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Review of Various Load Distribution Methods for Cloud Computing, to Improve Cloud Performance

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Abstract :- Cloud computing in an improve form for grid computing, cluster computing and distributed computing. Cloud computing provides sharing of computing resources such as platform, software, infrastructure and data over the network, on pay and use basis. Cloud computing provides service PaaS, IaaS and SaaS to various cloud users, by supporting various cloud models private, public, community and hybrid. Cloud computing reduces overall cost and efforts. Day by day numbers of cloud user are increasing rapidly. Higher number of cloud users are requires high computing resources on time, which creates a big challenge for cloud service providers so serve computing resources on time. Various cloud researchers are working on improvement on cloud performance by correct load distribution among cloud user request and computing resources. In this survey paper we are presenting a comparative study of various load distribution method for cloud computing.

Keywords : Cloud Computing ,Load Balancing ,Grid Computing ,Cloud Services

I. INTRODUCTION

Cloud computing is a new area of computing. The latest vision of large distributed computing is "Cloud". The term "cloud" originates from the world of telecommunications when providers began using virtual private network (VPN) services for data communications.

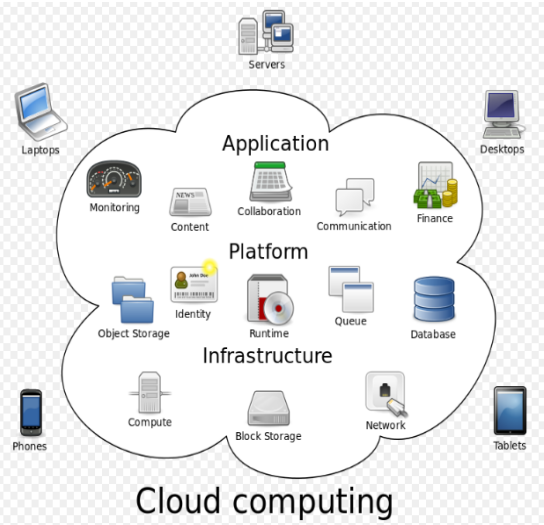

Figure 1 Cloud computing [4]

Cloud computing is an on demand service in which shared resources, information, software and other devices are provided according to the client's requirement at specific time. Cloud computing is internet based computing, whereby shared resources, software and information are provided to computers and other devices on-demand, like a public utility.

II. LITERATURE REVIEW

Sidra Aslam et al [1] worked on survey on various Load Balancing Algorithms in Cloud Computing and suggested various merits and demerits of load balancing algorithms also present a comparative study between various methods. The process in which the load is divided among several nodes of distributed system is called load balancing in cloud computing. Load balancing assists the cloud computing through algorithms. Lots of work has been done to balance the load in order to improve performance and avoid over utilization of resources.

Geethu Gopinath and Shriram K Vasudevan[2] worked on "process of load balancing in cloud computing using genetic algorithm". In this paper, author focused on various load balancing algorithms, the topic of load balancing in Cloud Computing are researched and compared to provide a gist of the latest way in this research area. By using Genetic Algorithm the balance is most flexible which is represented here. D. Zhang et al. [4] proposed a binary tree structure that is used to partition the simulation region into sub-domains. The characteristics of this fast adaptive balancing method are to be adjusted the workload between the processors from local areas to global areas. According to the difference of workload, the arrangements of the cells are

obtained. But the main workload concentrates on certain cells so that the procedure of adjusting the vertices of the grid can be very long because of the local workload can be considered. This problem can be avoided by the fast load balancing adaptive method.

Dhinesh et al. [3] proposed an algorithm named honeybee behavior inspired load balancing algorithm. Here in this session well load balance across the virtual machines for maximizing the throughput. The load balancing cloud computing can be achieved by modeling the foraging behavior of honey bees. This algorithm is derived from the behavior of honey bees that uses the method to find and reap food. In bee hives, there is a class of bees called the scout bees and the another type was forager bees .The scout bee which forage for food sources, when they find the food, they come back to the beehive to advertise this news by using a dance called waggle/tremble/vibration dance.

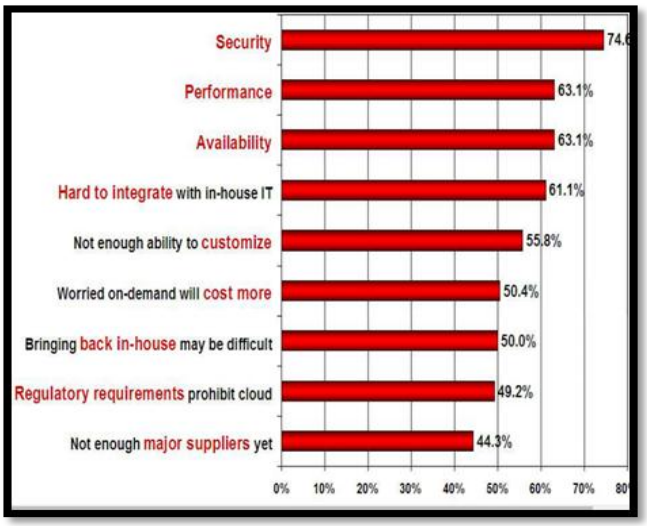

Figure 2 Challenge issues in cloud [15]

Suriya Begum et.al.[8] proposed a Mathematical model exclusively considering virtual machine for performing load balancing. The system jointly addresses the routing as well as task scheduling and also focuses on the issues pertaining to resource allocation. A novel mathematical model considering stochastic model for load balancing and scheduling in cloud computing clusters has been developed. A cloud system consists of a number of networked servers. Each of the servers may host multiple Virtual Machines. B.Bhaskar [10] has developed a novel Round Robin Algorithm for load balancing in cloud computing. Here, skewness measurement technique introduced along with load balancing using Round Robin Algorithm, in order to provide enhanced performance which results in Green Computing. Skewness concept is used to measure the utilization rate of a node. Cloud partitioning is the process of dividing a huge public cloud into sub partitions. Each cloud partition contains some number of nodes; one node might be working for a long time while other nodes are sitting idle. Despite a node being utilized for a long time the cloud partition status will be showing normal.

lll. LOAD BALANCING IN CLOUD

Load balancing is one of the main issues related to cloud computing. The load can be a memory, CPU capacity, network or delay load. It is always required to share work load among the various nodes of the distributed system to improve the resource utilization and for better performance of the system. This can help to avoid the situation where nodes are either heavily loaded or under loaded in the network. Load balancing is the process of ensuring the evenly distribution of work load on the pool of system node or processor so that without disturbing, the running task is completed. The goals of load balancing [6] are to:

- ✓ Improve the performance
- ✓ Maintain system stability
- ✓ Build fault tolerance system
- ✓ Accommodate future modification.
- ✓ Resources are easily available on demand.
- ✓ Resources are efficiently utilized under condition of high/low load.
- ✓ Energy is saved in case of low load (i.e. when usage of cloud resources is below certain threshold).
- ✓ Cost of using resources is reduced.

There are mainly two types of load balancing algorithms-

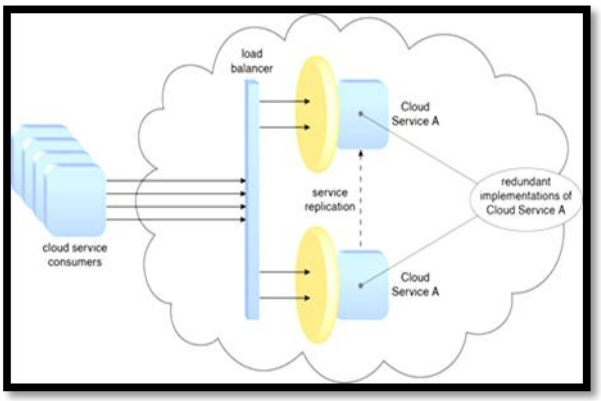

Figure 3: Load Balancing

3.1 Static Algorithm -

In static algorithm the traffic is divided evenly among the servers. This algorithm requires a prior knowledge of system resources, so that the decision of shifting of the load does not depend on the current state of system. Static

algorithm is proper in the system which has low variation in load.

3.2 Dynamic Algorithm -

In dynamic algorithm the lightest server in the whole network or system is searched and preferred for balancing a load. For this real time communication with network is needed which can increase the traffic in the system. Here current state of the system is used to make decisions to manage the load [5].

3.3 Load Balancing based on Spatial Distribution of Nodes-

Nodes in the cloud are highly distributed [4]. 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 [16, 17].

3.3.1. 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 [9]. 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 [6,7].

3.3.2. Distributed Load Balancing-

In distributed load balancing technique, no single node is responsible for making resource provisioning or task scheduling decision [11]. 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.

3.3.3 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 [13]. 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.

IV. COMPARISON OF VARIOUS LOAD BALANCING METHODS

Figure 4 shows comparisons of various cloud load balancing methods based on various parameters such as static environment, dynamic environment and based on spatial distribution of loads such as centralized load balancing, distributed load balancing and hierarchal load balancing.

Algorithm	*Static Environment*	*Dynamic Environment*	*Centralized Balancing*	*Distributed Balancing*	*Hierarchical Balancing*
Round-robin	Yes	No	Yes	No	No
CLBDM[22]	Yes	No	Yes	No	No
Ant Colony[20]	No	Yes	No	Yes	No
Map Reduce[9]	Yes	No	No	Yes	Yes
Particle Swarm Optimization [21]	No	Yes	No	Yes	No
MaxMin[22]	Yes	No	Yes	No	No
MinMin[22]	Yes	No	Yes	No	No
Biased Random Sampling	No	Yes	No	Yes	No
Active Clustering[18]	No	Yes	No	Yes	No
LBMM	No	Yes	No	No	Yes
OLB[23]	Yes	No	Yes	No	No
WLC	No	Yes	Yes	No	No
ESWLC	No	Yes	Yes	No	No
Genetic Algorithm[24]	No	Yes	Yes	No	No

Figure 4 Comparison of various LOAD BALANCING Methods

V. CONCLUSION AND FUTURE WORK

Load balancing methods are required to distribute the total workload evenly across all nodes to achieve high performance; with minimum overheads. With proper load balancing waiting time can be kept to a minimum which will further maximize the response time. In this research paper, comparison of different load balancing algorithms is carried out on the basis of certain parameters. The above comparison shows that static load balancing algorithms are more stable than dynamic algorithms but due to capability of performing accurate in distributed systems, dynamic load balancing is chosen over static load balancing algorithms.

In future this analysis further can also help in designing new load balancing algorithms. In future wore we will developed in efficient load balancing method for cloud computing, which helps to increase the cloud performance. To check the validation of proposed method we will compare existing methods such as round robin, honey beee, ant colony, PSO, ESWLC with proposed method, based on various parameters such as waiting time, turnaround time, load balancing time.

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