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Virtualizing the Private Cloud for Maximum Resource Utilization

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Abstract **–Cloud computing ,now- a- days is a trend in the IT industry.We normally deploy cloud based infrastructure, applications on Bare-metal hardware. But still the resource utilization is not at its maximum .There is still some amount of room for addition of more applications, etc..to utilize resources to their max. Now, since cloud is already virtualized, we further virtualize the cloud using Virtualization Software.The resources may be CPU,Memory,etc..Virtualization of cloud enables us to run multiple clouds on a single physical machine. That makes resource utilization, the maximum. This paper shows how to use the resources optimally by deploying multiple clouds on a single physical machine**.

Key words –Cloud Computing,Virtualization,Resources.

I. Introduction

During the last ten years, mobile handheld devices have become a part of our everyday lives. Cloud Computing is easily defined as "***Anything that is provided as a Service".*****Cloud computing** is the delivery of computing resources as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet).Cloud computing is a marketing term for technologies that provide computation, software, data access, and storage services that do not require end-user knowledge of the physical location and configuration of the system that delivers the services. A parallel to this concept can be drawn with the electricity grid, wherein end-users consume power without needing to understand the component devices or infrastructure required to provide the service. Or similar comparisons can also be done with the bus service we use. We don't have to buy the bus for our purpose of travelling we just have to pay for the service we use. Cloud computing describes a new supplement, consumption, and delivery model for IT services based on Internet protocols, and it typically involves provisioning of scalable and often virtualized resources. It is a byproduct and consequence of the ease-of-access to remote computing sites provided by the Internet.This may take the form of web-based tools or applications that users can access and use through a web browser as if the programs were installed locally on their own computers.

Cloud computing providers deliver applications via the internet, which are accessed from web browsers and desktop and mobile apps, while the business software and data are stored on servers at a remote location. In some cases, legacy applications (line of business applications that until now have been prevalent in thin client Windows computing) are delivered via a screen-sharing technology, while the computing resources are consolidated at a remote data center location. At the foundation of cloud computing is the broader concept of infrastructure convergence (or Converged Infrastructure) and shared services. This type of data center environment allows enterprises to get their applications up and running faster, with easier manageability and less maintenance, and enables IT to more rapidly adjust IT resources (such as servers, storage, and networking) to meet fluctuating and unpredictable business demand.

Most cloud computing infrastructures consist of services delivered through shared data-centers and appearing as a single point of access for consumers' computing needs. Commercial offerings may be required to meet service-level agreements (SLAs), but specific terms are less often negotiated by smaller companies.The tremendous impact of cloud computing on business has prompted the federal United States government to look to the cloud as a means to reorganize their IT infrastructure and decrease their spending budgets. With the advent of the top government official mandating cloud adoption, many agencies already have at least one or more cloud systems online.

II. Cloud Computing

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet). Cloud computing entrusts, typically centralized, services with your data, software, and computation on a published application programming interface (API) over a network. It has a lot of overlap with the software as a service (SaaS).End users access cloud based applications through a web browser or a light weight desktop or mobile app while the business software and data are stored on servers at a remote location. Cloud application providers strive to give the same or better service and performance than if the software programs were installed locally on end-user computers.

Cloud Service Models - Cloud computing providers offer their services according to three fundamental models: Infrastructure as a service (IaaS), platform as a service PaaS), and software as a service (SaaS) where IaaS is the most basic and each higher model abstracts from the details of the lower models.

a) Iaas (Infrastructure as a Service)- In this most basic cloud service model, cloud providers offer computers – as physical or more often as virtual machines –, raw (block) storage, firewalls, load balancer, and networks. IaaS providers supply these resources on demand from their large pools installed in data centers. Local area networks including IP addresses are part of the offer. For the wide area connectivity, the Internet can be used or - in carrier clouds - dedicated virtual private network can be configured.

To deploy their applications, cloud users then install operating system images on the machines as well as their application software. In this model, it is the cloud user who is responsible for patching and maintaining the operating systems and application software. Cloud providers typically bill IaaS services on a utility computing basis, that is, cost will reflect the amount of resources allocated and consumed. In our Cloud based query solver system the service provided to the students is the Iaas and Saas. It provides computer as virtual machines to the students and the software given as the service is the Query solver interface with the help of which the students can ask their queries to their respective Prof.

b)Saas (Software as a Service) - In this model, cloud providers install and operate application software in the cloud and cloud users access the software from cloud clients. The cloud users do not manage the cloud infrastructure and platform on which the application is running. This eliminates the need to install and run the application on the cloud user's own computers simplifying maintenance and support. What makes a cloud application different from other applications is its elasticity. This can be achieved by cloning tasks onto multiple virtual machines at run-time to meet the changing work demand. Load balancers distribute the work over the set of virtual machines. This process is transparent to the cloud user who sees only a single access point. To accommodate a large number of cloud users, cloud applications can be multitenant, that is, any machine serves more than one cloud user organization. It is common to refer to special types of cloud based application software with a similar naming convention: desktop as a service, business process as a service, Test Environment as a Service, communication as a service.

c) Paas (Platform as a Service) - In the PaaS model, cloud providers deliver a computing platform and/or solution stack typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some PaaS offers, the underlying compute and storage resources scale automatically to match application demand such that the cloud user does not have to allocate resources manually.

III. Virtualization of Cloud

We use VMware Technologies to deploy the cloud.Now ,VMware Workstation is used to deploy a private cloud using Ubuntu cloud. When we launch instances from the this cloud,we see that CPU usage is still 3-4% which is a very less.The CPU usage must hover around 70-80% for maximum utilization.The memory usage is also nearing 50%,which should be 100% for max.So we see that we can actually run multiple clouds on a same physical machine to increase resource utilization.

This can also be called as a “cloud within a cloud” as we are virtualizing the virtualized resources.Inside the “cloud within the cloud” there are a great number of pieces of infrastructure working together. There are core networking components i.e. routers, switches, DNS ,DHCP. Connectivity is not possible if these are not present.Moving up the stack we find load balancing and application delivery infrastructure; the core application networking components that enable the dynamism promised by virtualized environments to be achieved. Without a layer of infrastructure bridging the gap between the network and the applications, virtualized or not, it is difficult to achieve the kind of elasticity and dynamism necessary for the cloud to “just work” for end users.

It is the application networking layer that is responsible for ensuring availability, proper routing of requests, and applying application level policies such as security andacceleration. This layer must be dynamic, because the actual virtualized layers of web and application servers are themselves dynamic. Application instances may move from IP to IP across hours or days, and it is necessary for the application networking layer to be able to adapt to that change without requiring manual intervention in the form of configuration modification.

Storage virtualization, too, resides in this layer of the infrastructure. Storage virtualization provides enables a dynamic infrastructure by presenting a unified view of storage to the applications and internal infrastructure, ensuring that the application need not be modified in order to access file-based resources. Storage virtualization can further be the means through which cloud control mechanisms manage the myriad virtual images required to support a cloud computing infrastructure.

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The role of the application networking layer is to mediate, or broker, between clients and the actual applications to ensure a seamless access experience regardless of where the actual application instance might be running at any given time. It is the application networking layer that provides *network and server virtualization* such that the actual implementation of the cloud is hidden from external constituents. Much like storage virtualization, application networking layers present a "virtual" view of the applications and resources requiring external access.This is why dynamism is such an integral component of a cloud computing infrastructure: the application networking layer must, necessarily, keep tabs on application instances and be able to associate them with the appropriate "virtual" application it presents to external users. Classic load balancing solutions are incapable of such dynamic, near real-time reconfiguration and discovery and almost always require manual intervention.

Dynamic application networking infrastructure is not only capable but excels at this type of autonomous function, integrating with the systems necessary to enable awareness of changes within the application infrastructure and act upon them.

The "cloud within the cloud" need only be visible to implementers; but as we move forward and more organizations attempt to act on a localized cloud computing strategy it becomes necessary to peer inside the cloud and understand how the disparate pieces of technology combine. This visibility is a requirement if organizations are to achieve the goals desired through the implementation of a cloud computing-based architecture: efficiency and scalability

IV – Proposed Work

We propose a multi-cloud model on a single physical Machine using Virtualization Software. This model will help utilize resources more efficiently.

The screenshots of the same are as follows:-

1)

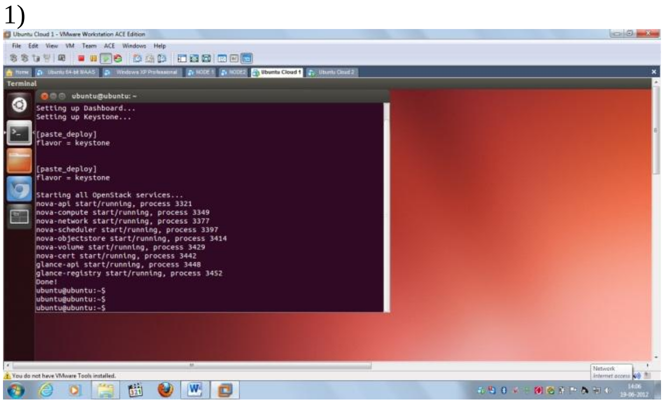

Fig. 1:Private Cloud 1 running

2)

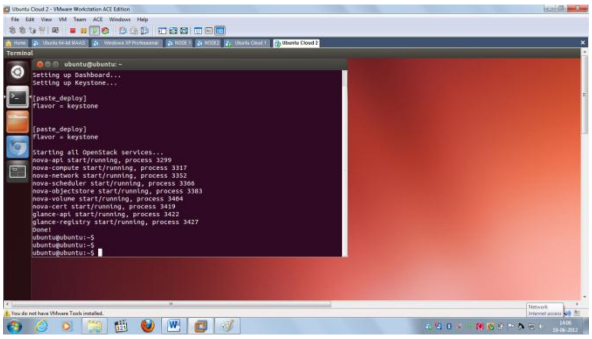

Fig.2:Private Cloud 2 running

We are running multiple clouds on the same physical machine. At present only Infrastructure is being provided as a service. This shows that we can consolidate resources much more instead of using bare-metal hardware. This bare-metal hardware can be used where there is a very huge demand viz. public clouds.For private clouds,there is no requirement of bare-metal hardware.

V - Implemented Work

1) Installed VMware workstation on the machine running windows.

2) Installed Ubuntu Cloud (OpenStack) on two of the virtual machines with 5.5GB of RAM and two processors each.

3) Deployed Ubuntu server(precise) on both of the clouds.

4) Launched instances in both the clouds

5) Connected to both the instances smoothly with windows running in background as the host OS.

A. Screen Shorts of the implemented work

Part I – Instances generated in ubuntu cloud

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1)

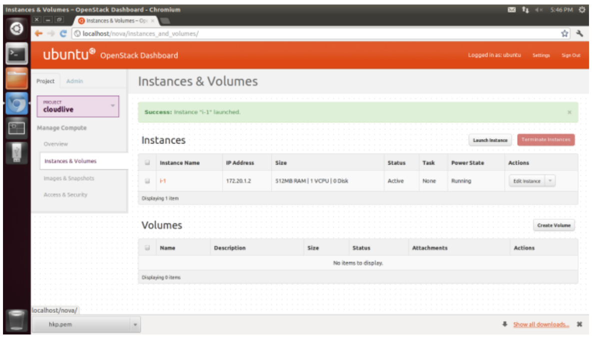

Fig. 3: No of instances created

2)

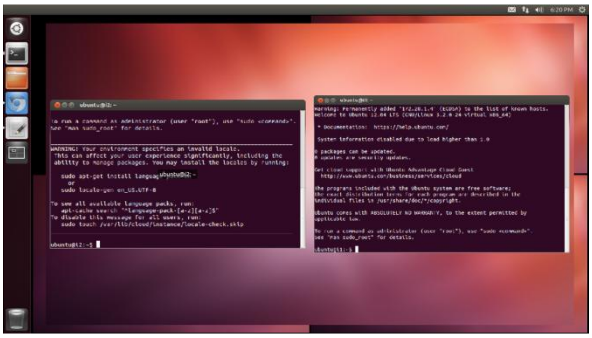

Fig.3:Connecting to an instance of IP 172.20.1.4

3)

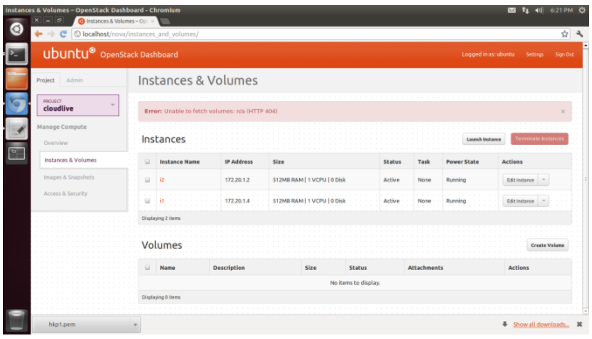

Fig 4:Generated 2nd instance 172.20.1.2 in parallel

4)

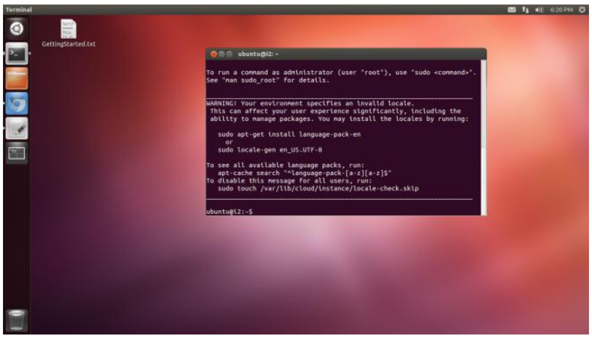

Fig. 5: Connecting to instance 172.20.1.2

5)

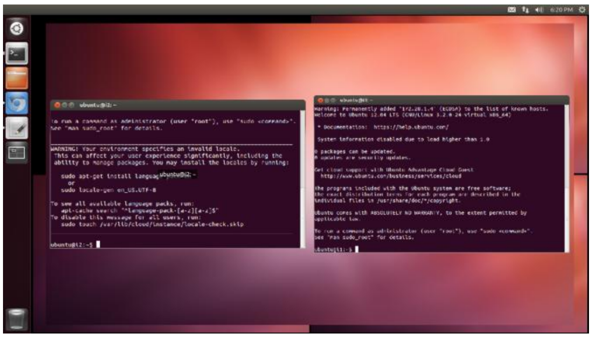

Fig. 6:Connectecd to two instances on the same private cloud

VI. CONCLUSION

It is seen that there are many private clouds running on bare-metal hardware and still there is less resource utilization. So it is better to run multiple clouds on a single physical machine. This enables us to consolidate resources to a much more extent.This proposal is suitable for private clouds as there are less users compared to public clouds.

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