



www.ijarcse.com

Volume 2, Issue 2, February 2012

ISSN: 2277 128X

# International Journal of Advanced Research in Computer Science and Software Engineering

Research Paper

Available online at: [www.ijarcse.com](http://www.ijarcse.com)

## Web Based Learning Eco-System Using Cloud Campus

**Sumanthkumar VV**  
PhD Scholar, Dept of MCA  
Bharath University,  
Chennai, India

**Rajani M**  
Director (Research)  
Bharath University  
Chennai, India

**Shanthi D**  
Professor  
Bharath University,  
Chennai, India

---

**Abstract -** *The philosophy behind any Education system is learning by experimentation. It is natural that education organizations would want to experiment with different kinds of applications and platforms. Under the traditional system using conventional classroom teaching, this is expensive and difficult to implement. A Combination of LMS, Cloud Computing and Virtual classroom facility offers greater flexibility to experiment with newer applications and platforms. The low cost of Cloud Computing associated with ubiquitous availability makes it a suitable candidate to level the playing field in education across many organizations of National Agricultural Research System of India. Cloud computing is gradually occupying the front stage and its core concepts appear to be sinking in all the fields including agricultural education. A E-learning ecosystem supported by learning management system, cloud infrastructure & virtual classroom facility would be a major boon for teacher and student community, where they can scale up and scale down as per their requirement. As the machine images run at server, the maintenance and administration becomes very easy. The content developed for the courses would be immediately available to the students anywhere and anytime by which one can implement Educational Resource Planning [EdRP]. This cloud based e-learning eco system would be very useful to Teachers-Student community and it takes the education to the next level. Cloud was found to be highly acceptable for students with minimal knowledge in technical area of computer science.*

**Keywords:** *e-learning, Cloud campus, learning ecosystem.*

---

### I. INTRODUCTION

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software and information are provided to computers and other devices as a utility over a network. Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

While there are many definitions of Cloud Computing, the simplest one defines cloud computing as obtaining computer services/resources from the Internet rather than from local individual platforms. Cloud is a known metaphor for describing the Internet. Cloud Computing can be deployed as:

- Software-as-a-Service (SaaS) - software application services obtained from the Internet.
- Platform-as-a-Service (PaaS) - the user utilizes the Internet as a computing platform, rather than having his own individual, localized platform.
- Infrastructure-as-a-Service (IaaS) - a computing infrastructure based on the Internet rather than local servers.

Higher education landscape around the world is in a constant state of evolution, mainly as a result of significant challenges arising from the efforts in adopting new and emerging technologies in their teaching and learning environments. This is mainly as a result of new

genre of students with learning needs vastly different from predecessors, and it is becoming clear to many people, including students that traditional methods are unable to address the needs of higher education where the emphasis is on higher order learning experiences and outcomes demanded of a changing knowledge and communication based society. More over in conventional classroom teaching participants have to move physically from one location to other.

### II. LEARNING ECOSYSTEM BASED ON CLOUD CAMPUS

Recent advances in bandwidth, hardware & software has proved that e-learning would be next generation of learning system. However, the current models of e-learning systems lack the support of underlying infrastructures, which can dynamically allocate the required computation and storage resources for e-learning systems. Cloud computing is a promising infrastructure which provides computation, storage, software resources as services. In this paper we present a web based learning ecosystem which replaced the conventional classroom training completely, where all the components of the ecosystem are virtual, but more effective and convenient than their physical counterparts. In any conventional IT classroom, teacher would conduct a class room session, provide resource material and computer systems with the required set of software installed. The components of this web based learning ecosystem are Learning Management System, Cloud infrastructure and Virtual Class Room implemented using Moodle, VMware and A-View

respectively. The reason for selecting these tools are that Moodle is a best tool for providing resource material and A-View is going to be hosted within NKN[National Knowledge Network] which provides a max of 40Gbps interconnectivity among NKN connected organizations in India and NAARM is one of them. A good bandwidth is very much essential to have live streaming of virtual classroom.

**III. METHODOLOGY AND ARCHITECTURE**

Our aim is to demonstrate the viability of cloud campus learning ecosystem for organizations especially in educational establishments. NAARM Cloud campus is developed by implementing Vmware<sup>4</sup> vSphere RC5 environment for optimal utilization of existing resources, Moodle<sup>5</sup> and A-View<sup>6</sup>. VMware Inc is generous enough to provide vSphere software on trail basis for 60 days for the purpose of evaluation, Amrutha University is kind enough to provide Virtual Class Room software A-View for having session with Acharya NG Ranga Agricultural University and Moodle is a open source course management system (CMS), also known as a learning management system (LMS). It is a Free web application that educators can use to create effective online learning sites. A-VIEW (Amrita Virtual Interactive e-Learning World) is an award winning multi-modal, multimedia e-learning platform that provides an immersive e-learning experience that is almost as good as a real classroom experience developed by Amrita e-Learning Research Lab. A-View system comes live with the classroom like interactions and question-answer sessions emerging in a natural way between the students and the teacher. All in all, this Cloud Campus provides a classroom experience that is both satisfying and fruitful to both the teacher and the taught. Technically, the communication network bandwidths requirements are especially engineered to be moderate so as to permit remote sites to effectively participate.

In the centre of Cloud campus there is vCenter Server. It is a tool that manages multiple host servers that run multiple machines and it acts as a control node of the cloud. With control node, we have quickly provisioned new server virtual machines and create a library of standardized virtual machine templates so the newly provisioned systems always conform to our Cloud Campus requirements. A control node has been established to provide a convenient single point of control to the data center. Control node unifies the resources from individual hosts to be shared among virtual machines [VMs] in the entire data center.

The vCenter Server allows migrating running virtual machines between host servers so that one can perform hardware maintenance with minimal downtime. It also features allow us to balance machine workloads across hosts and manage virtual machines for high availability and disaster recovery.

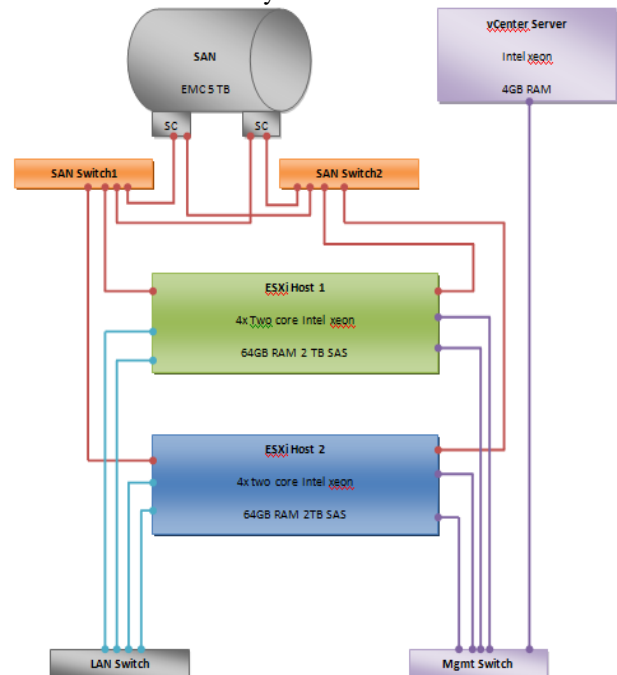
**Software Used:**

Host Operating system: VMware ESXi 5.0)  
 Server management Node: Windows 2003 R2 Enterprise edition  
 Cloud Management node Software: VMware vCenter Server 5 (Trial Version)

Cloud infrastructure :VMware vSphere 5 (Trial Version)  
 VMware View 5 (Trial Version)  
 Learning Management System: MOODLE  
 Virtual Class Room: A-VIEW

**Hardware Used:**

We have used our existing infrastructure of two Sun Blade x6270 M2 blade servers for implementing the cloud. The following figure-1 depicts the design of Hybrid Cloud of NAARM. One of the Virtual Machine is used to implement Moodle and A-View is currently hosted Amrutha University servers.

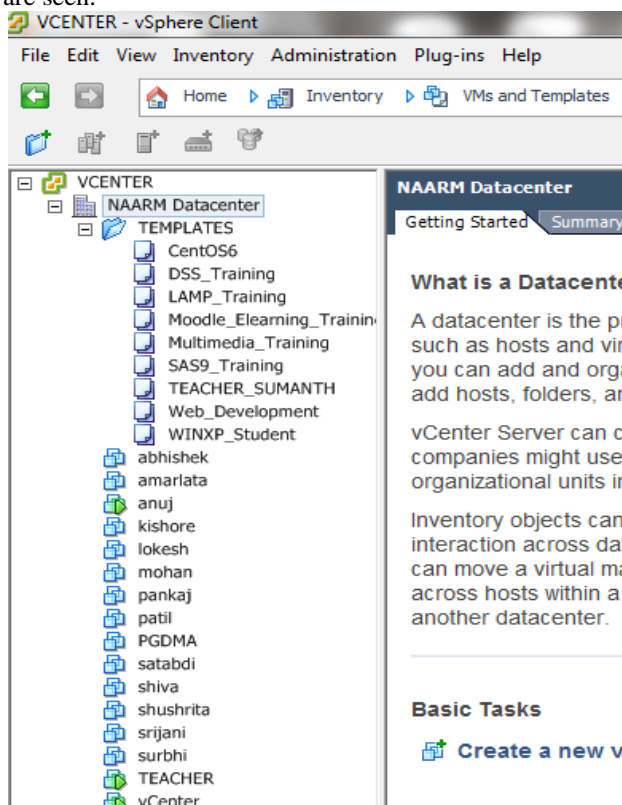


We used two hosts on which two ESXi servers are installed, out of which one is dedicated for PGDMA Students and the other one is for various training programmes of NAARM. NAARM Cloud can be accessed from anywhere at anytime, and can be easily shared with others over network. At client side all that user need is a browser and a internet connection by which one can have seamless access to the cloud resources.

**IV. CLOUD CAMPUS**

NAARM is conducting many training programmes/courses over the year and there is lot of time and money being invested into purchasing physical machines and software. There is a need of maintaining a specific set of software required for each training. The Coordinator of the training programmes has to ensure beforehand that all the machines are working without any issues and all the software required for that training got installed in all machines. This requirement of preparedness for training programmes takes the valuable man hours of the employees and this is addressed with cloud campus. The participants also need to travel from their respective NARS organization to NAARM by spending many valuable man hours, money and energy. We designed various templates, where a template meets the needs of a specific training programme. A template is a master image of a virtual machine that one can use to create and provision new virtual machines. Using these

templates can save the time of configuring a new virtual machine and installing a operating system & required software upon that. Based on the number of participants of a training programme, we have to create the same number of Virtual Machines[VMs], where a single VM can be assigned to a single participant. We can create logins required for a each user, so that un-authorized access can be avoided completely. Training Participant has to browse the web URL of control node of the NAARM cloud and has to provide the username & password provided to him. After logging in, he/she gets access to all the resources provided to him/her. Trainee can start and shutdown the machines [VMs] assigned to him as his personal computer. The policy is to allocate a single machine to each user with all the required software. Whenever a new training programme starts, we can start creating machines [VMs] from the concerned template which are already designed and can be hosted in our Datacenter. Also, we create a course in learning management system [Moodle] for providing resource material and A-View for streaming live teacher video to all the participants of that particular classroom. The only input required for Cloud is the name of the template/base image and the number of machines need to be created out of that. We have simulated a small cloud using the existing hardware and trail software on testing basis. Typically the cloud takes a 15 minutes time for creating 20 machines, which is less than a minute per machine. The scenario without cloud is few dedicated staff has to install operating system and all the required software in all the systems of lab. This activity has been completely avoided by using cloud computing. More over the VMs are created from proven template and are devoid of any manual mistakes during installation and configuration of software. Please see the following figure.2 where the templates developed for NAARM training programmes are seen.



After completion of training programme, NAARM will have a proper shake hand with the participant and remove the access to virtual machine[VM], LMS & Virtual Classroom, there by the resources will go back to the cloud for further utilization in other forthcoming programmes of the Academy.

**V RESULTS & DISCUSSION**

With the help of the proposed web based learning ecosystem, students, trainees and faculty can take advantage of the ability to work and communicate from anywhere and on any device using cloud-based applications & virtual classrooms. The integration of e-learning services to cloud computing infrastructure and virtual classroom takes the education methodology to a newer level. The effectiveness and efficiency of e-learning ecosystem in cloud infrastructure has been experienced by the implementation of this project.

The study of acceptance of cloud campus is conducted with PGDMA students of NAARM and some of the salient results are discussed below.

**5.1 User perception study**

In this regard, a questionnaire is prepared which touches various aspects of cloud enabled online evaluation were taken on 1-5 scale for different statements. The feedback has been collected from 16 PGDM students of the academy. There is highly positive feedback of above 4 points on four out of six aspects of cloud computing infrastructure. This strongly suggests that the new cloud computing infrastructure has been well accepted and implemented.

*Table 1: Perception of User access to Cloud Infrastructure*

Sl No.	Statement	Proportion of Rating, %					Mean Rating
		1	2	3	4	5	
1.	Login process is easy to reach my terminal in the cloud.	0.0	0.0	12.5	25	62.5	4.50
2.	There are no connectivity issues in connecting cloud.	0.0	12.5	12.5	25	50	4.125
3.	My System had not become 'slow' after connecting to cloud.	0.0	0.0	12.5	6.25	81.25	4.6875
4.	Accessing regular applications like MS Office, Internet Explorer etc., is quick on the cloud.	0.0	6.25	37.5	31.25	25	3.75
5.	Logging out process from the cloud is simple.	0.0	0.0	6.25	12.5	81.25	4.75
6.	Having multiple log-ins is not confusing.	0.0	18.75	18.75	12.5	50	3.94

**5.2 Perception of Cloud based online evaluation by the users**

A questionnaire is prepared which touches various aspects of cloud based online evaluation were taken on 1-5 scale for different statements. There is highly positive feedback of above 4 points on all aspects of online evaluation. This strongly suggests that the new method of cloud enabled evaluation has been well accepted and implemented.

Table 2: Perception of Cloud enabled Online Evaluation

Sl No.	Statement	Proportion of Rating, %					Mean Rating
		1	2	3	4	5	
1.	User Interface of screen for online examination is simple.	0.0	0.0	0.0	12.5	87.5	4.875
2.	Scrolling from one question to another is comfortable	0.0	0.0	0.0	18.75	81.25	4.812
3.	Going back to an answered question is easy	0.0	0.0	0.0	12.5	87.5	4.87
4.	Scrolling of screen is flexible	0.0	0.0	12.5	18.75	68.75	4.56
5.	Screen Resolution and font size is good	0.0	0.0	0.0	18.75	81.25	4.81
6.	Answering options (radio buttons) are clear	0.0	0.0	6.25	12.5	81.25	4.75
7.	Reviewing the answers before submitting the exam is easy	6.25	0.0	12.5	6.25	75	4.44
8.	Submitting the exam on completion is easy to understand	0.0	6.25	0.0	18.75	75	4.625

**VI. CONCLUSION**

An E-learning ecosystem supported by Learning Management System, cloud infrastructure & virtual classroom facility would be a major boon for teacher and student community, where they can scale up and scale down as per their requirement. As the machine images run at server, the maintenance and administration becomes very easy. The content developed for the courses would be immediately available to the students. Teachers/Students can work even in offline mode and changes made by them will get synchronized whenever there is a network connection. The old desktop systems can repurposed to be used as thin/zero clients. Both the hardware and software upgrades can be done at server side only without disturbing the client side environment. Development of the content majorly is an one time activity. The content developed for one school can be shared with other school, if they wish. This proposed cloud based e-learning eco system would be very useful to Teachers-Student community. The cloud infrastructure is well accepted by students and it is proven the cloud enabled evaluation system will save the resources of teachers and students. Educational institutions can take advantage of cloud applications to provide students and lecturers a dynamic environment by which quality as well productivity of learning and evaluation system will grow.

**ACKNOWLEDGEMENTS**

The support provided by the Head (ICM), Joint Director (Research) & The Director, NAARM, Hyderabad for carrying out this study is gratefully acknowledged. Authors acknowledge Amrutha University for sharing the software A-View which is useful in conducting the present study.

**REFERENCES**

[1] [http://en.wikipedia.org/wiki/Cloud\\_computing](http://en.wikipedia.org/wiki/Cloud_computing); accessed August 2011.

[2] [http://csrc.nist.gov/publications/drafts/800-145/Draft-SP-800-145\\_cloud-definition.pdf](http://csrc.nist.gov/publications/drafts/800-145/Draft-SP-800-145_cloud-definition.pdf); NIST of US Department of Commerce, accessed August 2011.

[3] "Cloud Computing: Clash of the clouds". The Economist. 2009-10-15. Retrieved 2011-11-03.

[4] "VMware 5.0 Documentation". [www.vmware.com/support/pubs](http://www.vmware.com/support/pubs). Retrieved 2012-01-03.

[5] "Moodle Documentation" <http://docs.moodle.org>, Retrieved 2012-01-03.

[6] "A-View" [aview.amrita.ac.in](http://aview.amrita.ac.in); Retrieved 2012-01-03.

[7] "Course Management System "optimization of a private cloud", Future generation computer systems (2011). [net.educause.edu/ir/library/pdf/DEC0302.pdf](http://net.educause.edu/ir/library/pdf/DEC0302.pdf); Retrieved 2012-07-03.

[8] "Learning Management System" [en.wikipedia.org/wiki/Learning\\_management\\_system](http://en.wikipedia.org/wiki/Learning_management_system); Retrieved 2012-07-03.

[9] Mohammed Alhamad., Tharam Dillon, Chen Wu and Chang Elizebeth, 2010, "Response time for Cloud computing providers" iiWAS2010 Proceedings, pp.603-606.

[10] Marcos Dias., Alexandre Costanzo and Rajkumar Buyya., 2009, "Evaluating the cost-benefit of using cloud computing to extend the capacity of Clusters" ACM HPDC 2009 June 11-13 2009.

[11] Hamoun Ghanbari, Bradley Simmons, Marin Litoiu and Gabriel Iszlai., "Feedback-based."