International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 11 (2015) pp. 27923-27929

http://www.ripublication.com

Load Balancing on Eucalyptus Platform

S.Vikram
Department of ADC, School of Computing, SASTRA University, Thanjavur, India.
E-mail: vikram.mscsw@gmail.com

Abstract

Cloud Computing plays an important role for providing various services. Several Private cloud platforms are provided as software stacks such as Open Nebula, Open Stack, and Eucalyptus are helpful in minimizing in licence costs. Limited number of servers and thousands of users are accessing different services at same time would result in heavy traffic and huge response time. A load balancer was deployed in the cloud to distribute tasks among virtual machines, to provide response time in a quick manner and also helps in providing fault tolerance. The incoming request was taken into consideration and the load balancer was responsible to distribute traffic among virtual instances in eucalyptus cloud. By registering instances with load balancer image all the requests will be load balanced between the instances.

Index Terms: Load Balancing, Eucalyptus, Private Cloud, Virtualization

Introduction

Traditionally applications are installed on system and update hardware as required. Usage of Cloud computing provides resources (e.g., Instances, Storage, Security) as services through a web interface offered by CSP (cloud service provider). Cloud has various characteristics such as elasticity, pay per use model, virtualized and scalable environment. Eucalyptus is an IAAS platform for provisioning of virtual machines instances which can be used to run applications.

Internet is the resource which helps in delivering applications to users desktop without much use of hardware. All powers rely on server and the servers can be efficiently used with the advent of virtualization technology. Hypervisors are the small engine that enables running multiple operating system and efficiently using the resources.

If the cloud services are being used then the company/organization can outsource management, maintenance and administration of large clusters of servers but still keep the benefits. While usage of a public cloud provider is sufficient for most of the tasks, bandwidth, storage, data protection or pricing details might encourage companies to

own its private cloud. The infrastructure to control and maintain the cloud can be proprietary like Microsoft Hyper-V Cloud [1], VMware vCloud [2] and Citrix Open Cloud [3], but there are also a number of free and open-source solutions like Eucalyptus Cloud[4], OpenNebula [5] and CloudStack [6].

The cloud can provide the processing power, but the actual framework to take benefit of these virtual instances does not inherently come with the machines. Traditionally all the jobs were meant to run on dedicated servers, but nothing limits them from running on a virtual machine on a cloud environment as that extracts the maximum that we can get out of a single hardware.

Elastic, Dynamic processing power and storage. Cloud can be defined as computing power when needed without worrying about hardware and maintenance [7,8]. Cloud typically a datacentre provides on demand resources to users which dynamically scale up or down based on user requirements. Cloud helps you to concentrate on application development and core logic rather than worry about infrastructure, networking, security and so forth [9].

There are four classes of load balancing mechanisms for geographically distributed web services:

1. DNS-based
2. Server-based
3. Dispatcher-based
4. Client-based

Inside cloud literally everything is virtualized to extract maximum resources out of a single hardware which helps cloud provide the most important benefits such as Elasticity, scalability and multitenancy by sharing of resources. Users are provided a web interface to manage their instance and are billed accordingly to their usage [10].

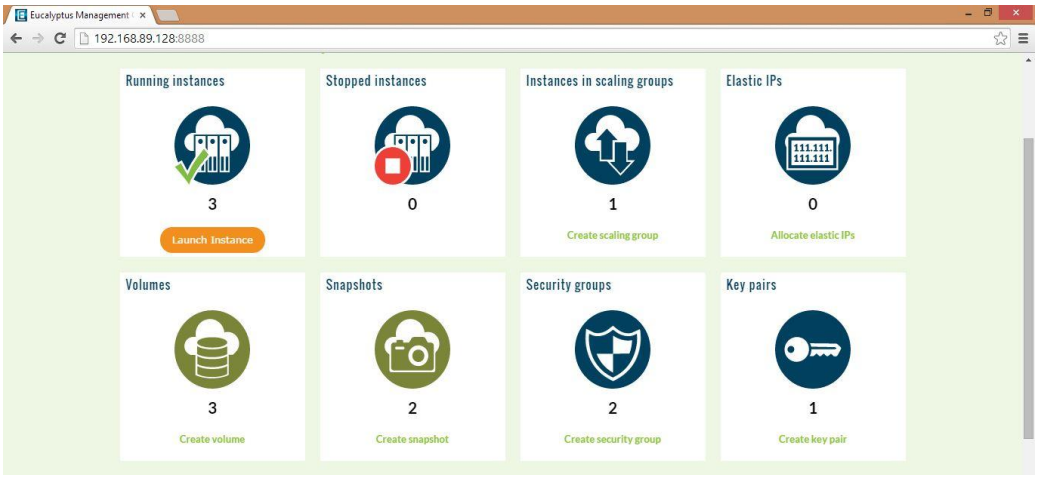

Figure 1: Admin Panel Diagram

Related Works

Load Balancing is the technique responsible for providing fault tolerance between registered instances.

Different approaches have been adopted to address the problem of placement and consolidation of virtual machines in modern data centers.These criteria range varies on different parameters. Recent survey states that IT data centre consumes 80% of the total workload, hence load balancing technique was introduced. Load balancing was used in server virtualization to provide better fault tolerance.

Algorithm VectorDot which tries to determine the best choice of physical machines for relocation of virtual machines from overloaded nodes using dot products of capacity usage and resource requirement vectors [11].

Minimize the number of active Physical Machine with a placement plan, which uses an Integer Linear Programming formulation to get a VM placement plan. This model may not work for large problems [12, 13]. Live Virtual machine Migration is used to migrate the entire OS and its associated application from one physical machine to another. The benefits include: conserving physical server energy, load balancing and fault tolerance [14].

Architecture Diagram

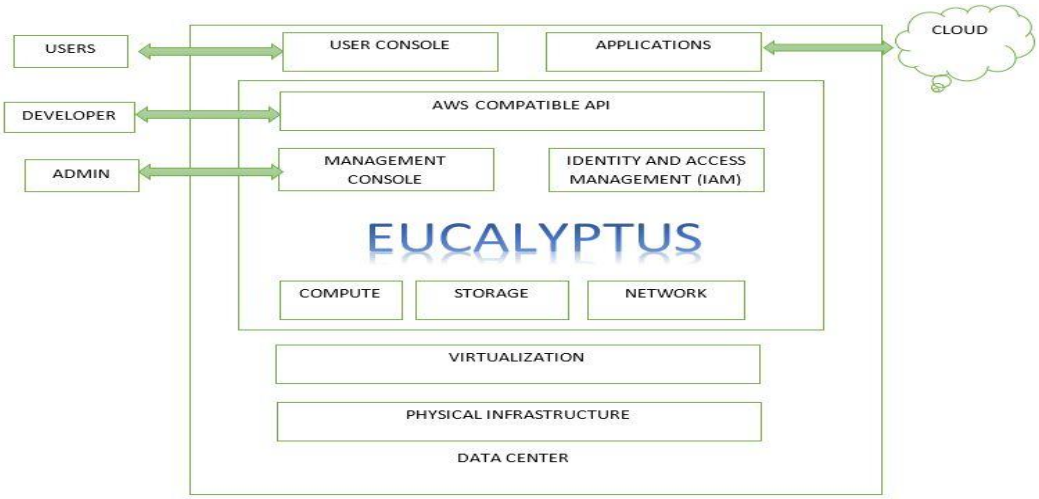

Figure 2: Workflow Diagram for Proposed Approach

Proposed System

The proposed method contains following components :

- Physical Machine
- Virtualization
- Walrus
- Eucalyptus Machine Image
- Networking Mode
- Security
- Virtual Machine Instance

A. Physical Machine

The Physical Infrastructure are the servers which acts as the backbone that can be provisioned for end users. The collection of such resources either in the form of physical servers that lies in the datacentre or the remote servers. Eucalyptus is a iaas platform for making all the resources dynamic in nature which can scale up and down based on the workloads of any given application. Below are simple procdure to install cloud and an associated load balancer to cloud

Step 1 : Install Host OS (Centos 6.5)
Step 2 : Assign 150 gb for storage for running virtial machines.
Step 3: Install Eucalyptus cloud by running a python script.
Step 4: Install Load Balancer Image into our running cloud.
Step 5: Configure Load balancer after registering with instances.

B. Virtualization

We have used KVM (Kernel based Virtual Machine) as our hypervisor in our cloud to provision virtual machines which need support of Virtualization enabled processor (Intel VT or AMDV) and eucalyptus supports any one among (KVM, Xen and VMware broker) these hypervisors.

C. Walrus

Provides Persistent data storage for the cloud for which all virtual machine store their data into walrus component. The data can be in the form of installed packages, images that used for launching the instance, log files and application hosted data. The Volumes can be created for instance which can be used as the storage for the instance we are attaching to until it is detached. Snapshots (Saved States) of volume can be taken to make the data persistent and attaching the instance to start from where we had left off.

D. Eucalyptus Machine Image

These are the operating system images that are installed in our cloud environment maintained by the cloud provider and a copy of the installed image gets launched as an virtual instance whereas the image will not be tampered and the changes to the instance persist only to the instance and not to the image from which it got launched.

E. Networking Mode

The computing resources can be measured in terms of VCPU (Cores), Ram and disk storage that are available in cloud datacentre. In Manage mode, eucalyptus manages the networking of instances and provides the features like elastic ip to assign a ip address for the vm instance when getting launched which cloud releases and assigns the ip address. The edge mode can only be created if there is an existing network topology already configured such as managed mode and cannot be created from scratch.

F. Security

Security group which act as the firewall for instances which also provides isolation between instances. Key pair should be used during instance launch and if no such key pair is specified we cannot connect to the instance. Key pair specifies the private key for connecting to that instance and if the key pair is lost, we cannot regain the access key unless it is an EBS backed instance.

G. Virtual Machince Instance

The instance when launched from an EMI can be an EBS backed instance or Store backed instance. The EBS instance are backed by the volume which get stored so that the state of the instance can be retrieved later after termination. The Store backed instanced are launched and does not have a separate device for backup and the lifecycle of the instance is till the termination of the instance.

Result and Analysis

Load Balancing

Elastic Load Balancing basically requires two elements to function properly. (i) Load Balancer image and (ii) Instances registered with load balancer. Generally Load Balancer routes request to instance with minimum load but we can make them redirect to any one application instance. For this we have used Duration Based session stickiness (for a specified time interval) and application controlled session stickiness.

Creation and configuring Load Balancer

Step 1 : Creating load balancer using :

eulb-create-lb Testbalancer –Z default –l “lb-port=80, protocol=HTTP, instance-port=80, instace-port=HTTP”

Step 2 : Verify load balancer using :

Eulb-describe-lbs Testbalancer

Step 3 : Creating load balancer listeners using :

eulb-create-lb-listeners --listener “lb-port=80, protocol=HTTP, instance-port=80, instace-port=HTTP cert-id=ARN” Testbalancer

Step 4 : Register Instances with load balancer:

eulb-register-instances-with-lb --instances centinstance –access-key-id <id> --secret-key <id> Testbalancer

Step 5 : Verify registered instances with load balancers using :

Eulb-describe-instance-health Testbalancer

Assuming the application is deployed in cloud having virtual machines (with 4096Mb of memory in each VM running on physical processors capable of speeds of 100 MIPS) and Parameter Values are discussed under

Table 1: Configuration of Machine Used

Parameter	Configuration
Operating System	Cent OS
VM Memory	4096mb
Architecture	X86
Virtualization Support	Intel VTX enabled

Conclusion

Thus a load balancer was deployed in the cloud to distribute tasks among virtual machines, to provide response time in a quick manner. This also helped in providing fault tolerance to the servers involved. The future enhancement of the project would be to improve the load balancing scheme for whatever the number of users logged into the system. Also the number of server instances which is deployed into cloud should also increase in an efficient manner with no disturbance or reduction in the fault tolerance level of the system.

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