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Proposed Architecture for Virtual Lab Using Amazon Services

Jyoti Chaudhary[1], Vijay Maheshwari[2]
[1]M.Tech CS(Scholer) Computer Science Department, Shobhit University, Meerut, UP, India
[2]Assistant Prof, Faculty of Electronics, Informatics and Computer Engineering, Shobhit University, Meerut. UP, India

Abstract— Education today is becoming completely associated with the information technology on the content delivery, communication and collaboration. The need for server storage and software are highly demanding in the university, colleges and schools. Today we use cloud computing, it is an internet based computing , Where by shared resources, software and information are provided to computers and devices on demand. The cloud computing gives us some services like Iaas (Infrastructure as a service) ,Paas (Platform as service) , Saas (software as a service).
In this paper we will give the features of the educational institutes can use from the cloud computing provider to increase the benefits of students and teachers. The setup of virtual laborartory is explained in this paper. This research aims at showing the concerns and challenges of the adoption of cloud computing technology in higher education. In this research work we are introducing an architecture of Cloud Computing for education sector and discuss the impact of our propose architecture on the availability of widespread resources to all around the educational institutions.

Keywords— Introduction, Cloud computing in education, Types of cloud, Proposed architecture of Virtual lab using Amazon services,Virtual lab setup process, Future scope, Conclusion

I. INTRODUCTION

Cloud computing is the use of internet-based technologies to conduct business, is recognized as an important area for IT innovation and investment. Higher educational institutions can benefit from using of Cloud Computing by increasing the computing performance, storage capacity, universal accessibility and cost reduction. This can help most of the institutions in terms of fixed and maintenance cost reduction in the IT investment of both hardware and software as well as computer services. The Indian education sector is constrained by cost but demand has been rising for cost-effective, robust software applications to deliver services for learning and administration. Existing systems are not scalable and require huge capex (Capital Expenditure) and IT staff to maintain the system, which has shifted the focus from the core education business to managing the overheads of IT operations. The Cloud Computing paradigm has emerged as the optimal solution to meet the requirements of cost effective, scalable, and secure systems. In this paper, the author examines how the deployment of cloud computing in the education sector in India can meet these challenges.
You could invest thousands of dollars in additional servers and staff to handle that load, but if those servers sit unused for most of the time, it's a waste of money.

II. CLOUD COMPUTING IN EDUCATION

Cloud Computing technology is a way to provide computer applications to users without the need to purchase, install, or support software on their local computers and servers. Educational institutions are beginning to take the advantages of existing applications hosted on a 'cloud'. Today the cloud based platforms provide no cost services to educational institutions like mail, messaging and collaboration tools (email, contacts, and calendars), office applications (document storage, creation and sharing documents) and platform applications (the ability to create websites or learning management systems). In recent days, many research institutes are struggling to adapt Cloud Computing for solving problems that are continuous increasing computing and storage.[1]
Most fundamental service models include a combination of IaaS (infrastructure as a service), PaaS (platform as a service), and SaaS (software as a service). These service models may have synergies between each other and be interdependent – for example, PaaS is dependent on IaaS because application platforms require physical infrastructure.
The **IaaS (Infrastructure as a Service)** model provides infrastructure components to clients. Components may include virtual machines, storage, networks, firewalls, load balancers, and so on. With IaaS, clients have direct access to the lowest-level software in the stack – that is, to the operating system on virtual machines, or to the management dashboard of a firewall or load balancer. Amazon Web Services is one of largest IaaS providers.
The **PaaS (Platform as a Service)** model delivers a pre-built application platform to the client; clients needn't spend time building underlying infrastructure for their applications. On the backend, PaaS automatically scales and provisions required infrastructure components depending on application requirements. Typically, PaaS solutions provide an API that includes a set of functions for programmatic platform management and solution development. Google AppEngine is a

popular PaaS provider, and Amazon Web Services also provides some PaaS solutions in addition to IaaS offerings.

SaaS (Software as a Service) provides ready online software solutions. The SaaS software provider has complete control of application software. SaaS application examples include online mail, project-management systems, CRMs, and social media platforms.[2]

III. TYPES OF CLOUD

Together with virtualization, clouds can be defined as computers that are networked anywhere in the world with the availability of paying the used clouds in a pay-per-use way, meaning that just the resources that are being used will be paid. In the following the types of clouds will be introduced.

1. Private Cloud:

Private clouds are normally data centers that are used in a private network and can therefore restrict the unwanted public to access the data that is used by the company.

It is obvious that this way has a more secure background than the traditional public clouds. However, managers still have to worry about the purchase, building and maintenance of the system.

2. Educational cloud:

A educational cloud makes use of the public network to access the services providers by the cloud. Both private and educational cloud which is developed for education has to specify the services provided by them. it used pay-per-use manner, meaning that just the resources that are being used will be paid by transaction fees

TABLE1: DIFFERENCES BETWEEN PRIVATE AND EDUCATIONAL CLOUD[3]

Cloud Feature	Private cloud	Educational cloud
Managed by	Single dept	Service provider(many dept)
Access	Limited to employees and student of single universities	By subscription
Control &customization	Yes	None

IV. PROPOSED ARCHITECTURE OF VIRTUAL LAB USING AMAZON SERVICES

In this architecture we are using the Amazon services. In the institute faculty members give the assignment, tutorials and notes in hard copy. if we follow the Amazon web services SQS then we can reduce the efforts of faculties. They can send their notes, assignment and tutorial to the students by SQS. For the computer lab we can establish virtual computer lab by using VCL application. In this we have a source implementation of a secure production level on demand utility computing for accessing a wide area of computational resources, storage and software. Operating systems and software applications are installed and configured manually on each computer in laboratories. Each course requires different environments (operating systems, libraries and software applications). Sometimes, they are incompatible and conflicting with each other. Thus, each course requires its own machine image, which contains an operating system together with software applications and libraries. [4][5][6]

When a computer is crashed, laboratory managers have to manually reinstall that computer. This manual installation process takes a lot of time, and students cannot use the laboratory during that period. As a result, laboratory classes will be delayed.

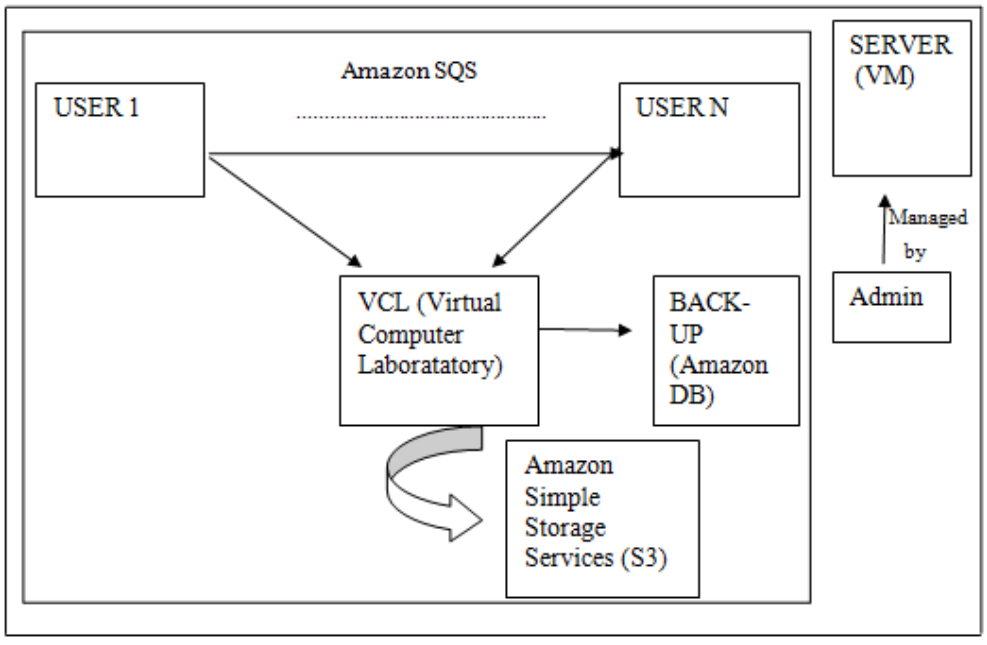

Fig 1.1 PROPOSED ARCHITECTURE OF VIRTUAL LAB USING AMAZON SERVICES

Whenever there is a change in software configuration for each course, all related machine images and consequently computers in related laboratories have to be reinstalled. This manual laboratory management process takes a lot of time and effort. To solve this problem, a private cloud computing model is adopted to provide computing. With this method, only a single virtual machine image for each course is stored on the server. Furthermore, such virtual machine images can be prepared by teaching staff. As a student needs to practice, he/she gets to the server and selects the desired course. The server loads the image of the course from the image repository to a virtual machine on the server and runs that virtual machine.

Every time the software applications and their configurations for a course need to be changed, laboratory managers only need to modify or reconfigure the master virtual machine image (in some cases, this is performed by teaching staff). With this approach, we reduce management complexity and storage. Besides the management of virtual machine images, in order to support students to perform course exercises, we provide and pack exercises as cloud applications. Such applications are diverse, as students have free choice to select suitable programming languages in many cases, for example, in our fundamental programming language course we allow student to use Java, C, C++, Prolog, Python, etc. Therefore, we decide using ontology to develop a model for specifying exercise applications.

V. VIRTUAL LAB SET-UP PROCESS

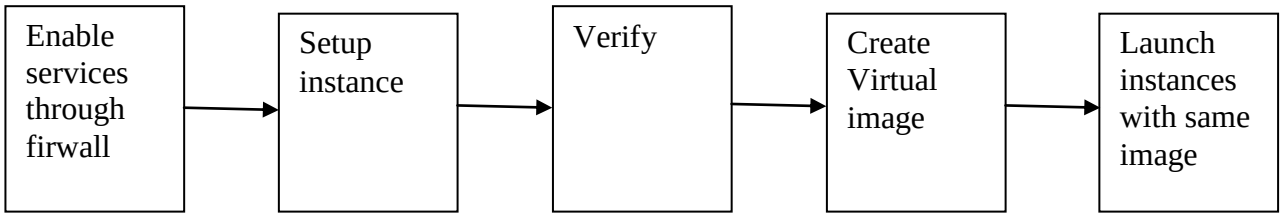

Fig 1.2 SETUP PROCESS

1.Identify user

- Lecturer
- Assistant
- Student

2. Create and grant permission to users

- Admin
- Assistant
- Student

3. Choosing a region

Like, US, Australia etc. The region that are located in USare cheapest and at same price.

4. Choosing an Architecture

Like Linux or windows etc

5.Find a suitable AMI/create custom image

There are as many as 20,000 Amazon machine images(AMI) that are pre-configurable out there and ready to use.

6. Enabling Firewall

Amazon made it clear for customer to enable specific ports instead of opening all by default.

7.Creating backup

For backup we use amazon S3 and Amazon DB. This service is connected to Ec2 and user can use this services easily.

8.Message passing from source to destination.

For the communication between faculties and student or assistant. Amazon provide a Amazon service SQS(Simple queue services).This service passing the message through the network.

VI. FUTURE SCOPE

The Cloud Computing is a new topic in the IT field. So the door is open for more academic research about this technology. The researcher suggested the following topics which may provide good research ideas:

- In future we can enhance the education process by using Cloud Computing technology.
- In future we can connect several universities by this architecture.
- Conduct a study to measure the effects Cloud Computing technology has on the reengineering process.
- Conduct a study to create a prototype of using Cloud Computing technology in e-government.
- Conduct a study about the roadmap for the adoption of cloud computing in education process

VII. CONCLUSION

The area of cloud computing in education is still at a nascent stage. Existing research focuses particularly on the analytical aspects of the cloud computing applications, describing some current and accomplished educational and research products. The successful applications of cloud computing models at educational institutions have been evaluated only to a limited degree. In this respect, this paper takes a first step by systematically bringing together the various definitions of cloud computing in the education with the different ways to implement cloud computing.

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