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A COMPARATIVE STUDY OF LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING

Gaganpreet Kaur[*1], Er. Charanjiv Singh[2] & Er. Gurjeet Singh Bhathal[3]
[*1]M.tech (Scholar), Department of Computer Engineering, Punjabi University, Patiala
[2&3]Assistant Professor, Department of Computer Engineering, Punjabi University, Patiala

ABSTRACT
Current year, Cloud computing is an emerging concept which efficiently combining many fields of computing. Cloud Computing offers several services on-line to users like: storage, process power, networking, databases, servers, Virtual Servers with minimum cost and energy. Users can easily access these services from anywhere and anytime over wed. Companies providing these computing services referred to as cloud suppliers and usually charge for cloud computing services supported usage, kind of like however you are pay for water and electricity bill. Users can simply store and retrieve data, files by accessing to the database of cloud system. Due to the increased number of applications, the load on the cloud is also incremented. Load Balancing is main concern in environment of cloud networking. LB (load balancing) is a technique that spread load among the nodes in a system. The main purpose of load balancing is to utilize the resources and for the enhancement in the performance. Along with this, it removes the nodes that contain heavy data or load also the nodes that are not working well or perform a little bit of task. Several kinds of load such as PL (processor load), ML (memory load) and NL (network load). Every node in the network perform equal amount of work and it assigned a virtual machines to each of the nodes. The time consumption of each node is same as other nodes. The review provides a scientific study related to LB (load balancing) technique used in the field of cloud networking.

Keywords: Cloud Computing, Load balancing, various methods, memory load and Network load)

I.   INTRODUCTION

Recent technology is cloud computing, where consumer is able to rent devices like hardware and software, communications and computational possessions as per consumer basis [1]. Cloud computing is a way in which user can store data or information permanently on servers and temporarily cache them on the client side through laptops, computers [2]. Cloud Computing is a distributed internet based paradigm, it allow user to access the resources and services like storage, computational power and application over the internet [3]. Cloud Computing is used in all the fields like: Information Technology industries, examine, students, government-sector, non-Information Technology etc. In conventional computing, we establish every software which we have necessary and inform hardware time-to-time. The works, we have completed and store up in our computer can't be access exterior the network. Cloud computing offers online devices like as a software, hardware, services according to users need with minimum cost and effort .Users easily access these services from anywhere and anytime through internet. If user want to use it then start and if doesn't use more than release them. Users pay for services according to use by them, like you pay bill of electricity and bill [4] and Ease of Use [24].

Classification of Cloud Computing
   1)   Private Cloud or Reserved Cloud (have access through one or two organization).
   2)   Public cloud (anybody can access).
   3)   Community Cloud (accessed by several organizations).
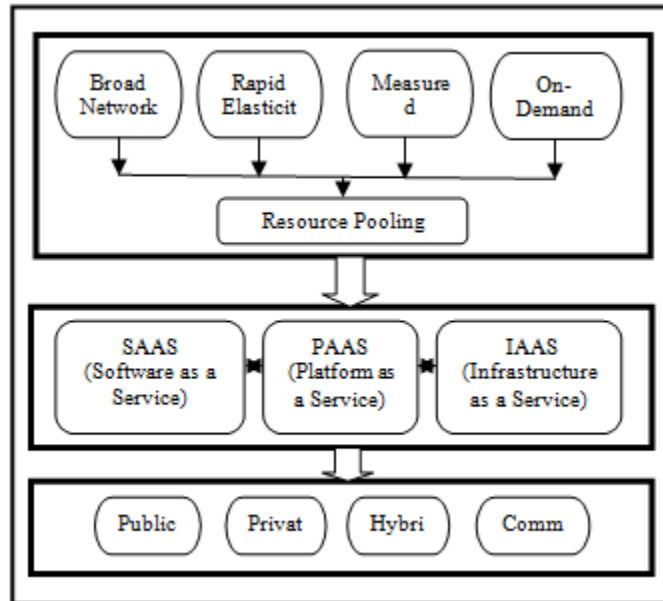   *4)*   Combined or hybrid cloud (collection of various clouds).

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Fig. 1. Architecture of Cloud Computing

Services of Cloud Computing
1) **IAAS (Infrastructure as a Service)** : In IAAS the client does not manage the underlying cloud infrastructure. In this client able to control OS, storage and all deployed applications. Amazon Elastic Compute Cloud (EC2) is one of the examples of IAAS provider.
2) **PAAS (Platform as a Service) : PAAS give the access to clients to use the required resources for creating new applications. There is no requirement of installation of software.**
3) SAAS (Software as a Service): SAAS give authority to the users to access applications. SAAS main used application is Google Apps. [5].

Load Balancing
It is an efficient concept in cloud computing. CC is a large platform which offers services to consumers at minimum cost over the internet. So, LB (Load Balancing) become very interesting and significant concept [1]. It is method that distributing the dynamic workload within several computing resources. It makes sure that all the nodes are properly utilized and not single node is Idle. All the resources perform equal amount of work. Resources can be data centers, physical machines and virtual machines. Load balancing schemes are applied to achieve user satisfaction, better resource utilization and minimum response time [6].

In daily life, websites is example of Load Balancing. Without Load Balancing users face many problems like delays, timeouts and long time response.
Needs of Load Balancing:
1. Improve the system performance.
2. Increase the resource utilization.
3. Maximize the user satisfaction.
4. Maintain the system stability.
5. Increase the availability of services.

Types of Load Balancing

1) Static Load Balancing Algorithm: Static algorithms are simple as compared to dynamic algorithms. It must consider prior knowledge of node and doesn't require the current state or behavior of node. It divides the workload among all the nodes and VMs before execution time. The static Algorithms are suitable for homogeneous and stable environment.

2) Dynamic Load Balancing Algorithm: Dynamic algorithms are more Flexible as compared to static algorithms. It doesn't consider the prior knowledge of node but require a current state of nodes while distributing the workload. It divides the workload among all the nodes and VMs at run time. It is suitable for heterogeneous and dynamic environment [7].
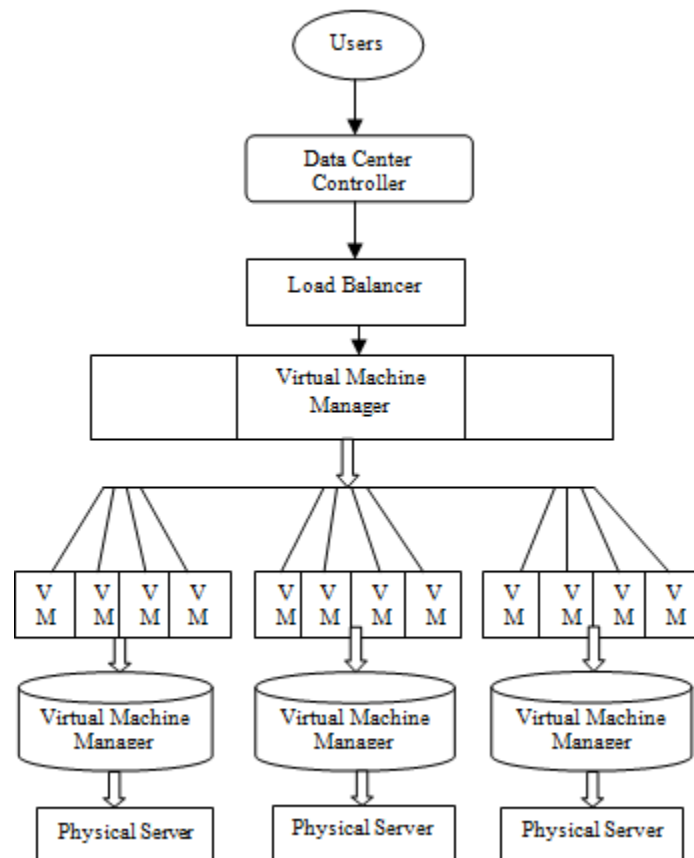

Fig. 2. Load Balancing

Classification of Load Balancing Algorithms

Round Robin Method: As like the name it is a simplest approach mainly used for load balancing, various processes are given to the processors in RR algorithm. The load distributions in the processors are same. Different processes have not same job processing time. Most of the time, some nodes become loaded and other nodes are of normal load [8]. Time slicing played out a crucial role in Round Robin Algorithm. In this algorithm, time is partitioned into small segments and each node is assigned to a different time segment and in this part, nodes performed their operations of working. If time slice is very large them Round Robin Algorithm is same as the FCFS Algorithm. If the time slice is shorter, then Round Robin Algorithm became similar as PSA (Processor Sharing Algorithm) [9].

Weighted Load Balancing Algorithm: The Round Robin Algorithm is not preferable mainly for cloud networking due to no information about the time taken for execution. Therefore possibility of nodes to get heavy load is increased. So, to enhance the most challenging issues of RR algorithm, Weighted RR algorithm was introduced for research. A specific weight is allotted to each node in this algorithm. The distribution of processes is fully dependent upon the weight values. It is useful to maintain and balance the network traffic or load [8].

Min-Min Load Balance Algorithm: It is static load balancing algorithm. This algorithm is start with a group of not assigned tasks. First of all, the minimum completion time of all tasks is found. Then, after that minimum value is selected from the other values in all tasks. As per the minimum time, task performed on machine is set up. The implementation of tasks is upgraded on machine and the tasks that are assigned are removed. Similar process is followed to assign tasks to access resources [8].

4) Max-Min Load Balancing Algorithm: It is static Load Balancing algorithm. This algorithm is similar to Min-Min load balancing algorithm. But there is little difference between them: In this algorithm, after balance the load searching out the less execution interval of time period, the maximum value is selected. As per required large interval of time, the task is assigned to particular machine which is choosen. In interval time required for execution of other tasks are updated on machine and assigned tasks are removed by tasks list [8].

5) Active Clustering Load Balancing Algorithm: Active clustering is a clustering based algorithm in cloud computing. In this Algorithm, similar nodes of system are grouped together and then work on these groups. Whenever the request is incoming, it will be first checked that to which group it belongs and once it is found, the request will be assigned to the node identified. It works like as self-aggregation. System performance improved with high availability of resources [10][11].

6) Equally Spread Current Execution Algorithm (ESCE): Equally Spread Current Execution Algorithm is dynamic load balancing algorithm. This algorithm handles the processes with priorities. It is SST (Spread Spectrum technique) that includes the load distributed between MVM (multiple virtual machines). Before the transfer of load, the load balancer checked out the size of virtual machine that is lightly loaded and controls the task easily, which take less time and give better throughput and after this load is transferred to that virtual machine [10].

7) Honey Bee Foraging Load Balancing Algorithm: HBF (Honey bee foraging algorithm) is dependent upon the nature of honeybee. The objective of this algorithm is to balance the load on system. This requirement of this algorithm is to create a different queue through each node. Each server sends a request and from task queue and check-availability. If the data availability is high then bees perform waggle-dance. The system increases diversity but doesn't increase the throughput system [10].

8) Biased Random Sampling (BRS): BRS (Biased Random Sampling) is a kind of dynamic load balancing algorithm. This is a distributed and scalable load balancing technique. In this algorithm, virtual graph is constructed where every node is connected with each node of a system. Whenever a new job is assigned to a node, its in-degree is decremented by one. Whenever a job is completed, the in-degree of that job is increased by one [10][12].

9) Throttled Load Balancing Algorithm: Throttled load balancing is dynamic load balancing algorithm. This is a simple algorithm mainly used for load balancing in virtual machines. In this algorithm, load balancer is having a list of all virtual machines in VM table [9]. Firstly, the client sends request to load balancer to verify the data availability of VM which could access to load simply and performs the task. If the virtual machine is found then job is assigned to the virtual machine, if there is no virtual machine is available then the job will wait for the virtual machine to be free [10].

Opportunistic Load Balancing (OLB) Algorithm: This algorithm is a category of SLB (Static Load Algorithm). Opportunistic load balancing method makes each node busy and it doesn't include the current workload of nodes. OLB assign unexecuted tasks to available node in free order. OLB method is easily but doesn't computed the execution interval of time of node, therefore the completion time is very slow [8] [13].

Queue Idle Join Algorithm: A Queue Idle Join load balancing algorithm is used for large scale system. When the job arrived, there is no communica¬tion overhead occur between dispatchers and processors in JIQ algorithm. The drawback of this algorithm is that it is not scalable [12].

Randomized Algorithm: RA (Randomized algorithm) nature is static. In random algorithm the procedure is controlled through particular node N and a probability P. This algorithm works well when the processes are equally loaded. RA attained the best performance output from all load balancing algorithms that used for special purpose applications. This algorithm does not required to maintain the deterministic approach.

Ant Colony Optimization Algorithm: Ant Colony Optimization Algorithm finds a shortest path between food source and colony of ants. In this algorithm, the behavior of ants is used for gathering information from different nodes in the system. When the call is initiated, the ant will move forward to find the first under loaded resource. If the ant finds the first under loaded server, it will move forward to check the next server status. If the next resource is under loaded as well, it will move forward to find the last under loaded resource. Otherwise, the ant will move backward from overloaded node to the previously available resource [13] [14][25].

Compare and Balance: It is distributed load balancing algorithm, which is based on sampling to attain an equalization situation and manage un-balanced system's load on the rules of the prospect which is the several of VM executing on the current host and complete cloud network. The recent host selected host randomly and it creates a comparison of loads. In case, the load of current host is greater than the selected node then the extra node is transferred to the particular node. This algorithm reduces the virtual machines migration time [12].

15) Scheduling load balancing algorithms are two phases: This algorithm is crossbreed algorithm which contained both Opportunistic and min-min algorithms in load balancing. Load Balancing opportunistic algorithm make each node in running state to get the desired aim of load balancing and Scheduling mitigates (LBMM) the implementation interval of time period of every task on the node. It is combined for the resource utilization to improve performance and balance [13].

II.   RELATED WORK

According to Er.Anu Sharma, Er.Nancy Arora et al. [2] deployment of virtual machine is major issue among the different issues of cloud computing. Different users are demanding different resources, different time from different locations. An efficient virtual machine placement approach is the need of cloud environment. In this paper, different virtual machine deployment approaches used by different cloud service provider has been analyzed. Then the new policy has been discussed and compared with existing using cloud sim simulator. It has been identified that proposed approach outperforms the existing one on all relevant parameters. Functionality of proposed work can be further enhanced by combining the feature of virtual machine migration with proposed virtual machine approach.
Yogita Kaushik, Dr. C.K Jha et al. [4] Compare the Load balancing algorithm in cloud environment. According to authors HN (honey -bee) method is searched to be best among these and both methods are compared throttled on the normal of similar parameter metrics as similar cloud-let. HB (Honey bee) methods works superior than Throttled load algorithm which is the better accessible balance the load methods in the cloud atmosphere.

G.Gayathri, R.Latha et al. [6] was proposed an algorithm for fault tolerance enabled load balancing in cloud computing. This algorithm is devised to maintain the fault tolerance level of the services running inside the VMs. VMs can be migrated from the overloaded host to the lightest one while preserving the fault tolerant requirements of all the services. In addition, based on VM migration, the hardware utilization, power savings, availability, security and scalability can be increased without disturbing the customer applications running in the VMs[23]. The simulation indicates that the algorithm works well and keeps stability in guaranteeing the fault-tolerant requirements of all services while balancing the load by VM migration.

Prabhjot Kaur and Dr. Pankaj Deep Kaur et al. [9] was proposed VM load balancing algorithm that used the technology of virtualization mainly for assigning data center resources powerfully on the demand of applications.

More than that, it used optimization numbers of servers for green computing.This paper introduce new algorithm for clouds under bursty workloads and describe the concept of skewness to measure the unevenness in the multi-dimensional resource utilization of server.

According to Ruchika Aggarwal, Latika Gupta et al. [11] Cloud computing usually has seen in the field of the business, Although, there are various subsisting challenges such as Server Consolidation, LB (Load Balancing), Energy Management, VMM (Virtual Machine Migration), and many more. Load Balancing is the current and most occurred problem among all these problems, which is required to spread the dynamic local workload equally to different nodes to accomplish a high user satisfaction. Existing LBS (load balancing strategies) which have been considered primarily focus on decrement of overhead, convenience replication time and enhancement of execution. Still none of the techniques has been included the execution time of any kind of undertaking at runtime. In this way, there is no aimed at the growth like load balancing approach which can improve the execution of cloud computing with along the huge asset uses.

Table I. different research work with different techniques

AUTHOR'S NAME	TECHNIQUE USED	RESEARCH GAP	PARAMETERS
Er.Anu Sharma,et al.,[2] 2017	Virtual machine placement	Different problems in cloud computing	-
Yogita Kaushik, et al.,[4] 2016	Honey bee algorithm	Load balancing	-
G.Gayathri,et al.,[6] 2017	Fault tolerance algorithm	Fault levels	Stability
Prabhjot Kaur, et al.,[9] 2015	VM load balancing Green computing	Bursty load of data	-
Ruchika Aggarwal, et al.,[11] 2017	Improved load balancing method	Balance of loading	-
Mahfooz Alam, et al., [12] 2017	ELB algorithm	Complex tasks	LIF overhead Migration time
Raviteja Kanakala, et al.,[14] 2015	Exponential smooth forecast	Weak performance	-
Shabnam Sharma, et al., [15] 2016	Bat load balancing algorithm	Load maintenance	Delay Response time
Jyoti Yadav, et al.,[16] 2017	ACO GELS	problem of span	-
Nikhil Rajeshirke, et al.,[22] 2017	Better load balance model	Resource management	Different strategies

Table 1. described that the survey of the various papers. Analyze the performance parameters, methods and gaps in load balancing in cloud computing environment.

Mahfooz Alam and Zaki Ahmad Khan   et al. [12] proposed an ELB algorithm for cloud computing server which is to show the better performance and achieved their important constrains such as LIF, overhead, migration time. The ELB algorithm proposed has been very efficient, mainly in the case of a more number of tasks and balance of load on each node.

According to Raviteja Kanakala and Vuyyuru Krishna Reddy et al. [14] Performance of the algorithms which were being implemented for balancing the load in cloud computing was not up to the requirements of cloud. So, they will implement changes to algorithms like Exponential Smooth Forecast based on Weighted Least Connection algorithm and Load Balance Max-Min Algorithm and improve their performance to meet the requirements of load balancing in cloud computing and to increase the performance of cloud.

Shabnam Sharma, Ashish Kr. Luhach and Sinha Sheik Abdhullah et al. [15] proposed Bat load balancing algorithm reducing the response interval period and executes a load balancing without causing any time delay. It also assist in load balancing an effectively over several VMs (virtual machines).

 Jyoti Yadav1, Dr. Sanjay Tyagi2 et al. [16] proposed cross breed method is name as ACO-GELS. ACO-GELS offers the results were better to solve in cloud computing load balancing minimize the problem make span. It optimized the make-span, reduced the resource-utilization and also enhanced the load balancing level as compared with GA-GELS.

According to Nikhil Rajeshirke1, Rohan Sawant, Sumeet Sawant3, Hasib Shaikh4 et al. [22] Resource Management is a crucial occurred challenge in the environment of cloud computing. It delivered both computing and storage capacity likes a service to a community that consists of end-recipients.it comes from the utilize the cloud shaped sign as a hiding from the problem environmental, it contains in system diagrams. CC (Cloud Computing) commend services with a user's data, software and computation over a network. They described better LBM (load balance model) mainly for the public cloud that is dependent upon the cloud partitioning concept with the use of a switch mechanism to select various approaches particularly for different conditions.

III.   CONCLUSION

Cloud Computing is emerging technique in Information Technology. It provides everything as services to users over network. Load Balancing is main issue in cloud computing. The primary purpose of load balancing is to complete the needs of customers through spreading dynamic workload among all the nodes maximize resource utilization and increase the performance of cloud system. There are several algorithms are used to solve the load balancing of problem. In the research work, A surveyed is demonstrated on various existing load balancing algorithms in environment of cloud computing

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