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Virtual Machine Allocation for Cloud Computing

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Abstract

Background / Objectives: Cloud computing is one of the best developing fields in Computer Technology due to good performance with high traffic. It's used to use for storing lots of data without direct active management by the user. So, these technologies in cloud computing are growing rapidly. In this paper, we are discussed about benefits and components as well as importance of virtualisation in cloud computing.
Methods / Statistical Analysis: It involves the concepts of parallel processing and distributed computing in order to provide distributed resources in many consumers by means of Virtual Machines (VMs) hosted by physical servers. Its emerging rapidly and no doubt it is the next generation technology where humans will be using anywhere and anytime lots of resources from the cloud. Over the past ten years, new technologies have significantly altered every area of human life. Nearly all resources were moved to cloud-based platforms, particularly following the COVID-19 pandemic.
Findings / Applications: The ability to access various software resources on a pay-per-user basis is made possible by cloud computing. The majority of the resources are ready to be used for cloud computing virtualization from virtual machines. A variety of virtual machine parameters can be adjusted to directly increase performance while using a large amount of cloud computing resources.
Improvements: The reader of this paper will profit from cloud computing because it provides a concise summary of all the difficulties, outcomes, advantages, and chances for scientific advancements in the subject of virtual machines, or virtualization, in cloud computing.

Keywords: Virtual Machine, VM Allocation VM Placement, Virtualization, Cloud Computing, Virtualization.

1. Introduction

It is one of the best and latest technologies that has changed the activity of Human life and fast in a big way it provides various services and resources using the Internet and cloud-based resources in the last some years in Virtualization Systems. Simply put, cloud computing is the practice of accessing and storing data and applications via the Internet without requiring physical storage on our computers' hard drives.
Through internet-connected devices, users can access applications that are available remotely and are not located within the working location. A different term for cloud computing has been provided by the National Institute of Standards and Technology (NIST), which states that cloud

computing is a model that allows for easy, on-demand network access to a shared pool of reconfigurable computing resources (such as networks, hosting servers, resource storage, applications, services, and many more) that can be quickly provisioned and released with little management work or service provider interaction. NIST has enumerated five fundamental requirements for cloud computing from virtual machines: self-service cloud computing on-demand, wide network access, resource pooling, quick elasticity, and measured service.

This is a new technology that is used to store data and get resources and applications via the internet. It operates under specific guidelines and is capable of storing enormous volumes of data and information without the need for a physical storage device. A virtual machine (VM) is a key component of cloud computing virtualization. It allows a single cloud resource to appear as several resources, a technique made possible by virtual machines. Cloud technology is expanding quickly and is being used in many fields, including e-commerce, artificial intelligence (AI), education, engineering, health, and the geospatial sciences, among many other scientific and business domains. Cloud-based servers are also employed in these fields. Because it allows various businesses and organizations to access vast amounts of storage and resources without the need for physical storage while maintaining proper administration, regulation, and security, cloud computing has grown to be a highly regarded technology with applications across the globe. Cloud computing's virtualization, viability, wide network access, abundant information storage, automated system, affordable security, scalability, and many other features are some of its primary attributes. With the aid of the Internet, cloud resources can be rented and released according to the specific rules and restrictions needed by each user. The use of cloud computing is a model for enabling on-demand network access to a shared pool of configurable computing software resources, according to NIST.

Physical and virtual infrastructure resources, such as servers, network systems, and other resources, make up a cloud data center. Cloud data centers are crucial because they enable a variety of user demands to obtain data quickly and accurately. It has a vast amount of data and information that is governed by laws and regulations.

Computing resources include networks, hosting servers, storage, applications, and many more resources available in cloud. The Future of Cloud Computing survey as of 2013 shows that cloud adoption among service providers and service consumers continued to increase in 2013. Cloud computing on demand is pay-as-use i.e., billing is done on the basis of customer usage thereby reducing operational and capital cost. Users can access applications that exist outside the work place which can access remote applications through Internet connection devices. This allows cooperative resource sharing and efficient utilization of computer resources while consuming less processing power. Amazon, Google, Microsoft, and other companies used to provide cloud computing services, but there are now a lot of them available.

Numerous industries, including the software, government, and healthcare sectors, use these services. The fundamental advantages of cloud computing are found in the methods used for data transmission, storage, and access. Infrastructure and maintenance expenses are decreased by using a virtualized platform with management features including availability, automated load balancing, and fault tolerance. This expansion is consistent with predictions made by GigaOM Research, which projects that the global addressable market for cloud computing would expand to $158.8 billion by 2014—a 126.5 percent increase from 2011.

What is Virtualization in Cloud Computing?

Virtualization deploys software resources that forms an abstraction layer in computer hardware, allowing the hardware components of a particular computer such as processor, memory, storage, and many more etc. to be divided into multiple virtual elements (also called virtual machines).

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This times virtualization is globally adopted in cloud computing of virtualization in enterprise IT architecture and drives cloud computing economics. Essentially, virtualization allows cloud-based resources providers to distribute users with existing physical computer hardware.

2. Virtualization Types

Virtualization in cloud computing can be referred to as the process of making a virtual rather than an actual version of something which includes operating systems, hardware devices, storage devices, networks and many other resources. The following section gives detailed information about it.

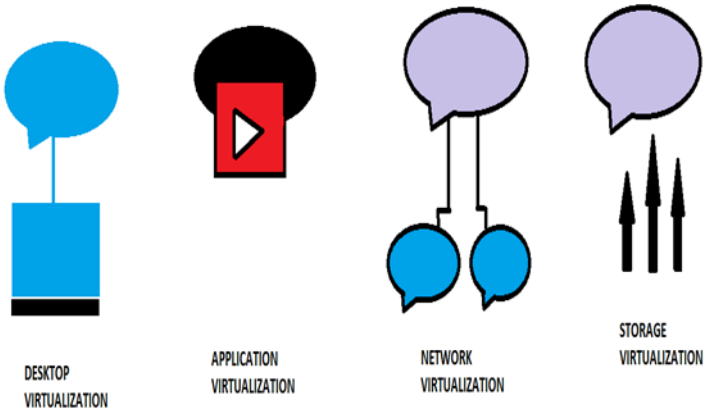

Figure 1. Virtualization Types

Application Virtualization

Application virtualization is the technology that allows users to access and use applications from a different computer than the one on which the application is installed. Using application virtualization software, IT administrators can set up remote applications on servers and distribute the apps to the end user's computers. For the user, the experience of a virtualized app is the same as using an app installed on a physical machine.

Network Virtualization

The capacity to operate several virtual networks, each with an own control scheme and data plan. On top of a physical network, it coexists. It may be run by different parties who are secretive about one another.
In a matter of days or even weeks, network virtualization makes it easier to create and provision virtual networks, including logical switches, routers, firewalls, load balancers, virtual private networks (VPNs), and workload protection.

Desktop Virtualization

Desktop virtualization enables the remote storage of users' operating systems on data center servers. Because of this, the user can access their desktop from almost anywhere, even on a different computer. Users will require a virtual desktop if they wish to use an operating system other than Windows Server. A cloud deployment model specifies who owns and where the servers are located that you are using.

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Storage Virtualization

Virtual storage system manages the storage virtualization i.e., an array of servers. Users' operating systems can be remotely stored on data center servers thanks to desktop virtualization. As a result, the user can access their desktop virtually anywhere, including on a separate computer. If users want to utilize an operating system other than Windows Server, they will need a virtual desktop. Who owns the servers you use and where they are located are specified by a cloud deployment model.

3. Cloud Deployment Models

Based on the nature and purpose of the cloud, as well as its ownership, scalability, and reach, the cloud deployment model categorizes several kinds of cloud environments. The location of the servers and the users who manage them are disclosed by the cloud deployment paradigm. It determines the general layout of your cloud infrastructure, what may be modified, and whether services will be given or you will have to construct everything from scratch. Types of cloud deployment also specify how users and infrastructure are related to one another.

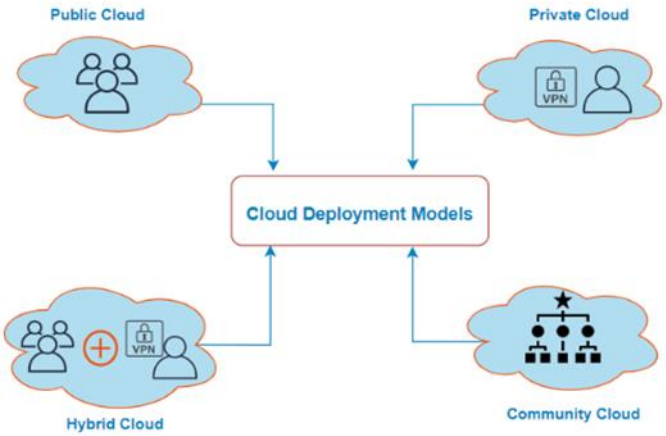

Figure 2. Cloud Deployment Models

Public Cloud

Access to systems and services is possible for everyone thanks to the public cloud. Because it is available to everyone, the public cloud could be less secure. A public cloud is one where large industry associations or the general public can access cloud infrastructure services via the Internet. In this cloud model, the company offering the cloud services owns the infrastructure, not the user. This approach permits the system to host in order to facilitate system and service access. This type of cloud computing is a traditional illustration of cloud hosting, where service providers offer their services to a broad range of clients. Storage backup and recovery services are offered under this structure for free, as part of a subscription, or on a per-use basis. Example: Google App Engine etc.

Private Cloud

The deployment model for private clouds differs from that of public clouds. It is an in-person setting for just one user, the customer. This solution eliminates the need to share hardware with

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others. What separates a private cloud from a public cloud is how all the gear is managed. It also goes by the name "internal cloud" and describes having access to services and systems inside a certain group or company. Cloud platforms are deployed in a safe, cloud-based environment under the supervision of an organization's IT department and protected by robust firewalls. It makes controlling cloud resources more flexible.

Hybrid Cloud

Hybrid cloud computing combines the greatest features of public and private cloud computing into a single layer of proprietary software. You may take advantage of the public cloud's cost reductions and host apps in a secure environment by using a hybrid solution. With this deployment architecture, data and apps are moved from one cloud to another.

Community cloud

It permits access to systems and services for a variety of organizations. Using the integrated services of numerous clouds, a distributed system design is used to suit the specific requirements. Organizations with similar tasks or concerns can share community infrastructure. It is typically run by a non-profit organization or by a coalition of one or more local organizations.

4. Advantages of Virtualization in Cloud Computing

Virtualization has become an increasingly common practice in the cloud computing landscape. Through virtualization, engineers can use available computers and hard drive space more efficiently, essentially by splitting a computer into several different virtual computers. Virtual machines (VMS) are created by this multi layered concepts and helps maximize your organization's hardware utilization.
When used properly, virtualization provides a strong foundation for all cloud computing efforts. Our storage devices, network resources, operating systems, hardware platforms, and other major computing facilities are protected, and we can comfortably move to any cloud infrastructure as needed.

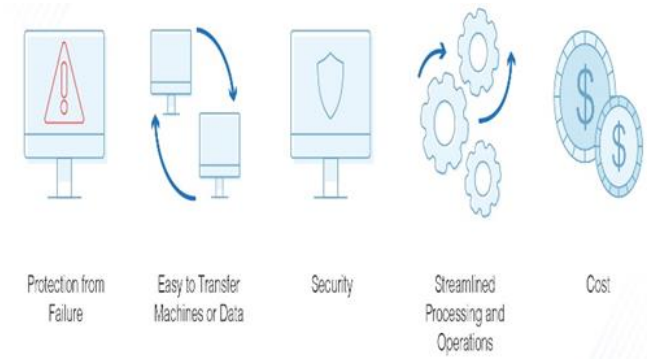

Figure 3. Benefits of Virtualisation in Cloud Computing

Protection from system failures

No matter how careful you are with the technology you use, technology in general can sometimes be plagued with system problems. Businesses can tolerate the odd hiccup, but the last thing you

need is a system crash when your developer is working on an urgent application that needs to be stopped right away.
One advantage of virtualization in cloud computing is the automatic backup that occurs across multiple devices. By storing all your backup data via virtualized cloud services or network, you can easily access files from any device. This multilevel access prevents you from losing any files, even if a system is shut down for some time.

Hassle-free data transfers

Fast data transport is another benefit of virtualization in cloud computing. Data may be moved from real storage to virtual servers and back with ease. In cloud computing, virtualization may also manage long-distance data exchanges. Finding data doesn't require administrators to spend time searching through hard drives. Rather, the cloud storage space and dedicated server enable us to quickly find and relocate the required files.

Firewall and security support

Security remains a central focus in the IT sector. We can use different virtual firewalls, also made possible through computer virtualization, we can restrict access to our data at a much lower cost than with traditional data protection methods. Virtualization protects the data you're from many potential cyber security issues and theft, through a virtual switch that protects your data and applications from harmful malware, viruses and many other threats.

Smoother IT operations

Virtual networks enable IT professionals' organizations to increase productivity and capacity at work. These networks are simple to use and process quickly, which helps you save progress in real-time and eliminates downtime. Technical staff could need days or even weeks to produce and support the same data on physical servers before virtual networks were introduced to the digital world.
Virtualization aids IT support teams in resolving important, occasionally nuanced technical issues in cloud computing settings in addition to operations. Technicians save time by not having to spend it rescuing files from a corrupted or crashed device because data is always accessible on the virtual server.

Cost-effective strategies

Virtualization is a great way to reduce operating costs. With all data stored on virtual servers or the cloud, there is hardly any need for physical systems or hardware, saving businesses a significant amount in waste, electricity and maintenance fees.
In fact, 72% of senior support developer that integration of virtualization in cloud computing at some level in their any organization, especially for its time & cost saving properties. Virtualization also saves any companies of organisation a significant amount of server space storage and provide high security, which can be used to further improvement daily operations and gives high security.

5. Experiments and Results

Eucalyptus storage bandwidths are used with and configuration regarding read/write operations.

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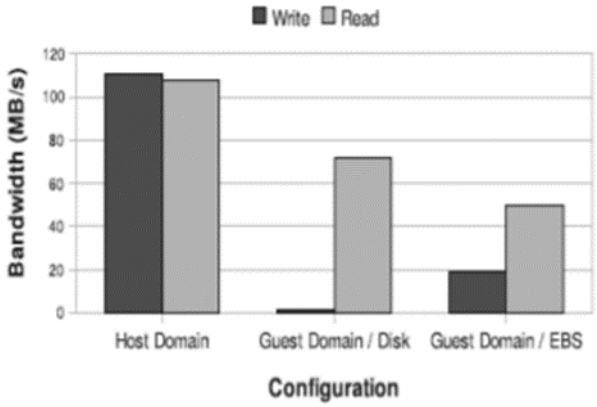

Figure 4. Eucalyptus Storage Bandwidth

Figure 4 illustrates how the host domain, disk, and EBS are tested in relation to the configuration and bandwidth I/O. More bandwidth is needed for the host domain.

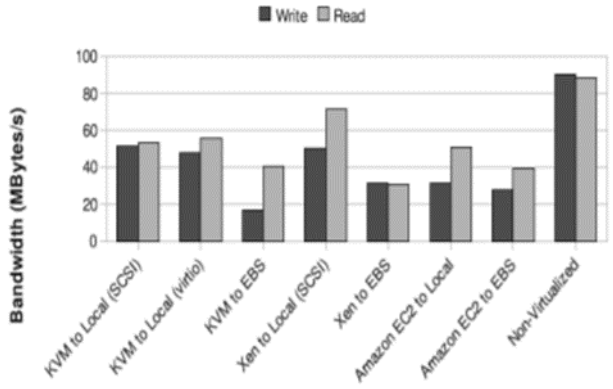

Figure 5. Hadoop Storage Bandwidth

With Hadoop, configuration versus bandwidth was assessed using the KVM, Xen, and Amazon environments. Comparing non-virtualized environments to their virtualized versions, the former uses more bandwidth and Hadoop storage.

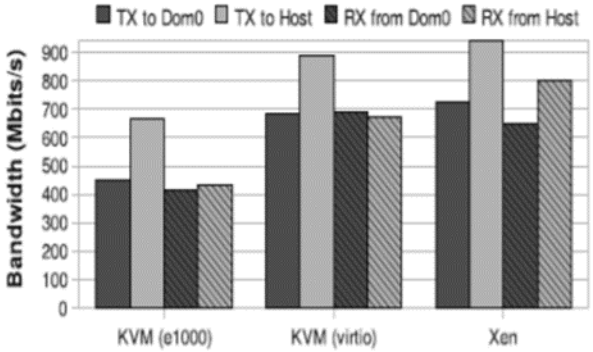

Figure 6. Hadoop Storage Bandwidth KVM, Xen

What are the setup and bandwidth-related uses for the KVM and Xen hypervisor environments? Figure 6 displays the findings displayed in Net perf network throughput. Six distinct settings.

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6. Research Challenges in Cloud Computing

In addition to allowing applications and development platforms to profit greatly from cloud computing in virtualization, cloud computing research has the issue of satisfying the demands of the future generation of private, public, and hybrid cloud computing infrastructures. We are still in the early stages of cloud computing research. Numerous present problems remain unresolved, and industry applications continue to give rise to new difficulties. The list of difficult research questions in cloud computing is not exhaustive.

- Service Level Agreement (SLA)
- Cloud data management and security
- Data encryption
- Access control
- Energy Management
- Platform Management
- Transferring virtual machines
- Interoperability

7. Conclusion

Resource allocation is one of the main security issues with the cloud computing paradigm. The development of virtualization in cloud computing is expanding the scope of information technology, and eventually cloud computing will make utility computing a reality. While this field has numerous advantages, there are drawbacks as well. For example, automated resource placement, energy management, and information security are just a few of the issues that draw attention from the academic community. There are still many issues like security and many more that remain to be resolved. The opportunities are ample to make some significant contribution to this sector and bring about significant growth in the industry. In our paper, we present an overview of cloud computing and highlight cutting-edge research and future issues to be handled by the research community. We are certain that our paper will provide readers with a better grasp of cloud computing and numerous research difficulties, which will encourage more study in this field as cloud computing is still in its early stages of research and development.

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