

# Comparative Cloud Deployment and Service Orchestration Process Using Juju Charms

Gaurav Raj<sup>1</sup>, Chaitanya Kapoor<sup>2</sup>, Dr. Dheerendra Singh<sup>3</sup>

<sup>1</sup>,PhD Research Scholar, Department of CSE, Punjab Technical University, Kapurthala, India,

<sup>2</sup>M. Tech.Department of CSE. , Lovely Professional University, Phagwara, India,

<sup>3</sup>Professor and Head of CSE Department , SUSCET, Tangori, India

[er.gaurav.raj@gmail.com](mailto:er.gaurav.raj@gmail.com) , [Chaitanya007kapoor@gmail.com](mailto:Chaitanya007kapoor@gmail.com), [hodcse@suscolleges.com](mailto:hodcse@suscolleges.com)

**Abstract**—This age is known as a service oriented age due to the globalization and advancement in technology day by day which lead business developers to deploy their services over the cloud. It lead to the development of new platform that has the capability to easily cope with the business expectations and has introduced a tough competition between the platform providers. These days Services like IaaS has been provided by many cloud service providers along with PaaS and SaaS. We provide a comparative study in between the types of platform (open source cloud platform as *OpenStack* and proprietary based platform as *Eucalyptus*) for deployment of IaaS , which has taken into consideration the *size of deployment, manageability and fault tolerance, API provisioning /support, performance, compatibility with other platforms and types of services to be hosted*. We discussed here about two high demanding IaaS platform provided by *OpenStack* and *Eucalyptus*. Both of the platform providers are competitive in terms of deployment of IaaS and service provisioning to its big clients. We also discussed here about the tools that can be used with these cloud platforms to easily install services on these clouds.

**Keyword-** Deployment Process, OpenStack, Eucalyptus, Cloud Computing, Dell Crowbar, Apache Hadoop, Juju Charms

## I. INTRODUCTION

Cloud computing is a new technology that surpasses web hosting and is used to provide computing utility ,storage as a service on Pay by use basis to the users. cloud computing provides elasticity i.e. we can increase or decrease the utilization of resources with passage of time .Cloud computing provides three types of services which are IaaS(Infrastructure as a service), Paas(platform as a service), SaaS(software as a service) IaaS deals with providing hardware resources (processor, memory, networking) as a service to the users. If IaaS is abstracted with language, framework then that is Paas. Similarly if PaaS is abstracted with software applications then it is known as SaaS. To provide and implement cloud based infrastructure services a cloud platform is required.

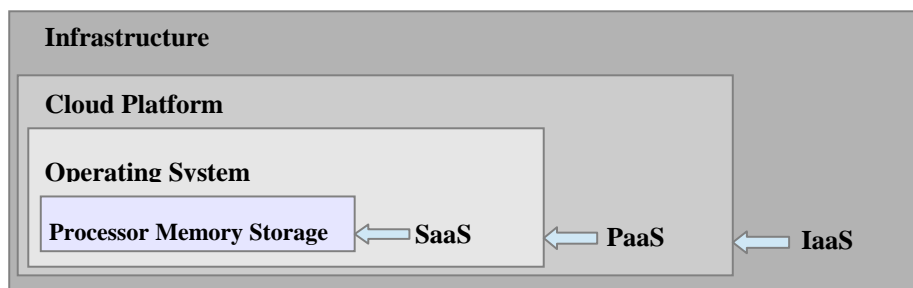


Fig 1. Architecture of IaaS

Figure shown above represents the architecture of IaaS where a cloud platform is installed over an operating system .Example –In case of openstack, it uses Ubuntu as an operating system for the deployment purposes. Currently in market there are many cloud platform providers out of which some are open source and some are proprietary based. Ubuntu Cloud Infrastructure (UCI), which is the successor of Ubuntu Enterprise Cloud (UEC), is providing facility of deploying Infrastructure-as-a-Service (IaaS) based on *OpenStack*. While *Eucalyptus* provides facility of deploying Infrastructure-as-a-Service with support of EC2 amazon web services over Ubuntu server edition 12.04 LTS as Ubuntu cloud guest on UEC private cloud.

## II. VIRTUALIZATION

Virtualization is also necessary in case of cloud computing. There are many hyper-visors which help in virtualization. Some of the most popular hypervisors are Xen, KVM, VMware and Microsoft HyperV. The main function of hypervisor is that they help in running an instance of an image, where an image is a fixed collection of system software, application software or environment that an application needs.

In case of virtualization in cloud computing, cloud platform is installed above the virtual machines as shown in Figure 2

It provides the following functions

1. *Virtual machine management* - which helps in allocating which application n will use which hardware resources.
2. *IP management* - When an instance of an image is created then it provides a public address and private address to that instance.
3. *Firewall rules* -It provides firewall rules in which security is given to the machines so that only authenticated users applications or requests can access the hardware resources.

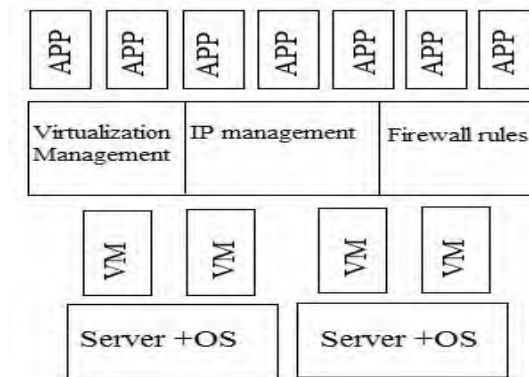


Figure 2: Virtualization in cloud platform

## III. OVERVIEW OF CLOUD PLATFORM

- A. **Openstack:** Openstack was started by Rackspace and NASA in 2010 .Currently there are more than more than 150 companies which have joined hands with this project including Intel, Dell, AMD, Yahoo. It has good developer community with large support base. Recently Ubuntu has also joined hands with openstack and provides openstack pre-installed in their Linux versions. Ubuntu also provides software orchestration MAAS (metal as a service) and juju charms for openstack.
  - Openstack has a modular architecture and have following components
  - Nova –It is used as a Computing service
  - Swift-It is the storage service and is compatible with Amazon Web services and Rackspace Services
  - Glance –It helps to initialize the instance using an image
  - Keystone-This is an Identity service which checks the authentication of the users.
  - Horizon –It is the user interface of the openstack dashboard
- B. **Eucalyptus:** Eucalyptus is a software available under GPL and helps in creating and managing public, private and hybrid cloud. It has maximum support with Amazon web services and provides many good features like Elastic IP etc. Following are the components of eucalyptus

### 1. Node controller

It is a server capable of running a hypervisor like KVM,XEN and controls the lifecycle of an instance.

It interacts with the Operating system and the instance and send necessary information to the cluster controller.

### 2. Cluster controller

Cluster controller manages one or more nodes and serves the requests that are coming from the cloud controller

### 3. Walrus storage controller

It is a storage controller which stores the machine images. It interacts with amazon s3 using REST and SOAP

### 4. Storage controller

It is similar to Amazon Elastic Block Storage and provides block storage to be used by the instances.

### 5. Cloud controller

It is the main part as it interacts with the Amazon web services like S3 and EBS on one side and with the rest of the infrastructure of the eucalyptus system i.e. it helps in making a private cloud a hybrid cloud.

It also monitors the running instances and selects a cluster and send requests to a particular node according to the availability of the resources and usage.

## IV. COMPARISON BETWEEN EUCALYPTUS AND OPENSTACK

TABLE I: Feature comparison between Eucalyptus and Openstack

	<b>Eucalyptus</b>	<b>Openstack</b>
<b>Authentication</b>	X509 authentication	X509 authentication+ LDAP
<b>license</b>	Proprietary-GPL v3	Open source-apache License
<b>support</b>	Good community support	Large community support + Ubuntu support
<b>DevOps deployment</b>	Chef,crowbar	Chef ,Crowbar,Puppet
<b>Upgrades available</b>	>4 month	<4 month
<b>Good for</b>	Private and hybrid cloud	Public and private cloud
<b>Software support</b>	Nil	Ubuntu Maas (metal as a service ) ,juju charms
<b>hypervisors</b>	KVM,XEN,VMware	KVM,XEN,VMware,Vsphere,LXC,Microsoft HyperV
<b>Platform support</b>	Linux	Windows,linux
<b>Interfaces</b>	Amazon EC2 and S3, Rest and SOAP Interface	Amazon EC2 and S3, Rest Interface. Working on OCCI
<b>Networking</b>	Four modes: (a) managed (b) managed-novLAN (c) system (d) static	Two modes: (a) Flat networking (b) VLAN networking
<b>Public cloud API compatibility</b>	Amazon web services API	Amazon web services API, Rackspace API

## V. TOOLS AND TECHNIQUES FOR DEPLOYMENT AND RESOURCE MANAGEMENT IN CLOUD

### I. Tools

- 1) **Dell Crowbar** – Dell Crowbar is DevOps Framework Cloud deployment tool which is used to deploy a cloud in less time as much of the configurations settings have been done by default. This makes the deployment of cloud easier and saves time. Dell Crowbar started as a project to deploy Openstack on Ubuntu and CentOS but later this project expanded by providing deployment to Apache Hadoop also. The main advantage of using Dell Crowbar is that by using Dell Crowbar it is easier to update components of Openstack and Hadoop when updates are available. Dell Crowbar by default install some of the tools like Ganglia, Nagios and Chef collectively known as Crowbar operations management. Dell Crowbar also provides the option to select KVM or Qemu as hypervisor.

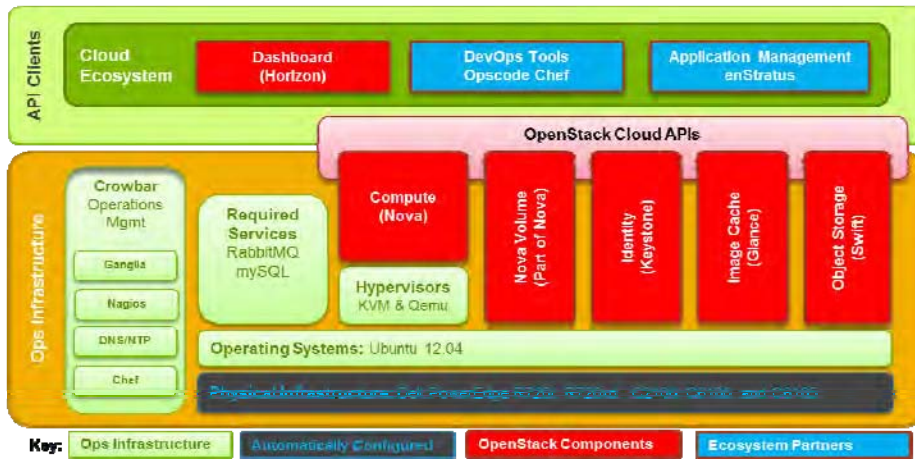


Figure 3: Architecture of Dell Crowbar

- 2) **Apache Hadoop** – Apache Hadoop is a big name in the industry of Big Data. Existing enterprise data warehouses and relational databases fails when the data is growing exponentially which becomes difficult to process and these existing relational databases are able to process only structural data. This is where Hadoop comes into the picture. At the base level Hadoop provides two core components which are HDFS and Map Reduce. HDFS is a file system used to store data and Map reduce helps in providing parallel computation over several cluster.

**II. Techniques**

With the advancements in Web 2.0 and cloud computing, the next problem in the IT world is how to store large amount of data .As database management systems are not capable of managing huge amount of data. Facebook and Google stores data in petabytes .Even languages like SQL are not capable of performing operations on this large amount of data. So to cope with this huge amount of data called as Big Data, Yahoo in collaboration with Apache has put forward a solution by using the Google search technology which is based upon NOSQL known as Apache Hadoop.

Hadoop consists of two key elements.

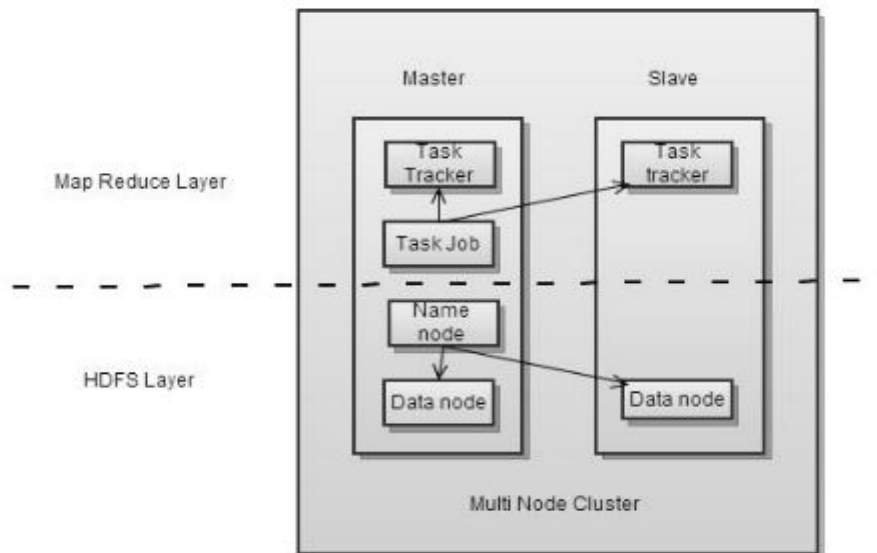


Figure 4: Hadoop Map Reduce and Hadoop Distributed File System

**1). Hadoop Distributed File System (HDFS)** – This is a file system made to store data and it permits high-bandwidth, cluster-based storage useful for Big Data computing. HDFS consists of name node and data node. Name node tracks the files across the cluster and makes a directory tree of all the files. It does not stores any data. Name node is responsible for adding, copying, moving and deleting a file.

Data node contains the data in the hadoop file system. A HDFS can have more than one data node which is useful in the replication of the data across the cluster. Data node takes instructions from the name node to apply operations on the file.

2). **Map Reduce** -The second part of Hadoop is a data processing framework called Map Reduce. Based on Google's search technology, this distributes or "maps" large data sets across multiple servers. Each of these servers then performs processing on the part of the overall data set it has been allocated, and from this creates a summary. The summaries created on each server are then aggregated in the so-termed "Reduce" stage. This approach allows extremely large raw data sets to be rapidly pre-processed and distilled before more traditional data analysis tools are applied. In MapReduce various algorithms are used. Some of them are capacity scheduler, Fair scheduler. But problem with these scheduling algorithms are that they are good in providing resources to tasks but they are not efficient in balancing the load which results in congestion.

## VI. CLOUD DEPLOYMENT PROCESS ON LOCAL SYSTEM

Here, we have the following steps for deploying cloud in local system.

1. Install Ubuntu 12.10
2. Open terminal and clone repository *devstack.git* for downloading OpenStack cloud platform.  
*git clone git://github.com/openstack-dev/devstack.git*
3. For successful download of the file, Check 'wether devstack directory exist in the system or not.
4. Now after cloning this go to devstack directory using  
*cd devstack*
5. Run command *./stack.sh*
6. It will take some time and at the end it will show the ip address to access the cloud

For deploying any service in this cloud we need to deploy, arrange, coordinate and manage complex and changing technology components and systems. For which we have to run lots of commands which take long time for installing a single service. In place of this, for our easyness we are using Juju Charms as service orchestration tool from the Ubuntu project, and MAAS, for automated bare-metal provisioning, work together to make service orchestration a reality.

### Juju Installation Steps

1. Download the repository of Juju Charms  
*sudo add-apt-repository ppa:juju/pkg*
2. Install Juju Charms  
*sudo apt-get update && sudo apt-get install juju*

### Configure environment

We have two ways of Configuring Juju Charms

#### [1] Configure Juju Charms on EC2

##### 1) *Juju bootstrap*

This will create the file *~/juju/environments.yaml* which looks like

```
default: sample
environments:
sample:
type: ec2
control-bucket: juju-faefb490d69a41f0a3616a4808e0766b
admin-secret: 81a1e7429e6847c4941fda7591246594
default-series: precise
juju-origin: ppa
ssl-hostname-verification: true
```

#### [2] Configure Juju Charms on OpenStack

##### 1) *Juju bootstrap*

This will create the file *~/juju/environments.yaml* which looks like

```

default: sample
environments:
sample:
type: openstack
control-bucket: juju-faefb490d69a41f0a3616a4808e0766b
admin-secret: 81a1e7429e6847c4941fda7591246594
default-series: precise
juju-origin: ppa

```

### [3] Configure Juju Charms on Local System

I) To configure local environment install *libvirt* using

*sudo apt-get install lxc apt-cacher-ng libzookeeper-java zookeeper*

II) use *juju bootstrap*

*This will create the file ~/.juju/environments.yaml which looks like,*

Add a section for type "local":

```

default: sample
environments:
sample:
type: local
control-bucket: juju-a14dfae3830142d9ac23c499395c2785999
admin-secret: 6608267bbd6b447b8c90934167b2a294999
default-series: precise
juju-origin: ppa
data-dir: /home/jorge/whatever

```

After this use these commands to deploy Hadoop HDFS and MapReduce

*Juju deploy hadoop hadoop-master*

*Juju deploy hadoop hadoop-slavecluster*

*Juju add-unit -n 2 hadoop-slavecluster*

*Juju add-relation hadoop-master:namenode hadoop-slavecluster:datanode*

*Juju add-relation hadoop-master:jobtracker hadoop-slavecluster:tasktracker*

To check the status of installation

*juju status*

```

machines:
0:
agent-state: running
dns-name: localhost
instance-id: local
instance-state: running
Services:
mysql:
charm: cs:precise/hdfs1-3
relations:
db:
- hadoop
units:
hdfs1/0:
agent-state: started
machine: 2
public-address: 10.0.3.99
wordpress:
charm: cs:precise/hadoop-3
exposed: false
relations:1
units:
hadoop/0:
agent-state: started
machine: 1
public-address: 10.0.3.24

```

And at last expose IP which is founded through status i.e. 10.0.3.24 so that it can be used by anyone. For exposing we need to execute command as follows

*Juju expose hadoop*

That was the final step, after which we can start our hadoop account from anywhere. But for accessing this account local system should be in running state over which we have configured cloud using Juju charms.

## VII. CONCLUSION

Based upon the comparison and the services provided by the clouds, Ubuntu Openstack stands better than Eucalyptus in terms of easy deployment and service orchestration. As Openstack is open source and funded by many large organizations and companies so there is a wide scope of development in Openstack. Openstack is a better option if the user is deploying a public or private cloud whereas eucalyptus is a good option if the user is wants to deploy a hybrid cloud. After deploying the cloud we can use this environment to work on different research topics based on load balancing and network optimization algorithms like Ant colony optimization and artificial bee colony.

## REFERENCES

- [1] OpenStack Web Page. <http://www.openstack.org>, May 2012.
- [2] Eucalyptus Web Pages (Open Source). <http://open.eucalyptus.com/>, May 2012.
- [3] Dell Crowbar Web Page , <http://en.community.dell.com/techcenter/cloud/w/wiki/3277.dell-crowbar-open-source-cloud-installer.aspx>
- [4] Apache Hadoop Web Page, <http://hadoop.apache.org/>
- [5] Juju Charms Web Page, <http://jujucharms.com/>
- [6] P. Sempolinski and D. Thain, "A Comparison and Critique of Eucalyptus, OpenNebula and Nimbus." presented at the IEEE 2nd Int. Conf. on Cloud Computing Technology and Science, 2010.
- [7] Eucalyptus Network Configuration 2.0. [http://open.eucalyptus.com/wiki/EucalyptusNetworkConfiguration\\_v2.0](http://open.eucalyptus.com/wiki/EucalyptusNetworkConfiguration_v2.0), May 2012.
- [8] Raj Gaurav, "An Efficient Broker Cloud Management System" ACAI '11 Proceedings of the International Conference on Advances In Computing and Artificial Intelligence ACM New York, NY, USA ©2011 ISBN: 978-1-4503-0635-5
- [9] Raj Gaurav, Katoch Munish, "Security Implementation through PCRE Signature over Cloud Network", Advanced Computing: An International journal, May 2012, Vol. 3 No. 3 ISSN: 2229 - 6727[Online]; 2229 - 726X [Print]
- [10] Raj Gaurav, Kamaljit Kaur, "Secure Cloud Communication for Effective Cost Management System Through MSBE", International Journal on Cloud Computing: Services and Architecture, June 2012, Vol. 2, No. 3, ISSN: 2231 - 5853[Online]; 2231 - 6663 [Print]