Role of Virtualization technology in cloud computing

Preet Navdeep

Assistant Professor, Department of Computer Applications,CGC Landran
bca.preet.sra@gmail.com

Abstract

Cloud Computing is the fundamental change happening in the field of Information Technology. It is a representation of a movement towards the intensive, large scale specialization. Virtualization is the key component of cloud computing.Cloud computing is experiencing rapid advancement in academia and industry. This technology offers distributed, virtualized and elastic and resources as utilities for end userscan support full recognition of "computing as a utility" in the future. In this research paper, we will discuss about virtualization, its role in cloud computing.Cloud computing technology is one of the biggest milestones in leading us to next generation technology and booming up business and IT field. It helps to overcome the problems of data loss, accessing data whenever needed and data security. This technology is mainly service oriented and focuses on cost reduction, hardware reduction and pay just for service concept. Virtualization in cloud computing is making a virtual image of the storage devices servers or network resources so that they can be used on multiple machines at the same time.

Keywords: Cloud computing, Virtualization, Distributed, Virtual machines

Introduction

Cloud computing is one of the most useful technology that is been widely used all over the world. It generally provides on demand IT services and products. Virtualization plays a major role in cloud computing as it provides a virtual storage and computing services to the cloud clients which is only possible through virtualization. Cloud computing is a new business computing paradigm that is based on the concepts of virtualization, multi-tenancy, and shared infrastructure. This paper discusses about cloud computing, how virtualization is done in cloud computing, virtualization basic architecture, its advantages and effects [1].
Virtualization is a foundational technology applicable to the implementation of both cloud computing and big data. It provides the basis for many of the platform attributes required to access, store, analyze, and manage the distributed computing components in big data environments. Virtualization — the process of using computer resources to imitate other

resources — is valued for its capability to increase IT resource utilization efficiency, and scalability. One primary application of virtualization is server consolidation, which helps organizations increase the utilization of physical servers and potentially save on infrastructure costs. However, you find many benefits to virtualization. Companies that initially focused solely on server virtualization are now recognizing that it can be applied across the entire IT infrastructure, including software, storage, and networks.This paper introduces cloud computing, virtualization technologies, and discusses the relationship between them

Cloud Computing

Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing storage, memory, process-sing and bandwidth. Cloud computing technology is based on three factors- grid computing, utility computing and automatic computing. All the data is stored on the servers and can be accessed simply by authenticating with the help of the internet anywhere in the world. Apple, Google, Microsoft, etc. are the biggest cloud service providers provide very large storage to its users and making the work easier [2].

Virtualization

Virtualization is basically making a virtual image or "version" of something such as server, operating system, storage devices or network resources so that they can be used on multiple machines at the same time. The main aim of virtualization is to manage the workload by transforming traditional computing to make it more scalable, efficient and economical. Virtualization can be applied to a wide range such as operating system virtualization, hardware-level virtualization and server virtualization. Virtualization technology is hardware reducing cost saving and energy saving technology that is rapidly transforming the fundamental way of computing [3].

Architecture of Virtualized Technology

In cloud computing space/memory is virtually allocated to the users in the servers which requires a host (platform) on which hypervisor (software which interacts with the hardware) runs [4] Fig 1. The virtualization model is consisting of cloud users, service models, virtualized models and

its host software and as well as their hardware. Virtualization software makes it possible to run multiple operating systems and multiple applications on the same server at the same time," said Mike Adams, director of product marketing at VMware, a pioneer in virtualization and cloud software and services. It is based on three service models that are SAAS (software as a service), PAAS (platform as a service) and IAAS (infrastructure as a service). SAAS provides applications to the cloud users to full fill their needs and demands. PAAS provides the cloud users a common platform on which they can execute their applications and IAAS provides the security and hardware to maintain the cloud resources [5]The basic idea is to share large pools of resources like compute cycles or virtual CPUs (VCPUs), storage, software services etc [6].
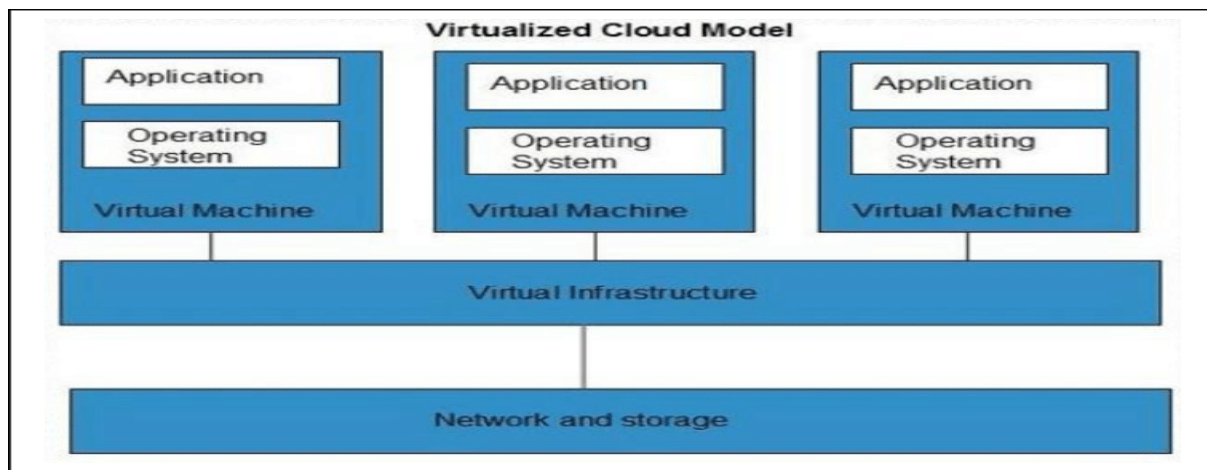

Figure 1.Virtualization in cloud computing

Using a distributed set of physical resources, such as servers, in a more flex ible and efficient way delivers significant benefits in terms of cost savings and improvements in productivity. The practice has several benefits, including the following

✓Virtualization of physical resources (such as servers, storage, and networks) enables
   substantial improvement in the utilization of these resources.
✓Virtualization enables improved control over the usage and performance of your IT resources
✓Virtualization can provide a level of automation and standardization to optimize your
   computing environment.
✓Virtualization provides a foundation for cloud computing. Although being able to virtualized
Resources add a huge amount of efficiency.

Traditional Servers and Virtual Servers

It plays a very important infrastructure in the cloud computing technology. It receives the requests sent by the cloud users and formulates it and also performs various tasks.

Basic traditional servers

Traditionally the servers that were used has a lost of disadvantages and were not at all cost effective. "These servers are maintained by system administrator, normally these servers are described as combined unit that consist of operating system, the hardware, the storage and the application" [7]. In traditional server if the storage becomes full then it has to be replaced by a new server Fig 2.
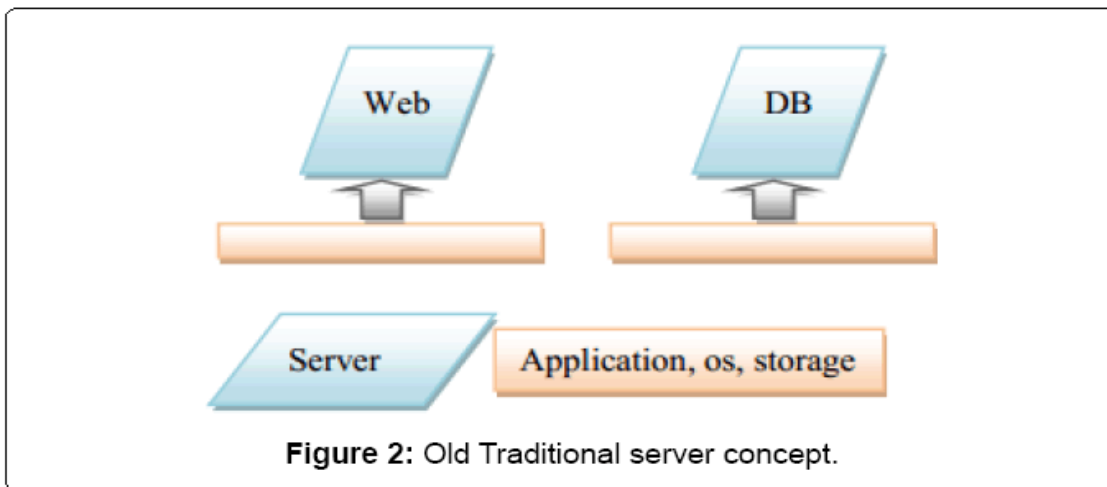

Figure 2: Old Traditional server concept.

Figure 2.Traditional server

Virtual Servers

Virtual server seeks to encapsulate the server software away from the hardware the virtual server consists of the operating system (OS), storage and application [7].By maintaining virtual server we can reduce the service provided by the cloud provider Fig 3.
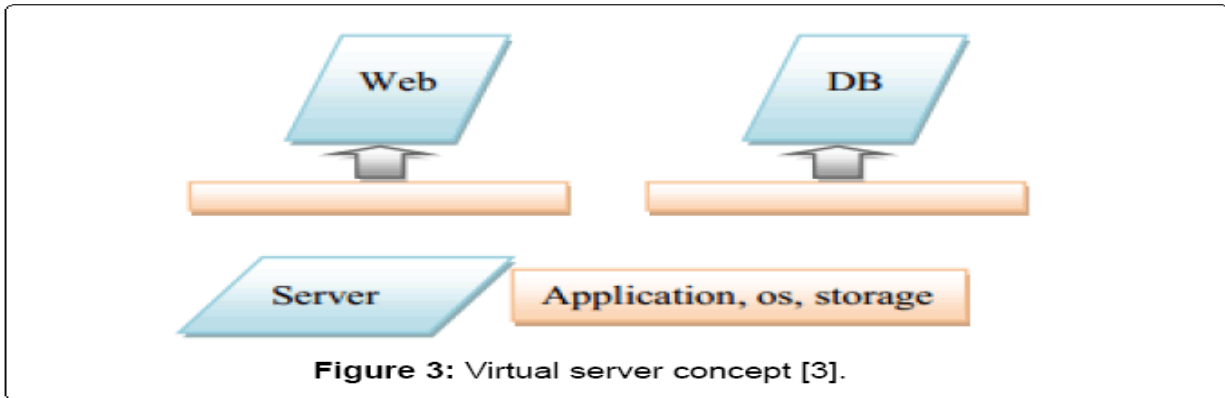
Figure 3: Virtual server concept [3].

Figure 3.Virtual server

Advancement for Real World

There are many positive and negative effects of virtualization technology on the environment as well as the business and IT field.

Temperature

Virtualization technology is based on the group of hardware machines due to which a large amount of heat is released when they are used. So to overcome this problem special cooling mechanism should be employed to cool them and rise its performance.

Energy consumption

With virtualization the power consumption due to machines has reduced as the number of hardware machines has been reduced which makes this technology more efficient and eco friendly.

Redundancy

Redundancy is basically the repetition of data which is mainly encountered when the systems don't shares a common storage and different memory storages are created. Due to the large number of data centers the fault tolerance is very high due to which redundancy is reduced.
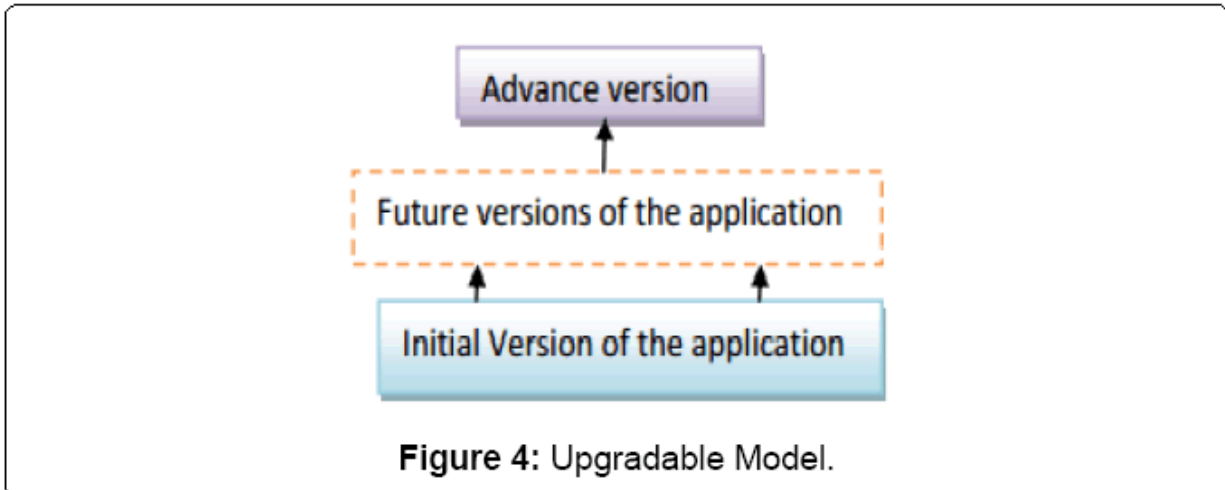
Figure4.Upgradable Model

Types of virtualization

In cloud computing the virtualization can be done in two ways either by storage virtualization or by software virtualization.

a. Storage virtualization: The storage available is virtualized to get large virtual storage access and it is further used for allocating memory to the cloud clients.

b. Software virtualization: software built by the company can be used by a large number of systems at the same time with the help of virtualization. A virtual layer is created on which the software is installed and used [8].

Why Virtualization?
With the help of virtualization we can increase the use of resources available to us in many to get more benefits. We should virtualize because of the following reasons:

a. Isolation among users: one user should be isolated from the other users so that he/she may not get information about the others user's data and usage and cannot even access other's data.

b. Resource sharing: a big resource can be fragmented into multiple virtual resources so that it can be used by multiple users using virtualization technique.

c. Dynamical resources: reallocation of resources such as storage and computational resources is very difficult but if they are virtualised then they can be easily re-allocated.

d. Aggregation of resources: the small resources available can be increased at a large extent with the help of virtualization [9].

Future Scope

Data loss, data security and inconvenience to access the data are some of the major problems that users face but with the use of cloud computing these problems can be resolved easily. Some of the major future aspects are:

a. Migration time will become negligible

b. Data is secured and data loss is minimized

c. One user-many devices relationship

d. Good service quality for computational resources

e. Good service quality for computational resources

f. Problem of geographical distance between clients and servers can be avoided

g. Band width will be sufficient for the users

h. Data redundancy is reduced

Challenges of virtualization and cloud computing

One of the major problems which can be faced by using this technology are mass data loss, infected application and data integrity.

a. Mass data loss: If some calamity hits the datacenters then it might destroy the data stored in the datacenters or might shutdown servers.

b. Infected application: If a virus is infects one file then it may corrupt whole system.

c. Data integrity: The integrity of data can be affected as anyone can access it from anywhere

[10].

Conclusion

Virtualization and Cloud Computing have come to stay and have carefully carved a niche for themselves in the world of business and IT generally. With the many advantages and possibilities provided by these two technologies, and the exciting prospects that have been envisaged, it would be safe to say that these are technologies that would continue to revolutionize and transform many areas of human endeavor for years to come.

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