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An Approach for Managing Different Applications Using Centralized Load Balancer in Cloud

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Abstract- **The data centers and end users are distributed across the globe in a large cloud environment. It is a tiresome situation for cloud data centers to serve huge requests coming from these end users. As a consequence, load balancing mechanism is used to distribute the loads efficiently and effectively among different nodes. To achieve high user contentment and high resource employment ratio, load balancers are used. In this paper we have used a "central load balancer" to balance the loads among different virtual machines in cloud data centers.**

Keyterms: **load balancing,cloud data center, cloud analyst, virtualization ,Quality of service(QoS);**

I. INTRODUCTION

Cloud computing enables companies to consume compute resources as a utility - just like electricity -rather than having to build and maintain computing infrastructures in-house. Several attractive benefits are promised in cloud computing for both businesses and end users. Three main profits of cloud computing includes:

- Self-service provisioning: End users can spin up computing resources for almost any type of Workload.
- On-demand. Elasticity: Companies can scale up as computing needs increase and then scale down again as demands reduce.
- Pay per use: Computing resources are measured at a coarse level, allowing users to pay only for the resources and workloads they use. The services

- offer by cloud computing are infrastructure as a service (IaaS) [1], platform as a service (PaaS) and software as a service (SaaS) that are made available to clients as pay-as-you-go model. Cloud Computing Deployment Model refers to the location and management of the infrastructure cloud services.There are different ways of using Deployment Model in cloud computing, and they are called Private Cloud, Community cloud, Public cloud and Hybrid cloud.Private cloud services are distributed from a business data center to internal users. This model offers malleability and ease, while preserving management, control and security. Internal customers may or may not be billed for services through IT chargeback. In the public cloud model, a third-party provider delivers the cloud service over the Internet. Public cloud services are sold on-demand, typically in the minute or the hour. Customers only need to pay for CPU cycles, storage or bandwidth they use. Leading public cloud providers include Amazon Web Services (AWS), Microsoft Azure, IBM/Soft Layer and Google Compute Engine. Hybrid cloud is a combination of public cloud services and on-premises private cloud – with interpretation and automation between the two.

In this modern technology world cloud computing is gaining its confidence and popularity among users and corporate world but despite of development and evolve of cloud technology, many critical problems still need to be solved for the realization of cloud computing. Load balancing is one of them; it plays a very important role to make the Cloud Computing technology to grow at faster rate. Actually meaning of load balancing is the ability to distribute the load over a number of separate systems therefore the overall performance of processing the incoming requests increased. There are four major resources processor (CPU), memory (RAM), network and storage (Disk). In long-established computing environments, researchers have proposed various static, dynamic and mixed load balancing policies. Static load balancing algorithm [2] assign load to machines according to their processing capability but do not consider dynamic changes of these attributes at run-time. Commonly used static algorithms are Round Robin (RR) & Weighted Round Robin (WRR) are some of the examples of static load balancing. Dynamic load balancing algorithm collects information at run times conditions of machines and according to gathered characteristics assign and dynamically reassign the load among machines. Least connection (LC) and weighted least connection (WLC) are dynamic load balancing algorithms commonly used.

In the cloud computing environment, load balancing is required to achieve short response time and high system throughput. For cloud environment various load balancing approaches have been proposed such as Honeybee-based load balancing technique , Active Clustering , Random sampling , Active Monitoring Load Balancer , Throttled Load Balancer, WCAP, JIQ, CLBVM etc.

The rest of this paper is organized as follows: Section II Offers related ideas for load balancing. Section III Bring in, the proposed approach for load balancing in cloud environment. Section IV includes the proposed method. Followed by Section V Conclusion.

II. RELATED IDEAS

Various load balancing algorithm have been proposed for cloud computing to provide efficient distribution of load among available machines. A number of techniques proposed for load balancing are based on live virtual machine migration.

A.Shrawankar et al.

CloudComputing is growing rapidly and clients are demanding more services and better flexibility.For providing user demands, cloud computing require effective load balancing techniques in computing nvironment.Load Balancing is essential for efficient operations in distributed environments and it has become a very interesting and importantresearch area. Many algorithms are used to provide variousapproaches and algorithms for assigning the client's requests to available cloud nodes. These algorithms are used to enhance the overall performance of the cloud environment and provide users the more efficient services. In this paper, the different algorithms are studied which are used for resolving the issue of load balancing and task scheduling in Cloud Computing and also discussed pros and cons of the algorithms to provide an overview of the latest approaches in the field[1].

B. ***Nahid, Azizi et al.***

Clouds are high configured infrastructure delivers platform, software as service, which helps customers to make subscription for their requirements under the pay as you go model. Cloud computing is spreading globally, due to its easy and simple service oriented model. The numbers of users accessing the cloud are rising day by day. Generally cloud is based on data centers which are powerful to handle large number of users. The reliability of clouds depends on the way it handles the loads, to overcome such problem clouds must be featured with the load balancing mechanism. The goal of balancing the load of virtual machines is to reduce energy consumption and provide maximum resource utilization thereby reducing the number of job rejections. This paper is a brief discussion on the existing load balancing techniques in cloud computing and further compares them based on various parameters like response time and Data processing time etc. The results discussed in this paper, based on existing Round Robin and Throttled scheduling algorithms[2].

author investigates the different algorithms proposed to resolve the issue of load balancing and task scheduling in Cloud Computing. The discussion is followed by comparing these algorithms to provide an overview of the latest approaches in the field [7].

H.***Chronopoulos et al.***

Load balancing is one of the central issues and challenges in cloud computing environments. In cloud computing environments, the system should avoid wasting resources as a result of under-utilization and avoid lengthy response times as a result of over-utilization. In this paper, the author propose a new load balancing method, named Cloud Light Weight (CLW), which not only balances the Virtual Machines'(VM) workload in cloud computing datacenters, but it also assures QoS for users. It reduces both the number of VM migration processes and the migration time during applications execution .The authors validated their algorithm using the Cloud Sim cloud system simulator[8].

I. ***Jain et al.***

The conception of Cloud computing has radically changed the field of distributed computing systems today. Cloud computing enables a wide range of users to access distributed, scalable, virtualized hardware and/or software infrastructure over the Internet. Load balancing is one of the appealing and major research topics in cloud computing, which has increase a large attention recently. This paper is based on dynamic load management for a cloud environment will give a basic over view on load balancing, static load balancing, and dynamic load management functionality for the cloud environment. This paper describes a comparative analysis on load balancing system in cloud environments. There were various load balancing techniques are used in these papers and their corresponding advantages, disadvantages and performance metrics are discussed in paper[9].

J.***Liuet al; Panet al; Wang et al;Xie et al***

Load balancing device is an important part of cloud platform. One of the most common applications of load balancing is to provide a single powerful virtual machine from multiple servers. In multi-core environment, the load balancing device can run multiple physically parallel load-

balancing processes to increase overall performance. An important issue when operating a load-balanced service is how to send all requests in a user's session consistently to the same backend server ,i.e. session maintaining. Most of multiprocessing load balancing solutions use shared memory and lock when manage session. By modifying Linux kernel, they avoid using shared memory and implement a lock-free multiprocessing load balancing solution[10].

K.***Katiyar et al.***
Cloud Computing is one of the latest computing paradigms in IT sector today where applications, platforms, software and some other IT services are provided over the internet. It is also known as On Demand Computing. Cloud Computing considers shared pool of configurable computing resources which requires proper resource distribution among the tasks, otherwise in some situations resources may over - utilized or underutilized. For the sake of efficient resource utilization, Load Balancing System problem needs more attention in cloud computing. This method used Agent Based Dynamic Load Balancing (ABDLB) approach in which mobile agent plays very important role, which is a software entity and usually defined as an independent software program that runs on behalf of a network administrator. It has ability to learn. After comparing the proposed method with traditional load balancing scheme the conclusion from this work is that Agent Base load balancing scheme greatly reduces the communication cost of servers, accelerates the rate of load balancing which indirectly improves the Throughput and Response Time of the cloud[11].

L.***Zhen Liu et al.***
In cloud computing, the system should avoid wasting resources as a result of under-utilization and avoid lengthy response times as a result of over-utilization. Recent research has focused on the globally optimal solution in virtualized data centers. However, the globally optimal solution
makes a lot of unnecessary migrations and cannot work in a large-scale cloud computing environment. In this paper, a new model for distributed load balancing allocation of virtual machine in cloud data center using the TOPSIS method is proposed. Results show that the system can achieve better load balancing in a large-scale cloud computing environment with less VM migration[12].

M. ***Reddy et al.***
Load balancing is the major concern in the cloud computing environment. Cloud comprises of many hardware and software resources and managing these will play an important role in executing a client's request. Now a day's clients from different parts of the world are demanding for the various services in a rapid rate. In this present situation the load balancing algorithms built should be very efficient in allocating the request and also ensuring the usage of the resources in an intelligent way so that underutilization of the resources will not occur in the cloud environment. In the present work, a novel VM-assign load balance algorithm is proposed which allocates the incoming requests to the all available virtual machines in an efficient manner. Further, the performance is analyzed using Cloud Sim simulator and compared with existing Active- VM load balance algorithm Simulation results demonstrate that the proposed algorithm distributes the load on all available virtual machines without under/over utilization[13].

N.***Obaidat et al.***
Workload and resource management are two essential functions provided at the service level of the distributed systems infrastructure. To improve the global throughput of these software environments, workloads have to be evenly scheduled among the available resources. To realize this goal, several load balancing strategies and algorithms have been proposed. Most of these strategies were developed assuming homogeneous set of sites linked with homogeneous and fast networks. However, for computational grids, some of the new issues, namely: heterogeneity, scalability and adaptability. In this paper, a decentralized cluster-based algorithm which achieves dynamic load balancing in the cloud architecture is discussed. The proposed algorithm presents the following main features: (i) it supports heterogeneity, (ii) scalability, (iii) low network congestion and (iv)absence of any bottleneck node due to its decentralized nature. Simulation results using Cloud Sim show the performance analysis of the algorithm for patronizing the claims about the load balancing achieved in the system[14].

O.***Anil Kumar et al.***
Internet is a great marvel of science. Internet has changed the face of world. It is most essential and revolutionary creation in this world. Cloud computing is associated with internet computing. Cloud computing has undoubtedly benefited both service provider and clients in great extent .There is rapid increase in cloud's customers constantly. Although, the cloud data centers comprised of tremendous power but due to expeditious requests of users there is sudden need of balancing load .However, load balancing emerged as the conspicuous issue in the cloud heterogeneous environment. This study highlights the performance analysis of load balancing policies which are taken in a combination with service broker policy. In Fact, this study addresses that there can be reduction in response

time and data center request processing time by using efficient load balancing policies. These all evaluations and results are carried out using cloud analyst simulation tool[15].

III.

PROPOSED APPROACH FOR LOAD BALANCING

The proposed load balancing algorithm "Centralized Load Balancer" will balance the load among virtual machines having different hardware configurations and will distribute the load based on hardware configuration and states of virtual machines in data centre as show in figure 1. The proposed technique will be able to perform quick and reliable load balancing in cloud computing environment through utilization of all virtual machines according to their computing capacities.

In the proposed technique, every request from user bases arrives at Central Data Controller. Central Data Controller queries the Centralized Load Balancer for allocation of requests. Centralized Load Balancer maintains a table that consist of id, states and priority of virtual machines. Centralized Load balancer parses the table and find out highest priority virtual machine, then check its states and if its states available then return that virtual machine id (VMid) to Central Data Controller. If the states of virtual machine is Busy then it chooses next less high priority virtual machine. Finally Central Data Controller assigns the request to that VM id that is provided by Centralized Load Balancer (CLB).The Centralized Load Balancer (CLB) is connected to all users and virtual machines present in cloud data centre through central Data Controller as shown in Figure 1. The Centralized Load Balancer calculates the priorities of virtual machines based on their CPU speed (MIPS).

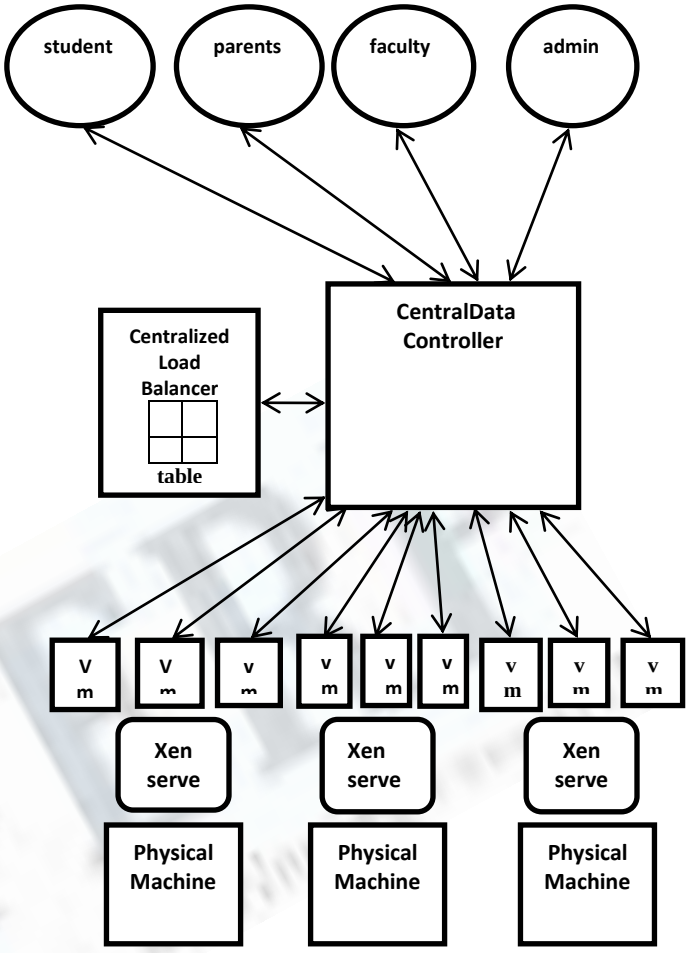

Figure 1: Load Balancing Approach

The proposed algorithm is shown in above page .The description of proposed algorithm is as shown in figure 2:

1. Centralized Load Balancer maintains a table that contains virtual machine id (VMid), states (BUSY/AVAILABLE) and priority of VMs. Initially, all Virtual Machines are in available state.
2. Central data Controller receives a new request.
3. Central Data Controller queries the Centralized Load Balancer for next allocation.
4. Centralized Load Balancer parses the table from top to find the highest priority virtual machine and the state of that virtual machine's is available.

If found:

THE CENTRALIZED LOAD BALANCER RETURNS THE

VMid to the Data Center Controller.

THE CENTRAL DATA CONTROLLER SENDS THE

request to the VM identified by that VMid.

CENTRAL DATA CONTROLLER NOTIFIES THE CENTRAL

Load Balancer of new allocation.

CENTRALIZED LOAD BALANCER UPDATES THE TABLE

accordingly. If not found:

e) The Centralized Load Balancer returns -1.

f) The Central Data Controller queues the request.

5. When the VM finishes processing of requests, and the Central Data Controller receives the response cloudlet, it notifies the Central Load Balancer of the VM de-allocation.

6. The Central Data Controller checks if there are any waiting requests in the queue. If there are, it continues from step 3.

7. Continue from step 2.

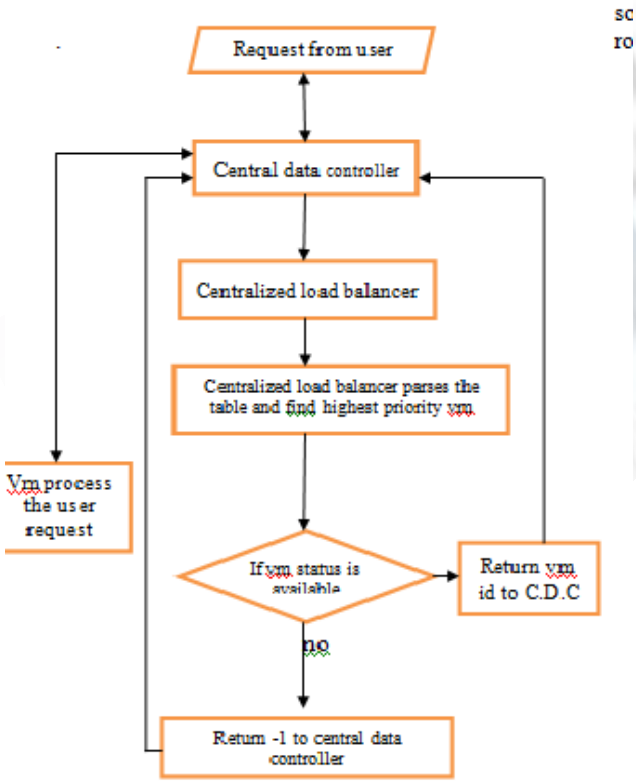

Figure 2: Flow diagram of the proposed system

Figure 2: Flow diagram of the proposed system

IV CONCLUSION AND FUTURE WORK

In proposed Centralized Load Balancer (CLB) technique, we tried to avoid the situation of over loading and under loading of virtual machines. The Centralized Load Balancer (CLB) manages load distribution among various virtual machines and assigns load corresponding to their priority and states. In this way this technique efficiently shares the load of user requests among various virtual machines.

The future work is to develop a load balancing algorithm that will have an alternate system if the centralized load balancer itself goes down the load so that whole system will be more dynamic and robust.

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