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Resource Management System in Cloud Environment with Virtual Machines

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Abstract: ***The term cloud is used as a metaphor for the Internet, based on how the Internet is depicted in computer network diagrams and is an abstraction of the underlying infrastructure it conceals. Typical cloud computing services provide common business applications online that are accessed from a web browser, while the software and data are stored on the servers. In this paper, we present a system that uses virtualization technology to allocate data center resources dynamically based on application demands and support green computing by optimizing the number of servers in use. Here in order to provide flexibility to the cloud service provider to process the clients requests we use virtualization technology with skewness algorithm which finds the unevenness in resource utilization, thereby we can combine the different workloads and process them easily. Experimental results will prove that our algorithm will achieve good performance.***
Keywords: Cloud computing, Green computing, Skewness, Virtualization, Resource allocation.

I. INTRODUCTION

Cloud computing is an umbrella term used to refer to Internet based development and services. [1] The characteristics of cloud computing include on-demand self service, broad network access, resource pooling, rapid elasticity and measured service. On-demand self service means that customers (usually organizations) can request and manage their own computing resources. Broad network access allows services to be offered over the Internet or private networks. Pooled resources means that customers draw from a pool of computing resources, usually in remote data centres. Services can be scaled larger or smaller; and use of a service is measured and customers are billed accordingly. In this paper we are going to achieve two things namely Overload avoidance and Green Computing. Along with these we can provide better flexibility to the cloud service provider to process the clients requests efficiently. Here we are using virtualization technology to map the requests to the servers or physical machines. This virtualization technology provides virtual servers to the cloud service provider and these virtual servers are invisible to the clients or cloud users and make the resources meet their needs. The VM live migration technology makes the vm and pm mapping possible when the execution is running.

A. Virtualization

Virtualization is a technology used for creating virtual machines for computer hardware, an operating system etc. Here the cpu is shared among the operating systems. Memory is shared using more level of indirections.

B. Virtual Machine Monitor

Virtual machine monitor is a computer software that is responsible for creating and running the virtual machines. Virtual machine monitor is also named as Hypervisor. [3] There are two types of hypervisors available

Type 1 virtual machines run directly on the host's hardware which controls the same and manages the operating system.

Type 2 virtual machines run within a operating system environment.

II. SYSTEM ARCHITECTURE

The architecture of this system is to process the requests to the clients. Here each and every client will have to create an account to have an authentication to enter in to the cloud. Cloud service provider will give the authentication facility to the client. Client will have to enter their own username and security details to the service provider. If service provider accepts the authentication details

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then account will be created to the particular client. After creating the account client has to search for a domain in order to create a domain. If a domain is already exists in the cloud with the same name then it rejects the domain by showing that"domain name already exists". Then client has to give another domain name. If the domain name is different from others then a domain with that name is created for that particular client. Now client has to register that domain with certain planning's by paying amount. This consists of certain time period depends on the amount. After paying the amount client will have all rights on that domain. Now it's cloud service provider duty to allocate that domain to the particular server. This is the place where we are actually using our virtualization technology. Here before allocating the domain to the server, service provider has to achieve overload avoidance and green computing. Overload problem can be identified by knowing number of requests allocated to each server and green computing can be achieved by optimizing the number of servers. Both these can be done by using skewness algorithm.

Each physical machine (PM) runs the Xen hypervisor (VMM) which supports a privileged domain 0 and one or more domain U [5]. Each VM in domain U encapsulates one or more applications such as Web server, remote desktop, DNS, Mail, Map/Reduce, etc. We assume all PMs share a backend storage. The multiplexing of VMs to PMs is managed using the Usher framework [6]. The main logic of our system is implemented as a set of plug-ins to Usher. Each node runs an Usher local node manager (LNM) on domain 0 which collects the usage statistics of resources for each VM on that node. The statistics collected at each PM are forwarded to the Usher central controller (Usher CTRL) where our VM scheduler runs. The VM Scheduler is invoked periodically and receives from the LNM the resource demand history of VMs, the capacity and the load history of PMs, and the current layout of VMs on PMs. The scheduler has several components. The predictor predicts the future resource demands of VMs and the future load of PMs based on past statistics. We compute the load of a PM by aggregating the resource usage of its VMs. The LNM at each node first attempts to satisfy the new demands locally by adjusting the resource allocation of VMs sharing the same VMM. The MM Alloter on domain 0 of each node is responsible for adjusting the local memory allocation. The hot spot solver in our VM Scheduler detects if the resource utilization of any PM is above the hot threshold (i.e., a hot spot). The cold spot solver checks if the average utilization of actively used PMs (APMs) is below the green computing threshold.

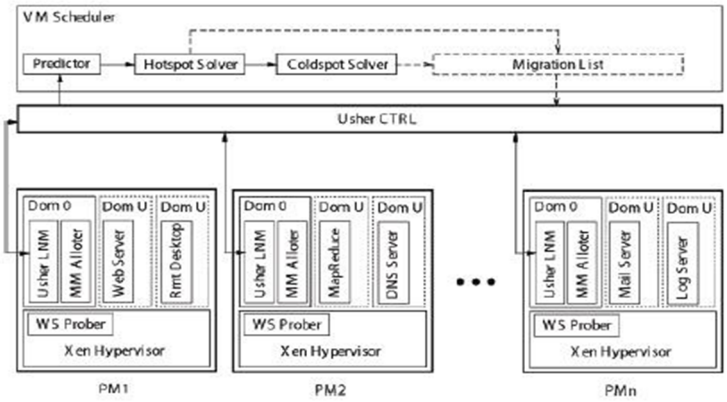


Fig.1 Architecture

III. SKEWNESS ALGORITHM

[4] Skewness concept can be used to measure the unevenness s in the multi-dimensional resource utilization of a server. By minimizing skewness, we can combine different types of workloads nicely and improve the overall utilization of server resources.

A. Hot Spot Migration

Hotspot is a area in which temperature is relatively higher than the surroundings. Hot spot migration can be done when server reaches its resource process rate to its maximum level. When resource requests reaches a server to its higher level then those request will dropped from the sever and transferred to migration list which is act as a buffer to store the requests. When server releases some of the requests and it is under its hot spot level then these migration list requests will be transferred to that server.

B. Cold Spot Migration

Cold spot is a area in which temperature is much lower than the surroundings. The process in cold spot migration is same as the

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process of hot spot migration. When the server is in the cold spot level, if requests came to that server then those requests will be transferred to the migration list. Again these requests will be transferred when one of the servers is in the normal level. After transferring the requests to the migration list that server will be switched off thereby we can achieve green computing by saving energy.

C. Skewness

[2] Let n be the number of resources we consider and ri be the utilization of the i-th resource. We define the resource skewness of a server p as

$$skewness(p) = \sqrt{\sum_{i=1}^{n} (\frac{r_i}{\overline{r}} - 1)^2}$$

where r is the average utilization of all resources for server p.

IV. RESULTS

The goal of the skewness algorithm is to mix workloads with different resource requirements together so that the overall utilization of server capacity is improved. Resource allocation status of three servers A, B, C has total memory allocated 500KB and resource used memory for serverA 80KB,serverB 170KB and serverC 80K. In Fig. 4 each cloud users provide cloud service Resource allocation in green computing. The cloud computing is a model which enables on demand network access to a shared pool computing resources. Cloud computing environment consists of multiple customers requesting for resources in a dynamic environment with their many possible constraints. The virtualization can be the solution for it. It can be used to reduce power consumption by data centers. The main purpose of the virtualization is that to make the most efficient use of available system resources, including energy. A data center, installing virtual infrastructure allows several operating systems and applications to run on a lesser number of servers, it can help to reduce the overall energy used for the data center and the energy consumed for its cooling. Once the number of servers is reduced, it also means that data center can reduce the building size as well. Some of the advantages of Virtualization which directly impacts efficiency and contributes to the environment include: Workload balancing across servers, Resource allocation and sharing are better monitored and managed and the Server utilization rates can be increased up to 80% as compared to initial 10-15%.

The results that we have achieved
Allocation of resource is done dynamically.
Saves the energy using the green computing concept
Proper utilization of servers and memory utilization is taken care using skewness.
Minimize the total cost of both the cloud computing infrastructure and running application.



Fig.2 User registration format

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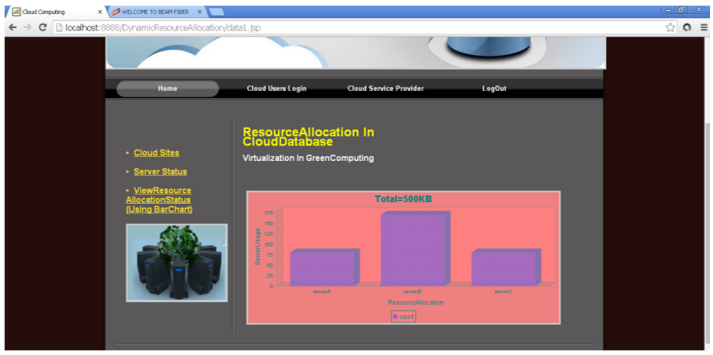


Fig. 3 View Resource Allocation Status

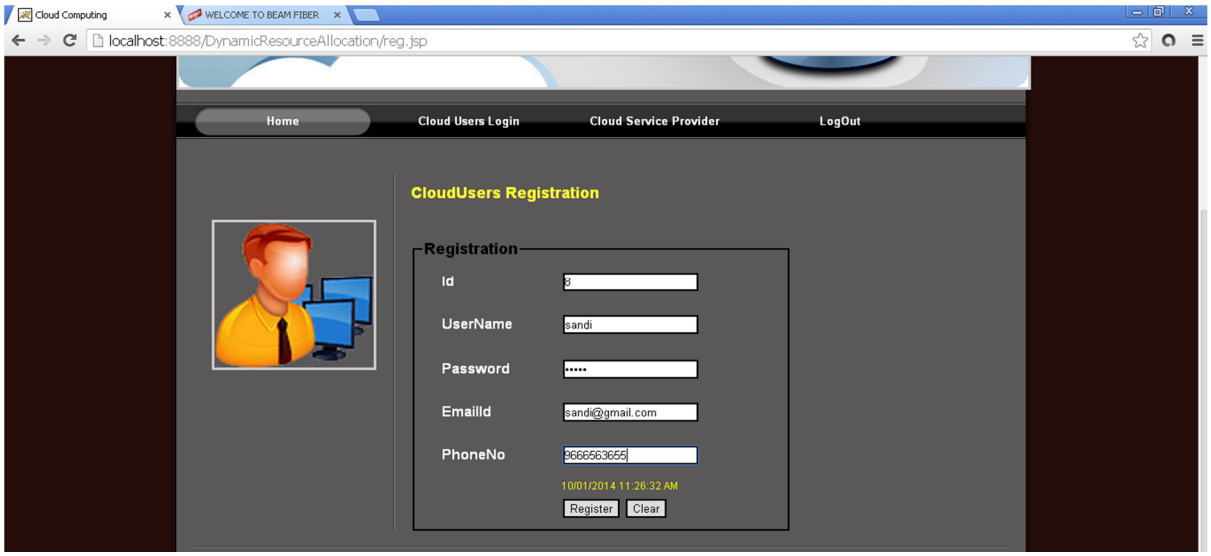


Fig. 4 View Resource Allocation Status using Bar Chart

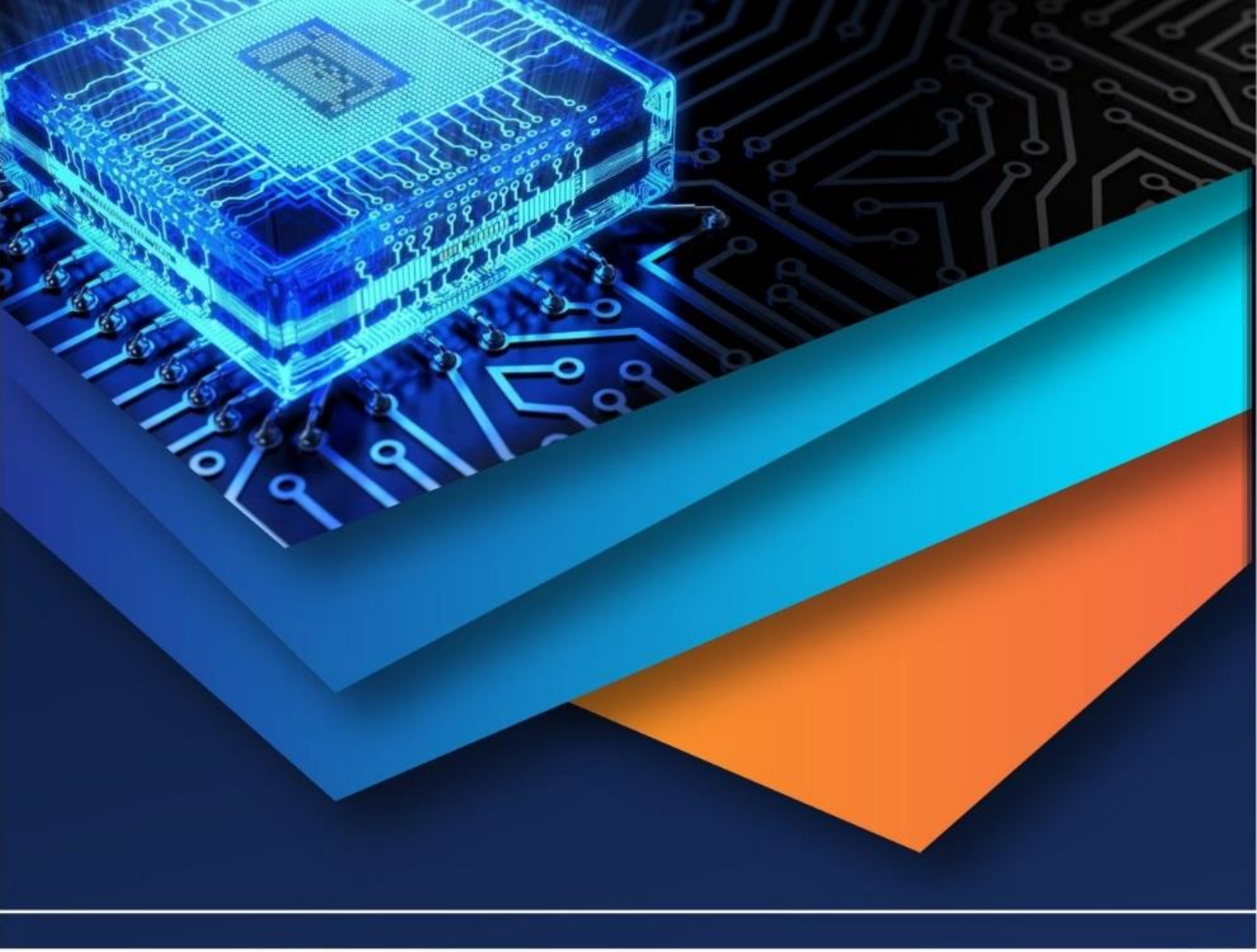
V. CONCLUSION

Here we have presented design implementation and evaluation of the resource management system in the cloud environment. Our system multiplexes the resource requests based on the utilization level of the server thereby we have utilized maximum form the servers without wasting the energy. This can be done by using skewness algorithm. Here we have achieved both overload problem and green computing for efficient data processing in the clod computing environment.

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