



Comparative Study on Open Source cloud Platform Solutions Available for Deploying on Private, Public or Hybrid Cloud.

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ABSTRACT: Instead of deploying applications on individual physical dedicated servers it is better to run them on shared datacenter. With shared datacenter, it is easy to upgrade compute resources based on applications requirement. Shared datacenter offers cost effective solution for setting up high end datacenter. In terms of downtime, load-balancing and data recovery shared datacenter serves better options compare to physical servers as applications can be deployed on virtualized hardware rather than on actual physical hardware. Virtualized hardwares are easy to maintain and can be allocated and dis-allocated to any virtual machine hosted in datacenter with great ease. The core task in cloud computing is to control and monitor compute, storage and networking resources. In this paper, I will show comparative study of few open-source software available in market which can be used to manage cloud resources.

KEYWORDS: Cloud, IaaS, Datacenter, Apache CloudStack, OpenStack, Open Nebula, Eucalyptus.

I. INTRODUCTION

Cloud computing simply means replacing physical hardware resources with infrastructure services provides over the internet. Using cloud computing all the smarts resides in powerful pool of servers located far and far away in cloud. In cloud, there are three model of cloud service: IaaS, PaaS & SaaS.

Infrastructure as a Service

It consists of highly automated and scalable pool of hardware resources which can be available on demand by the clients just as they would do with traditional servers.

Platform as a Service

This model provides a platform on which software can be developed and deployed.

Software as a Service

This provides software service on-demand where software is centrally hosted and available as per subscription. It's also referred as "Software plus service" by Microsoft.

To implement a cloud as Infrastructure as a Service, it's very important to manage all resources very precisely. This is required so that resources can be dynamically added and removed on demand. It's required to monitor cloud resources closely because they affect three key points: Performance, Cost & Service. Managing and controlling multiple datacenters in single cloud individually can be a tedious job for administrator as well as for developer. Also, it can be diverse and multi-vendor hardware pool of resources in a datacenter. Hence to implement datacenter as Infrastructure as a Service, a single platform is required to manage virtual infrastructure of datacenter.

II. OPEN-SOURCE CLOUD PLATFORM

There are several open-source cloud softwares available which can provide single platform to manage virtualized infrastructure of cloud.

Below there are four such open-source cloud platform on which a comparative study based on features is performed.

A. Eucalyptus

Eucalyptus stands for Elastic Utility Computing Architecture for Linking Your Program to Useful System. It is open source software that was developed by University of California-Santa Barbara for Cloud Computing to implement



Infrastructure as a Service. In early 2008, it become the first open source software which is compatible with Amazon Web Service API for deploying On-premise private cloud. Amazon Web Service (AWS) is one of the major players for providing infrastructure as a service. They have two popular services Elastic Compute Cloud (EC2) and Simple Storage Service (S3). Eucalyptus provides an EC2 -compatible cloud Computing Platform and S3-compatible Cloud Storage thus its services are available through EC2/S3 compatible APIs. [1]

B. OpenStack

OpenStack is a free and open-source software platform for cloud computing, mostly deployed as an infrastructure-as-a-service (IaaS).[2] The software platform consists of interrelated components that control diverse, multi-vendor hardware pools of processing, storage, and networking resources throughout a data center. Users either manage it through a web-based dashboard, through command-line tools, or through a RESTful API. OpenStack.org released it under the terms of the Apache License. [3]

C. OpenNebula

OpenNebula is a cloud computing platform for managing heterogeneous distributed data center infrastructures. The OpenNebula platform manages a data center's virtual infrastructure to build private, public and hybrid implementations of infrastructure as a service. OpenNebula is free and open-source software, subject to the requirements of the Apache License version 2. [4]

OpenNebula orchestrates storage, network, virtualization, monitoring, and security [5] technologies to deploy multi-tier services (e.g. compute clusters [6] [7]) as virtual machines on distributed infrastructures, combining both data center resources and remote cloud resources, as per allocation policies. As per the European Commission's 2010 report "... only few clouds dedicated research projects in the widest sense have been initiated – most prominent amongst them probably OpenNebula ..." [8]

The toolkit includes features for integration, management, scalability, security and accounting. It also claims standardization, interoperability and portability, providing cloud users and administrators with a choice of several cloud interfaces (Amazon EC2 Query, OGF Open Cloud Computing Interface and vCloud) and hypervisors (Xen, KVM and VMware), and can accommodate multiple hardware and software combinations in a data center. [9]

D. Apache CloudStack

Apache CloudStack is a top-level project of the Apache Software Foundation (ASF). The project develops open source software for deploying public and private Infrastructure-as-a-Service (IaaS) clouds. [10] Apache CloudStack is open source software designed to deploy and manage large networks of virtual machines, as a highly available, highly scalable Infrastructure as a Service (IaaS) cloud computing platform. CloudStack is used by several service providers to offer public cloud services, and by many companies to provide an on-premises (private) cloud offering, or as part of a hybrid cloud solution. [11]

CloudStack is a turnkey solution that includes the entire "stack" of features most organizations want with an IaaS cloud: compute orchestration, Network-as-a-Service, user and account management, a full and open native API, resource accounting, and a first-class User Interface (UI). [11]

II.COMPARISON

Features	Apache CloudStack	Open Nebula	Eucalyptus	OpenStack
Computing Architecture	It can have many numbers of availability zones. Also, can manage large network VMs. It	It has multi-tenancy, automatic provisioning and scalability. It	Eucalyptus commands can manage either Amazon AWS or Eucalypt	OpenStack software platform consists of interrelated



	provides service for both public and private cloud.	follows bottom-up approach driven by system admins, developers and end-users.	us instances . Users can also move their instances between a Eucalyptus private cloud and Amazon EC2 to create a hybrid cloud.	components that control diverse, multi-vendor hardware pools of processing, storage, and networking resources through out a data center.
Virtualization management	Virtualized resources into one homogeneous environment where we can delegate the creation to users of the virtual machines using the self-service CloudStack portal.	Virtual machines are managed irrespective of their zone or clusters.	Applications are isolated by hardware virtualization through computer hardware .	Many number of physical hosts and VMs in the virtualized infrastructure would likely to manage with OpenStack.
Load Balancing	This has an external Juniper SRX device and one optional external NetScaler for gateway and load balancing services.	Simple load balancing and round robin method is used into it.	Eucalyptus load balancer works with the High Availability proxy service.	It has unique neutron-Load Balancing as a service. Also, configure HAProxy Daemon



				. It is denoted as LBaaS.
Fault tolerance	Cloud stack uses Host anti-affinity as a fault tolerance.	Persistent databases are created at the backend to store the information of VMs and hosts.	Separate clusters are made to reduce the chance of duplication.	It has RAID controllers for fault tolerance at hardware level.
Hypervisor	LXC host on redhat 7, cent OS with KVM.	Amazon EC2, Xen and KVM.	Xen Hypervisor in Eucalyptus.	It supports NOVA matrix feature as KVM.
Storage	NFS and iSCSI.	Database and SQLite 3.	Amazon EC2, S3 and walrus front-end.	Ephemeral storage technology is used.[12]
Service	IaaS	IaaS	IaaS	IaaS
Compatibility with AWS	CloudStack provides compatibility with AWS EC2 and S3 for organizations that could deploy on hybrid clouds.	Open Nebula has compatibility with AWS APIs programming interfaces.	Eucalyptus embraces AWS to build private and hybrid cloud computing environment.	OpenStack has compatibility with AWS EC2 and AWS S3 along with its APIs.
OS Support	Cross-platform	Linux	Windows VMs and Linux	Cross-platform



Programming / scripting language	Java	C++, C, Ruby, Java, Shell Scripting.	Java , C	Python
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III.CONCLUSION AND FUTURE SCOPE

Here we have shown the different software available in the market for managing cloud resources. Each software has its own uniqueness and they are mostly dependent on client requirements. This paper gives a better decision making strategy to choose based on requirement. The main tasks of these softwares are to control and monitor the different aspects like storage and network resources and help in computing.

In future, all available open-source cloud platform can be rated based on their performance after implementation in the same given scenario and then selection of open-source cloud platform could be more defined.

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