



## A Comparative Analysis of Load Balancing Algorithm in Cloud Computing Environment

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**Abstract** — Cloud computing represents different ways to design and manage from far computing apparatuses. Load Balancing is an important aspect of cloud computing environment. This paper presents different a load balancing designs in different cloud environment based on requirements detailed in Service Level Agreement. Among implemented load balancing algorithms, ant colony optimization algorithm has achieved a better doing a play, when compared to others. Load balancing algorithms play a challenging task in cloud computing.

**Keywords** --- Cloud Computing, Load Balancing, Resources, Resource Scheduling, Service Level Agreement, Servers.

### I. INTRODUCTION

Cloud computing provides [1] internet based flat structure that is used for computer technology. In this main two term a first term is Cloud and the second term is computing. Cloud is a business ring of heterogeneous resources. It is a net of huge infrastructure A base structure says something about to both the applications handed over to end users as services over the internet and the hardware and system software in datacenters that is responsible for making ready those Services. computing is done based on certain criteria detailed in SLA.[8] Cloud computing stores all the computing resources and manages them automatically. Cloud computing provides an all together group of useable things, including knowledge for computers place for storing space, networks, computer processing power and is (became) expert with special knowledge united, as a body and user application. There are four placing models in cloud computing. They are

- Public
- Private
- Community and
- Hybrid

#### Cloud Services

Cloud computing provides a number of Services. [1]Services can be greatly sized or small, and use of a Service is measured and customers are made a request for payment as in agreement. Service copies made to scale are the adjustment models on which cloud computing is based. These can be sorted into three basic Service models as listed under:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

#### Cloud Perspectives

Cloud has different meaning to different stakeholders. [2]There are three main stakeholders of cloud:

- End users
- Cloud Provider
- Cloud Developer

## II. LOAD BALANCING

Load balancing [2] is a careful way for reassigning the complete amount of work to the separate network points for a group of systems, in order to make the time more good at producing an effect and utilize the resources in good at producing an effect way. Load balancing is the basic way of doing for scaling out an application computer base structure. As request request increases, new computers can be added to the useable thing business ring, were the amount balancer will directly Begin sending business trade to the new computer. There are two different kind of algorithm in amount balancing. They are at rest and forcefull algorithm.

### A. Static Algorithms

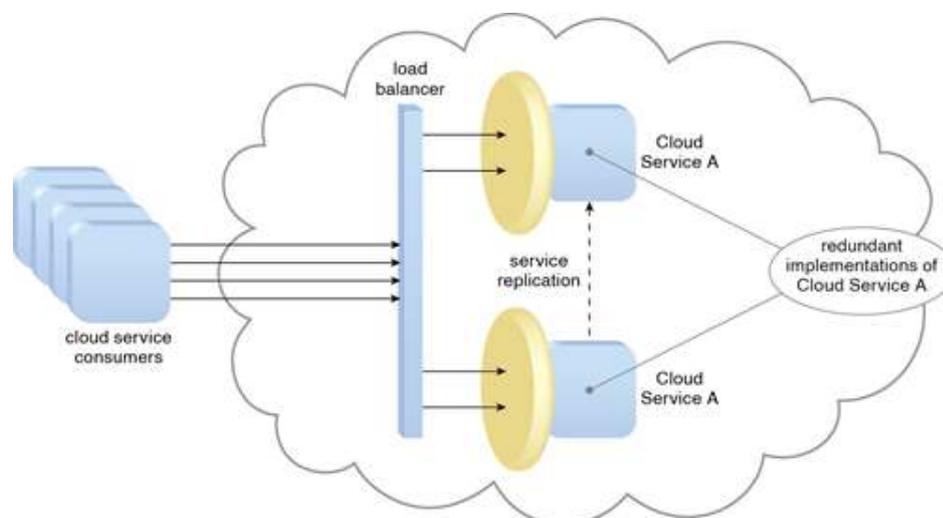
Static algorithms partition the traffic uniformly [1] among the servers. In this approach, the traffic on the servers will be contemptibly easy and subsequently it will make the circumstances imperfectly

### B. Dynamic Algorithms

A dynamic [1] algorithm selects the appropriate weights on server, by searching through the whole network and prefers the lightest server to balance the traffic. But selecting suitable server needs valid communication within networks that lead to extra traffic being added on system

### C. Benefits of Load Balancing

- **Redundancy**  
It describes the process of running two or more, the same servers thus providing a guaranteed event that one server becomes occupied.
- **Scalability**  
Even though modest resources requirements are offered, scalability must always be considered for finding the correct host solution.
- **Resource Optimization**  
Through load balancing, one can optimize how traffic is circulated to the server cluster so, that it guarantees the best performance.
- **Security**  
In security, only one IP is exposed to the web with load balancing, which significantly reduces the amount of break points in case of attack.



*Figure: Example of Load Balancing in Cloud Computing*

### **III. COMPARATIVE ANALYSIS OF LOAD BALANCING**

#### **A. Round Robin Algorithm**

Round Robin is one of the at rest load balancing algorithms, where going in front of states are not taken into account. It is simple and uses the Round Robin careful way for mixed bag of goods Allocation. It selects the first network point at random and then puts on one side the mixed bag of goods to all the other network points evenly in Round Robin careful way. The main better chances of Round Robin is that it does not need any interprocess communication. There is no before information about the processors running time, so that some tasks may get heavily loaded.

To over-come this, weighted Round Robin algorithm is being offered. Here each network point given to has a special weight. based on the network points weight, they would get the requests. If all network points are equal, then the network point is indicated to business trade.[3]

#### **B. Opportunistic Load Balancing Algorithm**

It is also one of the at rest load balancing algorithms, which do not take into account the present load of work of the VM. It usually keeps each and every network point having much to do. This low price offers with the unexecuted tasks quickly and in random order to the current network point, where each one of work is given to the network point as by chance. This algorithm provides an load balancing list of details but does not produce a good result.[1]

#### **C. Min-Min Load Balancing Algorithm**

Min-Min is an at rest load balancing algorithm, where the parameters associated to the job are recognized in advance.. In Min\_Min algorithm, the Execution and make complete time of the unassigned waiting in twisted hair hanging down back are taken to be by the cloud manager. The Jobs with least possible or recorded Execution in time are being given to first to the processors, so that the work is completed in time. But the tasks with greatest Execution need to wait for a special stage in time of time. As such, all the all the tasks in the processor must be changed knowledge and the tasks in the twisted hair hanging down back must be removed. The work with least possible or recorded time Execution acts better than the greatest point time Execution. [2]

- Excepted Time of Compute (ETC) - The running time excepted for tasks in all the nodes are stored in ETC,
- Minimum Execution Time Algorithm (MET) – It finds the best job-processor-pair, were current load is not considered, and
- Minimum Completion Time Algorithm (MCT) –It allocates the tasks based on the minimum completion time.

#### **D. Max-Min Load Balancing Algorithm**

Max-Min is same as the Min-Min algorithm, where the greatest point time Jobs are selected. Only once the least possible or recorded time Jobs are completed. When the least possible or recorded Jobs are completed, the tasks that are in the twisted hair hanging down back are given to the processor. Execution time of all tasks is being changed knowledge to the processor. Since it is a noise in back algorithm, the time of every work is worked out in advance and did in a right way. An got better account of max-min algorithm was sent out in. [3]

#### **E. Ant Colony Optimization Based Load Balancing Algorithm**

This algorithm is designed to look for out the most good selection footway among the food and colony of ant, based on its actions. The main purpose of this move near is to make distribution the work load the network points in a good at producing an effect way. The ants keep (self, thoughts) in order, under control the information from the cloud network point and give to the tasks to the one network point. Once the work is given to the head hard growth, the ant moves in a forward direction with the over-weighted network point to the next network point checking whether the network point is over-weighted or not. During the moving, if it gets any load network point again it moves in a forward direction, else it gets the over-weighted network point, it moves in slow in development direction and puts in place of another were the network point discovered before. Once the mixed bag of goods gets good it is changed knowledge, then the outcome is stated based on the person outcome of the ant. After letting into one's house the person outcome they are has at need together to make the complete go to person in authority. [1]

**F. Biased Random Sampling Load Balancing Algorithm**

Biased Random Sampling is a dynamic surfeit balancing algorithm. Here, casual sampling way of doing thing is over secondhand to get ahead the clog balancing across en masse the nodes. In this algorithm, for the most part the servers are treated as nodes. This rule of thumb is represented in the constitute of virtual design, constructed mutually the connectivity which represents the made a pig of on each node. Each node is taken as vertex in a started graph. When a brought pressure to bear is introduced from the shopper to the clog balancer, the jade balancer assigns the engagement in activity application to the node that has a essential of a well known in- degree. Threshold outlay is used as a parameter that considers each and every style by representing the maximum acquit length. The traversal is from a well known node to another node till finding a arrangement is supported as a walk. After interested the persuade from the made a pig of balancer, it compares the state-of-the-art node to the randomly engaged node by all of the threshold value. If the threshold arm and a leg is extend or in a superior way than the futuristic walk term, the node executes its business, or additionally it hail another neighbour node particularly randomly selected. The stance decreases as the place of business of servers increases.[2]

**G. Active Clustering load balancing Algorithm**

Active Clustering is an improved means of casual sampling. The work of genius of clustering is hand me down in this algorithm. The main component of this algorithm is grouping redolent nodes agreeably, and active based on those grouped nodes. Grouping of nodes helps the basic material to rebound the throughput efficiently. In this algorithm, a way of doing thing called match- mechanic is confirmed .While an death warrant starts, the as a matter of choice node selects the neighbour node. The neighbour node is taken as relate ratiocinate node, which connects the neighbour node that is related as front node. At get by the match maker node gets disconnected. And this fashion is done iteratively to insure the clog equally. The position performance is improved intensively, by increasing the throughput. There is an pragmatic utilization of basic material when there is an rebound in throughput.

**IV. COMPARISON OF LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING**

<i>Algorithm</i>	<i>Static Environment</i>	<i>Dynamic Environment</i>	<i>Centralized Balancing</i>	<i>Distributed Balancing</i>	<i>Hierarchical Balancing</i>
<i>Round-robin</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>No</i>
<i>OLB</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>No</i>
<i>Min-Min</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>No</i>
<i>Max-Min</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>No</i>
<i>Ant Colony</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>
<i>Biased Random Sampling</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>
<i>Active Clustering</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>

<i>Algorithm</i>	<i>Job Allocation</i>	<i>Advantage</i>	<i>Disadvantage</i>
<i>Round-robin</i>	<i>Selects the First Node in Random Manner, and allocates other nodes in Round Robin Method.</i>	<i>Treats the entire server equally.</i>	<i>Any process is not known in advance.</i>
<i>OLB</i>	<i>Based on the framework of the system.</i>	<i>Keeps every node busy.</i>	<i>The execution time is completed, but the node is still busy</i>
<i>Min-Min</i>	<i>Identifies and completes the job waiting in queue.</i>	<i>Performs better small execution time.</i>	<i>Leads to Starvation.</i>
<i>Max-Min</i>	<i>Finding the minimum execution time and deals with the maximum execution time.</i>	<i>Improves efficiency by increasing concurrent execution.</i>	<i>Execution that takes maximum time need to wait for long time.</i>
<i>Ant Colony</i>	<i>Based on actions of ants and seeking an optimal path in collecting their food.</i>	<i>Distributes the workload among nodes in efficient and optimal job scheduling is achieved.</i>	
<i>Biased Random Sampling</i>	<i>Based on Random Sampling Method.</i>	<i>Load balancing is achieved through all the nodes in the system.</i>	<i>Corrupts when load increases. Active</i>
<i>Active Clustering</i>	<i>Grouping nodes together.</i>	<i>Similar nodes are grouped together.</i>	<i>The performance is poor when there is an increase in variety of nodes.</i>

## V. CONCLUSION

Cloud computing is a very great idea and load balancing a very important part in clouds. We have had a discussion about and made a comparison different load balancing algorithms, other load balancing algorithms can also be send in name balancing .the network load equally is one of the important tasks in cloud computing . The ant colony optimization works better and makes distribution the load of work in a good at producing an effect way when made a comparison to other algorithms .

## REFERENCES

- [1] D. Saranya, L. Sankara Maheswari (July 2015) "Load Balancing Algorithms in Cloud Computing: A Review" Volume 5, Issue 7, ISSN:2277-128X.
- [2] Mayanka Katyal, Atul Mishra.(Dec 2013) "A Comparative Study of Load Balancing Algorithms in Cloud Computing Environment" Volume 1 ,Issue 2,
- [3] Rajesh George Rajan, V.Jeyakrishna (Dec 2013), "A Survey on Load Balancing in Cloud Computing Environment", Vol.2, Issue.12, pp.4726-4728.
- [4] ZenonChaczko,VenkateshMadadevan, ShahrzadAslanzadehand,ChristopherMedermind (2011),"Availability and Load Balancing in Cloud Computing", Vol.14.pp.138-140.
- [5] Foster, I., Zhao, Y., Raicu, I. & Lu, S. (2008). Cloud computing and grid computing 360-degree compared. IEEE Grid Computing Environment Workshops.
- [6] Shanti Swaroop Moharana,RajaDeepanD.Ramesh and Digamber Powar(May2013),"Analysis of Load Balancers in Cloud Computing",Vol.2,Issue.2,pp.101-108.
- [7] J.Uma,V.Ramasamy,A.Kaleeswaran(Feb 2014),"Load Balancing Algorithms in Cloud Computing Environment-A Methodical Comparison",Vol.3,Issue.2,pp.272-274.
- [8] Dharmesh Kashyap, Jaydeep Viradiya(Nov 2014),"A Survey of Various Load Balancing Algorithms in Cloud Computing", Vol.3,Issue.11,pp.115-119.