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Implication of Virtualization and Cloud Computing in Technical Education

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Abstract:

Cloud computing is an emerging technology of these days. It is a set of shared pool of resources. Virtualization technology makes cloud computing a powerful tool to handle critical and complex processing. Cloud computing is very useful for a big enterprise to a small scale business and also for individuals. In this paper, applications and importance of cloud computing and virtualization is discussed.

Keywords — **Cloud Computing, Virtualization, SaaS, PaaS, IaaS.**

I.   INTRODUCTION

Cloud computing is mainly refers to a set of resources; which may be either applications/ software's or any physical resources; that can be shared among multiple tenants those are geographically apart from each other [2]. Cloud computing has derived from earlier technology Grid Computing but in these days is reached the stage of commercially implemented technology with growth of internet and significant increment in e-commerce transaction [4]. Availability of internet for common individuals makes cloud computing a popular technology. The term virtualization is referred to providing a virtual instance of resources i.e. software or hardware. Virtualization creates a simulated computer environment called virtual machine. It has an important and active role to make cloud computing a successful infrastructure for enterprises as well as for individuals. By virtualization of resource; resources can be provided to consumers through cloud computing. Also virtualization reduced infrastructure cost because of a virtual instance of resources is providing rather than actual physical resource [3]. Thus with the help of virtualization, cloud computing has enabled companies to provide service over internet without need to purchase additional hardware, and also reduce cost of infrastructure. The main goal of cloud computing is

to manage huge amount of data and the ability to acquire data at the point whenever user demands [2].

II.   VIRTUALIZATION AND CLOUD COMPUTING

❖   **Virtualization**

When an end user uses a computer, he/she directly interacts with operating system which abstracts the underlying hardware from user. The user gets information that he is interested on from the view [6]. The virtualization is used provide different logic view from a physical machine and relaxing the foregoing constraints and increasing flexibility. When a system is virtualized, its resources are accessed through an interface mapped onto the resources of a physical system. Thus virtualization constructs a virtual system that maps virtual guest system to a real host [6].

Types of virtualization related to hardware are as following [6] –

- Full virtualization.
- Partial Virtualization.
- Para-virtualization.

Types of virtualization in user related approach are as following [6] –

- Desktop Virtualization.
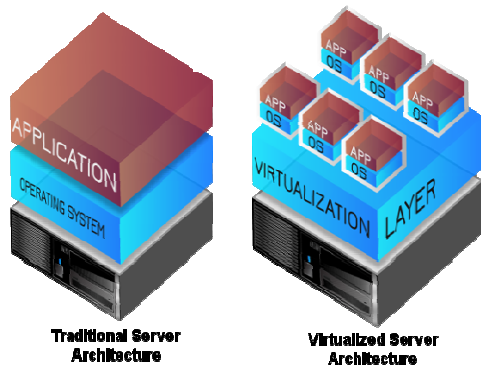- Infrastructural Virtualization.

- Cloud Virtualization.

Traditional Server Architecture   **Virtualized Server Architecture**

Figure 1 – Difference between traditional system and virtualized system

❖ **Cloud Computing**

Cloud computing provide various facility to user to store and process huge amount of data through internet or network. As NIST defined "Cloud computing is a model for enabling ubiquitous, convenient and on demand network access to a shared pool of configurable resources (e.g. servers, network devices, storage, applications, development tools, operating systems etc.)" all the resources available on cloud can be provisioned to user as per demand [1].
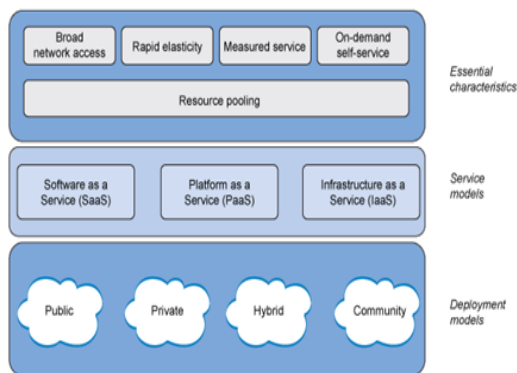

Figure 2 – Model of Cloud Computing by NIST.

NIST cloud model specify five essential characteristics, three services models and four deployment models.

Five characteristics of cloud computing are as following [1] –

- On demand self-service – customers should automatically provisioned resources without any human interaction as their requirement.
- Broad network access – all services are accessed through a shared network with heterogeneous devices.
- Resource pooling – the cloud service provider must pool resources among multiple tenets.
- Rapid elasticity – services available on cloud can be elastically or automatically provisioned and released.
- Measured services - Cloud systems can automatically control and optimize resource use by leveraging a metering capability (i.e. pay per use or charge per use basic).

Three service models of cloud computing are as following [1, 2] –

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructures as a Service (IaaS

Four deployment model of cloud computing are as following [1, 2] –

- Private Cloud
- Public Cloud
- Hybrid Cloud
- Community Cloud

❖ **Relation of virtualization with cloud computing**
As discussed earlier, virtualization provides a virtual subset of real resources and cloud computing provide access to a shared pool of resources through internet. Through virtualization; critical and costly resources can be provide to end user through end user i.e. servers, networking devices, storage etc [3, 4].
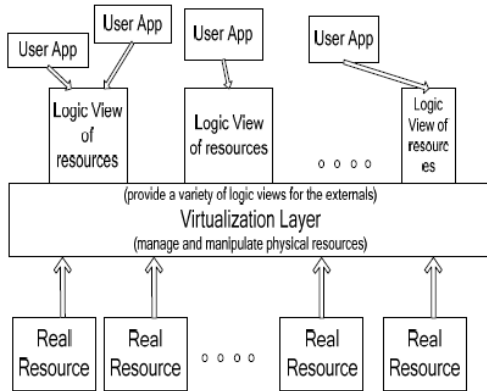
Figure 3 – Virtualization in Cloud Computing

❖ **Users of cloud computing technology**

Cloud computing is commonly used technology of these days. Cloud computing is used by different purpose by different group of individuals. As studies in various surveys cloud computing most frequently used for sharing photo, after that for sharing text files, music and videos and least for e-books and journals. By considering different groups of users employed persons used cloud computing more frequently in their professional work and personal work. After that retired persons, students and rarely unemployed personals. Therefore it is suitable to implement cloud computing in education [5].

III. CLOUD COMPUTING AND VIRTUALIZATION IN TECHNICAL EDUCATION

Cloud computing and virtualization has very important role in technical education. In a technical education institute cloud and virtualization is useful not only for teachers as well as students and administrators. By providing virtualized lab environment; student can get high-end machines of international standard which are very costly and cannot be afforded by all institutes [3]. With the help of virtual classrooms students can get information at anytime from anywhere. Teachers can use cloud resources for demonstration during their lectures. By implementing cloud technology a centralized

administration make possible. In technical education laboratory work and practice is more prices. Therefore student should engage more and more in lab. But in traditional lab facilities time constraints are imposed. Student can get access to lab only in institution's working hour, which not sufficient. And it also not possible to develop personal lab by the students. if institution provide virtual labs with cloud environment then student can get access to labs anytime and anywhere. Some of core benefits of implementing cloud computing in technical education are as following –

- Easy and unlimited access to the resources of institution like books, journals, lectures (video or text), software, etc.
- Freedom to work anytime from anywhere.
- Time saving and cost saving [3].

Some other benefits other than core benefits are as following –

- No need to carry additional gadgets and devices like pendrives, CDs/DVD, HDDs etc.
- Data stability, availability, and security.
- Less cost and space requirement in terms of shared resources.
- Easy and centralized maintenance rather than a full infrastructure.

IV. CONCLUSION

Based on above discussion it may be indicated that the cloud computing and virtualization is a very useful solution in technical education. On these days most of student are using cloud services in many forms and they have internet connectivity all time thus cloud computing may be included in education. With use of cloud computing and virtualization; students can access various resource like lectures, software's, application and labs anytime from anywhere. It removes the time and location constraints on student learning. It imposes a great advantage for students, teachers and institution's administration.

V. REFERENCEs

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