES

Load balancing algorithm has been designed to balance the whole load, and two types of load balancing algorithms are introduced:

A. Static Load Balancing :

Some characteristics of static load balancing algorithm are as follows: the load distribution decision does not depend on the current state of the system; they need prior knowledge about the system [2]. This algorithm is suitable for homogenous system environment [3]. They are not flexible. The performance of processors is explained at the starting of the execution and which does not change the executing process at run time for making changes in the system load [4]. Some of the static load balancing algorithms are: FCFS,RR, Max-min, Min-Min etc

B. Dynamic Load Balancing :

In dynamic Load balancing algorithm the load distribution decision is based on the current state of the system, they do not require any prior knowledge about system resources [2]. This is suitable for heterogeneous system. Load balancing decision is dynamic in nature, means load balancing decision can be at run time [3]. This algorithm provides outstanding improvement in performance than static algorithm [2]. Some of the dynamic algorithm examples are ant colony, throttled, GA, Honey Bee Algorithm etc.

III. VARIOUS PROPOSED THROTTLED ALGORITHMS:

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A. Throttled Load Balancing Algorithm:

Throttled Load Balancing Algorithm [5][6] is a dynamic algorithm for distribution of load that completely deploy on VMs. In VMs are grouped according to the requests they can handle. When the client sends the request, the load balancer immediately gets alert and searches for the group which can manage easily and allocates that request. But the issue is that the load balancer has to search for the suitable VM group, which results in the delay in operation. Working process of throttled load balancing is shown in figure 1.

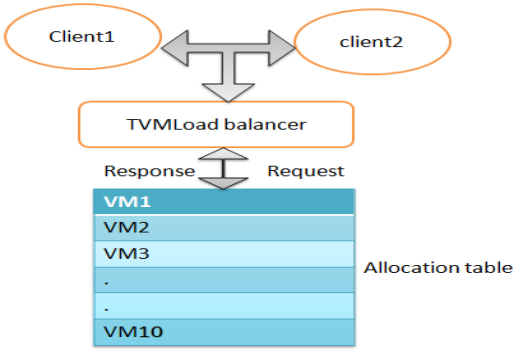

Figure 1. Throttled scheduling process

B. Modified Throttled Load Balancing Algorithm:

Modified Throttled algorithm [6] is modified version of Throttled Load Balancing Algorithm. It maintains a set of *VM* named as VM index table and that states the position of the VMs (i.e. Available/busy).when user requests come, VM at first index is initially selected depending upon the state. If VM is available then that request is assigned to that VM, and it returns (-1) to the DCC(Data Centre Controller), if VM is not found. Then the VM next to the already allocated VM is choose, when the next request arrives and this process is repeated continuously up to the index table size is reached, which is shown in Figure 2 below.

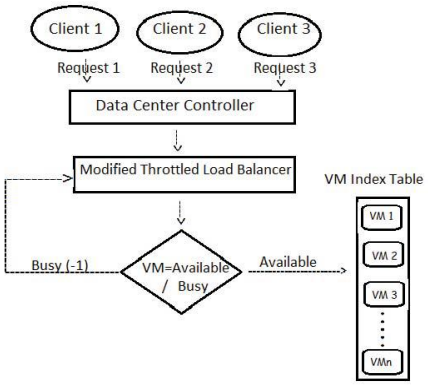

Figure 2. Flowchart of Modified Throttled Load Balancing Algorithm

Throttled algorithm has with better response time than Round-Robin but it failed to distribute load uniformly, it only overloads initial VMs , other VM are under loaded or get idle. In modified throttled, it distributes load uniform among VMs, and also improved response time as compared to existing throttled algorithms.

C. Hybrid Approach Using Throttled And ESCE Load Balancing[7]:

This is a hybrid load balancing algorithm, which is formed by Throttled and Equally Spread Current Execution (ESCE) algorithms.

Hybrid algorithm contains the excellent features of both ESCE and Throttled algorithms. In ESCE algorithm, load balancer maintain equal load to all the VMs connected to the data center. Using this technique the load balancer gets number of VMs by maintaining an index table and queue for the number of requests that are currently assigned to the VM. The load balancer scans the queue and the index list of VMs continuously. When a request comes, it is allocated to the available VM, that can handle the incoming request. If on the other hand there are two VMs, one is free and another one needs to be freed of the load, then the load balancer distributes some of the tasks of that VM to the free one so as to reduce the overhead of the former VM. Similarly the Throttled algorithm maintains an index table that lists all VMs as well as their states (i.e. Available or Busy).

Whenever a request comes to the data center the throttled load balancer scans the index table list from top until the first available VM is found or the index list is scanned fully. If a match is found on the basis of size and availability of the VM, then the load balancer allocates the task to that VM. If no VM is available then the load balancer returns -1 and the request is get queued. This hybrid approach utilizes best features of both the algorithms to get more efficient load balancing algorithm. The hybrid algorithm maintains two things, index of list of VM allocation status and list to count the allocated request. The allocated request list count is compared with the index list of VMs. If VMs index list if greater than allocated request list implies that there are more VMs available to handle the request else request has been queued in order to wait for the availability of VM. Hybrid throttled load balancing shown in fig-3 below.

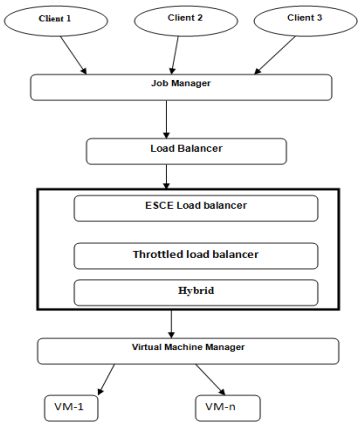

Figure 3. :Hybrid throttled load balancing Algorithms

D. Priority Based Modified Throttled Algorithm:

The Priority based Modified Throttled Algorithm (PMTA)[9] improves average execution time as compare to other existing load balancing algorithms such as Throttled and Round Robin. The working procedure of PMTA is shown in fig.4. In Cloudsim, DCC uses a VmLoadBalancer that determines for processing which VM should be assigned the next Cloudlet. VmLoadBalancers implementing '3' load balancing policies - RR Load Balancer VMs, Active Monitoring Load Balancer and Throttled Load Balancer, ensuring at any given time only a predefined number of Internet Cloudlets are allocated to a single VM. When a client request comes, the DCC (Data Centre Controller) queries for allocation table. Now if there is free VM available, then that request would directly be allocated to the suitable VM, if there is no such free VM available, then the VM's Load Balancer check for the job, executing in the V.M. which have the lowest priority then stops the execution and switch it to the Switching Queue. Switching Queue is used to hold the requests which have been removed temporarily from the VM due to the arrival of higher priority request .The high priority service request will be allocated to the vacant VM. The switched job have to be wait until availability of suitable VM but in this situation a problem may arise, If higher priority requests are continuously serve and the lower priority job would never get a chance to be executed and suffer from starvation. To overcome this problem, priority of the each waiting requests has increased. If any of the VM gets free, then it will check for new request and the waiting request, then selects the request having highest priority and allocate VM to it.

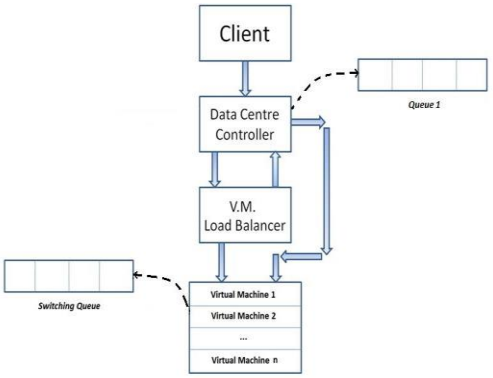

Figure 4. Priority Based Throttled Load Balancing Algorithm.

E. Weighted throttled load balancing approach

Weighted throttled load balancing algorithm [10]; is modification of the throttled load balancer, which assigns a weight to each of the VM in order to achieve better response time and processing time. In this weighted throttled load balancing approach it uses the concept of weights in throttled load balancing, the VMs are assigned different amount of the available processing power of server host to the individual application services. Tasks are assigned to the most powerful available VM between these VMs of different processing powers. In this algorithm a request is not queued and instead is assigned a busy VM that has a higher weight in comparison to others. This algorithm leads to better response time and processing time. The

proposed weighted throttled VM load balancing algorithm is illustrates in figure 5 by use of a flowchart.

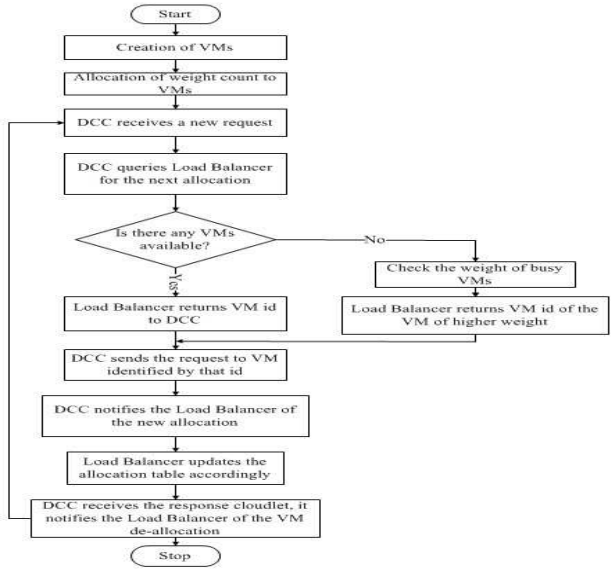

Figure 5. Weighted throttled load balancing algorithm

IV.CONCLUSION

The greatest challenge in cloud computing is load balancing, in which the user requests are allocated ensuring no VM get overloaded or under loaded. Throttled load balancing algorithm is a dynamic load balancing algorithm that can minimize the response time of service request. This survey paper focuses on different algorithms which are modified version of the throttled algorithm. These algorithms are designed to get better result and to overcome problems arise in previous one. In future more efficient throttled load balancing algorithm can be obtained which can give better result.

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