International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Implementation of Load Balance Algorithm in Cloud Computing

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Abstract: ***In the cloud environment, the multiple virtual machines handle the request and respond to the users. As the main concept of Cloud computing is to provide services efficiently, should be available at right time and consume fewer resources. The concurrent access of services load the servers and go down for the mean time which is not the aim to of the cloud computing. So there should be the provision of the load balancer which balance the services by analyzing the resources of each virtual machine or VS and allocate the load to particular VM. Load balancing is a core and challenging issue in Cloud Computing. How to use Cloud computing resources efficiently and gain the maximum profits which can be efficient load balancing algorithm. The load balancing aim is to maximize throughput, minimize response time and avoid overload of any one of the resources.***

Keywords: Concurrent, Load Balancer, VM, Throughput, VS

1. Introduction

Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access.

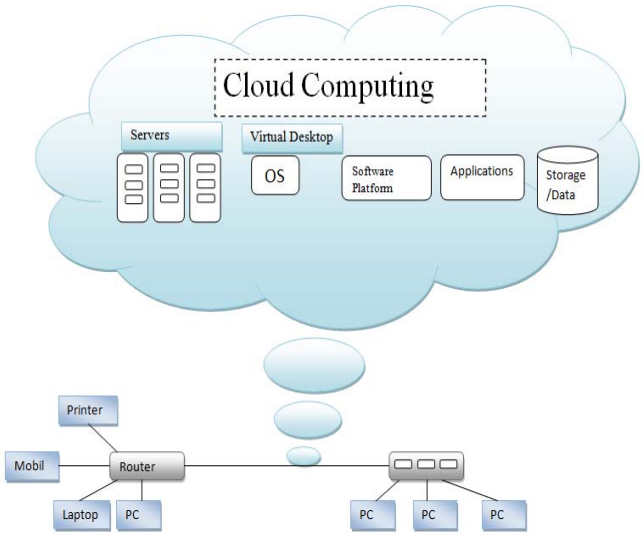

Figure 1: Cloud Computing Structure

2. Types of Cloud Services

Cloud computing offers a variety of ways for businesses to increase their IT capacity or functionality without having to add infrastructure, personnel, and software.

- IaaS (Infrastructure as a service)
- SaaS (Software as a service)
- PaaS (platform as a service)

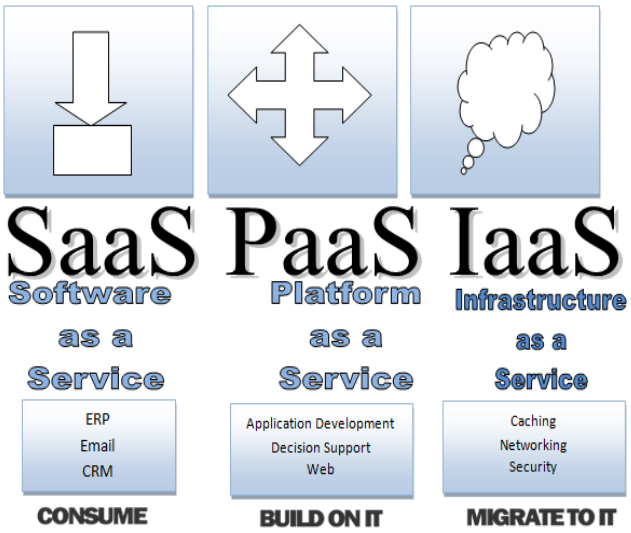

Figure 2: Cloud Services

3. Load Balancing In Cloud Computing

The load balancing algorithm is the main part of any web based services which is used as management of service requests. The load balancing algorithm will able to decide whether the service request needs to remain in the queue or get service from the other service provider. Load balancing is the process of reassigning the total loads to the individual nodes of the system to make the best response time and also good utilization of the resources and process. The Load Balancer systems allow creating an infrastructure able to distribute the workload balancing it between two or more Cloud Servers.

Load balancing must take into account two major tasks, one is the resource provisioning or resource allocation and other is task scheduling in distributed environment. a. Resources are easily available on demand.

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For measuring the efficiency and effectiveness of Load Balancing algorithms, simulation environment are required. There is some software entities allow user to set-up a basic cloud computing environment and measure the effectiveness of Load Balancing algorithms.

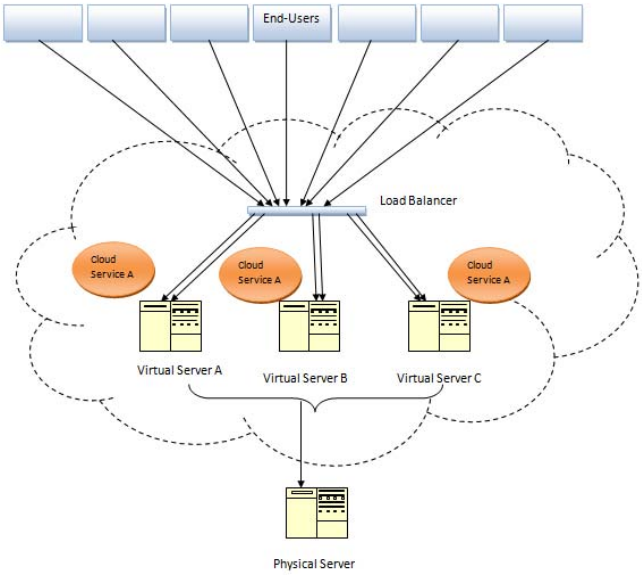

Figure 3: Load Balancing in Cloud Computing

3.1 Load Balancing Algorithms

1. Random

This load balancing method randomly distributes load across the servers available, picking one via random number generation and sending the current connection to it. The system builds an array of Servers being load balanced, and uses the random number generator to determine who gets the next connection.

2. Round Robin

Round Robin passes each new connection request to the next server in line, distributing connections evenly across the array of machines being load balanced. Round Robin works in most configurations, but could be better if the equipment that you are load balancing is not roughly equal in processing speed, connection speed, and/or memory. It works by sending one request to each machine before getting to the start of the queue and doing it again.

3. Weighted Round Robin

In this method, the number of connections that each machine receives over time is proportionate to a ratio weight you define for each machine. This is an improvement over Round Robin because you can say Machine 3 can handle 2x the load of machines 1 and 2, and the load balancer will send two requests to machine 3 for each request to the others.

4. Dynamic Round Robin

It is called Dynamic Ratio on the BIG-IP. It is similar to Weighted Round Robin; however, weights are based on continuous monitoring of the servers and are therefore continually changing. This is a dynamic load balancing method, distributing connections based on various aspects of real-time server performance analysis, such as the current number of connections per node or the fastest node response time. This Application Delivery Controller method is rarely available in a simple load balancer. The Weighted Round Robin can be implementing where the circular queue is rebuilt with new (dynamic) weights whenever it has been fully traversed.

3.2 Node Based Load Balancing In Cloud Computing

Nodes in the cloud are highly distributed. Hence the node that makes the provisioning decision also governs the category of algorithm to be used. There can be three types of algorithms that specify which node is responsible for balancing of load in cloud computing environment.

a) Centralized Load Balancing

In centralized load balancing technique all the allocation and scheduling decision are made by a single node. This node is responsible for storing knowledge base of entire cloud network and can apply static or dynamic approach for load balancing. This technique reduces the time required to analyze different cloud resources but creates a great overhead on the centralized node. Also the network is no longer fault tolerant in this scenario as failure intensity of the overloaded centralized node is high and recovery might not be easy in case of node failure.

b) Distributed Load Balancing

In distributed load balancing technique, no single node is responsible for making resource provisioning or task scheduling decision. There is no single domain responsible for monitoring the cloud network instead multiple domains monitor the network to make accurate load balancing decision. Every node in the network maintains local knowledge base to ensure efficient distribution of tasks in static environment and re-distribution in dynamic environment. In distributed scenario, failure intensity of a node is not neglected. Hence, the system is fault tolerant and balanced as well as no single node is overloaded to make load balancing decision.

c) Hierarchical Load Balancing

Hierarchical load balancing involves different levels of the cloud in load balancing decision. Such load balancing techniques mostly operate in master slave mode. These can be modeled using tree data structure wherein every node in the tree is balanced under the supervision of its parent node. Master or manager can use light weight agent process to get statistics of slave nodes or child nodes. Based upon the information gathered by the parent node provisioning or scheduling decision is made.

d) Place illustrations (figures, tables, drawings, and photographs) throughout the paper at the places where they are first discussed in the text, rather than at the end of the paper. Number illustrations sequentially (but number tables separately). Place the illustration numbers and caption under the illustration in 10 pt font. Do not allow illustrations to extend into the margins or the gap between columns (except 2-column illustrations may cross the gap). If your figure has two parts, include the labels “(a)” and “(b)”.

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4. Results

When the number of request will be entered, the simulation will start and step by step, the output will be shown that how the load is balancing. Starting from request 1, it will analyze the server load and as the second request received, on the particular time, the load on all servers will be calculated and then, the best server will be selected for serve the request.

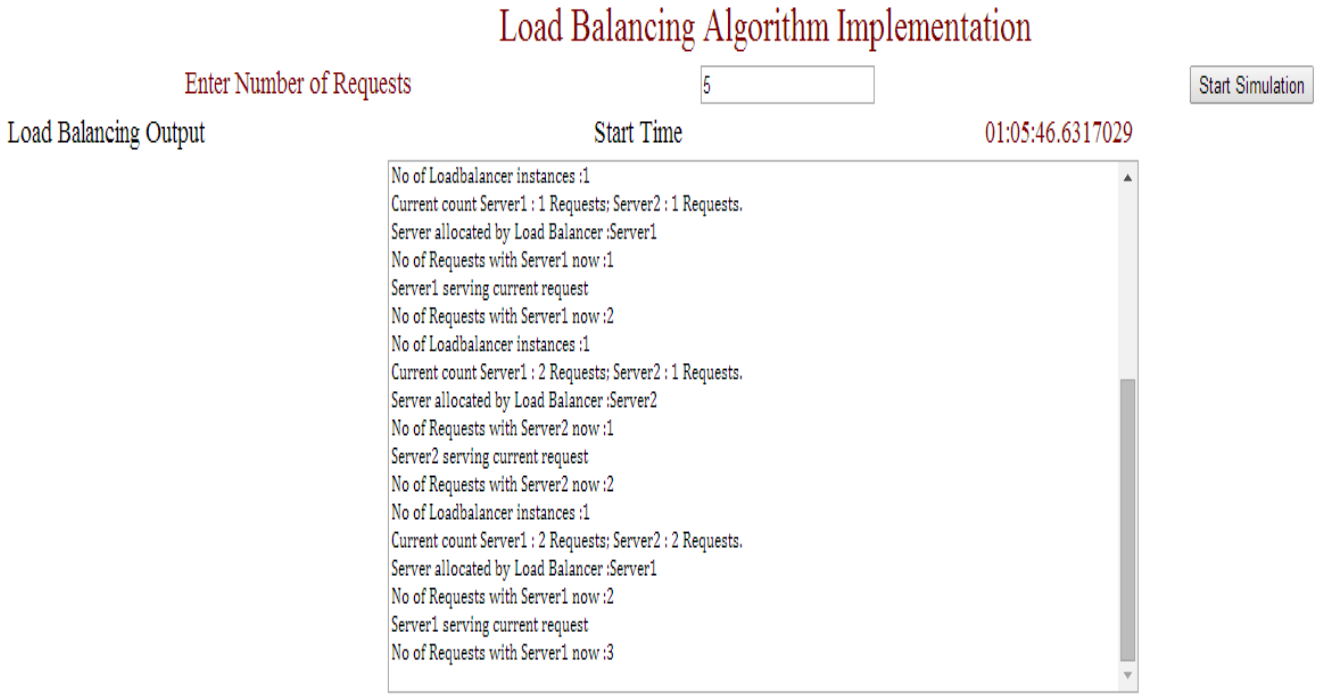

Figure 4: Server Load Balancing

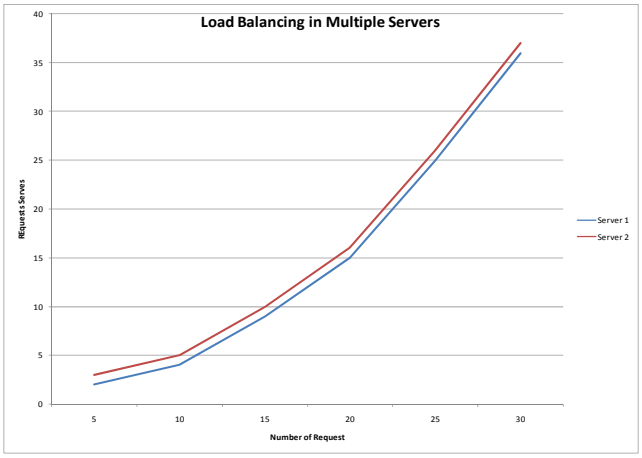

Figure 5: Load Balancing in Multiple servers

The graph shows that the number of request is 5 and server 1 is handling the 2 requests and server2 has been assigned the 3 request.

5. Conclusion and Future Scope

The load balancing algorithm has been implemented in this paper. The server implies that the virtual machine or virtual server which will serve and process the requests to the users. The multiple requests will be generated and processed in queue. The load balancer will identify the load on each server. If the server's resources are free, then the request will be allocate to the particular server. The prime condition is that the request should be concurrent because the load balancing aim is to balance the load on particular condition otherwise this will handle the request without considering the other pending request. On every request, the arrival time will be as input to the round robin algorithm which will manage the request as per the time and arrange in particular order. having minimum response time to the data center controller for allocation to the new request. This has been conclude that if the algorithm selects an efficient virtual machine then it affects the overall performance of the cloud Environment and also decreases the average response time.

In future, the algorithm complexity can be reduced means the time taken by algorithm to compute the order of requests on virtual servers and cloud computing environment. The multiple algorithms can be consider for handle the requests and grid computing algorithm for manage the resources efficiently and overall performance will be effected by the new algorithms and will provide the better response time and high availability of resources.

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