Load Balancing Schemes in Cloud Environment

[1]Minerva Gupta, [2]Deepti Malhotra
[1]Research Scholar, [2]Assistant Professor
[1]Department of CS/IT, Central university of Jammu
[2]Department of CS/IT, Central university of Jammu
[1]guptaminerva@gmail.com, [2]deepti433@yahoo.com

ABSTRACT

Cloud computing is a generic term, it is the method of employing a network of faraway servers hosted on the Internet to accumulate, administer, and alter data, instead on a personal computer. It facilitates companies to incorporate a computing resource, such as a virtual machine, storage or an application, as a service, rather than framing and managing computing infrastructures in house. The distributive nature of cloud computing makes the resources distributively available for delivering the services to cloud consumers. Load Balancing is one of the essential characteristics of cloud computing environment. In case of cloud environment Load balancing balances the process of assigning workloads across numerous computing resources. It is the process that allot a larger load to smaller nodes in order to get the work done in more efficient way and it's also enhances the overall performance of the system. It allots the dynamic local workload evenly between all the nodes. It results in the proper resource utilization, minimizing resource consumption, maximal throughput with minimal response time, scalability which in turn provides high user satisfaction. It helps in implementing fail over, and avoiding bottlenecks. In this research paper different load balancing strategies in the cloud environment are compared. The research paper also analyzed and discussed the behavior of distinct load balancing schemes on the basis of certain parameters.
Keywords: cloud computing; load balancing; load balancing algorithms; types of load balancing.

INTRODUCTION

Cloud computing characterize the action of accumulating, administering along with altering data online rather than on your own physical computer or network. Cloud Computing allows the accessing of applications as utilities over the Internet, it allows the manipulation and configuration of applications at any time over Internet, one does not require any installation of software to access cloud applications.

Cloud Computing offers load balancing that makes it more reliable. Cloud load balancing is a process of allotment of workloads across multiple computing resources. Two major tasks that load balancing must ensure are resource allotment and other is task organizing in discrete environment. The productive arrangement of resources and organizing of resources and tasks will in turn make the resources easily available on demand and will make the resources effectively utilized.[12,2]

The organization of the paper is presented as:Section 2 comprises of different load balancing algorithms. Section 3 outlines the comparison of these algorithms on the basis of types of load balancing. Section 4 comprises of some important terms used in the paper. Finally conclusions are given in Section 5.

EXISTNG LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING

There are discrete Load Balancing Algorithms which are jointly interpreted and co-related on the ground of type of load balancing in cloud environment: Some of the frequently accepted Load Balancing Algorithms are:

A. Round robin:

Round robin scheduling technique uses the principle of time slices, where every node is provided with the particular time slices or instance interval. It works on arbitrary selection of the VMs; here VM which is selected arbitrarily from the group will be assigned with the first request after which the data Centre controller will be requested in a round manner. After the request is authorized to the VM, the VM is then proceeds to the deadline of the list. [8,9]

B. Ant Colony Optimization Algorithm:

The food searching behavior of real ants is used in ACO. It is a random optimization technique. To find the best path to the source the pheromone concentration is used, more the deposition of pheromone more the positive feedback effect. The pheromone value is updated so that more ants follow that path.There are two types of pheromones which are used in ACO:Foraging Pheromone (FP): Which is used for movement towards overburdened node.Trailing Pheromone (TP): Which is used for tracing under loaded nodes.Overhead, stagnation pheromones are its disadvantages and this algorithm converges to local optimal solution. [1,3]

C. Genetic Algorithm:

Genetic Algorithm uses the mechanism of natural selection approach. It solves NP-Complete problems. The Simple GA approach comprises of: Population- The set of achievable results for scheduled problem. Chromosome- It is the individuals in the population. Gene- The variable in a chromosome. Fitness Function- The objective function which is used to figure out how conviently the solution is attaining the desired ambition .The GA emerges through three operators:-Selection- solutions with best capability are preferred. Crossover- for formation of Child, more than one parent is preferred [6]

D. MaxMin:

The working of max-min algorithm comprises of two stages: Firstly, on all the machines the expected exertion time and finished time for all the tasks will be determined. Secondly, the resource with minimum exertion time will be assigned with the task having the maximal

expected finished time. This task is then evacuated from the task-set and process is imitated until the task-set is empty. [5,7]

E. MinMin:

Min-Min algorithm provides the improved performance. This algorithm also works in two phases: Firstly, on all the machines the expected exertion time and finished time for all the tasks will be determined. Secondly, the resource with minimum exertion time will be assigned with the task having the minimum expected finished time. This task is then evacuated from the task-set and process is imitated until the task-set is empty. [7]

COMPARISON OF LOAD BALANCING ALGORITHMS IN CLOUD COMPUTING ENVIRONMENT

In this paper the different existing load balancing algorithms are correlated on the basis of types of load balancing in cloud computing environment.

Type of algorithm	**Load Balancing Algorithms**				
	Round -robin	Ant Colony	MaxMin	MinMin	Genetic Algorithm
Static Environment	Yes	No	Yes	Yes	No
Dynamic Environment	No	Yes	No	No	Yes
Centralized Balancing	Yes	No	Yes	Yes	Yes
Distributed Balancing	No	Yes	No	No	No
Hierarchical Balancing	No	No	No	No	No

TABLE- 1 COMPARISON ON THE BASIS OF TYPES OF ALGORITHMS

IMPORTANT TERMS USED IN THE PAPER:

The important terms used in this paper are discussed as under:

A. Static Environment:

In static environment the cloud provider installs alike resources. In the static environment the resources available in the cloud are not adjustable. As the name suggests static environment in the cloud will not allow any changes at run time, and the Algorithms which are recommended to accomplish load balancing in static environment will not be able to fit any changes at the run time.[4,8]

B. Dynamic Environment:

In dynamic environment the cloud provider installs composite resources. Unlike, Static Environment, here the resources are adjustable. Here is no requirement of preceding knowledge whereas it takes run-time statistics into consideration. As the name suggests dynamic environment in the cloud will allow any changes at run time, and the Algorithms

which are recommended to accomplish load balancing in Dynamic environment will be able to fit any changes at the run time. Dynamic environment is most suited in the cloud computing environment. [4,10].

C. Centralized Balancing:

In centralized load balancing technique a single node is subjected for all the allotment and organizing decision. . This technique can administer either static or dynamic approach for load balancing. This technique curtail the time required to evaluate distinct cloud resources but builds a vast overhead on the centralized node. The centralized balancing make the network more prone to faults, the failure concentration of the overburdened centralized node is immense and makes the improvement difficult in case of node failure.

D. Distributed Balancing:

Unlike centralized load balancing technique, here no single node is subjected for allotment and organizing decision. Here multiple domains are responsible for monitoring the cloud network to make authentic load balancing decision. In order to ensure skillful allotment of tasks in static environment and re-shuffle in dynamic environment all the nodes in the network maintains local knowledge base.[4]

E. Hierarchical Balancing:

The Hierarchical load balancing operates in master slave mode. These can be shaped adopting tree data structure where every node in the tree is balanced. The parent node is responsible for making the organizing decision.

CONCLUSION

One of an important characteristics of cloud computing environment is Load balancing , in order to utilize the resources to maximal extent. In this paper, various load balancing schemes are discussed with their, advantages and disadvantages. The static load balancing algorithm can be easily replicated but it cannot be used in composite nature of cloud whereas, dynamic load balancing algorithm are difficult to replicate but are used in composite environment of cloud computing. Centralized algorithm provides low fault tolerance whereas, Distributed Balancing algorithm provides better fault tolerance and alternatively, hierarchical algorithm distributes the load at distinct levels of ranking. Hence, dynamic load balancing techniques in dispersed environment provide superior performance.

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