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Research paper

A study on competence and enrichment of virtualization in cloud computing

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Abstract

The aim of this research is to study and enhance the applications of most profitable technology in cloud computing ever "Virtualization". Back then, a 15 years before, nobody knows about the technology named cloud computing exists. But now, every technology such as personal computer, mobile phone, tablet PC, even televisions rely on cloud computing. Cloud computing helps greatly in reducing costs, scalability and flexibility in computer services. Virtualization is the technology that helps cloud computing to emerge in a large profitable level. Using virtualization (such as server, network and storage virtualization technologies), the resource cost is reduced in great level.

Keywords: *Virtualization, cloud computing, hypervisor, virtual machine.*

1. Introduction

Cloud computing is a methodology to provide resources such as Infra structure, platform and software to be utilized by customers who rents it from the vendors. Virtualization has become a most important tech of the cloud computing in recent years. Virtualization technologies are used by several thousands of companies and institutes to consolidate their workloads to make their environments scalable and more flexible.
Simply, Virtualization is a technology that creates one or more virtual devices/resources from one physical machine, such as a server, storage, network or even an OS. For an instance, a task as simple as partitioning one physical hard drive into two or more local drives is considered virtualization. Users/Application/Devices accesses the virtual resources like it is a real one. Virtualizations are used more in these days mainly for some of the beneficial factors such as reduced expenditures, flexibility, easy maintenance and scalability.

2. Cloud computing

Before we know about the virtualization, it is important to know about the cloud computing. Cloud computing is a methodology to provide resources of hosted services to be rented through the internet. It is developed from various previous techniques like distributed computing, parallel computing, grid computing, utility computing with the evolution of virtualization. The services that cloud computing provides are SaaS, IaaS, PaaS which are Software as a Service, Infrastructure as a Service and Platform as a Service respectively. The word 'cloud' refers to a Network or Internet where the resources are hosted such as data, OS (Operating System), storage, applications which are ready to be shared. Cloud computing provides the resources that can be processed, created and manipulated for the business purpose.

The below diagram represented as the cloud clomputing process. The diagram describes that the a computer (which considered to be an application), CPUs (Infra structure), and a storage which are resides within the cloud i.e., the resources are hosted and the hosted resources are now accessed by various devices such as smartphones, Personal computers and Tablet PCs.

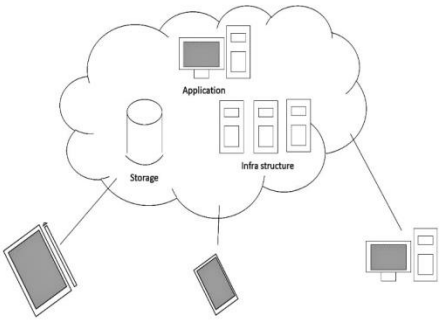

Fig. 1: Representation of cloud computing

Now, Virtualization is like a tool to utilize the cloud computing in a more efficient way. Still many of us confuses between Virtualization and cloud computing.

3. Virtualization vs. cloud computing

Virtualization

Virtualization is a technology which provides makes multiple different users to access a single resource through multiple different virtual environments which are created from that single resource. It is a tool to enhance the application of cloud computing. There is a software named hypervisor which connects to the hardware directly and it allows you to create more separate secure environments known as 'virtual machines'. This hypervisor

is the one that responsible for separating the resources from the hardware and distribute them respectively.

Cloud computing

Cloud computing is a methodology or an approach to deliver platform, storage, infrastructure and other resources to users through internet or any network. These resources, application and services are sourced from clouds, for which the access are provided through the web browser or an application via internet. It is not a special technology or something, it is just a method of providing access to the tenants for particular resources by the vendors through the internet, it is just like we rent a property but through the internet and the properties are IT related.
So basically, Virtualization is a technology that provides more than one virtual machines/resources from one physical machines/resources. Whereas, the Cloud Computing is the methodology which provides that one (there can be more as per the needs) physical machines/resources for renting by vendors.
The below table shows the different between these two technologies from the business point of view for helping to start enterprises.

Table 1: Virtualization vs. Cloud Computing

	Virtualization	Cloud Computing
Classification	Technology	Methodology
Purpose	Create multiple virtual environmental from single physical hardware resources	Provides resources for renting through internet
Use	Divide whole resources into multiple resources and deliver it to specific users for a specific purpose	Provide various resources to (group of) users for a different purposes
Design	Image based configuration	Template based configuration
Lifespan	Usually years	Usually hours to months
Cost	CAPEX is high and OPEX is low	If private cloud, CAPEX is high and OPEX is low If public cloud, CAPEX is low and OPEX is high
Scalability	High	Medium
Workload	More	Less
Tenancy	Single tenant	Multiple tenants

4. Different types of virtualizations

- Hardware Virtualization
- OS (Operating System) Virtualization
- Server Virtualization
- Storage Virtualization.

Hardware virtualization

Hardware virtualization is type of virtualization which is used to consolidate many physical servers/resources into a single large virtual server so that the CPU can be used way more effectively. The OS running on the physical server gets converts into an individual OS running inside the virtual machine. To achieve that, there is a software application named Hypervisor is used. The hypervisor has the control of CPU, RAM and other resources. That is achieved by it allows running different OS on the same machine without the source. So it appears that the OS running on the machine has its own CPU, RAM and other resources.

OS virtualization

Operating System virtualization is a type of virtualization technology which works on OS layer. This is also known as OS level Virtualization. In this virtualization, more than one user space is allowed by the kernel of an OS. Those user spaces are called software containers or virtualization engines. In other words, kernel will run a single OS and provide that OS's functions to replicate on each of the partitions. Simply, running multiple Operating System in a single machine using one OS as a core OS (core OS is the OS that the machine boots into). There are multiple sub OS's installed within in the core OS with the help of a software. There are many virtual machine software applications are available for this, some of them are VirtualBox, Windows Virtual PC, VMware workstation, Hyper-V.
This OS virtualization is commonly used to install different server OS's in one machine so that any kind of client machine can access the server machine.

Server virtualization

Server virtualization is quite opposite to the hardware virtualization. It converts a single server into several virtual servers. Those virtual servers can be accessed by different users for different purposes. This is also achieved through the help of a software application. It is a concept that has been researched and revived to overcome the problems like space inconsistent, inefficient use of servers and to help in the development of cloud computing and its services. There are 3 famous approaches to server virtualization which are the virtual machine model, the para virtual machine model and virtualization at the OS layer. This is the type that helps for the individual to upload and host their websites.

Storage virtualization

Storage virtualization is the technique of grouping the physical storage from multiple network storage devices so that it looks like a single. It just like the partitioning of the single hard drive into multiple local disks in your windows PC, but in this concept, each partition is accessible by different machines through an application or a web browser in general. In storage virtualization, the internal functions of a storage are abstracted and covered from the host network so that it can make the network independent management of storage.
This is the virtualization that uses by every types of users out here like IT industries, Institutes, individual users. Individual users uses the free provision of storage spaces provided by the vendors such as Microsoft's One Drive, Google Drive, iCloud. Whereas the industries rents the storage spaces from the vendors like Amazon Drive, Google Drive in a large amount.

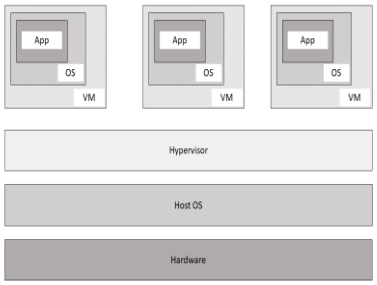

Fig. 2: Basic structure of virtualization

5. Advantages of the cloud computing and virtualization

- Greater Flexibility
- Increased ROI (Return on Investment)
- Budget Integration i.e., reduced cost in establishing resources
- Easy backup and recovery
- Efficient IT operation
- Better business continuity
- Allows for faster deployment of resources
- Promotes digital entrepreneurship
- Always-on availability
- Improved mobility
- Less environmental impact

6. Conclusion

The cloud vendor's industries have gone way beyond a simple server virtualization, and are exploring new fields to make virtualization an even more powerful technology. Virtualization is a powerful technology which makes the usage of the technology into a more efficient way. It helps everyone to use the resources in a cheap and efficient way. We can and should help this technology to evolve further more. There is a new service from cloud named Games-as-a-Service which helps the users who doesn't have high end PC to play the games using the hosted server from any kind of client devices. We should study and research to improve this service to make it better and popular.

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