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Optimization of Dynamic Load Balancing in Cloud Computing

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***Abstract**: Load balancing is essential for optimization of resources in distributed environments. The major goal of the cloud computing service providers is to use cloud computing resources efficiently to enhance the overall performance. Load balancing in cloud computing environment is a methodology to distribute workload across multiple computers to achieve optimal resource utilization with minimum response time. The proposed system pave the way for the green computing by dynamically allocating the virtual machine based on the load its processing for the optimization of number of servers in use. To balance the load of entire data center, we need to transfer the virtual machines of the overloaded host to the light weighted host using migration techniques .The performance of the algorithm is analyzed using Cloudsim simulator .The simulation result ensures that all the processors in the system as well as in the network does approximately equal amount of work at any instant of time by comparing with other algorithms by its spoofing abilities.*

***Keywords:** Virtual Machine, Cloud sim, load balancing.*

1. INTRODUCTION

Cloud computing is a comprehensive solution that delivers IT as a service. It is an Internet-based computing solution where shared resources are provided like electricity distributed on the electrical grid. Computers in the cloud are configured to work together and the various applications use the collective computing power as if they are running on a single system. The flexibility of cloud computing is a function of the allocation of resources on demand. This facilitates the use of the system's cumulative resources, negating the need to assign specific hardware to a task. Before cloud computing, websites and server-based applications were executed on a specific system. With the advent of cloud computing, resources are used as an aggregated virtual computer. This amalgamated configuration provides an environment where applications execute independently without regard for any particular configuration.

2. NEED OF CLOUD COMPUTING

There are valid and significant business and IT reasons for the cloud computing paradigm shift. The fundamentals of outsourcing as a solution apply.

- **Reduced cost:** Cloud computing can reduce both capital expense and operating expense costs because resources are only acquired when needed and are only paid for when used.
- **Refined usage of personnel:** Using cloud computing frees valuable personnel allowing them to focus on delivering value rather than maintaining hardware and software.
- **Robust scalability:** Cloud computing allows for immediate scaling, either up or down, at any time without long-term commitment.

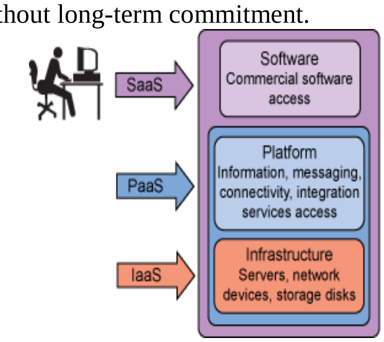

Figure 1: Layers in cloud

The cloud computing model is comprised of a **front end** and a **back end**. These two elements are connected through a network, in most cases the Internet. The front end is the vehicle by which the user interacts with the system; the back end is the cloud itself. The front end is composed of a client computer, or the computer network of an enterprise,

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and the applications used to access the cloud. The back end provides the applications, computers, servers, and data storage that creates the cloud of services. The cloud concept is built on **layers**, each providing a distinct level of functionality. This stratification of the cloud's components has provided a means for the layers of cloud computing to becoming a commodity just like electricity, telephone service, or natural gas. The commodity that cloud computing sells is computing power at a lower cost and expense to the user. Cloud computing is poised to become the next mega-utility service.

3. VIRTUALIZATION

Data centers consist of both physical and virtualized IT resources. The physical IT resource layer refers to the facility infrastructure that houses computing/networking systems and equipment, together with hardware systems and their operating systems (Figure 1). The resource abstraction and control of the virtualization layer is comprised of operational and management tools that are often based on virtualization platforms that abstract the physical computing and networking IT resources as virtualized components that are easier to allocate, operate, release, monitor, and control. A load balancer provides the means by which instances of applications can be provisioned and de-provisioned automatically, without requiring changes to the network or its configuration. It automatically handles the increases and decreases in capacity and adapts its distribution decisions based on the capacity available at the time a request is made.

Because the end-user is always directed to a virtual server, or IP address, on the load balancer the increase or decrease of capacity provided by the provisioning and de-provisioning of application instances is non-disruptive.

4. NEED OF LOAD BALANCING

With A load balancer provides the means by which instances of applications can be provisioned and de-provisioned automatically, without requiring changes to the network or its configuration. It automatically handles the increases and decreases in capacity and adapts its distribution decisions based on the capacity available at the time a request is made.

Because the end-user is always directed to a virtual server, or IP address, on the load balancer the increase or decrease of capacity provided by the provisioning and de-provisioning of application instances is non-disruptive. As is required by even the most basic of cloud computing definitions, the end user is abstracted by the load balancer from the actual implementation and needs not care about the actual implementation. The load balancer makes one, two, or two-hundred resources - whether physical or virtual - appear to be one resource; this decouples the user from the physical implementation of the application and allows the internal implementation to grow, to shrink, and to change without any obvious affect on the user.

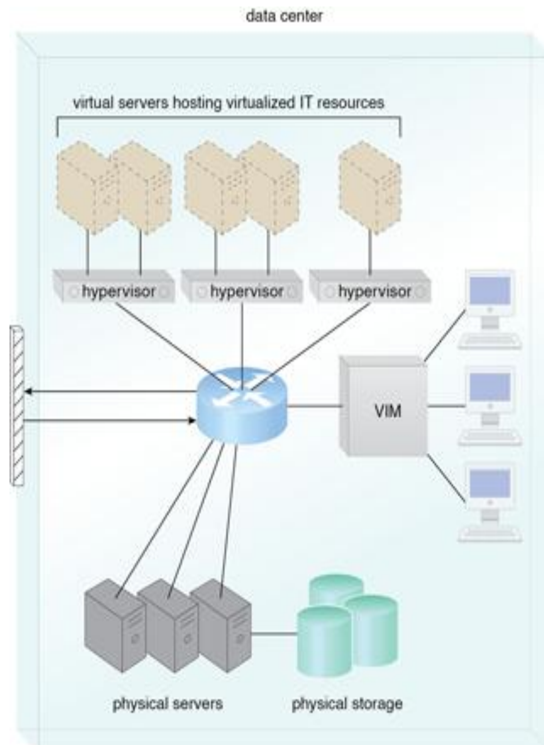

Figure 2: Virtualization

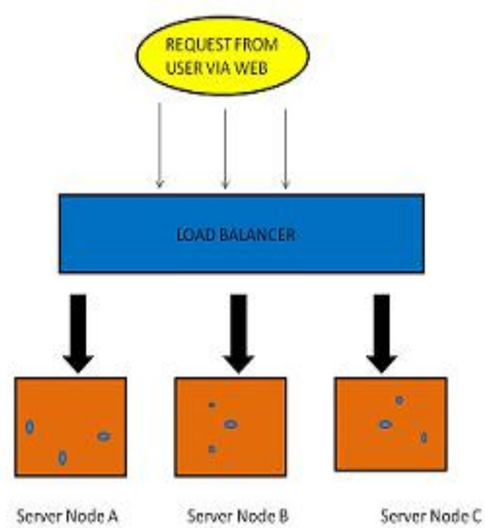

Figure 3: Load balancing

4.1 DYNAMIC LOAD BALANCING

Dynamic load balancing is a major key for a successful implementation of cloud environments.

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The main goal of a cloud-based architecture is to provide elasticity, the ability to expand and contract capacity on-demand. Sometimes additional instances of an application will be required in order for the architecture to scale and meet demand. That means there is a need for a mechanism to balance requests between two or more instances of that application. The mechanism most likely to be successful in performing such a task is a load balancer[3]. There's no other way to assume increased load other than adding new instances and distributing that load with software or hardware Similarly, when the additional instances of that application are de-provisioned, the changes to the network configuration need to be reversed, but software and hardware load balance is easy to scale up or scale down. Obviously a manual process would be time consuming and inefficient, effectively erasing the benefits gained by introducing a cloud-based architecture in the first place. [1] The below is an example of how dynamic load balancing can be implemented. Let's assume that cloud management console, or a custom developed application or cloud tool kit, triggers an event that indicates a new instance is required to maintain availability. How it determines capacity limitations may be based on VM status via VMware APIs or data received from the load balancer, or a combination both.

the basis of this assumption they had analysis that which factor greatly degrades the performance of the system which are added by developer and are not specified in the requirements analysis. In our work we are considering the artificial neuron system.

When we add some extra features to this system the performance of this system degrades. In our work we will define certain set of rules which will check that which extra features degrades the performance of the system and also check the impact of these features.

There are many server nodes comprising many clusters. Each server node and clusters are attached with counter for calculating the processed requests. Request is allocated based on value of the counter variable. If a suppose server node A is having 45 as counter value and server node B having 56 as value ,then the incoming request is allocated to A as it is processing less job at that time. Each time when a request is allocated to a particular cluster in a node ,its counter value is increased to one. After that respected server node is updated with that value.

ALGORITHM

Let CA,CB,…. be Counter variables

```
If(CA<CB)
{
     REQ=A;
      If(CA1<CA2)
          {
             REQ=A1;
           }
          Else
            {
               REQ=A2;
}
Else
{
        REQ=B;
}
```

The work flow is described as in the following section. Here we consider two server node A and B. If node A is having small value than B ,it compare the cluster node of A . If A1 is less than A2 then it is allocated to client request. It is shown in the algorithm.

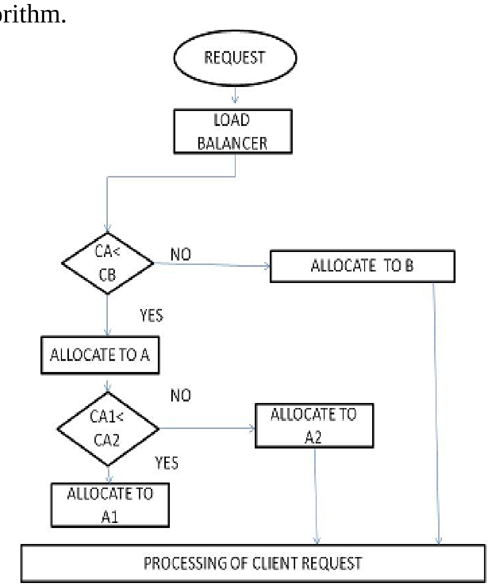

Figure 4: Flow of the algorithm

SIMULATION RESULTS

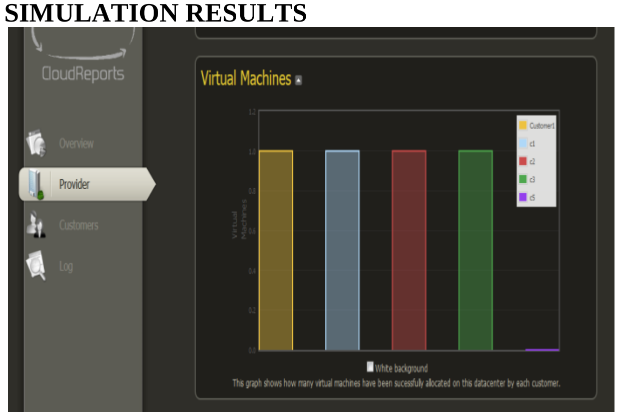

Figure 5: Equal utilization of resources

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5. CONCLUSIONS AND FUTURE WORK

Choosing right load balancer at the beginning is imperative to the success of complex implementations later. So far we studied about the various load balancing algorithms. The proposed algorithm least VM assign method distribute workload across multiple computers to achieve optimal resource utilization with minimum response time. Thus problems in existing algorithms are overcome in proposed method thus achieving increased resource utilization, minimum response time and maximum user satisfaction. Cloudsim simulator is used for algorithm implementations. Cloud sim is a framework which enables modelling and simulation and experimenting on designing Cloud computing infrastructure self-contained platform which can be used to model data centres, hosts, service brokers, scheduling and allocation policies. In future more clients can be added dynamically.

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