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Impact of Virtualization on Calculating Cost Factors of Cloud Computing

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***Abstract*– In this era of research the cloud computing models are used to build our own cloud for an organization and seems that creating the own cloud is very costly to build as well as to maintain. Through this research work the cost factor is reduced by virtualization of the server and devices attached to the server. The required software are open source hence no need to purchase, due to this it reduces the cost of cloud.**

Keywords: - Cloud Computing, IaaS, PaaS, SaaS, Virtualization, Cost.

I INTRODUCTION

The term cloud computing means you can access your information or supporting devices from anywhere any time over the net if you are the authentic user. For which required to gain the aims and objectives of this research work. It seems that without knowing this aspect cannot perform the research work.

II CLOUD COMPUTING MODELS

The cloud computing model is classified on the basis of their services provided. Cloud Computing is a model where in on-demand access to the resources are provided to the users as they plug into the cloud provided that a network connection is available. Cloud computing provides a shared pool of resources, including data storage space, networks, computer processing power, and specialized corporate and user application. Services can be scaled larger or smaller; and use of a service is measured and customers are billed accordingly (1).

Cloud computing model work on the basis of their services: Basically it is classified under two main categories.

Infrastructure as a service (IaaS):

This service model provides the infrastructure like storage allocation, network, and all the peripheral devices which is attached to the server in LAN. Also support to share the resources and software used in the Computer Laboratory. A web browser or a light-weight desktop or mobile application is required for accessing cloud-based applications by end users. Servers at a remote location are required to store business software and user's data. The improved manageability and less maintenance, and enables IT more rapidly to meet fluctuating and unpredictable business demand (2).

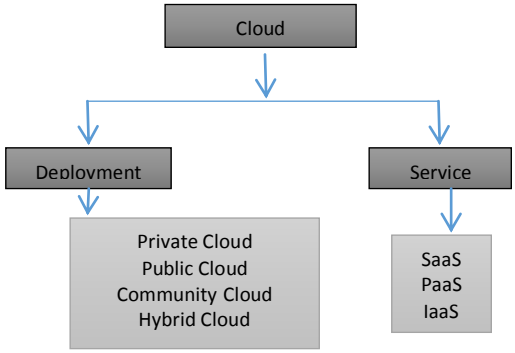

Figure 1: Classification of cloud

Platform as a service (PaaS):

In this Cloud service it provides the platform to be used which includes Operating System, the programming languages in which user wants to use for their implementation, environment where we download or upload the data on the net. But it matters the cost of software or hardware which is used on the cloud the environment. Cost is depend on the number of resources used by the user and time period for storing their data on the cloud.

Software as a service (SaaS):

Software as a services gives the facility to operate any application on the cloud and can be install. Also used to organize rents or leases storage spaces from SaaS. Software as a service is a cloud services delivery model that offers an on-demand online software subscription. As with other cloud delivery models, SaaS offers companies the opportunity to reduce internal IT support costs and transfer maintenance liability to the SaaS provider (3).

III CLOUD COMPUTING- DEPLOYMENT MODELS

Cloud computing is the next stage in evolution of the Internet. The cloud in cloud computing provides the means through which everything — from computing power to computing infrastructure, applications, business processes to personal collaboration — can be delivered to you as a service wherever and whenever you need. Cloud computing is offered in different forms:

A. Public clouds
B. Private clouds
C. Hybrid clouds
D. Community clouds

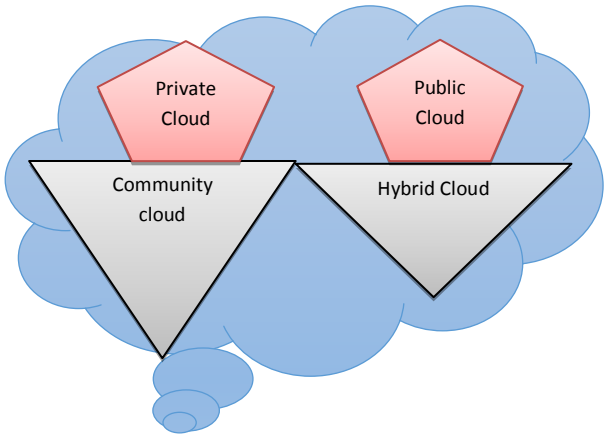

Figure 2: Classification of Deployment Model

A. Public clouds: Public cloud computing services are provided off-premise by third-party providers to the general public and the computing resources are shared with the provider‘s other customers. This is pure cloud computing and there is no debate on this one.

B. Private clouds: Many large organizations prefer, or are legally obligated, to keep their servers, software and data within their own data centers; and private clouds enable them to achieve some of the efficiencies of cloud computing while taking responsibility for the security of their own data. By implementing cloud computing technologies behind their firewall, enterprises can enable pooling and sharing of computing resources across different applications, departments or business units. Unlike the pay-as-you-go model of public clouds, however, private clouds require significant up-front development costs, data center costs, ongoing maintenance, hardware, software and internal expertise.

C. Hybrid clouds: Many enterprises take the _hybrid cloud‘ approach by using public clouds for general computing while customer data is kept within a private cloud, community cloud or a more traditional IT infrastructure. The use of virtual private cloud technology enables enterprises to connect their existing infrastructure to a set of isolated computing resources in public cloud infrastructure and to extend their existing internal IT management capabilities – such as security services, firewalls, and intrusion detection systems – to include their external virtual resources.

D. Community clouds: Community clouds are used by distinct groups (or communities‘) of organizations that have shared concerns such as compliance or security considerations, and the computing infrastructures may be provided by internal or third-party suppliers. The communities benefit from public cloud capabilities but they also know who their neighbours are so they have fewer fears about security and data protection (4).

Virtualization (5)

Virtualization is software that separates physical infrastructures to create various dedicated resources. It is the fundamental technology that powers cloud computing.

IV DIFFERENCE BETWEEN VIRTUALIZATION AND CLOUD COMPUTING

Essentially, virtualization differs from cloud computing because virtualization is software that manipulates hardware, while cloud computing refers to a service that results from that manipulation.

"Virtualization is a foundational element of cloud computing and helps deliver on the value of cloud computing," Adams said. "Cloud computing is the delivery of shared computing resources, software or data — as a service and on-demand through the Internet."

Most of the confusion occurs because virtualization and cloud computing work together to provide different types of services, as is the case with private clouds.

The cloud can, and most often does, include virtualization products to deliver the compute service, said Rick Philips, vice president of compute solutions at IT firm Weiden hammer. "The difference is that a true cloud provides self-service capability, elasticity, automated management, scalability and pay-as you go service that is not inherent in virtualization."

V ADVANTAGES OF VIRTUALIZED ENVIRONMENT OVER THE CLOUD

To best understand the advantages of virtualization, consider the difference between private and public clouds."Private cloud computing means the client owns or leases the hardware and software that provides the consumption model," Live say said. With public cloud computing, users pay for resources based on usage. "You pay for resources as you go, as you consume them, from a [vendor] that is providing such resources to multiple clients, often in a co-tenant scenario."

A private cloud, in its own virtualized environment, gives users the best of both worlds. It can give users more control and the flexibility of managing their own systems, while providing the consumption benefits of cloud computing, live say said.

On the other hand, a public cloud is an environment open to many users, built to serve multi-tenanted requirements, Philips said. "There are some risks associated here," he said, such as having bad neighbours and potential latency in performance. In contrast, with virtualization, companies can maintain and secure their own "castle," Philips said. This "castle" provides the following benefits:

- **Maximize resources** — Virtualization can reduce the number of physical systems you need to acquire, and you can get more value out of the servers. Most traditionally built systems are underutilized. Virtualization allows maximum use of the hardware investment.
- **Multiple systems** — With virtualization, you can also run multiple types of applications and even run different operating systems for those applications on the same physical hardware.

- **IT budget integration** — When you use virtualization, management, administration and all the attendant requirements of managing your own infrastructure remain a direct cost of your IT operation.

Cost factors of cloud computing

The cost of a cloud computing deployment is roughly estimated to be

CostCLOUD = Σ (UnitCostCLOUD x (Revenue – CostCLOUD))

Where the unit cost is usually defined as the cost of a machine instance per hour or another resource.

Depending upon the deployment type, other resources add additional unit costs: storage quantity consumed, number of transactions, incoming or outgoing amounts of data, and so forth. Different cloud providers charge different amounts for these resources, some resources are free for one provider and charged for another, and there are almost always variable charges based on resource sizing. Cloud resource pricing doesn't always scale linearly based on performance. To compare your cost benefit with a private cloud, you will want to compare the value you determine in the equation above with the same calculation:

CostDATACENTER = Σ (UnitCostDATACENTER x (Revenue – (CostDATACENTER/Utilization))

The costs associated with the cloud model are calculated rather differently. Each resource has its own specific cost and many resources can be provisioned independently of one another. In theory, therefore, the CostCLOUD is better represented by the equation:

CostCLOUD = 1nΣ (UnitCostCLOUD x (Revenue – CostCLOUD))INSTANCE*n* +
1nΣ (UnitCostCLOUD x (Revenue – CostCLOUD))STORAGE_UNIT*n* +. 1nΣ (UnitCostCLOUD x (Revenue – CostCLOUD))NETWORK_UNIT*n* + …

In practice, cloud providers offer packages of machine instances with a fixed relationship between a machine instances, memory allocation (RAM), and network bandwidth. Storage and transactions are unbundled and variable.

VI RESEARCH WORK

In this research work UBUNTO server is taken as operating system which is open source o.s. having no charges for downloading and used. It is to be seen the cost of operating system is very high. During this research work we concentrated on cloud is to be built and the cost of cloud should be minimum so that the educational institutions can built their own cloud for their organization. There should not be any dependency for retrieving the data from anywhere in world.

This provides our own cloud for an organization with the minimum and effective use of cloud.

For building the cloud the following steps should be remember:

- Installation of Ubuntu server.
- Open stack / own cloud open source software's
- By applying the concept of virtualization can be created number of virtualized server's .Perform the connectivity between virtualized clients and server virtually.
- Creation of own cloud.
- Make out the connectivity between local networks with created cloud.
- Assign the terminal / drive to store or retrieve the information from the network

This is how we can built our cloud.

During the research work for creation of cloud we require number of computers for storing the data, to run the cloud models (deployment or service), server which is used to allow or deny the accession over the cloud which maintains security.

The following basic requirement to build cloud (6):

1. Node Controller (NC)
2. Cluster Controller (CC)
3. Walrus Storage Controller (WS3)
4. Storage Controller (SC)
5. Cloud Controller (CLC)

According to this we require 5 different computers to serve its services.

But in this research work all requirements are fulfill to create cloud for an organizational organization can be possible on a single machine that maintains each and every thing.

The basic requirements are:

- A Single machine having i3 processor, 2 GB RAM, and Extendable hard disk 1 GB Cache RAM.
- Ubuntu Server
- Open Stack / own cloud (open source software)
- Minimum 5 mbps broad band internet connection
- External hard disk for holding data.

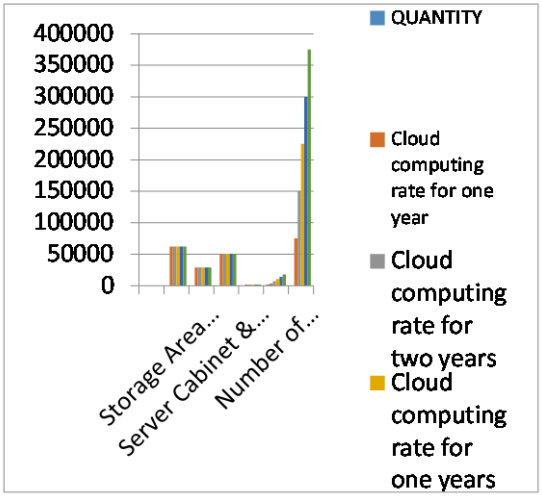

Figure 3: Shows graphical representation of rate of cloud computing per year.

These all are possible through the virtualization and any organization can easily make their own cloud.
The following table shows calculation of cloud:

Table 1: shows rate of cloud computing per year

Description	QUANTITY	Cloud computing rate for one year	Cloud computing rate for two years	Cloud computing rate for one years	Cloud computing rate for four years	Cloud computing rate for five years
Physical Servers	3	$61,800	$61,800	$61,800	$61,800	$61,800
Storage Area Networks (SAN)	1	$28,890	$28,890	$28,890	$28,890	$28,890
Network Switches	2	$50,958	$50,958	$50,958	$50,958	$50,958
Server Cabinet & PDUs	1	$2,000	$2,000	$2,000	$2,000	$2,000
Power and Cooling Costs	21 84	$3,559	$7,117	$10,676	$14,235	$17,794
NO. of Systems FTEs to manage the environment	1	$75,000	$150,000	$225,000	$300,000	$375,000
Total cost of ownership of your cloud		$222,207	$300,765	$379,324	$457,883	$536,442

VII CONCLUSION

Hence it is to be seen that the proposed research work is carry out with the help of cloud computing model and can be implemented in the college or organization environment. In future this technique can be enhance on mobile computing as well and cloud computing security can be apply through finger print recognition, face recognition.

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