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Portability between Eucalyptus and OpenStack- A Case Study of the challenges involved in Cloud Migration

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ABSTRACT

This paper attracts the attention towards providing a practical context for discussions on interoperability and standards and focuses the industry's attention on the importance of Open Cloud Computing and need to define standards to make the use cases possible. Standardization will increase and accelerate the adoption of cloud computing as user will have more choices in cloud without vendor lock in, portability and ability to use organizations own existing data centre resources seamlessly.

1. INTRODUCTION

Cloud computing has recently attained popularity and developed into a major trend in IT. Currently each vendor develops its own solution and avoids too much openness to tie consumers into their services and make it hard for them to switch to competitors. However, to new adopters, the fear of vendor lock-in presents a barrier to cloud adoption. More over there is a need to migrate VM's from one cloud to other for a variety of purposes, including load balancing, fault tolerance, power management, reducing response time, increasing quality of service, and server maintenance etc. Thus this work attracts the attention towards providing a practical context for discussions on interoperability and portability standards and focuses the industry's attention on the importance of Open Cloud Computing and need to define Open standards to make the use cases possible.

This paper is structured as follows: Section 2 reviews the previous work, Section 3 explains the generic open-source cloud computing system, Section 4 compares the features of two cloud platforms i.e. Eucalyptus and OpenStack, Section 5 demonstrate the migration from Eucalyptus to OpenStack and vice versa and Section 6 concludes the paper.

2. PREVIOUS WORK

Anita S. Pillai, L.S. Swasthimathi [1] explained the characteristics, application and also provided a comparison of the most commonly used open cloud platforms. Since cloud computing is an evolving technology, there are many features which are being added. The comparison is based on the current features and technology available in these open source platforms, however, there is need for incorporation of more features to improve these framework.

Grossman [2] points out that the current state of standards and interoperability in cloud computing is similar to the early internet era where each organization had its own network and data transfer was difficult. This changed with the introduction of TCP and other Internet standards. However, these standards were initially resisted by vendors just as standardization attempts in cloud computing are being resisted by some vendors.

Parameswaran and Asheesh Chaddha [3] say interoperability and standardization have huge impact on cloud adoption and usage. Standardization will increase and accelerate the adoption of cloud computing as user will have wider range of choices in cloud without vendor lock in, portability and ability to use the cloud services provided by different vendors. This will also include the ability to use an organization's own existing data center resources seamlessly. They discussed different approaches for interoperability i.e. cloud broker and orchestration layer. Challenges with such approaches are also discussed and concluded that standardization will pave the way towards realizing the true potential or benefits of cloud computing.

3. OPEN SOURCE CLOUDS

In a generic open-source cloud computing system, there are six basic components.

First, is hardware and operating systems that are on the various physical machines in the system. The processors of the physical nodes should have hardware extensions to run pure virtualization. Open source frameworks, must be flexible enough to work with many underlying systems.

The second component is the network which includes DNS, DHCP, subnet organization of physical machine and virtual bridging of network which is accomplished using bridge utils, iptables or etables.

The third component is the virtual machine hypervisor, (also known as a Virtual Machine Monitor or VMM). In addition to the actual VMM itself, each of these cloud frameworks relies on a library called libvirt, which is designed to provide a facility for controlling the start and stop of VMs.

The fourth component is an archive of VM disk images, repository of disk images that can be copied and used as the basis for new virtual disks.

The fifth component is the front-end for users. There must be some interface for users to request virtual machines, specify their parameters, and obtain needed certificates and credentials in order to log into the created VMs.

The last component is the cloud framework itself, where Eucalyptus, OpenStack are placed. This framework processes inputs from the front-end, retrieves the needed disk images from the repository, signals a VMM to set up a VM and then signals DHCP and IP bridging programs to set up MAC and IP addresses for the VM.

4. FEATURES COMPARISON EUCALYPTUS AND OPENSTACK

a) The Eucalyptus software allows the cloud consumers to create the virtual machine with default size (number of CPU cores and RAM size) using the command-line interface and both the live and cold migration are not present.

The OpenStack software allows the cloud consumers to create the virtual machines with default size (number of CPU cores and RAM size) using the command-line interface and allows the cloud consumers to create the virtual machines with different sizes using the graphical interface.

b) Both softwares provide some standard virtual machine images to download from their websites, the standard images help to create virtual machines easily.

c) For adding, listing, and removing virtual networks from the cloud management software cloud provider can use the command-line interface to manage the virtual networks

d) Hypervisors supported by Eucalyptus are Xen & KVM and by OpenStack are Xen KVM Microsoft Hyper-v& VM ware

e) Eucalyptus has two scheduling mechanisms greedy scheduler and round-robin scheduler. The OpenStack has three scheduling mechanisms, simple scheduler, chance scheduler and availability zone scheduler

f) The ability to impose limitation for virtual machine requests is not provided by the Eucalyptus. In OpenStack the limitation is based on per user request, and on the group usage.

g) Openstack does not provide an extension for a private cloud to combine the local resources with the resources from a public cloud.

h) The Eucalyptus and OpenStack has a single point of failure, if the Cloud Controller and nova service fails the system is isolated.

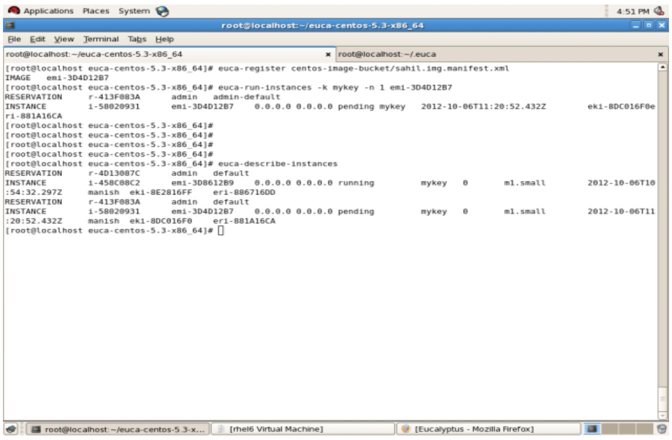
i) Contextualization is supported by both cloud management software

5. TESTING PORTABILITY

The process of interoperability commenced with creation of two test beds viz. Eucalyptus and OpenStack. In the first test bed of Eucalyptus Cloud Controller, Walrus, Storage Controller and Cluster Controller - all reside on one machine called the front-end, whereas the Node Controller sits behind it (called the node). The other testbed ‘OpenStack’ provides an operating platform or toolkit for orchestrating clouds; these services are Identity (key stone), compute (nova), image (glance), dashboard (horizon), and object Storage (Swift). All these OpenStack components are installed on ubuntu12.04.

Eucalyptus to OpenStack migration: In Eucalyptus there is no way to store running instance into an image as OpenStack does, thus while attempting migration from Eucalyptus to OpenStack, data was not saved in image. Actually, it doesn't capture the live state of the RAM, rather it shuts down the instance and copies the disk image to Walrus such that the image can be registered with different names or options. Hence the image saved is as fresh as the newer image. Therefore migration of the instance from Eucalyptus to OpenStack was not possible. The snapshot of the volume of the Eucalyptus instance is created. But this too did not help in the migration of the Eucalyptus to OpenStack.

OpenStack to Eucalyptus migration: Considering one of the running instance from Open stack server, shown in nova list, an image created using command ‘**image-create**’ .image is saved at /**var/lib/glance/images**/. Now that image file is copied to the Eucalyptus server, the first tested where other VM machines are running. Using‘**euca-bundle-image-Isahil.img[kernel_id][ramdisk_id]** ’command image is bundled for use with Eucalyptus and manifest file is generated. ‘**euca-upload-bundle’** command is used to upload the previously bundled image to the cloud. Manifest file is registered using ‘**euca-register’** and started the virtual machine using ‘**euca-run-instance’.**



6. CONCLUSION

Due to increased interest in more advanced usage scenarios involving multiple cloud service providers utilizing federal and hybrid clouds, cloud bursting application scenario, load balancing, fault tolerance, power management, reducing response time, increasing quality of service, and server maintenance and more migration of VM’s is also needed. But there is lack of support for migrating VM’s between different service providers as well as between private and public clouds. There should be ways of allowing cloud services to interoperate with other clouds i.e. the cloud services should be able to implicitly use others through some form of library without the need to explicitly refer them, the virtual servers can be transferred as a file from one machine to another. For this, there should be discussions on interoperability and portability standards. Although some organizations (DMTF), (OGF), (OCC) are working yet interoperability and portability are typically driven stronger by de facto standards than de jure standardization efforts.

Cloud providers must work together to ensure that the challenges to cloud adoption are addressed through open collaboration and the appropriate use of standards to ensure interoperability, ease of integration and portability. It must be possible to implement all of the use cases without using closed, proprietary technologies. Cloud computing must evolve as an open environment, minimizing vendor lock-in and increasing customer choice.

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