Virtualization: A Concept Implementation for Cloud

Mayank Aggrawal, Nishant Kumar, Apoorv Kaushik, Yatin Karel, Akshay Mathur

Abstract— **Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [7]. This is not a new concept but still in evolution phases in academics as it is difficult to implement it and the infrastructure required is quite costly. We in this paper provide a very easy method to implement virtualization the first step to have cloud implemented and thus provide Platform as a Service. (PaaS)**

Index Terms— **Cloud Computing, PaaS, Virtualization.**

I. INTRODUCTION

Cloud Computing is not a totaly new concept; it has its root in Grid Computing paradigm, and other technologies like cluster computing, utility computing and distributed computing in general.It can be defned as utilization of computer resources be it hardware and software from any device ,any time, any where and you pay as you need.

To implement a cloud lab is tough in terms of Technology and Cost both. Here we provide a step-by-step method to implement virtualization in a very simple manner to any system and use it as a PaaS, thus saving the cost also and keeping the process simple. It enables the cloud user to run and deploy their applications on our server without bothering about the Operating System and other Hardwar and Software services. This solution reduces the initial investment on the IT resources for any company. Now the non-IT companies do not have to worry about their IT department and can focus fully on their core business and they have to pay only as per the uses.

II. DEFINING CLOUD

Cloud Computing can be defined in various terms. Here we present some of the key definitions of cloud:
Cloud computing is a broad array of web-based services aimed at allowing users to obtain a wide range of functional capabilities on a 'pay-as-you-go' basis that previously

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required tremendous hardware and software investments and professional skills to acquire. Cloud computing is the realization of the earlier ideals of utility computing without the technical complexities or complicated deployment worries.[5]

Buyya et al. have defined it as follows: "Cloud is aparallel and distributed computing system consisting of a collection of inter-connected and virtualised computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers.[9]
McKinsey and Co. report claims that "Clouds are hardware based services offering compute, network, and storage capacity where: hardware management is highly abstracted from the buyer, buyers incur infrastructure costs as variable OPEX and infrastructure capacity is highly elastic." [6]

III. MODELS

There are three basic types of Service Models depending on the service each layer provides to its upper layers. The three models are:
Infrastructure as a Service(IaaS) : When user has got the maximum flexibility to deal with the Infrastructure , where he can even install his Operating System it is known as Infrastructure as a Service (IaaS) .
In it the provider makes entire infrastructure available as a service. The end user can use the entire infrastructure on pay per usage basis. The ability to support an IaaS architecture is through a combination of some of the special characteristics of cloud computing. They include dynamic provisioning, fine-grained measurement and metering, virtualization, broadband access, and flexible billing. Infrastructure services are considered to be the bottom layer of cloud computing systems [4]

Platform as a Service(PaaS) : A cloud platform offers an environment on which developers create and deploy applications and do not necessarily need to know how many processors or how much memory that applications will be using. In addition, multiple programming models and specialized services (e.g., data access, authentication, and payments) are offered as building blocks to new applications [2]. In it the cloud provides software platform or middleware as service on which the applications run. The user is responsible for creation, updating and maintenance of the application.
Platforms in the cloud are an interesting offering that takes the pain away from having to set up and configure the software platform or middleware. It is less flexible than IaaS.

Software as a Service(SaaS) : This is the topmost layer of the architecture , it has all the applications residing in it. Applications are provided as a Service and these Services can be accessed by end users through Web portals. Therefore, consumers are increasingly shifting from locally installed computer programs to on-line software services that offer the same functionally. Traditional desktop applications such as word processing and spreadsheet can now be accessed as a service in the Web. This model of delivering applications, known as Software as a Service (SaaS), alleviates the burden of software maintenance for customers and simplifies development and testing for providers [3].

We in this paper provide step by step method to provide PaaS by doing virtualization.

IV.   VIRTUALIZATION: A CONCEPT IMPLEMENTATION

Cloud computing services require a big data center for almost around thousand computers to serve many users and host applications. These data centers are all geographically distributed to make these data centers much more economical and energy saving virtualization was introduced. The idea of virtualizing a computer system's resources, including processors, memory, and I/O devices, has been well established for decades, aiming at improving sharing and utilization of computer systems [10]. Virtualization can be of many types but basic aim is it allows multiple operating systems running concurrently on a single physical platform, giving each user an illusion to own a separate machine. As depicted in Figure 1.2, a software layer, the virtual machine monitor (VMM), also called a hypervisor, mediates access to the physical hardware presenting to each guest operating system a virtual machine (VM), which is a set of virtual platform interfaces [11]. The advent of several innovative technologies—multi-core chips, para-virtualization, hardware-assisted virtualization, and live migration of VMs—has contributed to an increasing adoption of virtualization on server systems. It has resulted in much better utilization of resources, more reliability, cost saving, energy saving and many more advantages.
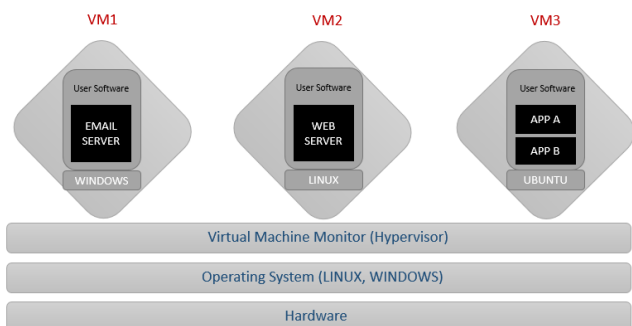

Figure 1.2

V.   IMPLEMENTATION

We implemented PaaS by using para-virtualization (hypervisor is installed over an Operating System). The steps used are given in various literatures [8], [1] and can also be had from help of Linux, the basic aim is to present the use of them in a very simple manner.To manage the virtual machines we used a hypervisor known as KVM (Kernel based virtual machines). Hypervisor allows a Single System to run multiple operating systems (Supervisor) in parallel and provides a feel that each Operating System is independent from others (having its own hardware resources), Although the hardware resources are shared among the Operating Systems on a time-sharing basis that is each VM gets an equal CPU time. Now when the client requests for a System (provides a configuration for the System) we at the server, setup a virtual machine as per the user requirements and provide authentication details to the user. The client using either VNC, RDP, SSH or any other remote control protocol accesses this virtual machine. To provide encrypted data transfer over network in VNC or RDP we use SSH tunneling. Also when the user needs any modification in their system (in terms of secondary memory, main memory, network cards, etc) they can request for that to the server and the server fulfills the requested configuration. Server can also provide virtual private network to the user on demand.

The step-by-step process is discussed below:

A.   PREREQUISITE

1.) Two systems required:
First Server with CentOS 6.4 or RedHat 6 installed. (All further implementation is done on CentOS 6.4)
Second is Client with Linux or Windows OS.

2.) Both the systems should be on a network (connected over LAN).

3.) Set Server IP 192.168.1.253
   Client IP Range192.168.1.252
Or as per your IP range but both should be on same subnet.

4.) Make sure Virtualization is enabled in server by checking the features of BIOS.

B.   SERVER-SIDE SETUP

5.) Required Package Installation: There are two process to install required package.
   a.) Connect to INTERNET to install all packages directly from the distributor repository.
   b.) Using available packages in CentOS or RedHat Installation Disk by creating own repository.
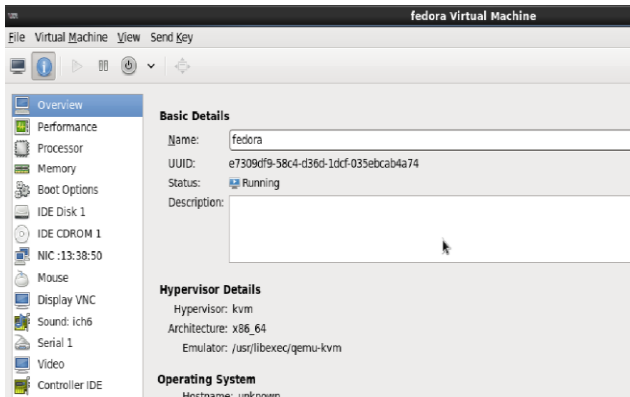
6.) Setup virtualization on Server:
   a.) Open terminal.
   b.) Install KVM, a hypervisior by using.
      yum install kvm
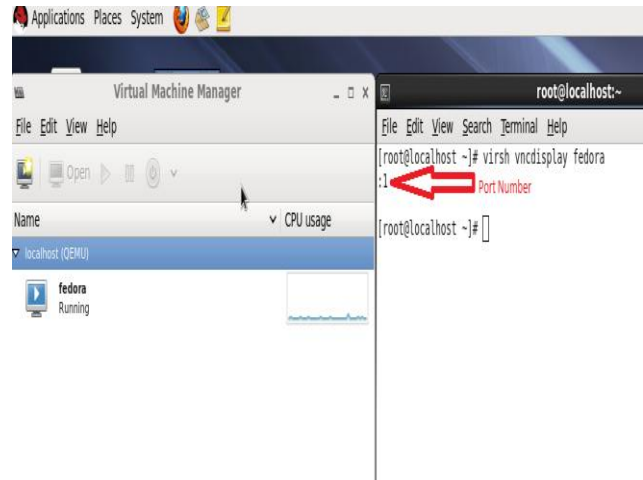   *c.)* Install virt-manager (Graphical tool to manage virtual machines).
      yum install virt-manager
   d.) Install libvirt
      yum install libvirt
   e.) Start libvirt service:
      service libvirtd start
   f.) Open virt-manager tool to install virtual machines.
   g.) Add new virtual machine and follow steps using Virtual Machine Manager Wizard and assign resources as required and available. Remember to choose qemu-kvm for virtualization in last step.
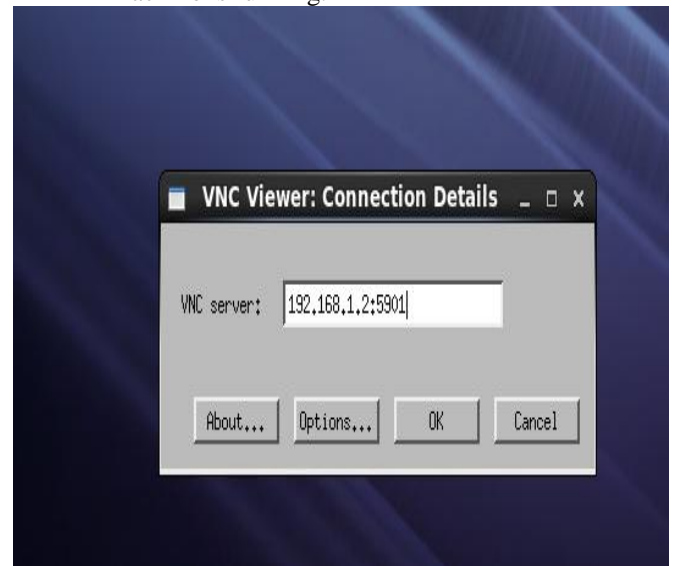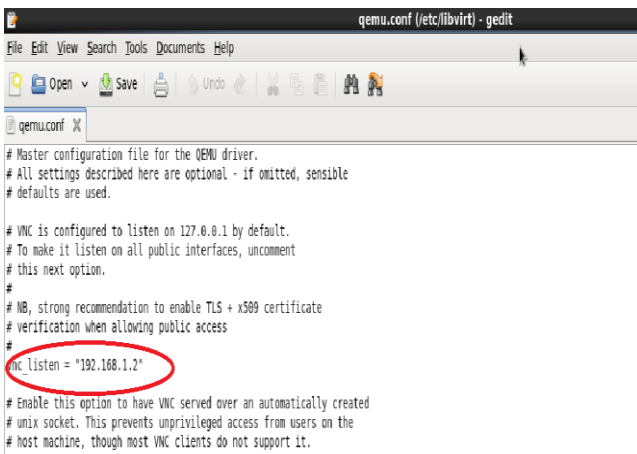   *h.)* After installation following screen will appear:

i.) Initially the hypervisor is setup to use virtual machine on local machine (127.0.0.1). To set-up to use it from the remote computer we have to configure it with the server IP address. *vi /etc/libvirt/qemu.conf*.

j.) Uncomment the *vnc_listen* parameter and replace 127.0.0.1 with your Server IP.
vnc_listen="192.168.1.253"

k.) Once a virtual machine is setup a configuration file is created for each virtual machine in /etc/libvirt/qemu/ directory with the name of the virtual machine.

l.) Edit this VM Configuration file to allow the vnc access of this vm, we can also add password to stop unauthorized access to the virtual machine (optional).

m.) Now our virtual machine is ready to be accessed remotely, just we need to know on which port

qemu is listening, to know that just run the following command:
virsh vncdisplay <virtual_machine_name>

C. CLIENT-SIDE SETUP
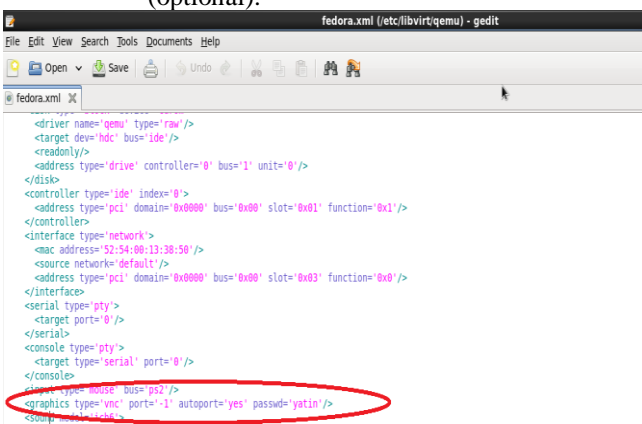
Setup client side to access the virtual machine:

a.) Install any VNC Viewer.
yum install tigervnc
b.) Open VNC Viewer
c.) Provide IP of Server and Port no on which virtual machine is running.

d.) Enter the VNC Authentication details (if applicable).
e.) Here you are in Virtual Machine running on Server.
f.) Now use the server resources remotely.

VI. CONCLUSION AND FUTURE WORK

The Platform as a service comes with many benefits. One of the main advantages is that it is environment friendly. The servers require a lot of power to run. When using PaaS a Single server provides many virtual servers or workstations, this helps in reduction of physical resources and thereby there is a gross reduction in power consumption. The user is free from changing the system configuration as frequently as he wishes. We have not provisioned the APIs and dynamic

scaling which shall be done in our future work.

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