Benefits and Different techniques of creating a Private cloud

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Abstract— In this era, Private cloud is now became popular by achieving a great efficiency of resources as well as improved to manage IT resources and services within an enterprise or organization. This can be achieved by developing a private cloud for organization and also provided security mechanism for internal attacks in the university data center. In the first phase of paper we will discuss basics of cloud computing. In the second phase of paper we will discuss different ways of creating a private cloud and finally we will discuss benefits and attacks in private clouds. Linux-Ubuntu Enterprise Cloud powered by Eucalyptus was used in this project as the preferred underlying technology upon which a private cloud infrastructure was built. We used windows server 2008 and hypervisor to create a private cloud. In third part we used RACKSPACE for private cloud implementation. The practical part describes the laboratory implementation of a private cloud.

Index Terms— cloud computing, hypervisor, SaaS, PaaS, IaaS

I. INTRODUCTION

Now a day's cloud computing plays an emerging factor in the field of technology. Cloud computing is modern trending in the computing industry in which elastic and scalable IT-enabled proficiencies are conveyed as a service to customers via the internet. Cloud computing evolved from parallel, utility, autonomic, distributed, and grid computing. There is a slight similarity between all these technologies but they all work differently. Computing can be simply explained as the sharing and use of resources and applications of a networked environment to complete a task without concern about ownership or management of the network's resources and applications. The image below describes the evolution of cloud computing since the advent of the internet up till now.
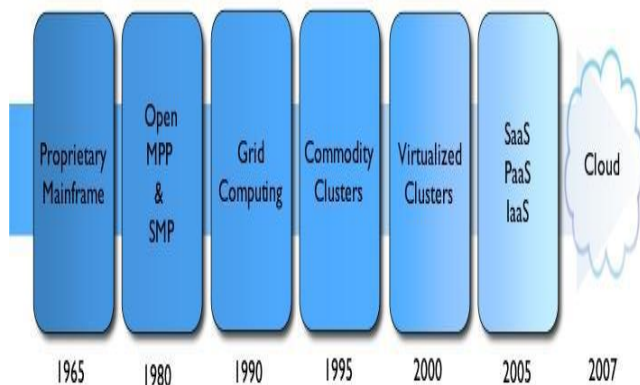

Figure 1. Evolution of Cloud Computing

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II. HOW THE CLOUD WORKS

This could be explained by considering conventional servers years ago (before the advent of virtualization), an enterprise installs an operating system (OS) on its hardware and has an email exchange client running on its operating system suffers the problem of dependency. Dependency here refers to the fact that the email exchange server depends on everything below it. For instance, if the OS gets a virus, or the hard disk crashes, or the CPU fan stops functioning, this will consequently shut down the email exchange services from the email server. In other words, since the application is installed on the OS and the OS is installed on the hardware, so if either the OS or the hardware fails, the application also consequently fails.

III. CLOUD ARCHITECTURE

The internet cloud is envisioned as a massive cluster of servers. These servers are provisioned on demand to perform collective web services or distributed applications using data-centre resources. The cloud platform is formed dynamically by provisioning or de-provisioning servers, software, and database resources. Servers in the cloud can be physical machines or virtual machines. User interfaces are applied to request services. The provisioning tool carves out the cloud system to deliver the requested service. The architecture of a cloud is developed at three layers: infrastructure, platform, and application. These three development layers are implemented with virtualization and standardization of hardware and software resources provisioned in the cloud. The services to public, private, and hybrid clouds are conveyed to users through networking support over the internet and intranets involved. It is clear that the infrastructure layer is developed first to support IAAS services. This infrastructure layer serves as the foundation for building the platform layer of the cloud for supporting PAAS services. In turn, the platform layer is a foundation for implementing the application layer for SAAS applications. Different types of cloud services demand applications of these resources separately. The layers of the cloud architecture are described below in Fig. 2.
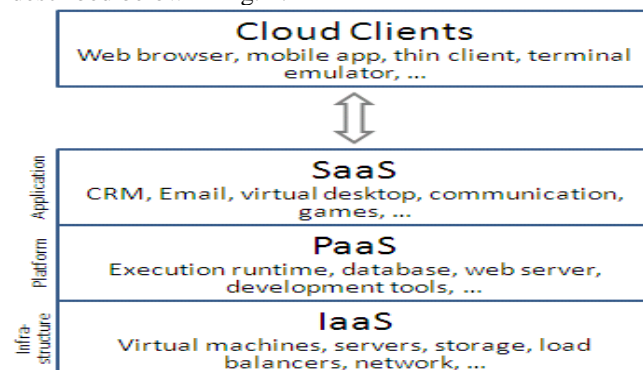
Figure 2. Cloud Computing Architecture

IV. PRIVATE CLOUD ARCHITECTURE

A private cloud can have its data centre on or off the enterprise's premises for performance and security reasons. A private cloud that is IAAS will usually leverage virtual machines, but not always. Private cloud solutions that leverage rapid provisioning (e.g. IBM cloud burst) will be available to support physical and virtual devices. The diagram below (Fig. 3.1) shows private onsite and offsite private clouds.

A private cloud possesses four main architectural elements; managing accesses, managing service, managing resource and pooled resources. A self-service portal may give access management and a relatively easy interface, but the automation of service behind that portal is also important.
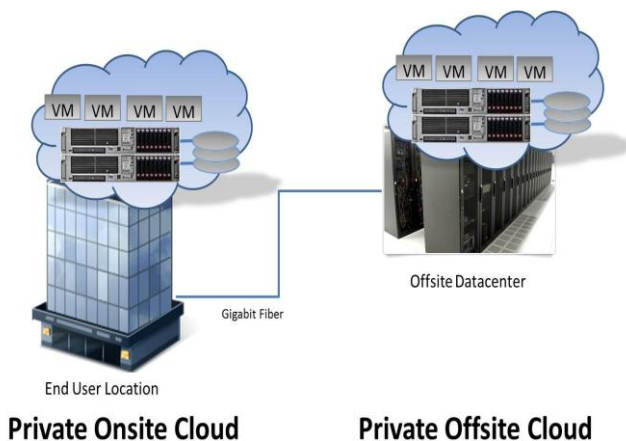
Figure 3.1. Onsite / Offsite Private Cloud Architecture

V. DEVELOPMENT OF PRIVATE CLOUD:

We are considering three ways for creating a private cloud. We will see steps and implementation results and benefits of creating a private cloud for any enterprise or any organization.

VI. PRIVATE CLOUD IMPLEMENTATION:

To demonstrate the implementation of a private cloud, a Linux Ubuntu 9.04 LTS (Jaunty) server distribution was used. Ubuntu was used because UEC uses the same machine images as AMAZON EC2. It is lean, fast and powerful. While setting-up this cloud, XEN hypervisor was considered instead of KVM. This is because KVM is limited to running only virtualization extensions of Intel VT or AMD-V CPU processors, although Ubuntu prefers KVM for its virtualization support and it is added to the default packages but without these extensions, KVM will not work. XEN is the underlying technology used by EUCALYPTUS. XEN hypervisor allows the simultaneous execution of several guest operating systems on the same computer systems hardware. Several virtual machines can be obtained from a single physical machine using XEN, in order to provide utility computing and server consolidation.

A. Front End Setup:

Linux Ubuntu 9.04 (Jaunty) ISO was downloaded and burned to CD. This fresh Ubuntu CD was installed but could be done

in two ways: it could be done either by installing an Ubuntu Cloud CD or an Ubuntu Server CD. For this purpose, we chose to install the Ubuntu Server CD and selected the open SSH server to be installed by default to enable remote connection to the front-end machine. Fig. 7 shows the Ubuntu cloud installation.

Figure 4. Ubuntu Cloud Installation

Step 1: The systems setup is updated with the following command to bring the systems up to date:
apt-get installs update

Step 2: Postfix Installation: Postfix is a mail server used by Eucalyptus to send notifications to users present on eucalyptus web interface with user privileges from the administrator.

Step 3: Installing the Cloud controller as well as the Cluster controller is the next step. This is done by installing the packages by Ubuntu; the package manager will install all the dependencies automatically.

Step 4: DHCP has to be installed because it is used by Eucalyptus to assign IP's to instances. DHCP server should not be in the running state. In addition, the DHCP server must be set not to run when the system is booted up again.

Step 5: Eucalyptus mode from the configuration files would have to be changed to static so that Eucalyptus can use Internet Protocol addresses from a dynamic pool of addresses that is in the configuration file.

Step 6: More configurations:
The path can be edited using NANO editor and the system has to be rebooted for the changes to take effect.

Step 7: After installing the eucalyptus front-end, the Eucalyptus web interface can be used to setup cluster and set other parameters. The Eucalyptus private cloud web address is URL: https://:8443/ which can be found under the configuration tab also, at this point, add cluster name and Set host to _local host_ Ram disk images and kernel can be created and set in the Eucalyptus official website. It is also important to remember to restart Eucalyptus for the system to effect changes.

XEN is used as virtualization package; the node controller package eucalyptus-nc was manually installed as seen in Appendix 2. The Eucalyptus node controller was installed by manually downloading and installing by passing dependencies list. Moreover, by using the package manager apt-get dependencies were also installed.

Step 1: Hardware compatibility

Step 2: Installing the XEN package By using the XEN virtualization package instead of Ubuntu default KVM and installing the eucalyptus-manually the node controller dependencies, the XEN package is successfully installed on the backend

Step 3: Install Libvirt bin packages
This can be downloaded from the Ubuntu Jaunty web site.

Step 4: Installing Eucalyptus node package
The Eucalyptus-nc package was downloaded from the Ubuntu package repository.

Step 5: Configuring Grub loader for the XEN Kernel and load XEN images to boot into XEN kernel and Setup grub menus. Modules and images were downloaded from the Ubuntu Debian website.

Step 6: Configuring Eucalyptus
Set the configuration depending upon your installation and stop the Eucalyptus daemon.

Step 7: Cloud integration
The permission and certificate files will be replicated to the nodes in order to have password-less communication between the node and cloud. To verify the cloud installation, and check if the node 43 TURKU UNIVERSITY OF APPLIED SCIENCES, BACHELOR'S THESIS | Odunayo O. Owopetu is communicating, run the **Eucalyptus-describe-availability-zones** verbose command and check the output listings for the presence of all the nodes.

VII. EUCALYPTUS TOOLS SETUP

Setting up Euca2ools: Dependencies as installed as seen in Appendix 3.
This is started by install curl lib open SSL-ruby ruby
The appropriate tar ball is downloaded from
http://open.eucalyptus.com/downloads
Installing cloud dependencies and creating the guest machine:
Installing Java JDK, the current java version and guest image was created using VM builder.
Creating the image:
EMI is created using this image file. This image is in the Ubuntu-XEN folder which could be tested to verify compatibility with XEN using the XM create command. The EMI status can be checked using the XM list command.
Creating EMIs
Now, cloud is setup, images should be created that can be run using Eucalyptus. EMIs for kernel, ram disk and instance still need to be created.

VIII. TROUBLESHOOTING

In the process of installing Eucalyptus, a few problems were encountered and as such required joining forums as well as searching on Google for assistance.
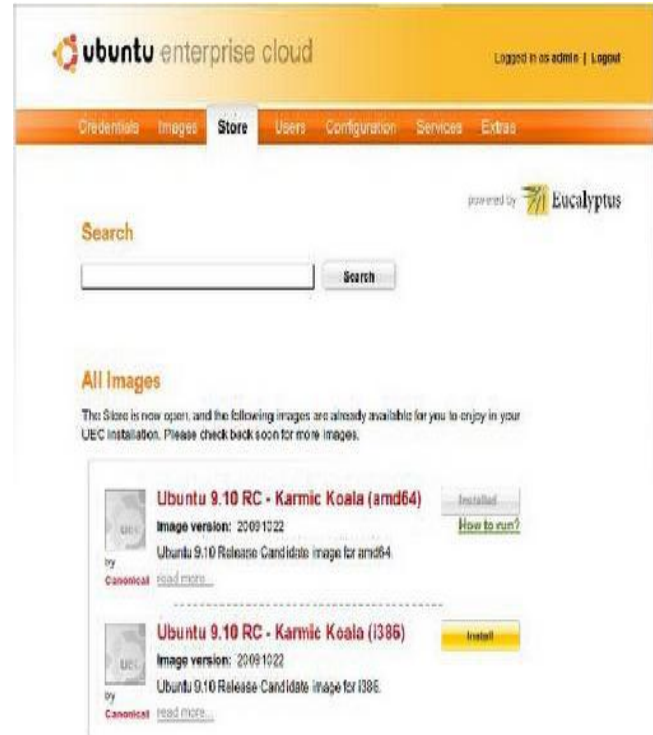

Figure 8.1. UEC Management Software

IX. CLOUD PROVISION FROM UBUNTU

Logging into Ubuntu cloud Admin console
In this section we will discuss how to install node controller. Once the cluster control and nodes are installed cloud is managed by costumer's IP address. The system is managed by web interface with port no. 8443.
Eg. Assuming the cluster controller's IP address is 192.168.13.12 and the URL is http://192.168.13.12:8443 can be used to manage cluster.

Ubuntu enterprise cloud

X. CONCLUSION

Implementing a private cloud using Ubuntu (open source software) has shown in this project that it is possible to link regular desktop computers which lack virtualization capabilities to form clusters based on Ubuntu Enterprise Cloud, using Eucalyptus as the management software to build a private cloud. Installations were fairly easy and following the steps in this thesis would allow a beginner to install an open source cloud but there were problems with logging

encountered with Eucalyptus. The result of this paper is a fully functional private cloud with possibilities of Infrastructure as a service which is the interactive Ubuntu Enterprise Cloud interface which is used to install images of operating systems and test the full functionality of the cloud. This has been a very challenging project because of limited educational resources. These problems require skills and experience to solve and in this case, was fortunate to find answers on internet blogs.

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