A Survey on Various Load Balancing Algorithms in Cloud Computing

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Abstract- *The use of cloud environment is growing day by day. The small businesses are using cloud for their day to day need of resources because cloud provide on demand and pay per use services. The business which are of low budget and not be able to setup wide infrastructure for recent technologies, Cloud computing is blessing for them. As the need increases, managing load at cloud is the biggest challenge that the cloud provider has. Distributing equal load in different node which may be geographically at different location is major issue. Various load balancing algorithms are there for even distribution of load. Again load balancing will improve the parameters like cost, response time , through put etc. Also Load balancing is a big aspect in terms of power utilization and resource utilization.*

In this paper we will discuss various static as well as dynamic load balancing algorithms with their advantages and disadvantages.

Keywords- Cloud computing, Load balancing, on demand access

I. INTRODUCTION

Cloud Computing is one of the emerging and important technology now a days. It provides on demand access to resources []. So the users have to pay for what they use. It will be adopted by more and more users, Industries, organizations -. The need to manage billions of user requests such that all requests will satisfy in proper time with less cost is very important. It will happen when all available resources utilize fairly.

The load balancing is the mechanism through which proper resource utilization is possible by distributing load equally among available resources. Also it will improve parameters like response time, throughput, cost etc.

This paper will discuss various available load balancing algorithms and their pros and cons.

The paper is arranged as follows. Section 2 gives brief idea about load balancing. Section 3 covers Literature survey of Load balancing algorithms. Section 4 contains the metrics for comparing the discussed algorithms and section 5 is conclusion of whole paper.

II. LOAD BALANCING

It is the process through which we can achieve fair resource distribution between tasks and improves the performance of cloud [8]. Highly loaded datacenter utilizes more power. Load balancing will also improve the power efficiency of datacenter and limit the wastage of power.

Load Balancing algorithms are mainly categorized in two types Static and Dynamic.

Static algorithm uses the current state of node [2].It will not bother about the previous state of node. The user requirements and available resources are predefined. Run time changes in requirements and resources are not allowed [1]. They are easier to implement and more suitable for homogeneous environment [4].

Dynamic algorithms use previous as well as current state of node to distribute the load [2]. The user requirements and Resources can be changed at run time. They are suited in homogeneous as well as heterogeneous environments [4].

III. LITERATURE REVIEW

Priyadarashini et al [2] propose the comparative study of Static algorithm like robin and weighted round robin algorithm and dynamic algorithms like FCFS, Throttled , Modified Throttled and Particle Swam Optimization Algorithm. In round robin the request are assigned in circular queue. Each job will be assigned to available VM for some fix time period after that VM will be moved at the end of queue.Weighted Round Robin will assign weight to each node. So requests are received depending on weight. Throttled Load Balancing algorithm group VM according to the request they can handle and request assigned to the VM which can

handle it by searching suitable VM.In Modified Throttled the second search will be started from the VM that is next to previously allotted VM.In FCFS the request are queued as they came. Load balancer will assign the first request to VM by considering Load of VM. In Particle Swam Optimization the pbest for each particle is calculated and compared with its previous fitness value and if new is greater than old is updated by new one. From all pbest the best value is assigned to Gbest and than particle position is updated and new velocity is calculated. They simulate above dynamic algorithm in cloudsim.

Geethu Gopinath et al [3] done comparative analysis of Min –Min and Max – Min algorithms. Min –Min is simple to implement. It will calculate minimum completion time for all nodes. Then the task having minimum completion time is chosen and assign to the respective node. Max- min chooses the task having maximum completion time to run on node. It will run short task concurrently with the long one. They simulate and compare both algorithm using cloud sim.

Shridhar et al [4] propose hybrid scheduling algorithm that combine Divide and conquer approach and throttled algorithm. The algorithm is having two pass. In first pass it uses divide and conquer approach for dividing task to available resource handler and assign task to available RH. Every time request is completed , the status of the RH is given to load balancer for next allotment. In second pass for next allotment the request will be allotted to available RH which was not used recently. Priority of request is also considered by load balancer. The proposed algorithm will be compared with throttled on simulator cloud sim.

Navtaj Shingh et al [5] propose algorithm uses the Improved Max min and ant colony approach. They sort the virtual machine according to improved max min and then calculate the execution time of submitted task on each resource. They use Ant approach for calculation of execution time. Task having maximum execution time is assigned to the resource having minimum completion time. Then that task is removed from task set. They simulate the proposed algorithm in cloud sim and compare it with improved max min algorithm.

Reena Panwar et al [6] propose Dynamic Load Management algorithm.They consider dynamic set of virtual machines. When new request comes they check for best suited virtual machine. Once the request is bound they remove that VM index from group of available VM, so it will not be considered for any future request until it finishes assigned workload and become available again. As the algorithm will not every time considers an overloaded VM again and again for scheduling so has less overhead. The author compares this algorithm with optimal VM Load balancing algorithm and simulates result in cloud analyst.

Surbhi Kapoor et al [7] propose cluster base approach for load balancing. They group the VM in clusters by using K Mean Clustering by considering three resource types as parameters i.e CPU processing speed, Memory and Network bandwidth. Load balancer will then assign the request to the appropriate VM of the chosen cluster by looking into the list of cluster and change the status to Available. The Proposed Algorithm is compared with throttled and modified throttle algorithm.

Mohamed et al [8] propose the load balancing architecture for cloud computing based on multiple cluster.The main three load balancing elements are: Main load balancer, Local load balancer and authentication element.MLB maintain the table of clusters with their processing capacity and match client request particular cluster. LLB uses scheduling algorithm to perform load balancing within cluster. They add authentication layer to authenticate user and also grant priority to user and his job.

Akhil Goyal et al [9] discuss firefly algorithm by using behavior of firefly. Threshold value is set for all virtual nodes. It will maintain index table for VMS. When request came the index table is searched for least loaded VM. Any VM will not get load more than threshold value. It focuses on Energy consumption which is a key research issue in cloud computing environment.

Ravi Shankar et al[10] propose Power Aware Resource Allocation Policy for Hybrid cloud. It passes data center list and request queue as argument to algorithm. It will first check the length of request queue and exit if queue is empty. Then compute the power efficiency of data center of public as well as private cloud and sort them. Private request is having higher priority than public request.If the request is private, it will be assigned to the high power efficient private datacenter which can satisfy the request. If high power efficient private datacenter is not available than assign request to public cloud datacenter having high power efficiency. If the request is public then it will be assigned to high power efficient public datacenter. If it was not available than assign to the private datacenter that is having minimum power efficiency.

IV. ANALYSIS METRICS OF EXISTING ALGORITHMS

Table 1. Analysis Of Some Load Balancing Algorithms

Author	Algorithms	Result	Advantage	Disadvantage
Priyadarashini et al [2]	Round robin	low efficiency in load balancing, more response time, improper resource management.	Simple to implement	Static in nature, poor Load balancing, Poor resource utilization, more response time
Priyadarashini et al [2]	Weighted round robin	Better compare to round robin	Simple to implement	Static
Priyadarashini et al [2]	Throttled	Better as compare to static algorithms i.e Round robin and Weighted round robin.	Improve response time , good load management	More time required to search suitable VM.
Priyadarashini et al [2]	Modified Throttled	Better as compare to Throttled as the second search will be started from the VM that is next to previously allotted VM. Simulated in cloud sim and found less VM and data transfer cost compare to FCFS.	Compare to static algorithms discussed [2] it has Less Response time, Less data transfer cost, Less time consuming compare to Throttled	Compare to PSO the response time and cost is poor.
Priyadarashini et al [2]	FCFS	Simulated in cloud sim and Found better response time compare to modified throttled.	Simple to implement. Dynamic in nature	Compare to PSO it has poor response time and cost.
Priyadarashini et al [2]	Particle Swarm Optimization	Modified throttled, FCFS and Particle swarm optimization are compared and simulated in cloudsim and found that PSO perform better than other two algorithm in terms of response time and cost.	Less response time and cost compare to Modified throttled and FCFS	Priority is not considered , Doesn't consider resource specific demand of task.
Geethu Gopinath et al [3]	Min Min	Simulated in cloud sim and found that performance of algorithm is depended upon cloud Environment. If More number of Heavier tasks are there then Min Min Performs better.	Simple to implement, more number of heavier tasks then Min Min Performs better in terms of resource utilization and make span.	Static in nature, prior knowledge of resources and task is required.
Geethu Gopinath et al [3]	Max-Min	Simulated in cloud sim and found that performance of algorithm is depended upon cloud Environment. If number of lighter tasks are more then Max Min Performs better then Min Min.	Simple to implement, If more number of lighter tasks then Max Min Performs better in terms of resource utilization and make span.	Static in nature so prior knowledge of resources and task is required.

Shridhar et al [4]	Hybrid of Divide and Conquer and Modified Throttled	Simulated in CloudSim and it compared with Modified Throttled algorithm. They found that the proposed algorithm reduces execution time by 9.972% and efficient load balancing as compare to Modified Throttled algorithm.	Better resource utilization compare to Throttled, also has better Execution time	Doesn't Consider priority of task, Doesn't consider resource specific demand of user.
Navtaj Singh et al [5]	Combination of Max-Min and Ant Colony Algorithm	They simulate on CloudSim and found that the total processing cost and completion time of proposed algorithm is less than that of Improved max min algorithm.	Better Load balancing and Response as compare to Improved Max min ,	Considered limited number of resources and VMs, Didn't considered cost model.
Reena Panwar et al [6]	Dynamic Load Management	They compare this algorithm with optimal VM Load balancing algorithm and simulate results in cloud analyst. It will Improves response time, data processing time and data transfer cost. It will make Proper resource utilization.	Improve resource utilization, data processing cost and response time.	It doesn't consider Priority of tasks. It doesn't consider resource specific demand of task.
Surbhi Kapoor et al [7]	K-mean Clustering	It will be simulated on Cloudsim and result shows that the proposed algorithm improves the parameters like Response time , Execution time , Make Span and throughput as compare to throttled and modified throttled algorithm	It considers the resource specific demand of the task. It has less overhead as scanning for VM done in only matched Cluster. It is suitable in heterogeneous Environment, It improves Resource utilization, Response time ,Execution time, Make span	It Doesn't Consider the Priority of Task, Load balancing within cluster is not considered.

Akhil Goyal et al [9]	Firefly	Simulate algorithm on CloudSim and Compared with PSO algorithm. Result shows that the firefly algorithm has less response time and good processor utilization as compare to PSO. The energy consumption using firefly is 10 to 14 % less compare to PSO.	Efficient in terms of Energy consumption. Also response time and resource utilization is good compare to PSO	Difficult to implement in heterogeneous environment. Priority is not considered.
Ravi Shankar et al[10]	Power Aware Resource allocation Policy	Simulated in CloudSim and compared with DVFS(Dynamic Voltage and Frequency Scaling). The proposed algorithm maximizes throughput and has less power consumption.	Good Resource utilization , minimize power consumption in hybrid cloud	Doesn't consider resource specific demand of task , More suitable in Hybrid cloud environment.

V. CONCLUSION

Load Balancing play an important role in cloud computing. It provides proper resource utilization and improves the response time and cost that lead the customer satisfaction. It also reduces the power consumption which is the biggest challenge in green computing. We have discussed almost fourteen load balancing algorithm and their pros and cons. The all discussed algorithm behave differently in different condition. The use of algorithms is dependent upon cloud environment, cloud size and user requirements.

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