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A REVIEW ON VARIOUS LOAD BALANCING ALGORITHMS WITH MERITS-DEMERITS IN CLOUD COMPUTING

Manpreet Kaur (Mtech Scholar)[1], Dr. BK Verma (Professor)[2]

[1]*Department of Computer Science Engineering, CEC Landran, IKGPTU*
[2] *Department of Computer Science Engineering, CEC Landran, IKGPTU*

Abstract— *Along with the expansion in information technology and cloud computing, the load balancing is also getting popular in this domain. The load balancing is done with an objective to perform proper resource utilization and to prevent the under and over utilization of available resources. The major goal to organize this study is to derive a review to the concept of load balancing in cloud computing. This study also traverses the previous work that has been done by different authors to improve the load balancing mechanisms. Various load balancing techniques also compared and it is observed that the round robin algorithm for load balancing is much advantageous in comparison to other techniques.*

Keywords*—Cloud Computing, Load Balancing, Resource Utilization, Round Robin Algorithm, NIST, Virtual Machines.*

I. INTRODUCTION

Cloud computing is also referred as Distributed computing. It provides new dimensions to various service providers as well end users. To incur these new dimensions, new techniques for designs are implemented that convey infrastructure as service (IaaS), Stage as a Service (PaaS) and also Software as a Service (SaaS) [1]. To get the virtualization of servers, routers, memory unit and various other components, IaaS service is used. After this the PaaS service is used to generate, implement and test the internet based application on the cloud service. Hence, this service is responsible to maintain the operation of software for their whole lifespan. Third service is SaaS, it is responsible for providing the software application when the end user demands for it [2].

The Cloud computing technique comprised of different phases. The Grid computing approach derived from the idea of connecting various systems in order to improve the availability and scalability. Example of resources are memory unit, infrastructure, power etc. In cloud computing service the utility computing plays the vital role. Hence, the computing is described in different by different researchers [3]. As per the National Institute of Standards and Technology (NIST) the Cloud computing technique may be described as "An approach which is used for initiating the suitable, on-demand access of network in order to share the different computing resources in the network. Example of different configurable resources as follow: networks, memory unit, servers, and services. Various resources can be quickly shared with least efforts and minimum interaction with the service providers [4]. The cloud computing method improves the availability of resources and it is comprised of 5 necessary factors, 3 services model, and also four types of deployment models.

Different advantages of cloud computing technique are described below:

- **Open Access:** If good internet link is available then the Cloud service provider can be easily accessed.
- **Improved economies of scale:** the investment and operation cost reduces from consumer side whereas, at the service provider side, the infrastructure services are arranged flexibly [5].
- **Capacity for on-demand infrastructure and computational power:** On the basis of pay per model, the end users can insist for the computational power, memory unit and different infrastructure as per their requirement.
- **Improved resource utilization:** in cloud computing the resources are used efficiently**.** Whenever user needs a resource only then it is available to the end user and on the other hand if it is not required then resource is returned back to the cloud service provider. Hence, the flexibility of the server has improved [6].
- **Reduced information technology (IT) infrastructure needs:** the infrastructure is provided in the form of service to the end user in cloud computing system. Therefore, need to pay for the IT infrastructure is eliminated. The users have an option to buy the infrastructure provided by the cloud service provider as per their requirement.
- **Resource pooling:** Usually the end user has no idea about the location of cloud service provider. Hence, the service provider allocates various resources virtually to different end users [7].
- **Control systems with abstract policies:** the detailed information about the service provider is not provided to the end user.
- **Organizations focus on their core competencies:** The organizations that require some services then they can easily contact the IT service provider.

II. LOAD BALANCING

In computing technology, the term load balancing is used to define the process of propagating the work load or jobs within available resources like computer devices, central processing units and other resources. Load balancing is a technique to optimize the utilization of resources in order to increase the turnout and reduce the response time. Load balancing is also helpful to share the burden or work load of single resource or device [8].

Load word refers here the network load, CPU load and the memory capacity of each server. This load is managed by using the different load balancing mechanisms. The objective of load balancing algorithms is to assure that each and every node of the cloud is busy in processing a sort of operations [9].Consequently, any node in the system should not be excessively over loaded as well as under-utilized. These load balancing techniques work as a load balancer which balances the load by distributing it to other nodes depending upon how much busy the server or node is. In a case where there is no load balancer then client has to wait until or unless the server or node is busy in completion of its task [10]. The process of waiting can be tiring as well as exhausted. The role of the processor in the load balancing is to share the information regarding the queue of the jobs. Thus, in case of failure in balancing the load can cause a serious issue where there can be chances of losing important information [11]. The table given delineates the different load balancing techniques along with their merits and demerits.

Table 1: Load Balancing Techniques [16]

S.NO.	Load balancing algorithms	Merits	Demerits
1.	**Static**	• Decision regarding load balancing has taken at the time of compilation. • Divide the whole traffic among the server equally. • Less number of complications	• On the other hand, limited to the environment where variations in the load are few. • During run time, it do not have the ability to handle the changes occurring in the load.
2.	**Dynamic**	• It performs balancing at the time of run time. • Only the current status of the system in necessary for the balancing • Fault Tolerant	• Requires frequently or constant check of the nodes. • More complex
3.	**Throttled**	• Good performance • To manage the task list is used.	• Long waiting list for the tasks
4.	**Round Robin**	• Have fixed time quantum • Easy to understand • Performs better for short CPU burst as well. • Works on priority	• Larger tasks takes long time • More number of switching from one to another due to short quantum time. • Works efficiently on similar types of jobs.
5.	**Weighted Round Robin**	• Decision has taken based on the weight values.	• More number of tasks are assigned to the heaviest load virtual machine
6.	**Improved Round robin**	• Packets are initialized to the best machine always. • Improved performance	• Most of the load have allotted to a single machine.

III. LITERATURE SURVEY

Mohit Kumar et al .[1] proposed a cloud structure by considering the multiple user support as a major issue. The proposed cloud structure was capable to handle the multiple users at given time before reaching to the deadline. The threshold based triggered mechanism was used to provide the scalability to the system. The proposed system decreases the span time, increased the acceptance ratio 30 times in comparison to the min-min algorithm and 10 times with respect to FCFS and SJF algorithm. .

Avinash Thakur et al. [2]discussed that the concept of load balancing in cloud computing is introduced to perform efficient utilization of available resources and to obtain high quality of service. This can be attained by employing optimal resource allocation techniques. As the importance of load balancing in cloud computing is known to everyone, thus a lot research work has been done in this domain and still going on. In this work, the author developed a systematic review to the load balancing algorithms used in cloud computing. The review was organized on the basis of the taxonomy of algorithms. The survey also reflects the comparative analysis of various load balancing techniques. Along with researchable questions are also discussed by the author**.**

Aarti Singh et al. [3] proposed a autonomous agent based
Load balancing algorithm for cloud computing. The author explains that load balancing is major issue in each and every domain and a large number of algorithms have been developed till now but a small number of algorithm supports load balancing issue in cloud computing. The proposed load balancing mechanism was simulated and observed to be efficient and effective.

Mainak Adhikari et al. [4] proposed a load balancing algorithm for IaaS cloud service. In this the tasks were allotted to the Virtual Machine (VM) on the basis of the size of the task and compatibility of the VM. Thus results to the enhanced resource utilization. For evaluating the performance of the system, the proposed mechanism was simulated and compared to the traditional algorithms in terms of performance metrics.

Reena Panwar et al. [16] recommended an enhanced and dynamic load managing mechanism for cloud computing. The focus of this study was to handle all the incoming requests by allocating them to suitable or available virtual machines. The experiments were performed by using cloud analyst simulator by evaluating performance parameters such as response time, processing time. A contrast study was driven between proposed and VM-assign algorithm to prove the proficiency of the work. The comparison results demonstrated that the proposed work was outperformed the traditional ones.

Agraj Sharma et al. [17] the traditional load balancing mechanisms were not able to handle the load when the server is overloaded and increased the computation cost and consumes higher amount of bandwidth after delivering the queries. The proposed mechanism of this study worked on the basis of preventive load balancing by considering the response time corresponding to the each and every allocated job. Then the observed response time helped the scheduler to schedule the upcoming jobs. The algorithm was static in nature and also leads to the decrement in the calculation cost of the cloud.

Vishnu Kumar Dhakad et al. [18] The time sharing distributed systems are so complex regarding the average waiting time , turnaround time, switching among jobs which are scheduled by the CPU schedulers on the basis of scheduling algorithm. The round robin algorithm is one of the scheduler algorithm which is widely used by various researchers but they ignores its disadvantage that it suffers from more average waiting period , high switching among the jobs, lower throughput etc. Author developed an adaptive round robin algorithm and it was modified on the basis of shortest burst time and time intervals. It was a preventive algorithm which process on the basis of burst time of the current processing job. First of all, whole of the jobs were arranged on the basis of their burst time and priority for execution. After then the smart time interval were elected which was dependent to the number of jobs. If the number of jobs is odd then the smart time slice was equal to the half of the CPU burst time if the jobs were even then the smart time slice is evaluated.

Alireza Sadeghi Milani et al. [19] developed an analysis study related to the traditional load balancing techniques to reduce the load on the nodes in a cluster. From the survey it has been found that the load balancing is the important challenge in the cloud computing environment. This paper also included the detailed classifications of different techniques based on the different parameters for their individual performance. Lastly, their advantages and disadvantages, their challenges were also addressed which can be helpful in the future for the development.

IV. CONCLUSION AND FUTURE SCOPE

While arriving at a conclusion, it has been surveyed that load balancing is a major concern in cloud computing. The primary intension of load balancing is to satisfy the user while distributing load among several nodes or virtual machines. Moreover, the proper utilization of resources with improved performance is a point of consideration of load balancing algorithms. Consequently, load balancing is vital for resource utilization, stability, system performance, minimizes response time and maximizes throughput. There are several load balancing algorithms have been proposed to balance the load.

In future, static and dynamic load balancing algorithms can be improved efficiently where load can be equally distributed among several virtual machines.

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