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A STUDY ON VIRTUALIZATION IN THE CLOUD DATA STORAGE

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Abstract: Cloud Computing is the optimal utilization of internet. It is the Internet based technology used to provide services like storage, security, bandwidth and processing. Because cloud computing uses virtualization process, there is no need for any physical or hardware or servers that will support the company's computer system and various other services of internet and networks. Since the past decades, storage of data is considered to be the main concern of information technology. To choose the cloud providers and their multiple datacenters, there are many different storage and compute services available. This paper gives the study about the cloud virtualization and related works and issues on cloud data storage, which is one of the main and important services provided by cloud computing.

Index Terms: Cloud Computing, Data Storage, Datacenters, Data Transfer, Virtualization.

I. INTRODUCTION

Cloud Computing involves the proper and full use of internet. Without Internet, Cloud Computing is Impossible. In Cloud Computing, aggregation of multiple computing, storage and network resources are involved into a single large unit known as "cloud" into which location-independent computing is performed. Virtualization is the key technique used in Cloud Computing. Creation of a virtual version of an operating system, existing hardware platform, storage device or a network resource is defined to be as the "Virtualization" in Computing Environment. Virtualization involves separation of resources and services from the underlying physical environment. Virtualization has three characteristics that make it ideal for cloud computing: Partitioning, Isolation and Encapsulation. In partitioning, many applications and operating systems are partitioned in a single system. In isolation, each virtual machine is isolated from its host physical system and other virtualized machines. One advantage of isolation is that, even if one virtual machine is crashed, it won't affect the other virtual machines. In addition, data sharing does not happen between one virtual container and the other. In Encapsulation, the encapsulated virtual machine can be presented to an application as a complete entity. Hence, each application is protected using encapsulation so that it doesn't interfere with another application.

Cloud Computing is split into three layers [2][3][4]of categories: IaaS, SaaS and PaaS. The abbreviation"IaaS" stands for "Infrastructure as a Service", that includes the basic essential facilities to run a software system application thereby providing service..The abbreviation "SaaS stands for "Software as a Service" which is software licensing and delivery model in which the software is licensed on a subscription basis and is centrally hosted. It is also known as "on-demand software". The expansion for "PaaS" is "Platform as a Service" which includes the facilities to develop an application and its execution on appropriate infrastructure.

II. RELATED WORK

Cloud Computing has evolved through a number of phases which include grid and utility computing, application service provision (ASP), and Software as a Service (SaaS) [18]. Beginning from the sixties, cloud computing has developed along a number of lines, with Web 2.0, but still the internet started to offer significant bandwidth during the nineties. During the year 1999, "Salesforce.com" was the first milestone in cloud computing history. Amazon Web Services development was emerged in 2002, which provided a suite of cloud based services including storage, human intelligence and computation. Amazon developed its next milestone during the year 2006, and the milestone was known as Elastic Compute Cloud (EC2 [19]), as a commercial web service which allows small companies and individuals to rent computers in order to run their own computer applications. The first widely accessible cloud computing infrastructure service was EC2/S3 hence providing its SaaS online video platform to UK TV stations and newspapers. During the year 2009, another huge milestone evolved, as Web 2.0 hit its stride, and hence Google and others started to provide browser-based enterprise application, through Google

Apps Services. The emergence of "killer apps" from the leading MNCs such as Microsoft and Google has been an important contribution to cloud computing. Other key factors have been introduced and enabled cloud computing to evolve includes the virtualization technique, the development of universal-high-speed bandwidth and universal software interoperability standards. Cloud Storage is based upon highly virtualized infrastructure and is made up of large distributed resources, in spite of it, it acts as one- often known as federated storage clouds. It is fault tolerant through redundancy and distribution of data. It is highly durable through the creation of versioned copies. With regard to data replicas, cloud storage is typically eventually consistent [1].

III. CLOUD STORAGE SYSTEM

The Cloud Storage System may be a service model during which knowledge is maintained, managed and protected remotely and created offered to users over a network. In alternative words, Cloud Storage is outlined as "storage of information on-line within the cloud", whereby company's knowledge is hold on in and accessible from several distributed and connected resources that kind a cloud. Cloud Storage will give the benefits of high accessibility and responsible, fast readying, sturdy protection for knowledge backup, deposit and disaster recovery functions, and lower overall storage prices as a results of not buying, managing and thence maintaining dearly-won hardware. However, the cloud storage will have the potential for security and compliance issues.

The figure 1 represents a Cloud Storage System. There are two parts in a Cloud Storage System: Cloud Storage Providers and users/clients and their devices. In the Cloud Storage Providers, data are stored in Virtual Servers managed by 3rd party companies. They can be shared to multiple users/clients. Data can be any type and format: 1) from any OS System: Windows, Mac, UNIX etc. 2) from any application: Windows Office, Adobe, Mac Office, etc. 3) with any format of file: zipped, TAR, CAB, binary, video, audio, text, executable etc. In the User/Clients, The users could be people or enterprises. Devices could be Desktop PC's, Smart/Mobile phones, Tablet PC and Laptops.

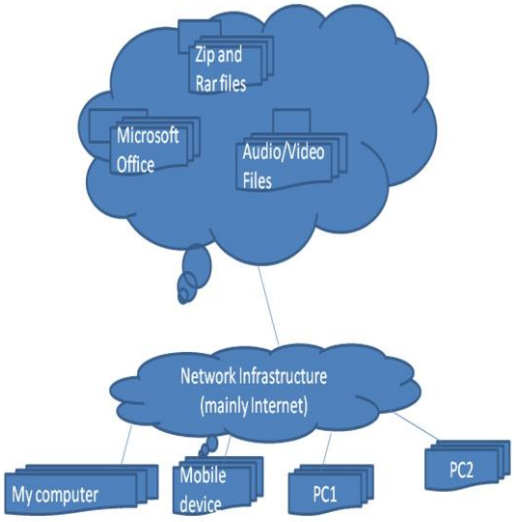

Figure1. Cloud Storage System

There square measure four kinds of Cloud Storage: 1) Personal Cloud Storage 2) Public Cloud Storage 3) non-public Cloud Storage and 4) Hybrid Cloud Storage. Personal Cloud Storage is additionally called Mobile Cloud Storage associate degreed could be a set of public cloud storage and applies to storing an individual's information within the cloud and thence providing the individual with access to the information from anyplace. Personal Cloud Storage conjointly provides information syncing and sharing capabilities across multiple devices is in the figure 2.

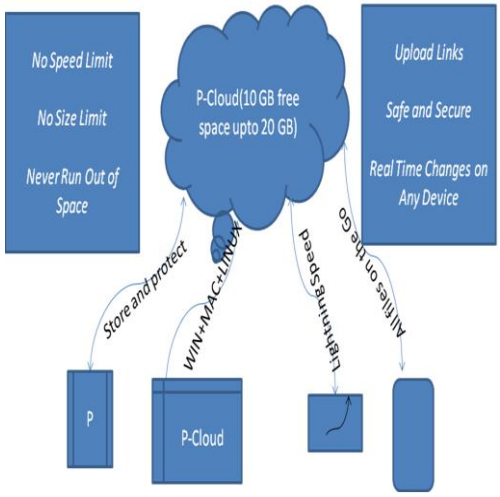

Figure 2: Personal Cloud Storage

Apple's Cloud is an example for personal cloud storage. Public Cloud Storage is where the enterprise and storage service provider are separate and there are no cloud resources stored in the enterprise's data center. The provider fully manages the enterprise's public cloud storage. In the Private Cloud Storage, the enterprise and cloud storage provider are integrated in the enterprise's data center. Here, the storage provider has infrastructure in the enterprise's data center that is managed by the storage provider. Private Cloud Storage resolves the potential for security and performance concerns while still offering the advantages of cloud storage. Hybrid Cloud Storage is a combination of private and public cloud storage where critical data are stored in the enterprise's private cloud while other data are stored in and accessible from public cloud storage provider. The figure 3 depict the different types of Cloud Storage:

There are several advantages of Cloud Data Storage. Storing of files remotely certainly proves helpful in different ways for professional as well as home users. Here are some of the advantages of Cloud Data Storage:

1) Accessibility thanks to advanced technology, completely different individuals have access to differing types of gadgets for work also as recreational purpose. Files and knowledge may be accessed from completely different places providing, there's web affiliation.

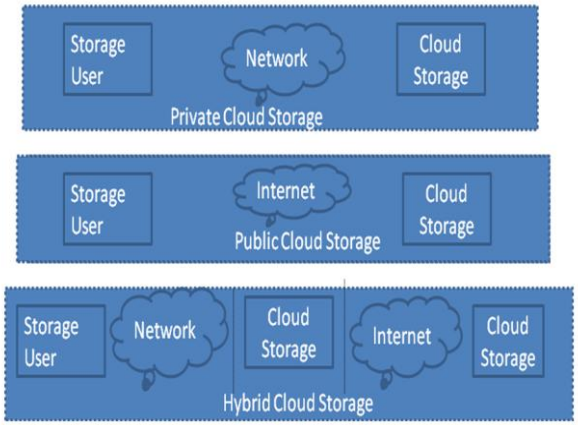

Figure 3: Public, Private and Hybrid Cloud Storages

2) Cost: : just in case of backing up knowledge, backup tapes or external laborious drives don't return for reasonable costs. Cloud storage services don't need ancient backup ways and offers lots of space for storing at low prices.

a. Security: : Storing files or info domestically presents businesses with additional security issues whereas encrypted knowledge and knowledge resources on on-line storage services prevents unauthorized use or access in a simple approach. Sharing a complete folder or one file with alternative users over cloud (cloud network) makes it completely convenient and straightforward for the users

b. Invisibility: Invisible information storage on cloud helps to stay valuable space at office or home from getting occupied.

c. Syncing: Automatic update of files across different devices is ensured by syncing due to which users can have access to their respected updated files irrespective of the device being used.

In spite of the big variety of benefits about cloud information storage, there are however a few disadvantages that need to be considered which are as follows:

1) Technical Problems: Although the cloud storage services provides information resources and data access to people from anywhere with an internet connection, there are still a few technical problems that can occur at any time. In technology, chances of technical issues can never be disregarded. Even the highly efficient and quality cloud storage service providers run into such risks at different times.

2) Security Breach: Although it is quite hard to break the security measures adopted by cloud storage service providers, but it is impossible to do so. An example, to be considered is a compromise within any of the servers where the personal information of millions of users is stored can expose it to the hackers.

3) Speed Issue: There are times when cloud storage service users face a difficult time downloading and uploading large documents as they tend to take huge amounts of time.

IV. VIRTUALIZATION IN CLOUD COMPUTING

Virtualization is a term that refers to the abstraction of computer resources. As discussed earlier, it is a key technique used in Cloud Computing. The terms and techniques, Virtualization and Cloud Computing both are linked with each other. There are five different categories of Virtualization, viz, Storage Virtualization, Desktop Virtualization (Endpoint Virtualization), Hybrid or Private Cloud Computing, Private Storage-as-a-Service Virtualization, and Server Virtualization [10]. Vijay. G.R, and A.Rama Mohan Reddy presented "Cloud Data Management Interface based Storage Virtualization Mechanism for Cloud Computing" have mentioned about the Virtualization techniques especially about the Virtualization and its benefits. Storage Virtualization explains about gaining and optimizing improvement and performance in Storage Area Network [10]. Desktop Virtualization is a technique of adding a hardware virtualization layer added to the centralized data centre server. In this technique, the desktops are managed centrally thus reducing the complexity of software installations, backups, and maintenance thereby reducing the administration and technical support [12].

Hybrid Private Cloud Computing is a private cloud linked to one or more external cloud services which acts as a whole unit, and is managed centrally on private networks. Private Storage-as-a-Virtualization: The main technology for cloud computing is the Virtualization technique. The Cloud Storage Systems use only the Virtualization Technique. The Storage as a Service is one such method of implementing the Virtualization technique in Private Clouds. Hence the name Private Storage as a Virtualization. The last one, viz, Server Virtualization is the masking of server resources, inclusive of the number and identity of the individual physical servers, operating systems, and hence the processors from server users. The Virtual Machine Model, the paravirtual machine model, and the virtualization are the three approaches to server virtualization. In this paper we will discuss about the Desktop Virtualization, and its working in detail.

V. DESKTOP VIRTUALIZATION IN CLOUD DATA STORAGE

Desktop Virtualization is also known as Endpoint Virtualization. It is a software technology which isolates the endpoint/desktop environment and associated application software from the physical client device that is used to access it. This approach supports a more complete desktop disaster recovery strategy as all components are essentially saved in the data center and backed up through the redundant maintenance systems. It also allows for a highly flexible and much more secure desktop delivery model. The Desktops are managed centrally, which reduces the complexity of software installations, backups and maintenance, which further reduces the administration and technical support [12].

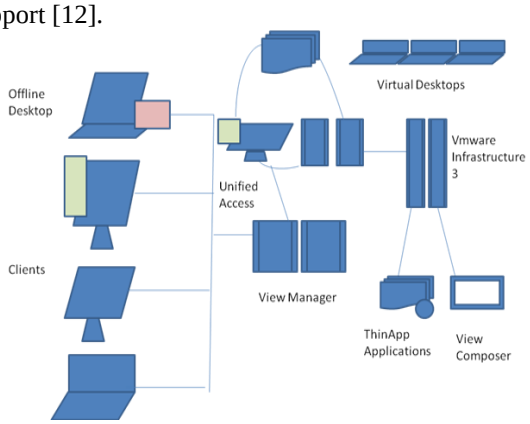

Figure 4: Desktop Virtualization

Desktop Virtualization is one among the characteristics and parts enclosed within the IaaS (Infrastructure as a Service) in Cloud Computing [14]. during this technique, just in case a user's device is lost, the restore is way additional easy and straightforward, as a result of essentially all the parts are going to be gift at login from another device. Also, if no information is saved to the user's device, if the device is lost, there's a lot of less likelihood that any necessary and important information are often retrieved and compromised. Desktop Layering may be a methodology of Desktop Virtualization that divides a disk image into logical components to be managed one by one. for example, if all the members of a user cluster use identical OS, then the core OS solely has to be secured, once for |the total environments who share this layer. Applications of layering ar physical disk pictures, client-based virtual machines or host-based desktops. There ar 2 styles of Desktop Virtualizations: Native and Remote Desktop Virtualizations..

Native Desktop Virtualization implementations run the desktop setting on the consumer device victimization hardware virtualization or emulation. just in case of hardware virtualization, counting on the implementation, each kind I and II hypervisors is also used. native desktop Virtualization is well matched for environments wherever continuous network property cannot be assumed, and additionally wherever application resource necessities are often higher met by victimization native system resources.

Remote Desktop Virtualization implementations treat client/server in operation setting. Application execution takes place on a far off OS. a really common implementation of this approach is to host multiple desktop OS instances on a server hardware platform running a hypervisor. it's additionally used as a method of providing access to Windows Application on non-Windows Endpoints together with tablets, sensible phones, and non-Windows-based desktop PCs and laptops. it's additionally used as a method of resource sharing to supply low value desktop computing services..

VI. RESEARCH ISSUES

Apart from the various advantages of the cloud data storage using virtualization, especially by using Desktop Virtualization, there are however certain issues and challenges being faced in the Security aspect of storing data in the cloud. Data stored in this case can be considered as a sensitive data, whose disaster recovery may be quite difficult [15]. As per the research done in the past years [16][17], there are various security issues being faced, viz, access to sensitive data, privacy in data, virtualization visibility, management control security, etc. A major solution for such issues as per the research done in the past years is the technique of cryptography, which involves converting plaintext into cipher-text using encryption method [15].

VII. CONCLUSION

In this paper, we described what a Cloud Computing means, how cloud is used for storing data and about the concept of Virtualization, the VM Ware instance of the Cloud Environment, different types of Virtualization, viz., Storage, Server, Desktop, Hybrid or Private Cloud Computing, Private Storage as a virtualization. The various research issues related to cloud computing apart from the advantages of the cloud data storage are also explained in this paper. We have also briefed about the Desktop or Endpoint Virtualization and hence future applications can be concluded from the advantage of Desktop Virtualization like, conferencing, instant messaging, video, and voice messaging capabilities.

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