Research on the Virtualization Technology in Cloud Computing Environment

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1) Abstract -

Virtualization and cloud computing have been two popular avenues of research over the past few years. Today, virtualization is being used by more and more organizations to diminish power consumptive, Consolidating servers, testing and development, dynamic load balancing and Recovery from catastrophic events, Virtual workstations and enhanced system reliability and safety. The virtualization process provides high uptime for mission-critical applications as well, and streamlines application deployment and migrations. Through cloud computing, information technology resources can be provided in the following ways: Web-based services provided to the final-user. Virtualisation is one of these key foundational technologies It's about cloud computing services.. In this document, a comprehensive review of virtualization is presented. In Additionally,3 x86 CPU virtualisation technologies and the Xen architecture are introduced. To be more precise, we do not offer a virtualisation-based cloud computing platform architecture. Last but not least, we discuss evaluating the performance of server virtualization performance in terms of cost, time and energy savings.

2) Introduction-

Based on Wikipedia, virtualisation makes reference to an act of creating a virtual version of anything, including, without limitation, a virtual computer hardware platform, operating system, storage device, or resources of the computer network. Virtualisation includes virtualisation of servers, network virtualisation, virtualisation de stockage, virtualisation of applications and virtualisation of the office. Under recently time, virtualization techniques have achieved many benefits such as reduced costs and energy, simplified administration and roll-out, improved mobile applications support and so forth [2].Cloud Computing is a computational style whereby dynamic scalability and virtualized resources are provided as an on-line service. That is the integration of a number of technologies which comprise distributed computing, utility informatics, Parallel computing, Virtualisation. etc. It can be classified as public, private or hybrid. Cloud-style computing Environments have three levels of service, namely SAAS, PAAS and IAAS. Current virtualisation is one of the largest basic cloud computing technologies. Whether virtualization technology applies to cloud informatics. more and more businesses are able to get the benefits of saving operating management expenses, equipment costs and energy consumption. Recently, cloud media virtualization-based services have been used extensively in numerous areas, data centers, for example, Education, Finance and Government:

A key issue when it comes to virtualization and cloud management is: How to build cloud architectures A virtualisation-based computer platform. and how to provide server impact assessment virtualisation of cloud-based network performance. for resolving this problem is build a cloud computing platform using existing virtualisation products on the market. Additionally, the results of the assessment are given on the performance of server virtualization by comparison to several sample applications.

In this article, we focus on constructing a virtualization-based cloud computing platform merchandise. We will introduce the architecture of the cloud computing platform and discuss later about assessment of the effect of server virtualization on the performance of a cloud network. On The remaining sections of this document are organized as follows: in Section 2, we introduce a more in-depth review of the virtualization technology, and especially the architecture of Xen. from Xen. Section 3, explains how to submit an application virtualisation to the cloud. See section 4.Assessing the performance of the cloud network platform based on server virtualization is presented. Finally, the finding is given in section 5.

3) Review on Virtualization

Virtualisation came into being in the IBM project in 1964, but its development was very slowly. Following commercially available virtualization software on the X86 platform
was introduced by VMware Inc in 1999.there rapid development phase. Currently, with AMD, Intel and Microsoft joining, the the development has entered a stage of hatching.

- **The architecture of x86 virtualization**

  With the x86 virtualisation architecture, a layer known as the Virtual Machine Monitor hypervisor (VMM) is added between hardware and system of operation.
  The architecture has two types: VMM as illustrated in Figure 1.Type I is a hyper-viewfinder architecture which installs the virtualization layer directly on an x86 clean system.
  Type II is the hosted architecture that installs and carries out the the virtualization layer as an application at the top of an operating system. Currently, Type I is used within enterprise-level virtualization products, including Oracle Security, VMware ESX Server, Microsoft Hyperv as well as Citrix XenServer.

- **Three techniques for x86 virtualization with type I VMM**

  With x86 architecture, each VMM requires to implement virtualization with CPU virtualization, virtualisation of memory and device and virtualisation of input-output. x86 architecture features four tiers of recognized privilege, or privilege. like Ring 0, 1, 2 and 3 to operating systems and applications to handle access to the computing equipment. x86 architecture requires virtualised statements defined so that the guest operating system in addition to the VMM may have access to computer material resources, however there are a few sensitive instructions that cannot be virtualized as they have a hard time catching. To tackle this problem, three techniques now exist in the implementation of virtualization in the x86 Architecture Processing Unit [3, 4, 5].

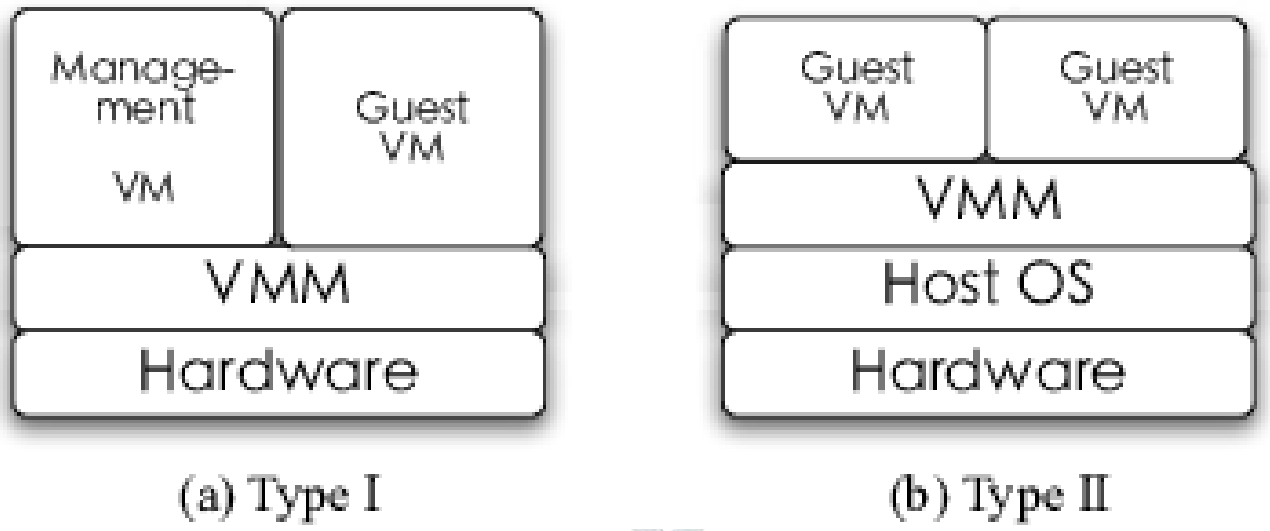

Fig. 1 Two types architectures of VMM

- **Full virtualization using binary translation**

  In a completely virtualized environment, the hypervisor works on bare hardware, acting as a host Operating System Assembly, but the virtual machines managed by the hypervisor run the invited operating system. The United States of America hyperviseur offers complete virtualisation thanks to a combination of binary and direct translation enforcement. for execution. Binary translation makes responsive instructions virtualized
  by the translation of a small set instructions from the processing unit. Further instructions can be performed made directly to the virtual machines. The invited operating system cannot be distinguished from being installed on the physical machine or on the hyperview finders. Complete virtualization delivers the benefits simplified migration and portability. It provides The greatest possible isolation and security for the virtual machine. The unchanged guest operating system instance may run on virtualised and native based devices. His main drawback is the with the help of binary translation work. There are numerous comprehensive virtualisation products, such as Microsoft Virtual Server.

- **OS assisted virtualization or paravirtualization**

This approach involves the hypervisor handles every virtual machine and letting them be independently of the two of them.This approach adds a specific virtual instruction that carries the name of Hyper calls in the prompted operating system. and adds the corresponding telephone interface within the hypervisor, by which instructions can be directly invoked by the hyperviser layer. Parachuting provides the benefits of high performance and reduced virtualisation. His downside is poverty compatibility and portability due to the necessity of modifying the paravirtualised virtual machine and operating systems pattern.

There are numerous examples of paravirtualization, including Xenserver.

- **Hardware assisted virtualization**

By expanding and upgrading the CPU instruction set and processor operation mode, complete Virtual OS may call directly to the hardware resources. Typical technologies are IntelVT and AMD-V.

- **The architecture of Xen**

Xen is an open-source hypervisor of type I, supporting para virtualization and complete virtualisation.is made up of three basic components, as shown in Figure 2, including the xenon hypervisor, Domain 0 and DomainU [6]. Xen Hypervisor works right above the material, but also monitors the performance of virtual machines because they share a common processing environment.. Area 0, which is Modified Linux kernel, contains drivers for the hardware, as well as the tools to control VMs. Area 0, which is Modified Linux kernel, contains drivers for the hardware, as well as the tools to control VMs. There has a right to access physical input/output resources and may interact with other virtual machines. On Domain 0 has to be executed before other virtual machines can be started. The DomainU is a customer operating system running on the Xen hyper-visor. He has no direct access material resources directly. However, a plurality of DoMainU can operate in an independent manner.

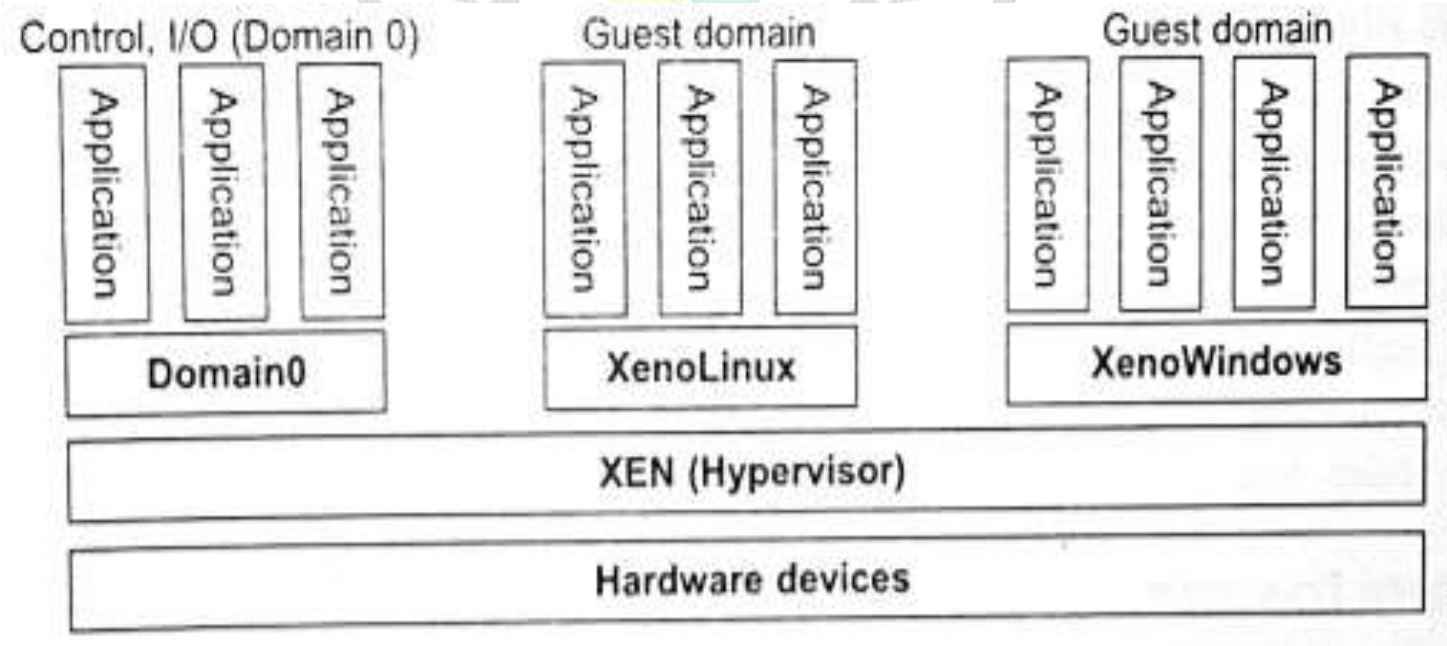

Fig. Xen Architecture

To summarize, there is no open standard for defining and managing virtualization. At present, each company develops its own virtualizing solutions. However, plenty of people think new material Assisted virtualization is very promising down the road because.it will reduce the necessity of para virtualization and end-to-end virtualization.

4) Applying Virtualization to Cloud Computing

Cloud computing is the delivery of computing as a service rather than as a product, meaning that shared resources, software solutions, and the information is provided for use by computers and other devices through the use of a network. An appropriately designed cloud computing platform should have the following features: dynamic scalability, or scalability under dynamic. distribution of resources on demand, high availability, high performance and equilibration. Cloud computing involves numerous research topics, such as energy management, stability, virtualization and scalability, among others. Virtualization technology is only one amongst several important technologies in the cloud computing industry. Virtualization Enables Cloud Computing Hardware within a pool of distributed shared resources. Any computer resources through virtualization can be improved the use of resources and how they are allocated dynamically. Currently, VMware, vCloud and Xen Cloud Platform products are commonly used to construct the cloud-based infrastructure. Xen Cloud Platform is an enterprise ready for virtualisation and the cloud loud ready company computer platform based on the powerful Xen hypervisor. While Xen Cloud Platform allows users to go to the VM consoles, display the VM properties, performing power operations, managing VM instantaneous events, and move the VMs between the servers of a pool. VMware vCloud is an online cloud of VMware infrastructural instruments. Here we demonstrate how to construct a cloud infrastructure using VMware vCloud tools are available.

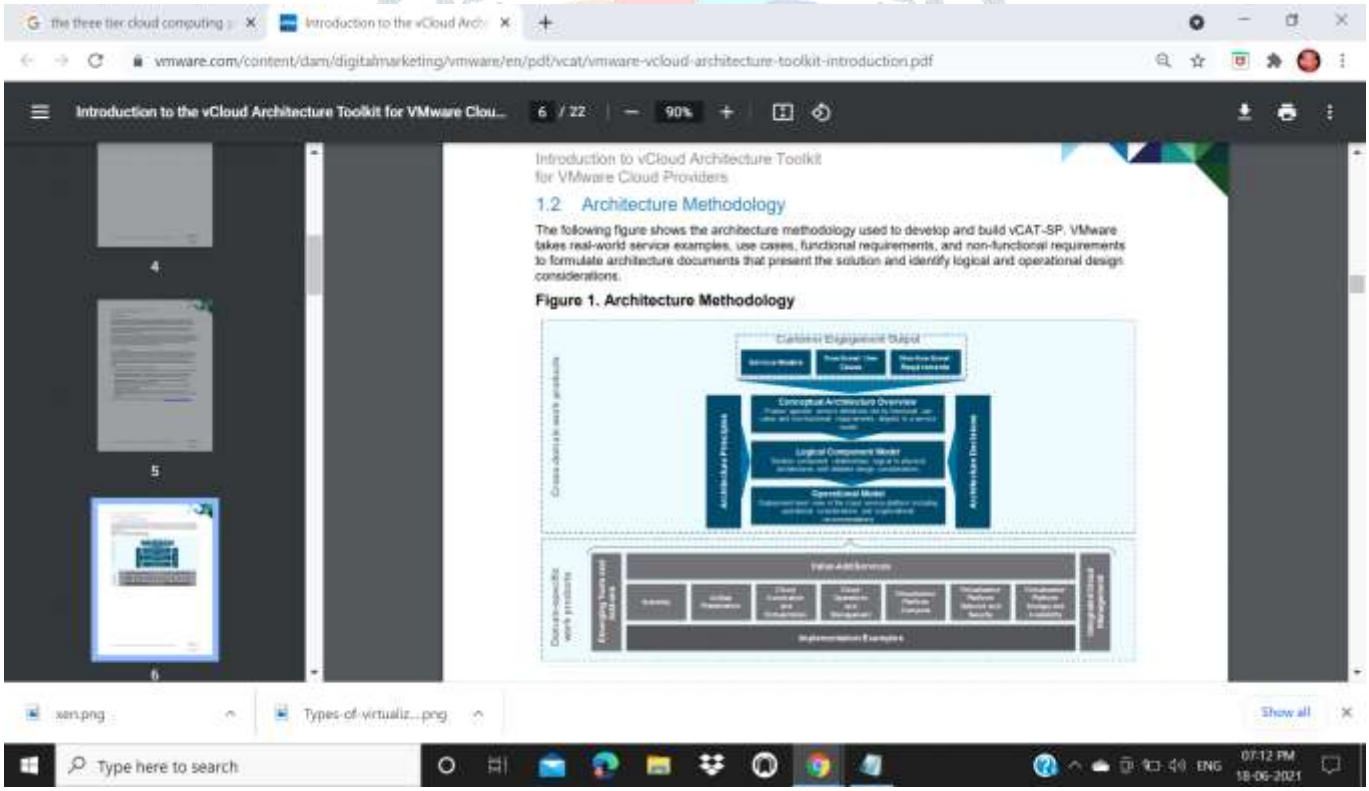

Fig. 3 The three-tier cloud computing platform based on the VMware vCloud tools.

As shown in Figure 3, the Cloud Computing Platform Solution also has a 3-tiered structure.The SAAS layer is primarily designed for the virtualisation of terminal applications. The PAAS layer provides cloud management application-based platform-it allows developers to create mobile cloud applications. The IAAS layer is a two-layer cloud-based infrastructure and is built through the VMware vCloud[8, 9].

The VMware vCloud consists of 5 The main components, which are VMware vCloud Director, VMware vSphere, VMware vShield, VMware vCenter Chargeback as well as VMware vCenter. They are at the heart of the department infrastructure percent. The VMware vCloud Director component allows customers to integrate the infrastructure resources in a Virtual Data Centre resource pool.and allow students to do so upon request consumptions of means.It can also use technologies such as clones and fixtures related to the significantly accelerate the availability of infrastructure.VMware vShield component shall provide network security services, including layer 2 insulation, NAT, firewall, DHCP and VPN.It provides support for the virtualization protection for virtual data centers and cloud-based environments, and him also Empowers the user to increase the security of applications and data security.VMware vCenter contains offers a central control point to monitor all aspects of virtual infrastructure and achieve daily automation missions;It also supports a large data center with scalability. VMware vCenter Charger back The component provides resource and cost accounting templates. The primary purpose is to assist users obtain a precise cost Estimates and analysis of cloud-based computing services.It may also provide users with a better understanding of what cost of resources is,and how to optimise resource utilization and reduce overall infrastructure the costs associated with cloud computing services.VMware vCloud utilities built from vSphere The vSphere component has numerous features including server virtualization,storage virtualization, as well as Networking virtualisation. It can carry out automatic load balancing between hosts and virtual real-time machine migratement.It also does non-disruptive storage migration, eliminates VM storage and I/O bottlenecks and release valuable storage capability. Simply put, the IAAS layer is the backbone of the cloud services platform, and we can compilation of the IAAS layer using the VMware vCloud tools.By means of this framework shown in Figure 3, Both public and private cloud platforms can be built for businesses.

5) Performance Evaluation

Server virtualisation (SV) is a proven technology that allows multiple virtual machines to operate on a single physical server [2].At present, server virtualization has been widely used within the architecture from data centres and cloud computing platforms. This has a myriad of advantages such as extensibility, cost savings, and energy efficiency, to name a few.As a result of these benefits, this technology could be readily inculcated into cloud computing. Below is the assessment of performance across several petition.

A. The evaluation of the total cost benefit

Many new problems are now present in the data centres, such as the management and excessive hardware and service costs.Jing Nie [10] arrives at the conclusion that are five types of costs that are the cost of hardware, the cost of power, the cost of software,maintenance costs, maintenance costs, downtimes and data center collection costs. They analyzed the overall profitability using the server virtualization.They carried out experiments to compare the total costs between the usage of 20 physical host slice and virtual host slice.The result shows that the cost has gone down significantly by using server virtualization technology for the long run.

B. The evaluation of energy efficiency

In recent times, it is regarded as out of place to excessively purchase physical servers for enterprises.OAS technology makes it possible to consolidate servers and reduce the number of servers waiters.It may also meet the target of reducing electricity consumption and the carbon footprint.Lee Liu [11] has provided detailed analysis of how server virtualisation provides an energy efficiency solution. On the experiments were completed under three conditions, including the VMware workstation,VMEware ESX/ESXi as well as physical servers.The data collected during the experiments demonstrate a Power consumption between VMware Workstation and VMware ESX/ESXi under 4 different types workloads.The data gathered also shows that virtualized disconnectors can dramatically reduce energy consumption compared with physical webservers under the same workloads.

C. The evaluation of time efficiency

CIVIC is a hypervisor-based computer platform from Jinpeng Huai[12]. the platform is composed of five layers from the bottom upwards,comprising the Resources layer, the Containers layer, Coordination layer, instance layer and interplay layer.The stratum of resources is formed by machines distributed on the web. The container layer can deploy the hyperviser at the top of physical machines and

supply a few interfaces for remote management and interaction.The online The machine instance may be hosted within the container layer.There are numerous differences between the co-ordination layer types of co-ordination activities. The instance layer provides a virtual machine instance, a virtual machine instance machine network instance, as well as virtual application instance for users.The interaction layer contains the following: two kinds of interactive modules for users and managers respectively.In the CIVILIAN architecture, the OAS the technology is applied in the container layer made up of several knots of containers. Each knob can I want you to put in a hypervisor.Experimentation based on the CIVIC platform shows that the installation time of The virtual machine templates is a lot less than the physical mashine installation time.To which reason, we can conclude that the effectiveness of time can be achieved through SV technology.

6) Conclusion

In this article, we have introduced the development of virtualization and analysed the architecture an commercial virtualisation product. And then applied virtualization technology was applied to the cloud. computing, and is building the cloud platform using VMware vCloud tools. Finally, the efficiency Server virtualization assessment on the cloud platform is summarized examples of the implementation process. Through technology-related research and analysis in virtualization and cloud computing, we have introduced a number of performance benefits, notably earn Read more International Journal of Engineering Research in Africa Vol. 21 195 total costs, thereby reducing energy use and time. Upcoming studies may be directed to: using virtualization and cloud computing to search for distributed information [13,14] in order to determine its environment.

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