Cloud E Learning Application: Architecture and Framework

Gagandeep Kaur[1], Dr.Sonal Chawla[2]

[1]*(Research Scholar DCSA PU Chandigarh, India)*

[2]*(Associate Professor DCSA PU Chandigarh, India)*

Abstract-*Cloud computing provides a great collection of computing resources that can be rapidly and elastically provisioned and released based on users' demand to serve a wide and regularly expanding variety of information processing requirements Due to its tremendous advantages this technology is maturing quickly and is being adopted in many applications including government, business, and education.Cloud computing is an exceptional substitute for implementing information systems in educational institutions which are especially under resources deficiency without spending any more capital for the computers and network devices. In this paper, we propose architecture of Cloud E Learning and framework to implement advance java E Learning application on cloud.*

Keywords-*Cloud Computing, E Learning ,Iaas,Paas,Saas*

1.INTRODUCTION

In modern time, web based technologies have a enormous contribution in reducing routine work. Many institutions and universities are introducing some new courses to give knowledge about these technologies. But institutions are facing many problems like lack of experienced teachers to teach technical courses to their students.So to overcome this problem, many institutions introduce online education service for those courses. Hence, E-Learning is one of the best and most important technologies which help them to create a good learning environment. E-learning is a term used to describe any form of electronically-based learning and teaching, including computer-based teaching both in and outside of the classroom, such as the streaming of university lectures on an institution's website [5].So it becomes necessity for many countries especially developing nations such as India to implement the E-Learning software solutions to improve their educational standard. But there are many problems to implement these solutions like lack of infrastructure and proper facilities in educational institutes throughout the country. Thus, the cloud computing technology in E- Learning is the best solution to overcome this problem.

2.CLOUD E- LEARNING

In these days Cloud computing is acting as an emerging technology.It is a kind of computing which uses virtualized and highly scalable resources that can be shared by the users. Users need not be aware of the resources that they are using through cloud computing. A user on the Internet can communicate with many servers at the same time and these servers exchange information among themselves [6]. Cloud Computing also known as on demand computing or internet as platform is currently one of the new technology trends will have a major impact on teaching and learning environment in coming days. Cloud Computing technology makes e learning solutions possible for mobile phones and other devices such as tablets, smart phones,PDAs etc. In recent days many companies emerge in market to offer the cloud power to many technical solutions to make their products more cost effective and enhancive with the cloud power.The accelerated development in Information Technology and the necessity for enhanced learning environments by harnessing existing technologies and resources has created a need to teach students more effectively. Cloud Computing appears to be one of the most

beneficial technologies for this purpose due to its numerous characteristic such as: availability, scalability, agility, elasticity, and reliability for on demand services. These characteristics, among many others, can give the impression that Cloud Computing could significantly enhance the learning environment.

There are many advantages offered by cloud computing[4]:improved performance of PCs, lower maintenance issues, lower hardware requirements for users, IT Infrastructure costs are lower, lower software cost, increased computing power, unlimited storage capacity, instant software updates, improved compatibility between operating systems, increased data security, Accessibility from a range of devices, portability of documents and easier group collaboration.On the other side there are some drawbacks of cloud computing[4]: an internet connection is needed, low-speed connections ,limit accessibility and data security.

3.RELATED WORK IN THIS AREA

There are certain interested achievements and implementations in this field.A brief analysis of these systems is presented here. Several modern Cloud Computing-based E-Learning applications that can use IaaS for dynamic assignable storage and compute resources were proposed by [1]. They describe a general and simple architecture with monitoring, policy and provision modules.

BlueSky cloud framework[1], developed by Xi'an Jiaotong University (China), enables physical machines to be virtualized and allocated on-demand for E-Learning systems. The BlueSky framework is focused on delivering IaaS and has some architectural layers dealing with physical resources, provisioning, monitoring and user interface but no security layer for user access policies.

Snow Leopard Cloud[2] provides PaaS for North Atlantic Treaty Organization (NATO) to run its various military exercises and mission events. In addition, Snow Leopard is used to run web 2.0 applications, such as video teleconferencing, voice over IP, and remote management, over handheld devices and terminals. As Snow Leopard Cloud is targeted towards military usage, it has a multi-level securityand the network infrastructure is encrypted.

Virtual Computing Laboratory (VCL) [7], developed by North Carolina State University (USA), enables students to reserve and access virtual machines (VMs) with a basic image or specific applications environments, such as Matlab and Autodesk. VCL does not offer collaboration features, but offers (IaaS and PaaS) platforms which could be used to host collaboration systems (SaaS) on top of it.

4.PROPOSED ARCHITECTURE OF CLOUD BASED E LEARNING(CEL)

In this section we describe the proposed architecture of Cloud based E-Learning(CEL) (Fig.1).This proposal is based on cloud computing and Web 2.0.As there are many new advances in computer technology these days,so we use cloud computing and Web 2.0 to develop,deploy,test and use our E Learning application.This proposed architecture consists of three main layers:Cloud Model Layer,Service Model Layer and Application Model layer.

4.1Cloud Model Layer

Cloud Model layer consists of different types of clouds like private cloud,public cloud,hybrid cloud through which user can access her resources.

4.1.1Public Cloud*:* Public clouds are owned and operated by third parties, i.e. cloud service providers. Main advantage of a public cloud is that they may be larger than an enterprise cloud, thus providing the ability to scale seamlessly, on demand. Educational institutions do not need to invest and house large IT infrastructures for educational and research purposes.Examples of public cloud are EC2 and S3(Amazon web services).

4.1.2Private Cloud*:* Opposite the public cloud model, a private cloud model enables educational institutions to have complete control of services, data security, applications and resources that are provided to their users. Recently, the number of private cloud based solutions within E-Learning systems has been significantly increased.[3].

4.1.3Hybrid Cloud*:* A hybrid cloud is a cloud computing environment in which an organization provides and manages some resources in-house and has others provided externally. For example, an organization might use a public cloud service, such as Amazon Simple Storage Service (Amazon S3) for archived data but continue to maintain in-house storage for operational customer data.
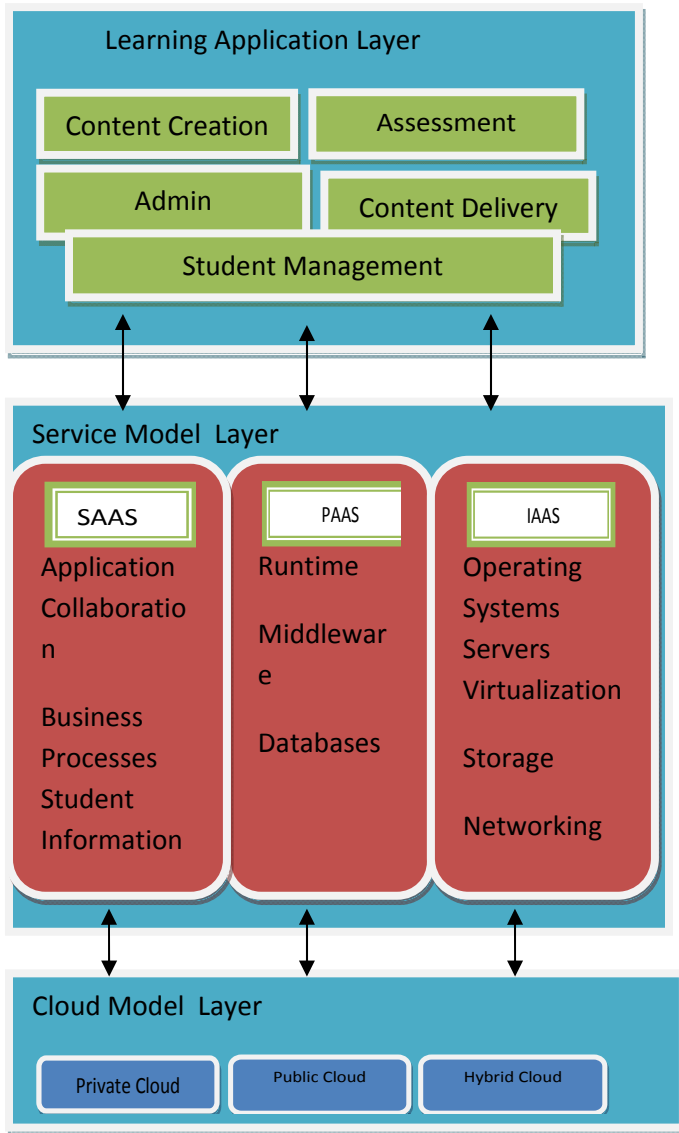

Fig. 1 Proposed Architecture of Cloud Based E Learning(CEL)

4.2Service Model layer

This layerconsists of various services provided by cloud like Software as Service (Saas), Platform as Service (Paas) and Infrastructure as Service (Iaas). Software-as-a-Service also known as 'On-demand software' provides applications, collaborations, business processes and student information.Saas is a model in which software and associated data are hosted on the cloud. Using a web browser SaaS is accessed by users.Software offered as an Internet-based service can be developed, tested, and run on a computing platform of the vendor's choosing. Updates and bug fixes are deployed in minutes.The term 'software as a service' is considered to be the part of the nomenclature of cloud computing, along with platform as a service and infrastructure as a service and Backend as a service (BaaS) [10].

Paas provides runtime,middleware, databases.In this service model users can create their softwares using tools, libraries and use networks,servers,storage and other services provided by providers. There are various types of PaaS vendors which offer application hosting and a deployment environment along with various integrated services. The services offer scalability and maintenace [8]. Open platform as a service provides open source software to allow a PaaS provider to run applications. Example, AppScale allows a user to deploy some applications written for google app engine to their own servers, providing data store access from standard SQL database [9].

Iaas provides operating systems,servers,virtualization,storage and networking. Infrastructure is the groundwork of cloud computing. It provides delivery of computing as a shared service reducing the investment cost, operational and maintenance of hardware. Infrastructure should be reliable and flexible for easy implementation and operations of applications. Amazon1 offers S3 for storage, EC2 for computing power, and SQS for network communication for small businesses and individual consumers.

4.3Application Model Layer

This layer consists of E Learning application. Learning Application Layer consists of various modules like content creation, content delivery, admin, student management, assessment. Cloud computing services for providing E Learning includes advanced java which has various user centric provision and administration functions . The requirements of students are fulfilled by student management module which includes student registration, access to content ,access to various assignments and class tests ,submit exercises and check marks and results. The requirements for instructors include creation of classrooms, creation of content, delivery of content, creation of problem sets ,creation of assignments and evaluation of assignments. Instructors can also monitor students' performance. The requirements of administrator includes creating and maintaining instructors and students accounts ,allocating new classrooms to instructors and handling changes in application. Framework of advance java E Learning as cloud is described in Fig. 2.Advance java E Learning application is deployed on Saas.Web browser Saas is accessed by users(students,teachers,administrators) to run the advance java E Learning application.Service Layer Paas is used to develop the application.We use various tools,libraries and softwares to develop this application and servers on Paas to deploy the application.Iaas is used for data storage,networking,backup of the data and for recovery.

The requirements of students are fulfilled by student management module which includes student registration, access to content ,access to various assignments and class tests ,submit exercises and check marks and results. The requirements for instructors include creation of classrooms, creation of content ,delivery of content,creation of problem sets ,creation of assignments and evaluation of assignments. Instructors can also monitor students performance. The requirements of administrator includes creating and maintaining instructors andstudents accounts ,allocating new classrooms to instructors and handling changes in application.
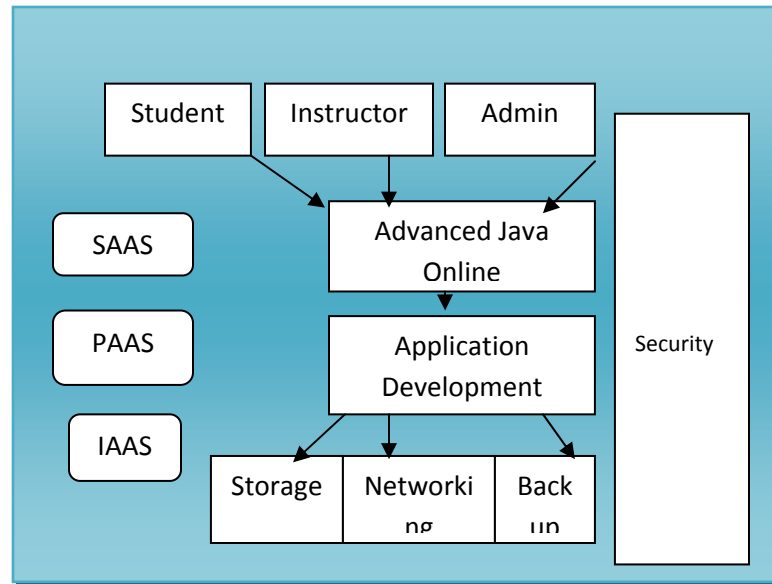

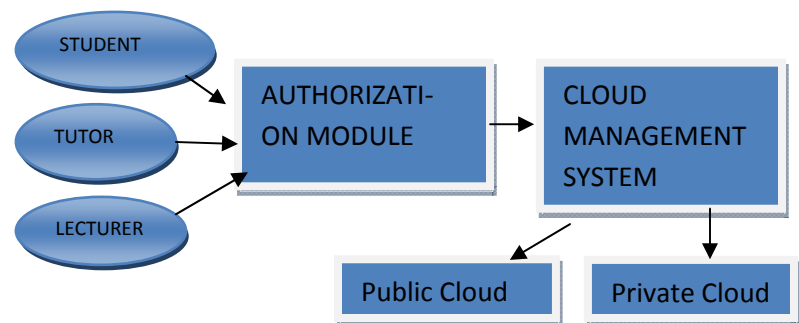**Fig.2 Framework of Advance Java E Learning as Cloud**

Fig. 3 Overview of cloud based E Learning(CEL)

The platform in Fig. 3 for advance java course can help students to develop, to deploy and to test their own applications without the need of software installation and configuration. Course coordinators can create VMs so that they can provide backup of their lectures and assignments. Also VMs are created so that users can install their softwares and databases on these machines and can use them when required.Since each virtual machine is running in isolation so open source learning management system is used for authorization.

To implement this framework of E-Learning application,we use tools like WordPress for content creation and management and MySQL for

database.WordPress is a free and open source blogging tool and a content management system (CMS) based on PHP and MySQL, which runs on a web hosting service[11].

5.FUTURE WORK

In future we are going to migrate the above architecture of cloud based E-Learning (CEL).CEL is developed,deployed and tested according to service oriented architecture i.e. Saas,Paas,Iaas.Performance of this cloud based E-Learning can then be evaluated with respect to internet based E-Learning application.Further research will be oriented towards improving the performance of application.

REFERENCES

[1] Dong, B., Zheng, Q., Qiao, M., Shu, J., Yang, J. (2009b): BlueSky Cloud Framework: An E-Learning Framework Embracing Cloud Computing. In: Proceedings of the 1st International Conference on Cloud Computing (CloudCom 2009), Beijing, China (165–171).

[2] Cayirci, E., Rong, C., Huiskamp, W., Verkoelen, C. (2009):Snow Leopard Cloud:A multinational Education training and Experimentation Cloud and Its Security Challenges. In: Proceedings of the 1st International Conference on Cloud Computing (CloudCom 2009), Beijing, China

[3] Liang, P. H., & Yang, J. M. (2011). Virtual Personalized Learning Environment (VPLE) on the cloud. Lecture Notes in Computer Science, 6988, 403-4

[4] Micheal, M., Cloud computing: Web- based applications that change the way you work and collaborate online. 2009, USA: Que.

[5] http://www.cloudpro.co.uk/saas/e -learning

[6]Hayes,B.(2008).Cloud Computing Communications of the ACM,51(7),9-11.

[7] VoukC, M., Averritt, S., Bugaev, M., Kurth, A., Peeler, A., Schaffer, H., Sills, E., Stein, S., Thompson, J. (2008): "Powered by VCL" – Using Virtual Computing Laboratory (VCL) Technology to Power Cloud Computing. In: Proceedings of the 2nd International Conference on the Virtual Computing Initiative (ICVCI'08).

[8] "Cloud platform as a service (PaaS) in cloud computing services.Cloud Computing Sec 2011 retrieved 2011-12-15

[9]"Comparison of Cloud Computing Service Models:Saas,Paas,Iaas "in IJECT Vo l. 4, Issue spl- 3, April-June2013

[10] Anderson, Tim (5 May 2011),"Full form of SaaS", The Register.

[11]"WordPress Web Hosting". WordPress. Retrieved 21 May 2013.