Building Private Cloud Using Eucalyptus

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Abstract: Eucalyptus is free open source software. Eucalyptus was started as a university project at university of California at Santa Barbara, a few eveloper/researchers started this project and at the end they came up with this Eucalyptus cloud software. The co-founders of Eucalyptus were Dr. Rich Wolski (CTO), Dr. Dan Nurmi, Dr. Neil Soman, Dr. Dmitrii Zagorodnov, Chris Grzegorczyk, Graziano Obertelli and Woody Rollins (CEO).

In the paper I shall discuss Overview of Eucalyptus, Advantages of Eucalyptus, Over-view of various components of Eucalyptus cloud, Installation and configuration of Eucalyptus.

Keywords: Eucalyptus, Linux, Cloud, Walrus, Open source software.

I.   INTRODUCTION

Eucalyptus cloud software is widely used for creating private cloud for organization. Eucalyptus is a Linux-based software. Eucalyptus has a self-service interface that allows you to manage various resources like hardware, storage and network in effective way. Employees of organization can access cloud resources using enterprise intranet. In this private cloud sensitive data is secure behind the enterprise firewall.

You can use following Linux distribution to install Eucalyptus:

• CentOS 7

• Red Hat Enterprise Linux (RHEL) 7

Eucalyptus is written in Java and C programming language. Eucalyptus stands for Elastic Utility Computing Architecture for linking Your Programs to Useful Systems. Eucalyptus allows you to create a pool of IT resources (computer power, network and storage) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

II.   COMPONENTS OF EUCALYPTUS

Eucalyptus components are explained below:

- Cloud Controller [CLC]: Cloud controller in written in java. CLC is the entry point. When you try to access cloud resources from outside world, first request goes to CLC, if it approves the request then only access is given. Suppose an unauthorized persons tries to access cloud resources, CLC immediately terminates it's session. It the place where decision is taken whether allowed to access the resources or not. CLC maintains complete database of cloud resources.

- Walrus: Walrus is written in java, it is equivalent to AWS S3 (Simple Storage Service). Walrus is for storage of files, objects, snapshots, images and other files. There can be only one walrus and CLC active per cloud.

- Cluster Controller: The Cluster Controller (CC) runs on the machine that has network connectivity to both the nodes running NCs and machine running the CLC, machine that has these two features is the front-end machine. CCs performs two tasks first it collects information about set of VM then schedule VM execution on specific NCs.

- Node Controller: The Node Controller (NC) runs on every node that hosts VM instances. NC manages the execution, termination and inspection of VM running on hosts. It also fetches and maintains a local cache of instance images, and it queries and controls the system software (host OS and the hypervisor) in response to queries and control requests from the CC.NC manages life cycle of VM instances. It maintains data related to resource utilization and availability.

- Storage Controller: The Storage Controller (SC) provides functionality that is equivalent to Amazon Elastic Block Store (Amazon EBS). SC can interface with various storage system like NFS, iSCSI, SAN devices etc. Elastic block storage exports storage volumes that can be attached by a VM and mounted or accessed as a raw block device.

- VMware Broker: VMware Broker (VB) is optional component in Eucalyptus. It is available when you are a Eucalyptus Subscriber. VMware Broker mediates all interactions between the CC and VMware hypervisors (ESX/ESXi) either directly or through VMware vCenter.
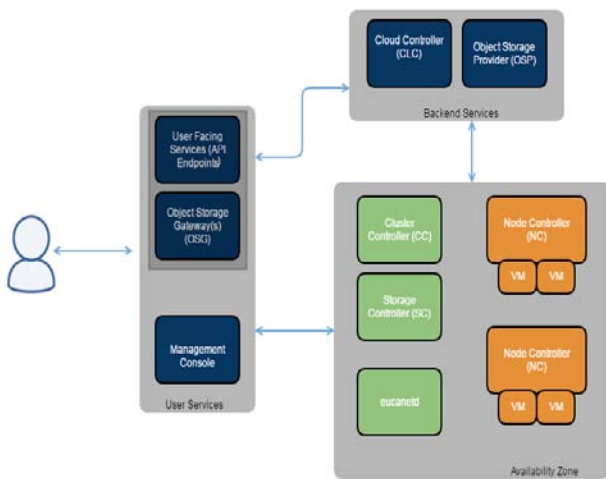
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Fig. 1 High-level architecture of Eucalyptus
[Source: Eucalyptus documentation
https://docs.eucalyptus.com/eucalyptus/4.0.2/]

- Management Console: The Eucalyptus Management Console provides web-based interface through which you can manage cloud activities.

- Eucanetd: The eucanetd service implements artifacts to manage and define Eucalyptus cloud networking. Eucanetd runs alongside the CLC or NC services, depending on the configured networking mode.

III.   SETTING UP EUCALYPTUS IN YOUR OWN ENTERPRISE

Here we set up a simple Eucalyptus cloud on a set of two machines, one machine acts as the one acting as the management server containing the cloud controller, Walrus, the cluster controller and the storage controller, and the other as the node controller running atop a KVM hypervisor. Figure 2 shows the set-up diagram.
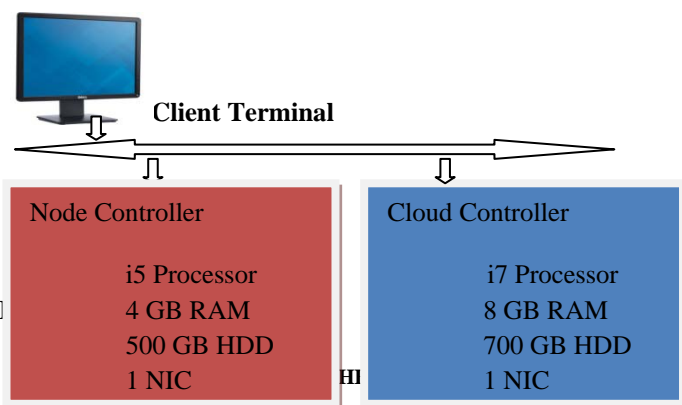
There are two ways by which you can install Eucalyptus. First, one can download the required RPMs onto your machine, install each of them and then manually configure cloud as per your needs. In second way your Eucalyptus cloud is up and running in just a matter of minutes. We shall explain the second way it called Eucalyptus Faststart. It is CentOS-based ISO that has all the Eucalyptus components embedded in it. Just burn

ISO to a DVD and run it on your machine. Installation is wizard based and this wizard guides you for installation process and finally set up your Eucalyptus cloud. It is advised to install the node controller first so that it is easier to add them to cloud controller. Once machine boots from the Eucalyptus Faststart DVD, then select 'Install CentOS 6 with Eucalyptus Node Controller' option from the boot screen.

Next, select the appropriate 'Language' and 'Keyboard settings' according to your locale. Provide a '*Static IP*' and a suitable '*Host Name*' to your node controller in the 'Network Configuration' wizard.

You must provide a strong 'Root Password' for node controller. After this node controller with base OS is ready. Once installation is complete you have to reboot your system.

Next step is Log in to the node controller using root username and password. At this moment few scripts run in background automatically during node controller's networking configuration. Once completed, node controller can be added to cloud controller.

Note: Follow the above mentioned steps for each of the node controllers that you wish to use for your cloud.

Figure 3: Eucalyptus Faststart boot screen

V.   INSTALLING THE CLOUD CONTROLLER

Installation steps for cloud controller is very much same as the nodes, with a few exception. Once machine boots from Eucalyptus Faststart DVD, choose 'Install CentOS 6 with Eucalyptus Frontend' from boot screen.

Next select the 'Language and Keyboard settings' from wizard. In the Network Configuration' wizard provide 'Static IP' and 'Host Name' to cloud controller.

After this, you need to give 'Public IP Range/ List' for Eucalyptus cloud (see Figure 4).These public IPs will be mapped to individual Eucalyptus instances (virtual machines) once they are launched in the cloud.

The rest of the installation process remains the same. After the cloud controller reboots, it will execute a number of configuration scripts that helps to set up Walrus, the cluster controller and storage controller with default parameters. These scripts will also create a CentOS 6 EMI (Eucalyptus Machine Image). With help of EMI we can launch multiple CentOS 6 instances in our cloud.

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Now you need to check whether installation process was successful. For this you need to open web browser type following command, it will open Eucalyptus user console:

http://<Cloud_Controller_IP>:8888

Figure 4: The Eucalyptus user console

VI. LAUNCHING YOUR FIRST INSTANCE

To start your first instance, follow these steps:

1)   First Create a security group: A security group is same as firewall that protects our instances against network-related attacks. All inbound traffic is blocked by default.

Use the following command to create a security group:

euca-create-group 'd 'Description of the group' Group_Name

euca-create-group 'd 'My First Security Group' TestSecurityGroup

After this step you need to open some ports like SSH port 22 to gain   access   to   instance. Use following command to open port for your security:

euca-authorize 'P 'Protocol' p 'Port_No' 's ' IP_Source'Group_Name

euca-authorize 'P 'tcp' 'p '22' 's '0.0.0.0/0'
 TestSecurityGroup

2) Next step is to create a key pair. This key pair helps in authentication between users and the instances.

To create a key pair, use the following syntax:

euca-create-keypair Key_Pair_Name' >>
 'Key_Pair_Name'.private

euca-create-keypair TestKeypair >>
TestKeypair.private

3)   Last step is to launch the instance: An instance is launched from a machine image (in this case, EMI). You will require an EMI ID to launch your first instance. You can get this form Eucalyptus   cloud   user-console.

To launch an instance, use the following syntax:

euca-run-instances'EMI_ID' 'g 'Group_Name' 'k 'Key_Pair_Name'

euca-run-instances 'EMI-E90A38DA' 'g
 'TestSecurityGroup' 'k ' TestKeypair'

The instance will take few seconds to launch. Note down the the instance IP address either from the terminal or by using the Eucalyptus cloud user console.

SSH into the instance using the earlier created key pair by using the following syntax:

ssh -i <Key_Pair_Name> ec2-user@<Instance_IP>

ssh -i TestKeypair ec2-user@192.168.2.100

VII. BENEFITS OF EUCALYPTUS

•   Eucalyptus supports scalable data center infrastructure. So enterprise can scale up or down their data center resources as per their needs.

•   Eucalyptus provides Elastic resource configuration. This feature allows user to flexibly reconfigure computing resources as requirements change. It helps enterprise workforce workforce remain adaptable to sudden changes in business needs.

•   Eucalyptus is open source software. Users add new functionality to the software as per their needs. The Eucalyptus open source software core is available for free download at www.eucalyptus.com.

VIII. CONCLUSION

The EUCALYPTUS system provides the ability to deploy an infrastructure for user-controlled virtual machine creation and control atop existing resources. Administrators and researchers can take advantage of this. EUCALYPTUS hierarchical design targets resources that are commonly found in academic and laboratory settings.

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