An Efficient Resource Allocation in Multiple Virtual Machines using Load Balancing Algorithm

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Abstract

The cloud computing is based on the resource sharing to approach the communication over the network. It is a new trend emerging technology with high range of infrastructure requirements and resources. In cloud computing, many services are available for many users, therefore the load balancing is an important feature in environment of cloud computing. In this paper, we propose to clarify the resource allocation with firewall framework identify how far along users are in terms of cloud deployment, its applications, its benefits and challenges associated with cloud computing using load balancing algorithm in virtual machine with decentralized cloud firewall in cloud computing. An efficient load balancing scheme to guarantees the efficient resource utilization by resources provisioning to avoid the attacks using cloud decentralized firewall. Load balancing in virtual machine is a computer network king computer, computers, network associations, disk drives or central processing units. It aims to optimize the uses of resources, increases the throughput, reduce the response time and avoid the resource overloading. It increases the reliability through redundancy using multiple components with load balancing instead of a single component. Load balancing is usually furnished by dedicated software or hardware, such as a switch of multilayer or a Domain Name System server process.

Keywords— *Cloud computing, Load balancing algorithm, Firewall Framework, multiple virtual appliances, optimizing and resource allocation.*

I. INTRODUCTION

Cloud computing refers to the delivery of computing and storage capacity as a service to a heterogeneous community of end-receivers. Cloud computing is an internet technology that uses both central remote servers and internet to direct the applications and data. This technology allows many businesses and users to use the data and application without setting up. Businesses and users can access the information and files at any computer system having an internet links. Cloud computing provides much more effective computing by centralized memory, processing, storage and bandwidth [8]. Cloud computing has several applications such as Infosys is using Microsoft's Windows Azure services of Cloud, including Data Services of SQL, to improve Cloud-based software capabilities that would let automobile dealers share information on inventories and other resources. Most excellent Buy's Giftag applet uses Google App Engine to let users create and share wish lists from the visited Web pages. Wang Fu Jing Department stock up, a vendor in China, utilizes Cloud services of IBM, containing supply chain management software for its network of retail stores [9].

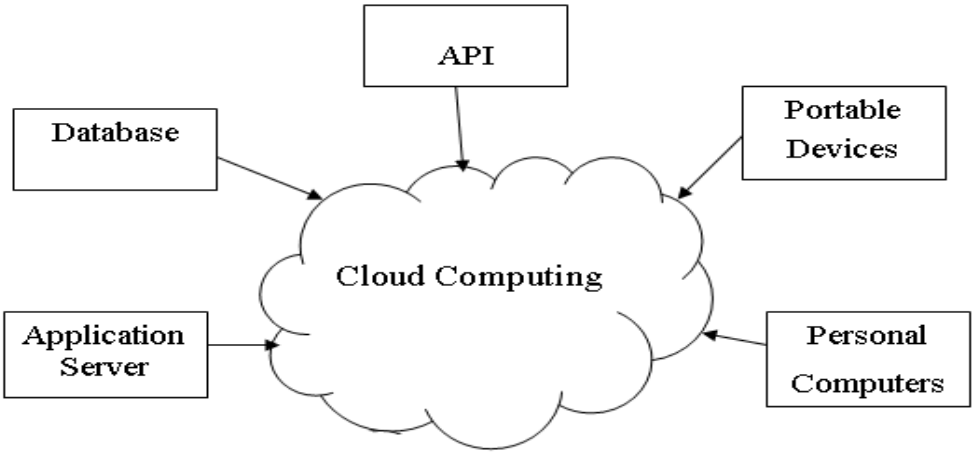

Fig. 1 Basic Structure of Cloud Computing

Cloud Service Provider (CSP)

A cloud provider is a company that offers some component of cloud computing – typically Infrastructure as a Service (IaaS), Software as a Service (SaaS) or Platform as a Service (PaaS) – to individuals or other businesses. Cloud providers are also referred to as cloud service providers or *CSPs*.

About when you evaluate cloud providers there are a number of things to think. The cost will usually be based on a per-use utility model but there are a number of variations to consider. For sensitive data, the physical location of the servers may also be a factor.

Reliability is crucial if your data must be available. A typical cloud storage service-level agreement (SLA), for example, specifies precise levels of service – such as, for example, 99.9% uptime – and the recourse or compensation that the user is entitled to should the provider fail to provide the service as defined. Though, it's important to understand the fine print in that agreement because some providers discount outages of less than ten minutes which may be too long for some businesses.

Security is another important deliberation. Organizations such as the Cloud Security Alliance (CSA) offer certification to cloud providers that meet their rules. The CSA's Trusted Cloud Initiative program was created to help cloud service providers develop industry-suggested, secure and identity of interoperable, access and management configurations compliance and practices.

II. LITERATURE SURVEY

Hamid Shoja et.al., [4] In this paper, day by day the numbers of users accessing the cloud are rising. Usually cloud is based on data centers which are powerful to handle large number of users. To overcome such problem clouds must be featured with the load balancing mechanism the reliability of clouds depends on the way it handles the many. The aim of balancing the load of virtual machines is to decrease energy consumption and provide maximum resource utilization thereby reducing the number of rejections of the job. This paper is a brief discussion on the existing load balancing techniques in cloud computing and further compares them based on various parameters like Data processing time response time. In this paper, the results discussed based on existing Round Robin and Throttled scheduling algorithms.

Subhadra Bose Shaw et.al., [14] The cloud provide high performance gain to the user and at the same time must be beneficial for the Cloud Service Provider (CSP) because the cloud can be accessed anytime and anywhere through commodity hardware only its demand is increased. Several challenges have to be faced to achieve this target. To meet the QoS requirements of the users, load balancing is one of them which help the CSP and at the same increased his profit by optimum use of the resources. Balance the load in cloud the resources and workloads must be scheduled in an efficient way. Varieties of Scheduling algorithms are used by load balancers to determine which backend server to send a request to. On the same physical machine, the selected server allocates resources and schedules the job dynamically on some virtual machine (VM) located. It is also the responsibility of the provider to dynamically reallocate or travel the VM across physical machines for workload consolidation and to avoid under utilization of resources or over utilization. In this reference, in Cloud Computing, they have discussed different algorithms proposed to resolve the issue of load balancing and task scheduling. They have mentioned some of their shortcomings for further

development in cloud. The VM migration issues involved in load balancing are also described briefly.

Raza Abbas Haidri et.al.. [11] In this paper they presented a heuristic based load balanced scheduling model for efficient execution of tasks. This model balances the loads coming from several users among datacenters and hence it offers better resource utilization and high availability in the form of improved turnaround time and response time. This algorithm is implemented using CloudSim simulator and the result shows that the proposed algorithm outperforms to existing algorithms on similar objectives.

Mayanka Katy et.al., **[9]** Load Balancing is an important cloud computing environment appearances. This efficient load balancing scheme ensures efficient resource utilization by provisioning of resources to cloud user's on-demand basis in pay-as-you-say-way. By applying appropriate scheduling criteria, the Load Balancing may even users of support prioritizing. This reference introduced various load balancing schemes in different cloud environment based on requirements specified in Service Level Agreement (SLA).

Bhaskar.R et.al., [1]This paper proposed a Dynamic resource allocation method for environment of Cloud. Cloud computing is a model for delivering information technology services in which resources are retrieved from the internet through applications and web-based tools, rather than a direct connection to a server. For the required resources, the users can set up and boot the required resources and they have to pay only. Therefore, providing a mechanism for efficient resource management and assignment will be an important objective of Cloud computing in the future. In this reference they proposed a model on Infrastructure as a service (IaaS) dynamic scheduling and consolidation mechanism that allocate resources based on the load of Virtual Machines (VMs). This model permits users to dynamically add and/or delete one or more instances on the basis of the load and by the user the conditions are determined. Their objective was to improve an effective load balancing algorithm using Virtual Machine Monitoring increase or decrease different performance parameters(throughput for example) for the Clouds of different sizes.

III. METHODOLOGY

A. En Efficient Resource allocation in VM with Cloud firewall

Each Virtual Machine appliances has the capacity of service constraints for the applications of cloud computing. The various firewalls can operate in concurrently; several hosting servers are accumulated into various clusters and each cloud firewall has the one virtual machine for each cluster in decentralized cloud firewall. By placing the Virtual Machine instances, the cloud firewall can be hosted, in which the VM instances are provided by the Cloud service Providers. An individual cloud firewall can fulfill the Quality of Service (QoS) by placing a adequate VM instance in each cloud firewall and sharing the arrival rate of packet to different parallel firewalls. It will satisfy the response time using the individual cloud firewall. The resource provisioning cost of cloud firewall is reduced as long as QoS requirement is accomplished.

To create both dynamic and travelling objects by leveraging the JAR (Java ARchive) programmable capabilities and to assure the any access of data of the users can trigger automated logging local and authentication to the JARs. In this process, the files can be stored in the database and data is stored based on the size of the file and current issue preference.

The resource and virtual monitor are fitted to the each virtual machine with firewall for the security purpose. The Load Balancing algorithm can be used in Virtual machine to reduce the overload of resource allocation during the attack time. This algorithm automatically monitoring and optimizing the allocation of resources in VM with help of resource and VM monitor and therefore it can provide the QoS of cloud customers because of load balancing mechanism. The data is transmitted between the cloud customers and the internet without any loss of packets through the decentralized cloud firewall with dynamic efficient resources in VM.

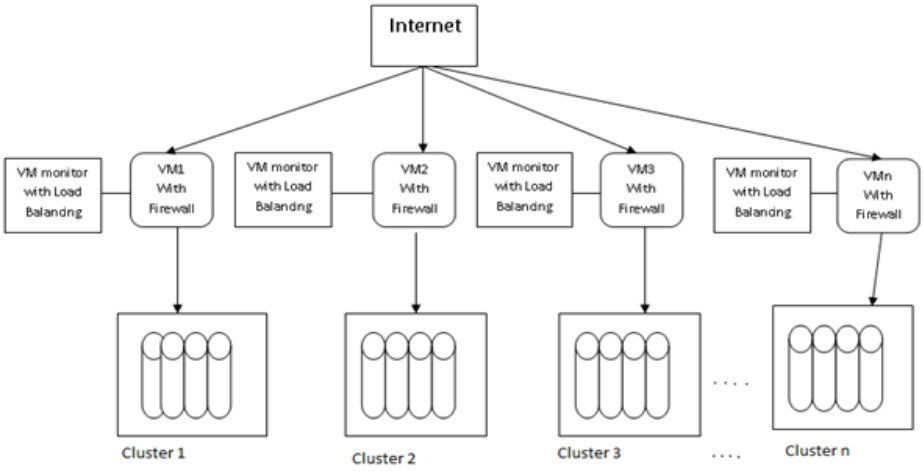

Fig.2 Decentralized firewall with Load Balancing

B. Dynamic Resource Allocation in VM

A method dynamic resource allocation, which is fitting for allocate loads of a virtual machine cluster in which the cluster has a physical machines majority and each of the physical machines at least has a virtual machine. The following steps are used to dynamic resource allocation.

- Calculating a resource usage weight of the individual virtual machine and physical machine and a standard resource weight of the physical machines;
- Dispensation following steps when any one of difference values between said resource usage weight of the respective physical machines and said average resource usage weight of the physical machines is greater than a default migration value:
  - With the greatest resource usage weight as a migration source machine to finding out one of the physical machines
  - With the least resource usage weight as a migration object machine to finding out one of the physical machines.
  - Evaluating a movement difference value between the resource usage weight of the migration source machine and the average resource usage weight of the physical machines.
- Finding out one of the virtual machines in the migration source machine with the resource usage weight thereof being closest to the migration difference value as a migration VM.
- The dynamic resource allocation method as defined, wherein the resource usage weight of the respective virtual machine, the resource usage weight of the respective physical machine, and the average resource usage weight of the physical machines are figured out based on resources of processors and memories in the respective physical machine being used.

- The method of dynamic resource allocation as defined in claim 2, wherein the resource usage weight of the respective virtual machine, the resource usage weight of the respective physical machine, and the average resource usage weight of the physical machines are calculated with following equations: $VM_{ji}Rate=(VM_{ji}CPUuse*VM_{ji}RAMallocate)/\Sigma_i=\mathbf{1}.sup.n(VM_{ii}CPUuse*VM_{ii}RAMallocate)$ $HOST_iRate=\Sigma_i=\mathbf{1}.sup.vVM_{ii}Rate$ $\alpha=1/P$ wherein, j represents a serial number assigned to each of the physical machines.

  Where i denotes a serial number assigned to each of the VMs; P denotes total numbers of the physical machines in the cluster of virtual machine; n indicates the total numbers of the virtual machines in the cluster of virtual machine; v denotes the total numbers of the virtual machines in each of the physical machines correspondingly; $VM_{ii}Rate$ represent the resource usage rate of i virtual machine in j physical machine to act as said respective virtual machine resource usage weight; $VM_{ii}CPU$ use denotes a processor load rate of i virtual machine in j physical machine; $VM_{ii}RAM$ assign represents an allocated memory of i virtual machine in j physical machine; $HOST_i$ Rate represents the resource usage rate of j physical machine to act as said resource usage weight of the respective physical machine; a represents the

average resource usage rate of the physical machines to act as said average resource usage weight of the physical machines.

- The method of dynamic resource allocation as defined in step one, wherein said failure to pay migration value is dogged by users.

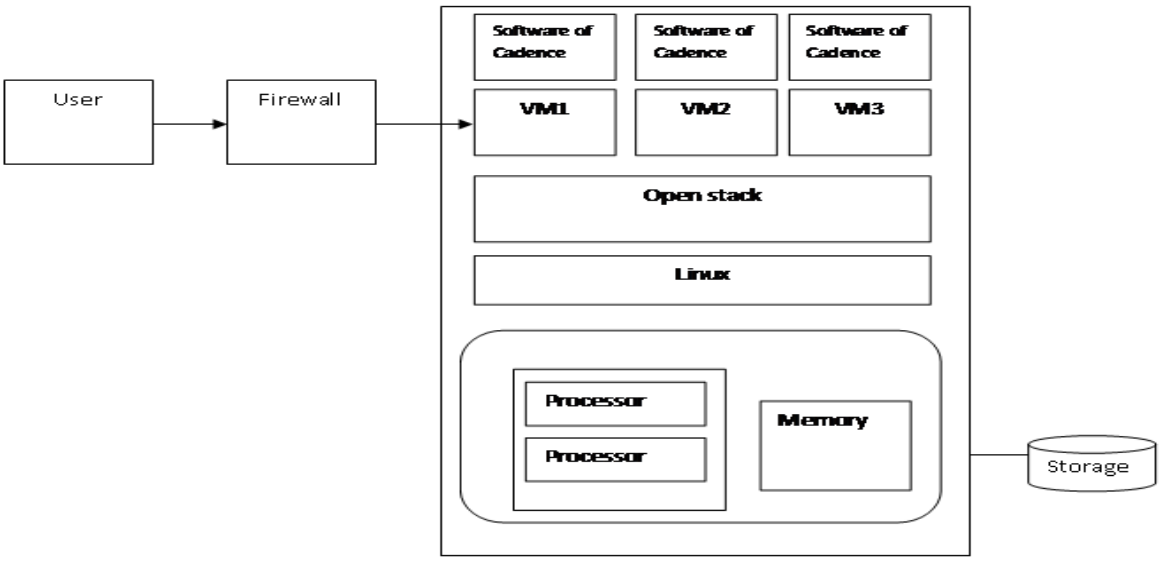

Fig.3 VM with Firewall

C. Load Balancing in VM

Load balancing in Virtual Machines with decentralized firewall offers an efficient solution to different emissions staying in environment of cloud computing application and set-up. The Load Balancing algorithm has two types of main works; one is the resource provisioning or allocation of resources in Virtual Machines and another one is scheduling in VM for leveraging the loads in distributed environment. The resource allocation efficient provisioning and resources scheduling in VM as well as tasks will ensure.

a) On-demand resource allocations are available.
b) Under the high/low load condition, the resources are competently used.
c) During the case of low load, the energy can be saved because it has the certain threshold value.
d) The resources cost is reduced using the load balancing algorithm.

Simulation environment are required for measuring the competence and usefulness of Load Balancing algorithms. CloudSim is the most efficient tool that can be used for cloud modeling. CloudSim allows VMs to be managed by hosts which in turn are managed by datacenters during Cloud lifecycle.

Cloudsim offers architecture with four basic entities. In the cloud computing these entities allow user to set-up a basic cloud computing environment and measure the Load Balancing algorithms effectiveness. Using CloudSim a typical Cloud modeled consists of following four entities Datacenters, Virtual Machines, Hosts and claim as well as System Software. To the Cloud Users Datacenters entity has the liability of providing Infrastructure level Services. They are active as a home to several Host Entities or several instances hosts' entities combined to form a single Datacenter entity.

In Cloud, hosts are Physical Servers that have pre-configured Capabilities of processing. Host is responsible for providing Software level service to the Cloud Users. Hosts have their own storage and reminiscence. Hosts dispensation capabilities are expressed in MIPS (million instructions per second). To form a Host entity they act as a home to Virtual Machines or several instances of Virtual machine entity combined. Virtual Machine allows development as well as deployment of custom application service model. They are mapped to a host that matches their critical characteristics like storage, processing, memory, software and availability requirements.

On demand basis, resource provisioning is the mapping tasks of the resources to different entities of cloud. In the cloud Resources must be allocated in such a method that no node is overloaded and all the

available resources in the cloud do not experience any kind of expenditure.

The fig.4 shows that load balancing in cloud computing. In this figure, cloud service consumer provides the services and the load balancer schedule the all services that are provided by the cloud service consumer. The service replications are sending to other virtual machines from main Virtual Machine. It will reduce the load in all Virtual machines using the load balancing algorithm. The load balancing can reduce the load in all Virtual machines.

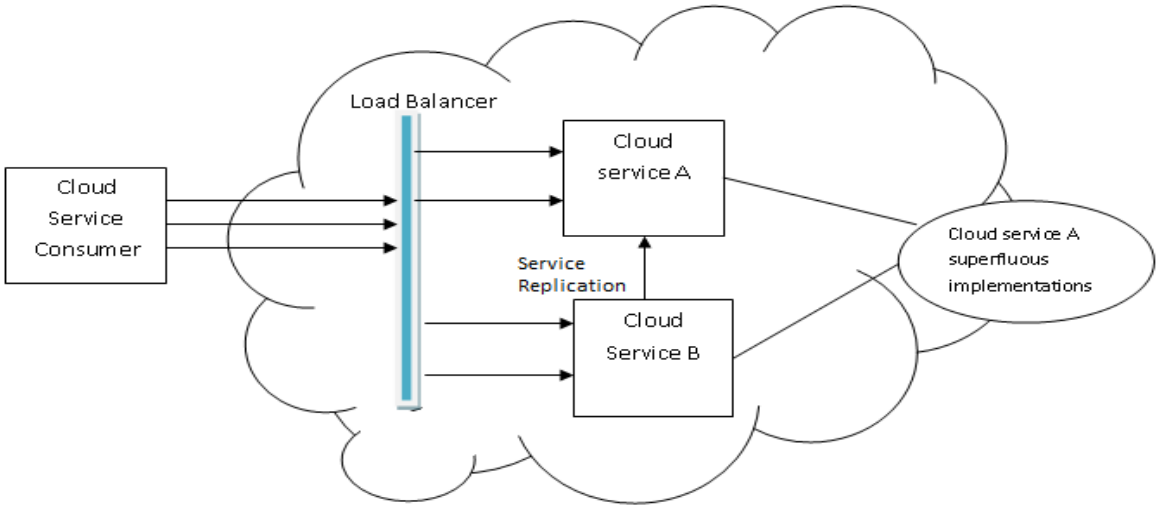

Fig.4 Load Balancing in cloud computing

Virtual Machine enables the abstraction of an OS and Application running on it from the hardware. Center hardware communications services unified to the Clouds are modeled in the simulator by a Datacenter element for handling service needs. These requirements are application elements sandboxed within VMs, which need to be owed a share of processing power on Datacenter's host apparatus. Data Center object manages the data center management behavior such as VM formation and obliteration and does the routing of user needs received from user via the Internet to the VMs. The Data Center Controller uses a Vm Load Balancer to decide which VM should be assigned the next request for dispensation. The majority common VM load balancer are throttled and active monitoring load balancing algorithms. Throttled Load Balancer maintain a record the state of each Virtual Machine (busy/ideal), if a request arrive concerning the allocation of Virtual Machine, throttled load Advanced Computing balancer send the ID of ideal Virtual Machine to the data center controller and data center controller allocate the ideal Virtual Machine. Energetic Monitoring Load Balancer maintains in sequence about each VMs and the number of requests currently allocated to which VM. While a request to allocate a new VM arrives, it identifies the least loaded VM. But there are more than one, the first identified is selected. In this paper two load balancing algorithms in Cloud computing was done. A new algorithm has been proposed from modifying the active monitoring load balancing algorithm in Virtual Machine environment of Cloud computing in order to achieve better response time, processing time and cost.

Optimization of Virtual Machine load is a process of reassigning the total load to the individual Virtual Machines to make resource utilization effective and to improve the response time of the job. A load balancing algorithm which is dynamic in nature does not consider the previous state or behavior of the system, that is, it depends on the present behavior of the system. The important things to consider while developing such algorithm are, estimation of load, comparison of load, performance of Virtual Machine, nature of work to be transferred, selecting of Virtual Machine and many other ones. This load considered can be in terms of CPU load, amount of memory used, delay or Network load.

The time required for completing a task within one process is very high. So the task is divided into number of sub tasks and each sub task is given one one job. The Proposed Load balancing algorithm is divided into two phase. A two-level task scheduling mechanism based on load balancing to meet dynamic requirements

of users and obtain high resource utilization. It achieves load balancing by first mapping tasks to Virtual Machines and then Virtual Machines to host resources thereby improving the task response time, resource utilization and overall performance of the Cloud computing environment. In the first phase, find the CPU utilization and memory required for each instance and also find available cpu cycle and memory of each VM. In second phase compare the available resources and required resources, if resources are available instance is to be added otherwise discard the instance finally returns instance status to user. The Cloud Watch monitoring service is a special storage engine that is designed for time series data. On one end data collected periodically from servers and from other services is pumped into the monitoring store, and at the other end clients can run queries against the store to extract data from it.

The load balancing service is designed to serve as a first level of distributing load across a number of instances, dealing specifically with DNS and handling the failure of an availability zone. Amazon Cloud Watch provides monitoring for AWS Cloud resources and the applications customers run on AWS. Developers and system administrators can use it to collect and track metrics, gain insight, and react immediately to keep their applications and businesses running smoothly. Amazon CloudWatch monitors AWS resources such as Amazon EC2 and Amazon RDS DB instances, and can also monitor custom metrics generated by a customer's applications and services. With Amazon CloudWatch, you gain system-wide visibility into resource utilization, application performance, and operational health.

IV. CONCLUSION

In this paper, the load balancing algorithm is used in Virtual Machines with the decentralized cloud firewall in the cloud environment. It reduces the all overloaded services in VM by dividing the services and allocates the all services to each virtual machines using scheduling process. An efficient load balancing scheme to guarantees the efficient resource utilization by resources provisioning to avoid the attacks using cloud decentralized firewall. Load balancing in virtual machine is a computer network king method for distributing workloads across multiple computing resources, such as cluster of computer, computers, network associations, disk drives or central processing units. It aims to optimize the uses of resources, increases the throughput, reduce the response time and avoid the resource overloading. It increases the reliability through redundancy using multiple components with load balancing instead of a single component. Load balancing is usually furnished by dedicated software or hardware, such as a switch of multilayer or a Domain Name System server process. The attacks also decreased by this process through the dynamic resource allocation with cloud firewall in efficient manner using the load balancing in all Virtual Machines.

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