A Review Paper on Virtualization in Cloud Computing

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ABSTRACT: The recent past have observed remarkable rise and fame of technology solutions like cloud applications and virtualization. Cloud computing is a construct that allows us to access requests that actually reside at a location other than your virtual machine, most often, this will be a distant data center. Many institutions have already started instituting this latest technology to further reduce costs through improved utilisation. Cloud computing and connectivity enable users to use applications on internet and intranet. In Cloud computing many of the solutions relies heavily on virtual servers hardware. Virtualization is the foundation of Cloud computing's Infrastructure as a Service (IaaS) model, which separates data, network, applications, and machines from hardware constraints. Because of this, we carefully reviewed existing virtual hardware services in order to both understand how the process works and to find the service that is best suited to Cloud computing and virtualization in different situations.

KEYWORDS: Cloud Computing, Network, Operating System, Virtual Machine, Virtualization.

1. INTRODUCTION

Cloud computing is gaining popularity among IT companies because of the agile, flexible, and cost-effective services available at the software, platform, and infrastructure levels. Users can use Software as a Service (SaaS) to access applications hosted on the Cloud by various vendors via the internet[1]–[3]. On IaaS, developers can code, test, and deploy their implementations using Platform as a Service (PaaS). Cloud providers use the infrastructure as a service (IaaS) model to provide services such as computing, networking, storage, and databases over the internet. IaaS serves as the foundation for all Cloud services, with PaaS and SaaS built on top of it. Elasticity and virtualization are the two most important characteristics of IaaS. Virtualization allows a single system to run multiple disconnected virtual machines (VMs), operating systems, or instances of a single operating system (OS) at the same time. Virtualized hardware is heavily used in Cloud Suite. As a result, we scrutinized existing virtual hardware services to better understand how the process works and to identify the service that is best suited to Cloud Suite[4], [5].

One of the oldest areas of interest in business is virtualization. The Java Virtual Machine (JVM) is one of the most successful examples of virtualization. The JVM allows the Java programming language to produce identical results regardless of the hardware platform's instruction set architecture (ISA). This is because the compiled Java code is, essentially, running on the same machine, albeit in a virtual setting. The results will be identical as long as a system has a J V M installed that can translate Java byte code into the appropriate ISA[6], [7]. A single piece of virtual hardware may be present on many distinct systems thanks to the Java virtual machine. Multiple virtual hardware systems may be present on a single piece of physical devices thanks to software like VM Ware. One of the pillars of cloud computing is the creation of numerous virtualized hardware images on a single piece of real hardware. A hypervisor allows these many virtual images to exist at the same time. In cloud computing, there are many kinds of virtualization, including client virtualization, storage virtualization, and server virtualization[8], [9].

1.1 VM Migration Requirements, Benefits, and Contraindications:

Cloud computing relies heavily on VM migration. The following are the requirements and advantages of virtualization:

- Several Operating Systems: Virtualization allows us to execute multiple programs on the same physical hardware, even if they are running on separate operating systems.
- Increase the power usage with better power management.
- Improved Resource Usage: With virtualization, resource utilization improves.
- Load Balancing: The load may be dispersed based on the available resources.

Maintenance and service are two words that come to mind while thinking about maintenance and service.

- It raises the system's availability.
- It may be scaled up or down as needed throughout time.
- Multiple servers operating in isolation offer security.

The main issue with virtualization is that the network load rises during the transfer, resulting in higher communication costs. As a result, the performance of applications operating on virtual machines has suffered.

1.2 Techniques for Placing a Virtual Machine:

First Fit, Next Fit, Random Fit, Least Full First, Most Full First, First Fit Decreasing (Single Dimension), First Fit Decreasing Product, First Fit Decreasing Sum, Dot Product, and Minimizing Angle are some of the previous algorithms used for VM placement in data centers. Simple algorithms include first fit, next fit, and random fit. These methods do not take into account the resource capabilities required for virtual machine placement, nor do they account for resource usage in real computers. Based on CPU capacity, methods such as least full first, most full first and first fit decreasing (single dimension) are developed. For multidimensional resources, the first fit decreasing product, first fit decreasing sum, and dot product algorithms are used. The resource volumes of physical/virtual computers are computed utilizing all resource capabilities in these methods[10]. All resources are directly engaged in the minimizing angle method for deploying virtual machines. Different resource consumptions are balanced in this method, resulting in physical machine minimization. Instead of optimizing resource consumption of physical machines in each dimension, this method focuses on resource balance. After all, of these Virtual Machine Placement methods, the Modification of the Best Fit Decreasing (BFD) algorithm is used to put Virtual Machines in cloud data centers.

1.3 Some Important Virtualization and Cloud Service Providers:

Google is a search engine (Google App Engine) Google App is ideal for a variety of uses, including business, consumer, marketing, mobile, and website.

- Simple to Create: By utilizing a familiar programming tool, the user may rapidly create and launch an app.
- Scalable: It can handle any number of users and automatically adjusts to changes in data flow.
- Easy to Manage: Administering the app via the centralised app online interface ensures that it is constantly active and functional, eliminating the need for software installation, server, or backup, among other things.
- Simple to Store: GAE's sophisticated storage infrastructure allows businesses to store and retrieve data with ease.
- Highly Scalable.
- Flexible Security and Sharing.
- Fast.
- Data Access.
- Reliable Storage Access

1.4 Microsoft (Windows Azure):

Microsoft Azure is an open cloud platform that allows users to create, deploy, and manage applications over Microsoft's worldwide network of datacenters. The user may use any language, tool, or framework to create apps. It allows customers to install and utilize whatever language they choose, including net, node.js, java, and php.

- Always up and always on: Microsoft claims that its services are delivered 99.95 percent of the time to its customers, allowing them to develop and operate highly available applications without having to worry about the infrastructure.
- Open: Because MWA is open source, customers may develop their apps using whatever language, framework, or tool they choose.
- Unlimited Server and Storage: MWA allows its customers to expand their applications to any size with ease. Microsoft Azure is accessible in a variety of datacenters across the globe, allowing users to deploy their applications close to their consumers.
- Extensive Capabilities: MWA can provide a versatile cloud-computing platform that can meet any application need. It is CDN and distributed caching services enable users to reduce latency and provide excellent application performance wherever in the globe.

1.5 Amazon EC2 (aws.amazon.com):

- Compute: Whether it is a single server or a big cluster, Amazon can expand to meet customer application needs.
- Elastic Compute Cloud by Amazon (EC2).
- AEC is a web service that offers cloud-based resizable computing capability. The Amazon EC2 web service makes it easy for users to acquire and build up resources. Amazon EC2 gives customers full control over their computing resources and allows them to operate on Amazon's infrastructure.
- Networking: Within the cloud and outside of it, Amazon customizes and controls user network resources.

1.6 Virtual Laboratories:

Developing a cloud-based ad hoc laboratory system like Cloud Suite necessitates the use of a number of different technologies. Hardware virtualization is the most important technology for a Cloud lab. Fortunately, we have a wealth of examples at our disposal. We will look at hardware virtualization services in general, as well as Amazon.com offerings in particular. We will look at current virtual lab settings, templating systems, remote storage solutions, and A P Is and Frame Works in addition to virtualization.

1.6.1   Amazon.com Elastic Compute Cloud:

Jeff Bezos launched the restricted beta of Aws Extreme Compute Cloud, often known as Amazon E C 2, on August 25, 2006. Amazon E C 2 is a service that enables customers to rent computing resources on a need-to-know basis. This kind of service is made feasible by Amazon E C 2's use of the Xen hypervisor, which enables it to construct Virtual Private Servers as needed. These virtual servers run operating systems that have been specifically designed for para virtualization. Once the virtual machine has been configured to the end user's satisfaction, it may be saved as an Amazon Machine Image, or A M I.

An A M I is a system image developed specifically for use with E C 2. Users may use their own software packages to modify this A M Is, enabling them to be customized for any purpose. The Amazon Simple Storage Service is heavily used in the Cloud Suite code. HTTP requests enable a user to upload and download files using. Although Amazon Simple Storage Service, like the rest of Amazon Web Services, is not free, at the time of writing, Amazon does provide a one-year free tier of service.

SDKs are software development kits that enable developers to interface with Amazon Web Services. Amazon and different third parties provide them. S D Ks for P H P, Python (Boto), and UNIX forward slash Linux command line are used to create the Cloud Suite framework. SDKs, on the other hand, is available in a variety of platforms and languages. The SDKs offered significantly simplify connection with Amazon's cloud services.

1.6.2   Google Compute Engine:

Amazon is not the only provider of cloud computing services. In addition to the long-running Google App Engine, Google just launched "Google Compute Engine," a service comparable to Amazon E C 2. We will take a deeper look at cloud services provided by companies other than Amazon.com in the following section.

1.6.3   Heroku:

Heroku is deserving of particular attention since it is one of the finest instances of a cloud platform for running arbitrary applications. Heroku enables the end user to create an application and then delegate the application's operation to Heroku. Using the Git version control system, the developer uploads code to Heroku. Heroku uses HTTP requests to communicate with the client application after the code is in place.

1.6.4   Google App Engine

It is a web-based application development platform developed by Google. Google App Engine is a comparable service to Heroku semicolon, but Google App Engine has a few limitations on what code developers may utilize. Unlike an Infrastructure as a Service provider, G A E restricts the types of code that may be run and only allows the proprietary Google Query Language to be used as a data store.

1.6.5   Eucalyptus

The University of California, Santa Barbara has conducted extensive study on cloud technologies. Eucalyptus and App Scale are two of the most well known products of that study. Eucalyptus is a free and open source

Amazon E C 2 emulator that may be operated on local clusters. Eucalyptus has proven to be a commercial success since its original release, and it is now included in the Ubuntu operating system.

1.6.6   Application Scale

Application Scale is an open source implementation of Google App Engine and other cloud A P Is. App Scale is available as an Amazon E C 2 image, Eucalyptus image, or Ubuntu image. Virtualization is used by App Scale to offer a consistent experience across different cloud platforms.

1.6.7   Coursera online education platform:

Distance learning has become progressively more accessible as high-speed internet connection has grown. Many institutions are making lessons accessible online for free, in addition to complementing existing courses with online offerings. Coursera is a hub where students looking to further their education may take free online courses from sixteen institutions, including Caltech, Stanford, and Princeton. Furthermore, several institutions have started to provide free online courses for no credit. The University of California, Berkley, for example, used Heroku to enable students to deploy a web-based application and view real-time results. Free online courses are also available from the Massachusetts Institute of Technology. It is essential to note that these online courses generally do not result in a degree or certificate, with the exception of Coursera, which offers an electronic certificate of completion of its courses. Online courses may benefit greatly from using a solution like Cloud Suite to give an interactive lab component to their students.

1.6.8   Khan Academy:

Khan Academy is a non-profit online learning platform. Khan Academy has videos that teach a wide range of subjects. Khan Academy provides a web-based collection of tools for improving mathematical competence in addition to videos. Khan Academy launched a Computer Science curriculum in late 2012, which includes programming teaching and presentation. The programming curriculum, which is based on the Java Script language. The software is intended to teach the basics of computer science to someone who has little or no prior knowledge.

1.6.9   Virtual Lab at the University of Hawaii:

The University of Hawaii at Mano's Department of Educational Technology released a paper in 2007 describing an experiment in which an online biology class used a C D hyphen ROM-based virtual wet lab. The researchers compared the usage of a virtual lab to a "face to face" lab. While students considered virtual laboratories helpful, data analysis revealed that face-to-face lab time was more important to the overall learning experience than a solely computer-based lab. The research focused mainly on the virtual lab's efficacy and did not go into great depth on the technology.

1.6.10 Navy Virtual Lab:

The Naval Postgraduate School has created a remote learning system that enables non-resident students to complete signal processing lab projects. The Electrical and Computer Engineering department has created a unique combination of hardware and software that allows students to use lab equipment from anywhere. Students may conduct experiments in real time thanks to a variety of signal generators and field programmable gate arrays.

2. DISCUSSION

The author has discussed about the virtualization in cloud computing, Cloud computing is a framework that enables us to access programs that are stored somewhere other than our computers. Virtualization is a method for providing separation between a computer system's hardware and software. Virtualization is the process of creating a virtual version of a resource (usually a computer system or an application that runs on it). Virtual machine and cloud services make resources accessible from a distance. Some resources are shared and accessed by many people at the same time. The method makes advantage of resource sharing to boost system usage. To fully use the processing and storage, the computer is virtualization in a clustering computing environment managed by Cloud computing. The cloud will offer dynamic resource allocation to guarantee efficient system usage by closely monitoring resource workload and available physical resources and continuously delivering managed solutions. The most essential element of virtualization is to provide a platform that students can use from anywhere, regardless of time or place. The cloud creates a separate virtual environment that does not influence any external systems or other virtual systems inside the cloud.

3. CONCLUSSION

Cloud computing is a framework that enables us to access programs that are stored somewhere other than our computers. Virtualization is a method for providing separation between a computer system's hardware and software. Virtualization is the process of creating a virtual version of a resource (usually a computer system or an application that runs on it). Virtual machine and cloud services make resources accessible from a distance. Some resources are shared and accessed by many people at the same time. The method makes advantage of resource sharing to boost system usage. To fully use the processing and storage, the computer is virtualization in a clustering computing environment managed by Cloud computing. The cloud will offer dynamic resource allocation to guarantee efficient system usage by closely monitoring resource workload and available physical resources and continuously delivering managed solutions. The most essential element of virtualization is to provide a platform that students can use from anywhere, regardless of time or place. The cloud creates a separate virtual environment that does not influence any external systems or other virtual systems inside the cloud.

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