Original Research Paper

Volume : 5 | Issue : 11 | November 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Different approaches of virtualization in cloud computing

Computer Science

KEYWORDS: Virtualization, Cloud Computing, Hypervisor.

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ABSTRACT

Cloud computing is an emerging hypothesis of computing that replaces computing as a personal commodity by computing as a public utility. As such, it offers many advantages in terms of public utility system, in terms of economy of scale, flexibility and convenience. Here many issues rises like not least of which are: loss of control and security. The aim of this study, to understand the different approaches of virtualization and appropriate approach of virtualization in cloud computing.

Introduction

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.[1] Cloud computing advantages include lower capital costs, Lower IT operating cost, no hardware or software installation or maintenance and optimized IT infrastructure provides quick access to needed computing services. Cloud computing is a modern technology that increase application potentialities in terms of functioning, elastic resource management and collaborative execution approach.

Virtualization technology is the backbone of Cloud Computing which enables organizational IT resources through on-demand allocation dynamically. The resources are in different forms such as network, server, storage, application and clients. [2] It provides efficiency, flexibility and scalability in cloud computing. Virtualization in cloud computing can be done through different virtualization platform.[3] 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. It reduces the number of physical servers required for a given workload and also allows for more flexible sizing of computer resources such as CPU and memory. Virtualization can even increase the performance of risk management in IT because it is easier to set up the right network access controls between machines.

Virtualization, as a term and a concept, has broad utility and can be applied to several areas of cloud computing; virtualized servers, storage, processors, memory, desktop and network, etc.[4] It is extensive applications and cost savings, being evaluated by Chief Information Officers (CIOs) worldwide as they strategize how to provide agility and computing power to meet their enterprise needs. The Concept of virtualization, we have discussed here will help to handpick an easier approach of its in cloud computing for improving the risk management.

Approaches of Virtualization

Virtualization is the backbone of cloud computing that is creation of resources from physical resources. In a cloud environment, virtual machines can be created quickly and easily. To create a virtual machine or virtual computing environment VMware, Microsoft Hyper – V and IBM AIX are mostly used as application based, operating system based and hypervisor based virtualization approaches. [2,6,7,8,9,10,11]

Google, Microsoft, Amazon; IBM etc. are being also used in cloud computing & build data center based application over the internet and recommending several services of virtualization. [12]

Cloud services allow users to use software and hardware that are managed by cloud service provider on pay as you use basis at remote locations. It offers the usual advantages of public utilities, in terms of efficiency (higher usage rates of servers), economies of scale (time sharing of computing resources), capacity (virtually unlimited computing power, bounded only by provider assets rather than by individual user assets), convenience (no need for users to be computer – knowledge, no need for technical support), dependability (provided by highly trained provider staff), service quality (virtually unlimited data storage capacity, protected against damage and loss), etc. are a model of cloud computing.[13,14,15,16,17,18]

Comparative Study of Different approaches

The comparative study of different approaches of virtualization as above identified are discussed here under with variours parameters.

Application Based Virtualization: A virtualization application is hosted on top of the hosting operating system such as Windows, UNIX, or Linux. It is within this virtualization application that one or more virtual machines are created to run the guest operating systems on the host computer. This technique has the advantage that no changes are necessary to either host or guest operating systems and no special CPU hardware virtualization support is required.

Operating system based virtualization: Operating system virtualization takes advantage of the architectural design of operating systems. The virtual guest systems each have their own root file system but share the kernel of the host operating system. Virtualization is enabled by a hosting operating system that supports multiple isolated, virtualized guest – operating system instances on a single physical server, all sharing the same operating system kernel. This type of virtualization is made possible by the ability of the kernel to dynamically change the current root file system to a different root file system without having to reboot the entire system.

Hypervisor based Virtualization: A hypervisor is embedded in the hardware or implemented as the hosting operating system kernel. The hypervisor is available at the time of machine boot to control the sharing of system resources across multiple VMs. In this architecture, the privileged partitions have visibility and control over the virtual machines. Out of many of the virtualization approaches like as application based (eg. VMware), operating system based (eg. Hyper – V) and hypervisor based (eg. IBM AIX), which reduces number of resources; application, operating system and hypervisor in cloud computing.

The comparative study of different approaches of virtualization is given in table 1:

Table 1: Comparative Study of different approaches of virtualization

SN	Parameters	Application Based VMware	Operating System Based Hyper–V	Hypervisor Based IBM AIX
1	Implementation	Application based virtualization emulates each VM containing its own guest operating system and related applications.	Virtualization is enabled by a hosting operating system that supports multiple isolated, virtualized guests – operating system instances on a single physical server.	A hypervisor is embedded in the hardware or implemented as the hosting operating system kernel.
2	Application	testing, education, and demo purposes	hosting operating system	manage the virtualization platform and hosted virtual machines
3	Abstraction	Abstraction on Physical layer	32 – bit and 64 – bit virtual machine	Flash caching
4	Interface	Interface enables users to connect remotely to sever	Large memory support with in virtual memory 64 GB	Virtual network interface controller functionality can be used with capable network adapters
5	Web Interface	Provide standard interface for VMware and third party solution	Symmetric multi – processor up to four	Live updates for interim fixes to apply kernel and kernel extensions
6	Performance	A high performance cluster for file system	Integrated cluster support for quick migration and high availability	Automatic recovery of cluster
7	Accessing	Enables a single virtual machine to use multiple physical processor	Pass through high performance disk access	Automated System Patching
8	Migration	Migration from one physical server to another physical server	Virtual machine snapshot for administration	Storage allocation of maximum 40 GB
9	Sharing	High availability of virtual server	New hardware sharing architecture	Dynamic system optimizer
10	Allocation and balancing	Allocation and balancing storage capacity dynamically	Robust networks on virtual area networks and network load balancing	Expertise Class system leadership with the power systems and supported OS
11	Support	Allocation and balancing computing capability dynamically	support for full or server core installation	High impact performance and usability enhancement
12	Platform	Windows & UNIX	Supported on Windows	IBM Power – 7

Result and Discussion

Different virtualization approaches are studied and compared in terms of various parameters. Operating system based virtualization gives better performance with in its associated parameters and supports multiple isolated and virtualized guest operating systems on a single physical server with all the physical server properties and resources. Application based virtualization is much similar to OS based virtualization but it is not commonly used in commercial purpose. Whereas in hypervisor based virtualization a type of software/firmware is used for implementation of virtualization with sharing of hardware resources in it. It is more vulnerable because of hypervisor has a single point of failure. When the system fails all over control losses and attackers given control over it.

Conclusion

The different approaches of virtualization in cloud computing; application, operating system and hypervisor based virtualization on the basis of various parameters. On the basis of above study it is found that operating system based virtualization is an easier and suitable approch. Application based virualization is found more memory consumable beacuse of abstraction of host operating system whereas hypervisor based virtualization causes a single point of failure and taking control over the hypervisor from virtual machine level is not possible.

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