RESEARCH ARTICLE

Critical Analysis of Cloud Computing Using OpenStack

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Abstract— IT world is changing. Evolution of cloud computing in recent past has brought drastic change in era of IT field. Major advantage of cloud computing is that the hardware need not to be upgraded as Cloud Services provides everything of demand basis. Consuming electricity is the best example by which cloud computing can be explained, just pay for whatever you used. In this paper, we present a comparative study of leading cloud providers such as Amazon Cloud Services, Rackspace powered by OpenStack and other open source Cloud providers. Further discussing about how to implement OpenStack or just trying out by Devstack and Trystack just for testing purpose and at last covering releases and recent work going on in OpenStack. The aim of this paper is to show importance of OpenStack as a Cloud provider and how to get started with OpenStack.

Keywords— OpenStack; Trystack; Devstack; Cloud Computing; Eucalyptus; Open Nebula

I. INTRODUCTION

Cloud Computing [7] has become the essential requirement for the IT companies. Cloud Industry is growing at a very good pace, and providing essential services i.e. infrastructure as a service (IaaS), network as a service (NaaS), platform as a service (PaaS), software as a service (SaaS). Due to significant cost saving many smaller and medium sized organizations are also looking forward for using cloud services. The emerging demand for cloud services is driven by continuing globalization, consumer acceptance of technology, economic downturn and the growth of the extended enterprise. Cloud Computing [8] enables many organizations to limit the large capital investment that is associated with costly data centers and for the applications and transforming these costs into operating expenses paying for cloud resources only as required. Moreover, using the cloud services enables the end users to speed up tome to market since it uses pre-existing virtual technology and infrastructure that can be delivered and used globally.

So basically cloud computing is combination of very well-known and existing technologies that were available is the early 1990s i.e. grid computing, utility computing and virtualization. Each of these technologies form the essential component in the layers of cloud computing, which allows the end users to pay only what resources they have used.

In today market many cloud providers are available, choosing an optimal cloud provider has always been a challenge for an organization which is looking for implementing cloud or using its services. Organization should understand on what factors a specific cloud provider should be opted. Understanding requirements first

and discussing with all the stakeholders is very important so as to search for the desired cloud   provider. Leading cloud providers available are Amazon EMC2 [1], OpenStack [2], CloudStack [3] Open Nebula [4], Eucalyptus [5] etc. In this paper we will be discussing little about Rackspace [6] cloud that is power by OpenStack, Amazon Cloud Provider and some open source cloud providers like Open Nebula.

This paper is organized as follows. In Section 2 brief review of cloud computing and different cloud providers. Introduction to cloud computing and cloud service providers [12]. Next part gives brief introduction of OpenStack and how it can be implemented. Last part covers the current work going on in OpenStack..

II. Cloud Computing

Cloud Computing [5] has emerged as a flashing model of providing IT infrastructure to a large and small companies both private and public. When it comes to organization to choosing a cloud provider several points need to be taken into consideration for selecting the appropriate solution. The intent of this chapter to give overview of good cloud providers available in market. A cloud service provider offers customers storage or software services available via a private (private cloud) or public network (cloud). Usually, it means the storage and software is available for access via the Internet. So, in this chapter we will briefly discuss about some cloud providers.
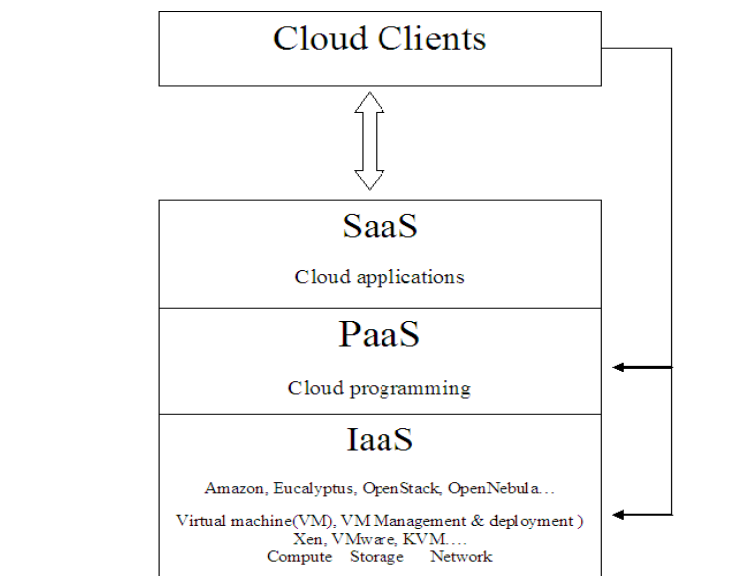
Fig 1. General Architecture of Cloud

A. *Amazon Web*

AWS is defined as the collection on remote computing services that together helps in making up cloud computing platform. It is provided by Amazon.com. Amazon EC2 and Amazon S3 are the most well-known services offered by it. It provides large computing capacity and faster and cheaper than that of building a physical server. Companies using AWS are like 8K Miles, 99 Designs, Adobe Systems, Dextra, Engine Yard, Ericsson, Global Blue, Mahindra Systems, SAP, Site 24*7.

B. *OpenStack*

OpenStack, the Linux of cloud computing. OpenStack has become the world‟s leading cloud platform that is open. OpenStack is the worldwide global collaboration of all developers and other cloud computing technologists that produce the ubiquitous open source cloud platforms for private and public clouds. The OpenStack project aims to offer solutions for all cloud to being simple to implement and which can be scalable and feature rich. More than 190 companies have joined the OpenStack project that includes: Intel, NetApp, Citrix, Dell, AMD, Canonical, HP, Cisco, Red Hat, AT&T and IBM, Rackspace [9], IFCA, Sina.com, NASA, DreamHost.
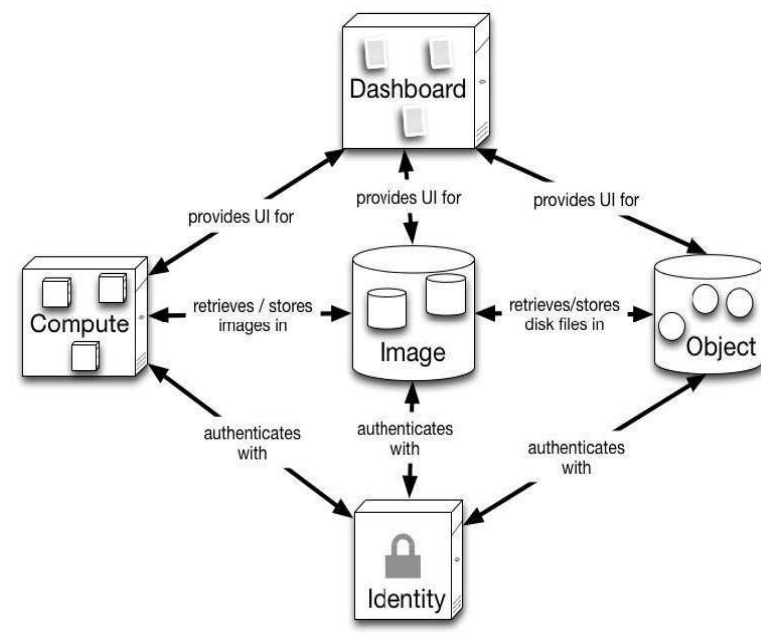
Fig 2. OpenStack Architecture

According to the documentation "OpenStack Compute is the internal fabric of the cloud creating and managing large groups of virtual private servers" and "OpenStack Object Storage is software for creating Redundant, scalable object storage using clusters of commodity servers to store Terabytes or even petabytes of data.

OpenStack main characteristics [10] are that is:

• Open: The entire code of OpenStack is open and therefore can be updated or modified as per requirement. There are certain validations process that must be processed for the adoption and development of new standards.

• Compatible and Flexible: OpenStack is very flexible and supports most virtualization solutions of the market: ESX, Hyper-V, KVM, QEMU, UML, Xen and XenServer.

• Scalable: OpenStack is very much scalable and is already deployed in companies in which data volumes is measured in petabytes and is scalable upto 1 million physical machines.

C. *Eucalyptus*

Eucalyptus is an open source + commercial IaaS service provider. Eucalyptus is the short form for „Elastic Computing Architecture for Linking Your Programs to useful Systems". Each and every Eucalyptus cloud will be having one or many Node Controllers per Cluster Controller which controls VM activities- launching, termination, inspection, clean-up of instances. The Cluster Controller manages a collection of Node Controllers, manages access to public and modular and extensible architecture; thus, it is very easy to implement third-party tool integration. Private networks, controls execution of virtual machines and manages virtual networking. Every Eucalyptus cloud have multiple Cluster Controllers. A Cloud Controller manages virtualized resources; each Eucalyptus cloud will have a single CLC.

Fig 3. Using OpenStack and Eucalyptus by Country
2011-2012

D. *Open Nebula*

   Open Nebula manages virtual infrastructure to build public, private, public and hybrid as Service Clouds. It manages virtualization, storage, network, monitoring and security. Open Nebula allows to build and manage virtualized enterprise data centers and IaaS clouds with core values such as openness, cooperation and innovation. Open Nebula provides AWS EC2 and EbS API, and self-service portal for cloud consumers. It provides a powerful CLI which looks same as UNIX commands. Security is available via user, group and role management, as well as access control lists, auditing, and isolation at different levels. Open Nebula adheres to a modular and extensible architecture; thus, it is very easy to implement third-party tool integration.
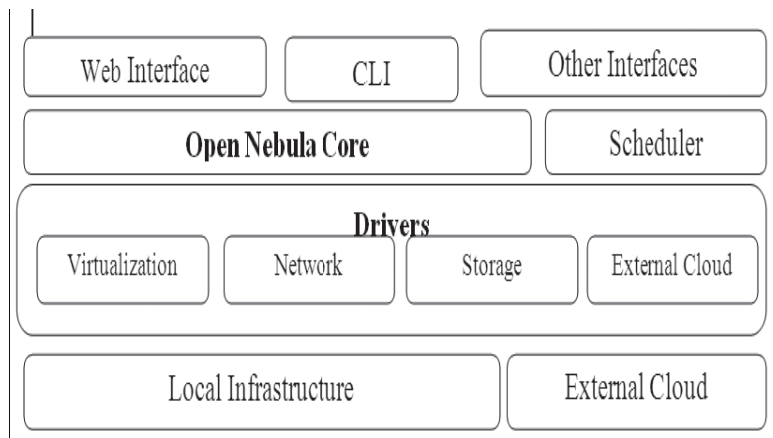

Fig 4. Open Nebula Architecture

III. FIGURES/CAPTIONS

A. *Comparing of OpenStack with Eucalyptus and Open Nebula [11]*

   There are also comparative studies of different solutions. It is essentially an overview of the solutions Eucalyptus, OpenNebula and a presentation of their different characteristics. In, comparative studies of Eucalyptus and OpenNebula including architectures, features, characteristics, architectures and applications are done in order to provide more freedom of choice for the users of the cloud. Different solutions exist for the deployment of open source clouds. Among these, we have Eucalyptus, OpenStack and OpenNebula. We propose a comparative study of the last three solutions in order to select the most appropriate solution to our criteria. These include popularity, community use, modularity, openness, open source. Figures 2 and 3 show a comparison of the solutions using Eucalyptus, OpenNebula and OpenStack in all countries between April 2010 and April 2012 and the interest of some countries to these solutions.
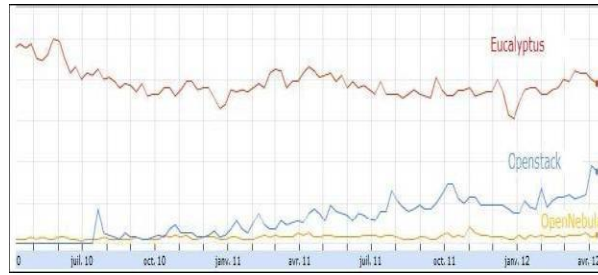
Fig 4. Comparative solutions Cloud 2010- 2012

Table 1. Comparative study of IAAS solution

Graphics	OpenStack	Eucalyptus	Open Nebula
Installation	+++++	++	+++
Docs	+++++	+++	+++
Code Openness	+++++	+++	+++++
Security	+++++	++++	+++
Storage	+++++	+++++	+++
Network	+++++	++++	+++++
Hypervisor	++++	++++	+++
Scalable	+++++	+++	++++

B. *Comparing Rackspace (OpenStack with Amazon Cloud Services)*

There has been always a competition between these two cloud providers. In the following part we will be comparing the both cloud providers in detail. Rackspace greatest asset is OpenStack. Rackspace provides a superb Support whereas Amazon is not very good known for its customer Support. Amazon always tries to keep power on but if the power goes off, the user is in dark until Amazon restores its services. Both the Amazon and Windows Azure don"t have strong reputations in terms of customer support. It doesn"t matter how small or large business is, Rackspace support phone picks up quickly. The operators of Rack Space route the customers to experts who easily understand and troubleshoot network, storage, computer, database and other cloud issues. Rackspace also has an advantage over others that the users using Rackspace with OpenStack can easily implement a flexible, scalable and reliable solution. OpenStack means that the cloud will be flexible and will attract more and more customers to keep them away from AWS.

Rackspace"s has a very simple interface as compared with one of AWS. User"s request for server like Ubuntu 12.10, 1 GB RAM, 100 GB disk will only take minutes to get ready which on other hand on EC2 is bit more difficult. But EC2 offers one good option that users can either selects a classic or quick wizard for launching the instance.

Both Rackspace and AWS provide a browser-based terminal connection. For connecting to Rackspace server, user can user iTerm, or SSH compatible terminal. Then user has to ping his server and then it will connect to the server using username and password provided to user. It only takes about 15 minutes. But in case of EC2 server, it seems to be much more complex For EC2 user has to download a keypair for SSH and after that maze of options from Amazon, it connects to server.

IV. INSTALLING OPENSTACK USING DEVSTACK AND TRYSTACK

In this section we will explain the steps the installing private cloud using Devstack [13]. If you are lack of resources and still want to learn cloud practically, then Devstack is the best option available. Devstack can be installed on your laptop and you can easily experience cloud environment within some hours. Now I will be discussing all the steps required to install Devstack on your local machine.

i. Add a user to install Devstack. Adduser stack
ii. Give sudo privileges to this user stack. To do this, edit the sudoers.sh file and all the following command at last of sudoers.sh file
stack ALL=(ALL) NOPASSWD: ALL
iii. From here on you should use the Stack user you created.
iv. Download Devstack
sudo apt-get install git -y || yum install -y git

git clone git://github.com/openstack-dev/devstack.git cd Devstack
v.   Run Devstack
Now to configure stack.sh. Devstack includes a sample in devstack/samples/localrc. Create localrc as shown below :
FLOATING_RANGE=192.168.1.224/27
FIXED_RANGE=10.11.12.0/24
FIXED_NETWORK_SIZE=256
FLAT_INTERFACE=eth0
ADMIN_PASSWORD=supersecret
MYSQL_PASSWORD=iheartdatabase
RABBIT_PASSWORD=flopsymopsy
SERVICE_PASSWORD=iheartksl
vi. Run Devstack:
./stack.sh
At this point Devstack is installed on your machine. Now you can open localhost on your browser and OpenStack Dashboard will be opened. Just login with the credentials of username "admin" and password "admin".
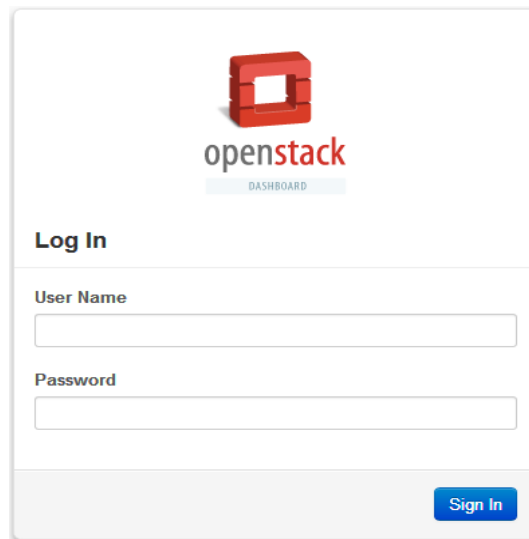

Fig 5. OpenStack Dashboard

After this you can create the keypair, by clicking on access and security tab in the dashboard and download it. Devstack comes up with a default image of cirros operating system. Click on Image tab and launch the instance. Give the instance name and then click on launch. Once the instance is launched, run the image in console and Open your Ubuntu terminal. Add the keypair from terminal and then simply by using ssh command connect to the instance created via dashboard. Your ubuntu terminal will be connected to the cirros instance that is created by Devstack.

Launch the instance with secure connection.

Steps to SSH into an instance by using the keypair that was recently downloaded.
1. Download the MyKey.pem file from the OpenStack Dashboard.
2. In a command line interface, modify the access to the .pem file:
$ chmod 0600 MyKey.pem
3. Use the ssh-add command to ensure that the keypair is known to SSH:
$ ssh-add MyKey.pem
4. Copy the IP address from the MyFirstInstance.
5. Use the SSH command to make a secure connection to the instance:
$ ssh -i MyKey.pem ubuntu@10.0.0.2
You should see a prompt asking "Are you sure you want no)?" Type yes and you have successfully connected.
Once you type yes, you will experience cloud IaaS that you created by OpenStack Dashboard. Now you can install whatever software you want to use on the cloud and then can connect the cloud machine to other machines connected on the network. You can experience services of cloud like software as a service by

installing software on cloud instance and platform as a service also. But this Devstack is just for trying out OpenStack because every time you have to run ./stack.sh command which means all services will start again.

Conclusions

OpenStack is designed to allow researchers and administrators to deploy IaaS infrastructure and provide tools for creating and managing virtual machines on top of existing resources. This work aims to illustrate that the system OpenStack has filled an important niche in the design space of cloud computing by providing an easy to deploy over the existing resources, easy to use in experimentation by being modular, and most importantly forms open source and provides powerful features while following emerging open standards. Currently, we deployed the entire system. This system will be used in future works to study and evaluate its performances in dynamic reconfiguration in an IaaS Cloud Computing.

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