A REVIEW OF CLOUD COMPUTING'S VIRTUALIZATION TECHNIQUES AND TYPES

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ABSTRACT

Virtualization is regarded as the most significant technology for creating and running virtual copies of hardware, software, operating systems, and applications. In other words, on a single server platform, many copies of computing resources are produced and run independently. As a result, it not only reduces computer costs but also enables the best possible use of computing resources. Virtualization is regarded as the most significant technology for creating and running virtual copies of hardware, software, operating systems, and applications. In other words, on a single server platform, many copies of computing resources are produced and run independently. As a result, it not only reduces computer costs but also enables the best possible use of computing resources. Because a pool of computing resources is established from a single existing resource and provided to customers in a secure environment under cloud computing services, virtualization is regarded as the foundation of these services. Utilizing virtualization techniques, a pool of resources or numerous resources are produced. Basically, hypervisor accomplishes this. The investigation of various virtualization approaches used in cloud infrastructure will form the foundation of the paper that will be presented. Discussing and weighing the benefits and drawbacks of various virtualization strategies is the study's main goal.

Keywords: Virtualization Techniques, Cloud Infrastructure, Virtual Machine, Resource Sharing, Application Virtualization, Storage Virtualization, Desktop Virtualization, Network Virtualization.

I.   INTRODUCTION

One way to construct virtual computing resources from a single physical resource is through virtualization. This method allows for the creation and execution of virtual copies of a certain resource, such as a processor, operating system, software, applications, and bandwidth, in a setting that is secure and isolated from users or the system. By simulating hardware using a programme called a hypervisor, virtualization separates real hardware from software.

The cloud infrastructure and services use a variety of virtualization types and techniques, including application virtualization, server virtualization, storage virtualization, network virtualization, desktop virtualization, etc. In essence, these are the various virtualization layer levels, and each layer has its own architecture, regulations, benefits, and complications.

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The physical information technology resources are divided up through virtualization into a number of physical objects that can run on different operating systems. To provide on-demand and specialised services to cloud customers, the cloud architecture separates and hides various services.
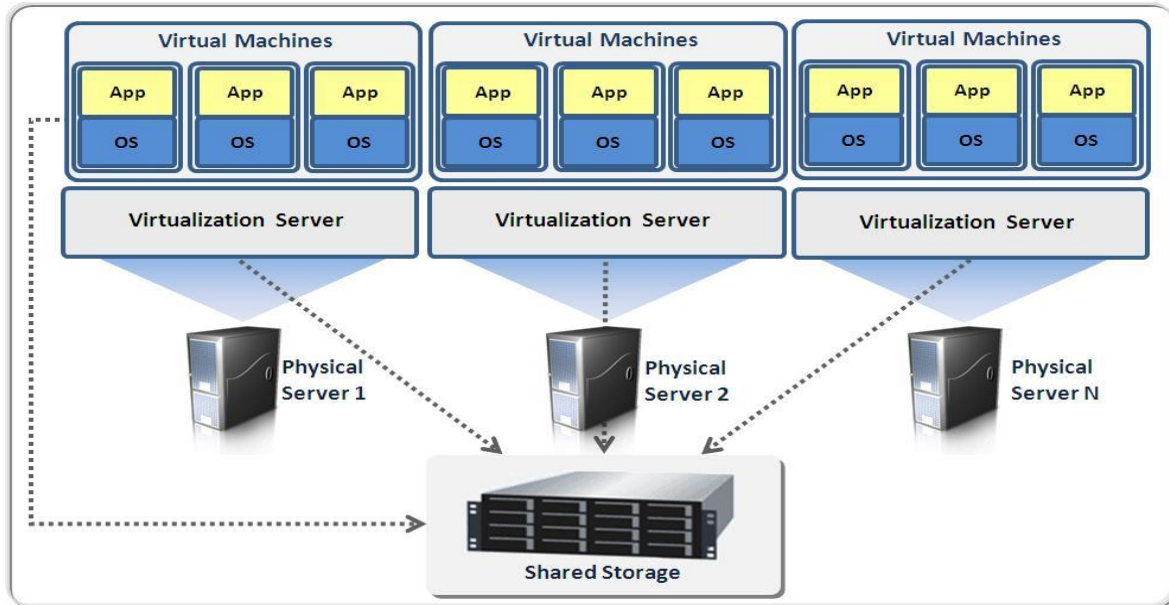
Figure 1: Architecture of Virtualization

Source:"https://www.researchgate.net/figure/illustration-of-the-concept-of-Virtualization-7_fig1_269636339"

II.   VIRTUALIZATION AND CLOUD COMPUTING

The foundation of cloud computing activities and services is virtualization. In the form of Virtual Machines, virtualization divides and detaches abstract functions from the physical hardware. In contrast, the cloud computing architecture makes advantage of them to instantly deliver the needed services to faraway consumers. Virtualization processes and techniques are largely responsible for all of the services that Cloud Network provides.. Everything in a cloud environment is virtual, including the operating system, microprocessor, memory, storage, etc. Abstraction levels do vary, for sure. Cloud computing uses these virtual machines or resources to deliver need-based and on-demand service to the client through the Internet at various abstraction levels. Virtualization creates a virtual environment in the form of virtual machines or need-based architecture and applications or other computing resources. A pool of virtual resources is created by the cloud and made available to users on demand or through self-service in a secure setting for a range of users and purposes.

III.   BACKGROUND

The IT giant IBM launched a project named CP/CMS (Control Program / Cambridge Monitor System) System in 1964, which is when the virtualization techniques were first developed. An operating system called the Control Program has the ability to use a machine's physical computing resources in many virtual forms. This was an operating system or time-sharing application that later developed into a virtual machine. At first, virtual resources were either employed in the same location or in specialised computing resources as requested by the intended organisation. However, they were not available in self-service or on-demand modes at the time. Virtual copies of computer and network resources did exist at the time. Because it was built to allow shared working environments, mainframe computers are among the best examples of virtualization at the time. In this case, mainframe servers offer computing resources to a number of clients in a shared mode.

Today, the cloud uses virtualization techniques to generate pools of resources and administer them in the form of virtual computers. These resources are then made available to users and clients in self-service mode over the Internet or Intranet. The IT market now offers a variety of VMware products that may be used to generate and replicate virtual resources. Some of them are unrestricted, while others can be acquired legally. Popular virtual machines that are readily available include:

1. Techniques of Virtualization Used in Cloud Based Services: The cloud computing environment uses a variety of virtualization methods. We'll talk about several virtualization methods used in cloud-based services.

1.1 Server Virtualization: To accomplish this, VM Software is used. Operating systems can switch between numerous servers as needed thanks to virtual machines. Many different types of users with a variety of needs and time constraints use this type of resource. These features, along with the technique's effectiveness, dependability, and "no usage no cost" policy, have made it popular with consumers.
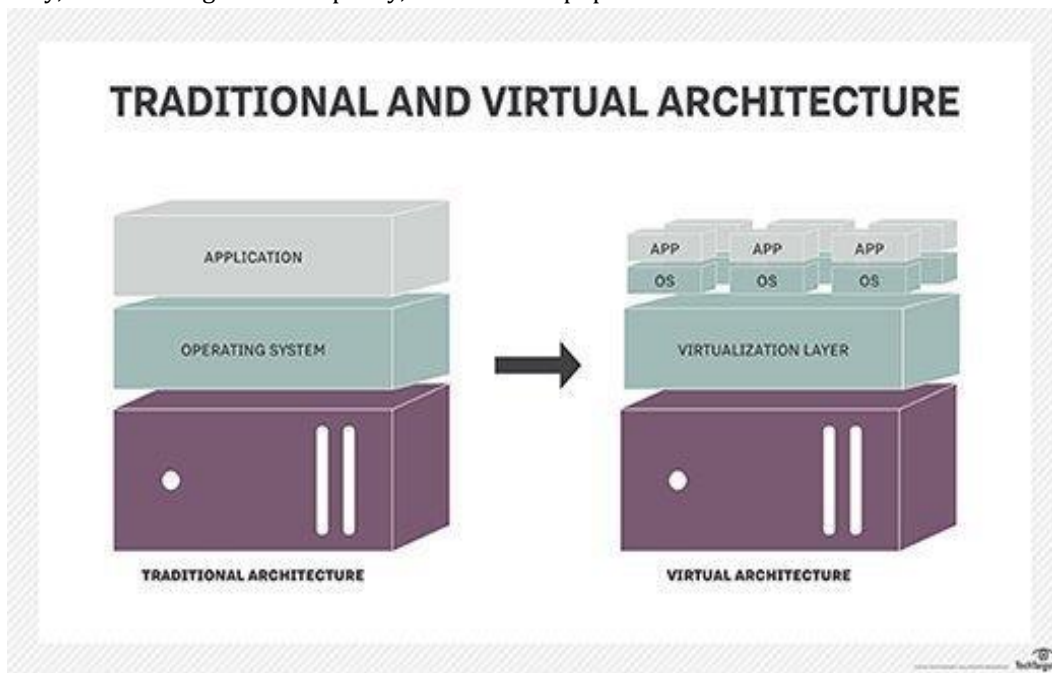
**Figure 2:** Server Virtualization

Source: "https://whatis.techtarget.com/definition/virtualization-architecture"

Under the category of server virtualization, there are two popular methods. Which are:

1.1.1   Operating System Virtualization: A virtualization software can perform this kind of virtualization. The system is controlled by this software, allowing various virtual resources to be created from a single physical infrastructure. Users receive a virtual replica of the operating system in the form of virtual computers.

1.1.2 Full Virtualization: This kind of virtualization is utilised to give clients a full virtualized architecture. The sharing of a virtual computer environment is also possible thanks to the virtual architecture.

2. Storage Virtualization: Using this method, we can combine a number of connected storage devices into a single, manageable simulated physical object. This method is primarily employed for backup and achievement. Storage Area Network is the best illustration of this kind of virtualization. Users can store their data using these strategies without having to worry about the intricate Storage Database architecture. Data recovery also becomes highly effective.
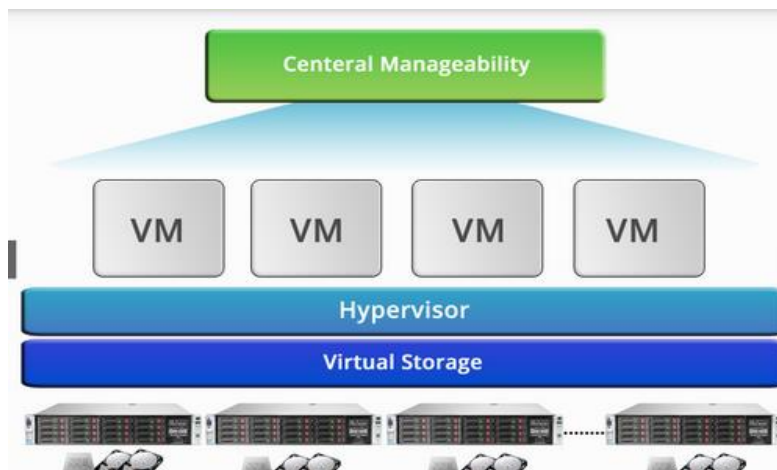
Figure 3: Storage Virtualization

3. Desktop / Client Virtualization: Users can remotely simulate a full desktop load or client load using this technique. A virtual remote desktop environment is provided here for users to utilise as a separate system. Users here simply enjoy a workstation-like experience similar to what we get with remote desktop.
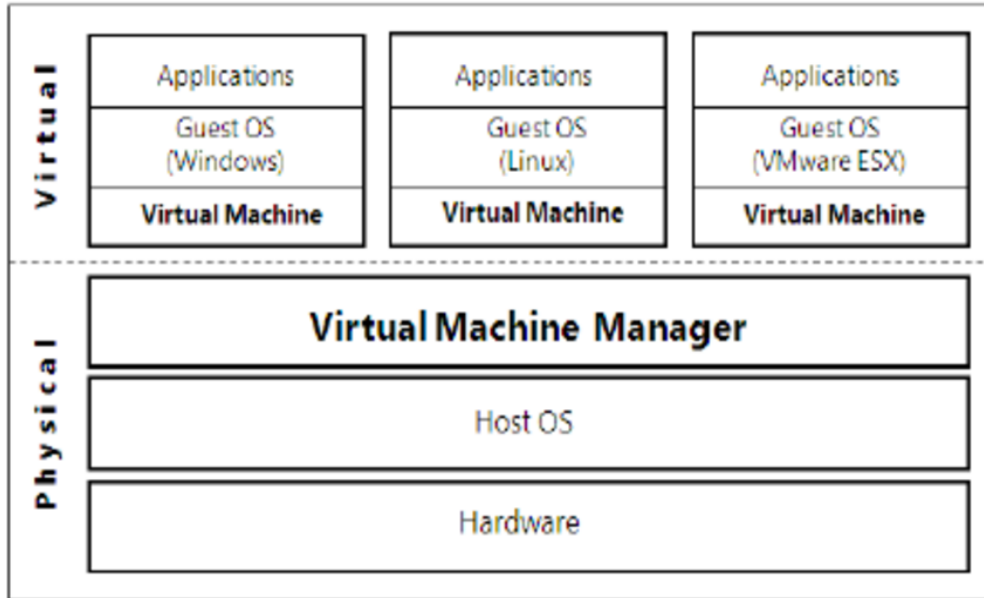

Figure 4: Desktop Virtualization

4. Application Virtualization / Software Virtualization: Encapsulated application environments are made available to users via the application virtualization technique, independent of the operating system. Users can use any type of application on any operating system because to the elegance of this technique.

5. Network Virtualization: This method virtualizes bandwidth and other network resources. The available bandwidth is essentially divided into a number of distinct bands, each of which is used as a separate, secure channel. This method gives users complete control over given bandwidth while hiding the difficulties of controlling network resources from the user end.
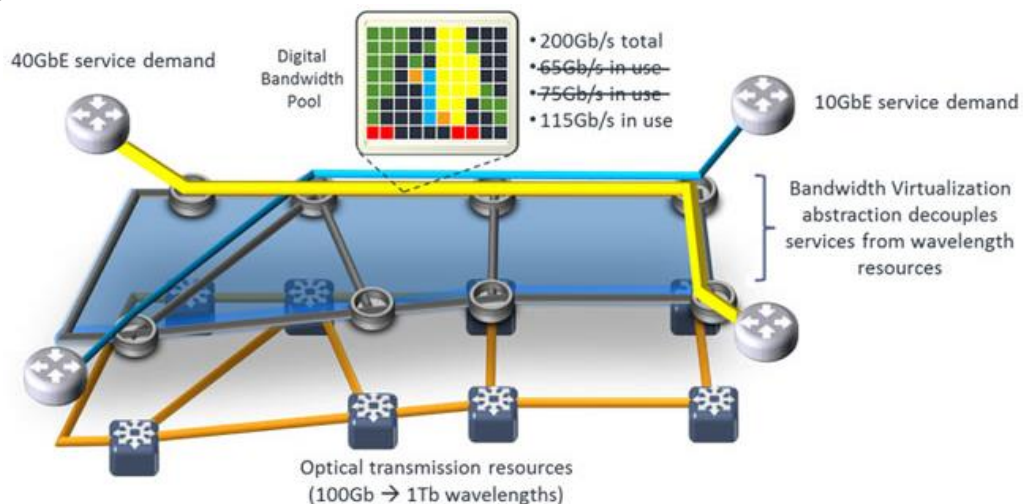

Figure 5: Bandwidth Virtualization

Source: "https://www.slideshare.net/infineracorp/extending-sdn-to-transport-may-2013-v2"

IV. CONCLUSION

Using virtualized computing environments and Cloud Computing Service Architecture, we may take into consideration a virtualized computing world. In a cloud environment, a business, enterprise, or person can obtain specialised computing services without having to manage the IT resources, and virtualization plays a key part in the delivery of these IT-based services via cloud networks. Using this method, nearly all computing resources can be virtualized for a better, more effective, secure, and on-demand self-service manner.

V.   FUTURE WORK

We want to examine the effectiveness of various virtualization strategies, particularly with regard to security, benefits, and drawbacks. The analytical study must offer a detailed explanation of potential methods that different user types could use to choose a certain service over cloud services.

VI.   REFERENCES

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