

Cloud Computing For E-Learning System Based On System Architecture

Muruganandam. S, and .Sruthi .K. L.V^{2*}

^{1,2*} Department of computer science and computer Applications
Vivekanandha College of Arts and Sciences for women, Namakkal, Tamil Nadu, India.

www.ijcaonline.org

Received: Oct/22/2014

Revised: Nov/04/2014

Accepted: Nov/18/2014

Published: Nov/30/2014

Abstract—Cloud computing is growing rapidly, with applications almost in any area, including education. E-Learning system requires many hardware and software resources. Therefore, there is a need to redesign the educational system to meet the needs better. The advent of computers with sophisticated software has made it possible to solve many complex problems very fast and at a lower cost. This paper introduces the characteristics of the current E-Learning and then analyses the concept of cloud computing and describes the architecture of cloud computing platform by combining the features of E-Learning. This paper describes the following aspects: architecture, construction method and external interface with the model and tried introduce cloud computing to E-Learning.

Keywords— Architecture, Cloud computing, E-learning, Information Technology

I. INTRODUCTION

Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources; it can be utilized under circumstances where the availability of resources is limited. At present, most of the conventional education forms are becoming not being suitable for requirements of social progress and educational development and not being able to catch up with the changes of learning demand in time, thus computer networks have brought opportunities for it.

As cloud computing has become a research hotspot among modern technologies, researchers pay more attentions to its applications. However, in traditional web-based e-learning mode, system construction and maintenance are located in interior of educational institutions or enterprises, which results in a lot of problems existed, such as a lot of investment needed, but without capital gains to return, without development potential and staying power.

As concerned as cloud computing applied in the field of education, a lot of problems had been studied, such as the technology for future distance education cloud [1], teaching information system [2] [3] [4], the integration of teaching resources[5], teaching systems development[6].

II. CLOUD COMPUTING

A.Cloud Computing: A lot of times when we hear that something is "in the cloud," it's referring to something like

Flickr, where you upload a photograph and the file exists somewhere, but you're not sure where and you don't really care. In other words, it is Software as a Service (SaaS) as opposed to software that you get on a disk or download and install on your home computer and use without an Internet connection. Other popular cloud-based services are gmail, Facebook, and salesforce.com.

A cloud can also be a way of arranging its internal infrastructure, regardless of how the end user is consuming the computing power.

B. Cloud and its use: Technically a computing cloud is a group of servers networked together with the following two characteristics:

- They are accessible over a network such as the Internet.
- They are virtualized, meaning multiple independent operating systems can be run on a server at once.

Clouds are being used by business for main two things:

- **Virtual datacenters.** It takes an incredible amount of attention, up-front investment, and talent to build out a datacenter.
- **Occasional muscle power.** Instead of a steady-state fundamental infrastructure, you may have need of occasional extra computing power. The typical example is the New York Times PDF thing

Corresponding Author: *Sruthi .K. L.V*

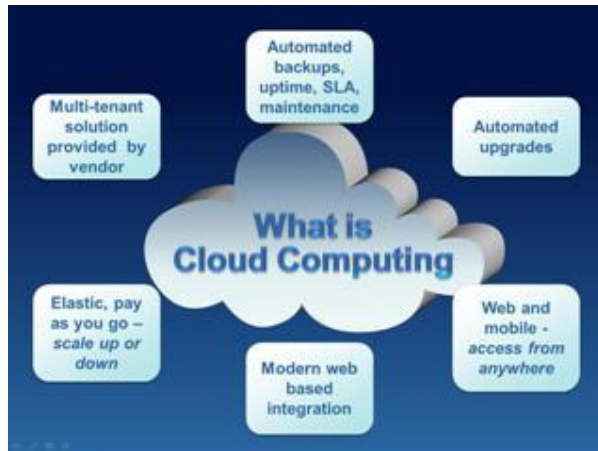


Figure 1 Cloud Computing

III. FROM TRADITIONAL E-LEARNING TO CLOUD E-LEARNING

A. E-LEARNING: E-learning is first and foremost about learning. Without a focus on the learner, the learners' needs, and the aptitude of the learner, e-learning cannot take place. However, the enabler for all this online learning is technology. An online learner cannot learn if he or she is encountering technical difficulties.

To make e-learning successful, the technology must have several characteristics that make the learner's and the instructor's experience enjoyable. Nothing dampens a new e-learner's enthusiasm more quickly than technological glitches or kills an instructor's drive to work online like difficult-to-use software.

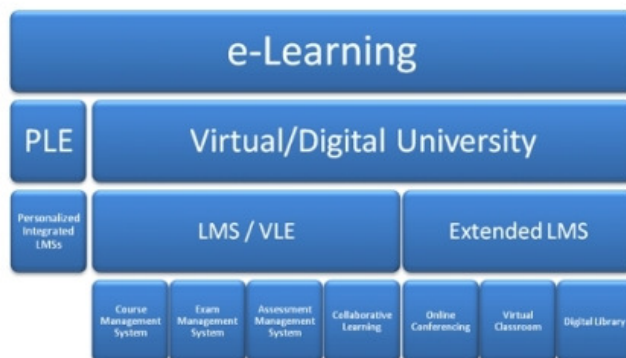


Figure 2 Architecture of a Simplified Learning

This article looks at different e-learning technologies and briefly discusses the pros and cons of each. It then explains five technology characteristics that you should look for when selecting an e-learning solution.

Regardless of whether your focus is academic or corporate, you should look for the following five characteristics to aid you in choosing an e-learning program that supports instructors and learners.

Mendez [19] illustrates that in traditional web-based learning mode, system construction and maintenance are located inside the educational institutions or enterprises, which led to a lot of problems, such as significant investment needed but without capital gains for them, which leads to a lack of development potential. In contrast, cloud-based e-learning model introduces scale efficiency mechanism, i.e. construction of e-learning system is entrusted to cloud computing suppliers, which can make providers and users to achieve a win-win situation.

The cloud-based environment supports the creation of new generation of e-learning systems, able to run on a wide range of hardware devices, while storing data inside the cloud. This article analyses the most important cloud-based services provided by public cloud computing environments such as Google App Engine, Amazon Elastic Compute Cloud (EC2) or Windows Azure, and highlights the advantages of deploying E-Learning 2.0 applications for such an infrastructure. The authors also identified the benefits of

Cloud-based E-Learning 2.0 applications (scalability, feasibility, or availability) and underlined the enhancements regarding the cost and risk management. Chandral [21] focused on current e-learning architecture model and on issues in current e-learning applications. The article presents the Hybrid Instructional Model as the blend of the traditional classroom and online education and its customization for e-learning applications running on the cloud computing infrastructure. The authors underline the e-learning issues, especially the openness, scalability, and development/customization costs. The existing e-learning systems are not dynamically scalable and hard to extend – integration with other e-learning systems is very expensive.

The article proposed the hybrid cloud delivery model that can help in fixing the mentioned problems. In this article a new paradigm is highlighted in educational area by introducing the cloud computing in order to increase the scalability, flexibility and availability of e-learning systems. The authors have evaluated the traditional e-learning Networking model, with its advances and issues, and the Possibility to move the e-learning system out of schools or enterprises, inside a cloud computing infrastructure.

The separation of entity roles and cost effectiveness can be considered important advantages. The institutions will be responsible for the education process, content management and delivery and the vendor takes care of system construction, maintenance, development and management. The e-learning system can be scaled, both horizontally and vertically, and the educational organization is charged according to the number of used servers that depends on the number of students as in Fig. 2.

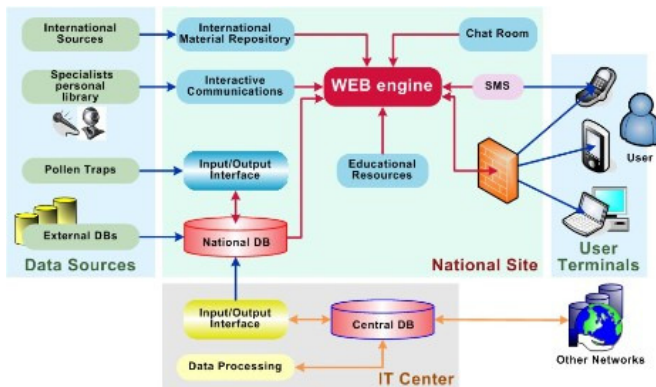


Figure 3 Architecture of Modified E-learning System

B.FIVE E-LEARNING SOFTWARE CHARACTERISTICS

Regardless of what level of software you choose for your e-learning solution, you need to consider five characteristics. These are maintainability, compatibility, usability, modularity, and accessibility. Each of these characteristics is critical for success. It is important to note that, in reality, many of the characteristics overlap. However, looking at the five characteristics individually helps to ensure a broader understanding of the technological needs of e-learning solutions.

1. Maintainability: The ability to maintain, over the long-term, your e-learning technology is critical. If it is difficult to add new users or delete old ones, hard to add content or inconvenient to recycle quizzes, instructors are going to abandon the technology quickly. In addition, if it is hard to perform updates or increase the server capacity, problems will arise. You do not want to be at the mercy of a vendor for maintenance, changes, and alterations to your e-learning.

The system should be easy to administer and should be simple to update course content using pre-existing templates. Look for e-learning software that separates content from structure so you can update content without accidentally deleting critical navigational or menu items. Check out the help system to make sure that it is, indeed, helpful.

Examine the software. Make sure you are comfortable with maintaining both the content and the software itself. Look for the ability to recycle a course by removing users and test results but not course content. If a course is used over and over again, you want features that allow you to quickly move the old learners out and the new learners in. You also want the ability to archive records of past learners.

2. Compatibility: Look for a solution that is compatible with other e-learning solutions on the market. You do not want to end up with a proprietary product that links you and the e-learning vendor together for life. Select a vendor that uses software and standards that are widely recognized. While it is impossible to have a solution that is "compatible with every known LMS or standard on the market," it is possible to choose e-learning solutions that are widely recognized and utilized.

Even though several groups are all vying for the right to claim to have *the standard* in e-learning, you can still make choices that ensure some level of interoperability. First, you need to determine which of the standards are most relevant for your situation. Ask questions like:

- Do we need to move content from one Learning Management System to another?
- Are we creating content to be placed into many learning management systems?
- Are we going to use the authoring package that comes with the LCMS we purchased?
- Do we need to find employees who can quickly create courses using this software?

One way to ensure compatibility is to seek e-learning software that adheres to certain standards that are emerging within the e-learning industry. The basic ideal behind e-learning standards is to allow one vendor's e-learning modules to share information with another vendor's module. Standards allow e-learning modules to easily share information with LCMS or LMS systems. If all vendors adhere to the same standards, a learning module or learning object can be used interchangeably in multiple LMS or LCMS systems.

There are several organizations which are developing standards. These organizations are the AICC (Airline Industry CBT Committee), the quasi-governmental organization Advanced Distributed Learning (ADL) who is working on SCORM (Sharable Content Object Reference Model), and IEEE (Institute of Electrical and Electronics Engineers).

The most comprehensive is the SCORM project which encompasses many of the other standards. The important element in looking for compatibility is to understand that compliance with a standard like SCORM doesn't automatically ensure interoperability.

Interoperability is the ability to take one learning course and use it in many different learning management systems seamlessly. The standards are currently ONLY guidelines for interoperability and can still be interpreted differently by different vendors. It is important to know what types of courses you want to interact with your LMS, so determine

from the vendor whether or not those courses can function with their LMS. Don't take it for granted that a SCORM compliant course automatically links with a SCORM compliant LMS.

3. Usability: Another technical issue you want to address is that of usability. You want to be assured that the e-learning solution is easy to use. This is important because if technology is seen as cumbersome or difficult to navigate, the potential learners or instructors will never use it. You want the software to be intuitive. It should be easy to find the help menu, easy to move from one section of the course to another, and easy to have communications with the instructor.

Instructors are not going to want to read a huge, thick manual to be able to understand how to create instruction. Or spend hours trying to figure out how to create a quiz. The software needs to be simple and straightforward. This is true not only for the instructor and learners but for the administrators as well.

4. Modularity: E-learning solutions can now be developed as small interchangeable knowledge objects. A knowledge object or learning object is small piece of instructional content. It is a small *chunk* of self-contained information that can be reused as necessary to meet the instructional needs of the learner. Learning objects are small pieces of instruction that can easily be moved from one course, lesson, or program to another completely different piece of e-learning. The idea is to reduce development time because once you develop the learning object; you can reuse it again and again.

The analogy most often used for learning objects is one of plastic, interchangeable blocks. Each learning object is self-contained but can easily be added to or subtracted from similar pieces, just like Lego blocks. These blocks can be snapped together, unsnapped and re-arranged in different configurations regardless of their size or color—they are all interchangeable.

If you are considering reusing bits and pieces of your course materials, you need an e-learning system that supports this type of functionality. Look for systems that allow you to determine the learning objects and that require the instructor to link the learning objects to specific learning objectives.

5. Accessibility: This can cover two layers. The first layer is that the e-learning program is accessible to all individuals regardless of physical obstacles. This may mean that your e-learning software conforms to the Americans with Disabilities Act (ADA) Section 508 standards. This can be required when you are doing work for the federal government. You may need to make sure your e-learning is

compatible with screen readers. Screen readers are software that literally reads the words on the Web page to an individual who is unable to see the text.

While most of the screen readers do an excellent job of reading text, an instructor or course developer can make it easier on the learner by following certain conventions. One such convention is to add an alternative tag to each graphic to explain the purpose and meaning of the graphic.

Second, you have to make sure that the technology you are purchasing is available to all the users. For example, if some of your learners do not have the latest Macromedia Flash plug-in, then the learners won't see your brilliant simulation you created using the latest version of Flash, or if the table structure you use is for a 5.0 browser and your students have a 4.0 browser, they may not be able to access the information they need.

You need to know that your learners can gain access to e-learning without any technical obstacles. Your e-learning software solution needs to be checked in the browsers that are going to be used by the learners. You need to check several scenarios to make sure e-learning works when it should on the platforms it should. It is best to check the solution on a few representative machines or workstations rather than rolling out to 40,000 people only to have it fail. If you can't control the technical environment of the learners, you must make strong recommendations about the configuration of their equipment.

IV. CLOUD BASED E-LEARNING ARCHITECTURE

The e-learning cannot completely replace teachers; it is only an updating for technology, concepts and tools, giving new content, concepts and methods for education, so the roles of teachers cannot be replaced.

The teachers will still play leading roles and participate in developing and making use of e-learning cloud. The blended learning strategy should improve the educational act. Moreover, the interactive content and virtual collaboration guarantee a high retention factor.

On the other hand, E-learning cloud is a migration of cloud computing technology in the field of e-learning, which is a future e-learning infrastructure, including all the necessary hardware and software computing resources engaging in e-learning. After these computing resources are virtualized, they can be afforded in the form of services for educational institutions, students and businesses to rent computing resources.



Figure 4 : E-Learning Cloud Architecture

V. ARCHITECTURE BENEFITS

The intended advantages derived from the proposed Architecture are as follows:

a) *Powerful computing and storage capacity:*

Cloud based E-learning architecture locates the computing and data in a large number of distributed computers, the sea of clouds in the tens of thousands of computers to provide powerful computing power and huge data storage space, puts the “cloud” as a service available to students via the Internet.

b) High availability: Through the integration of mass storage and high-performance computing power, this system can provide a higher quality of service. Cloud computing system can automatically detect the node failure and exclude it, do not affect the normal operation of the system.

c) High security: In the cloud computing model, data is stored intensively. Relying on one or more data center, the managers manage the unified data, allocate the resources, balance load, deploy the software, control security, and do the reliable real time monitoring, thus guarantee the users data security to the greatest possible degree.

d) Virtualization: Virtualization is the most important characteristics of this type of architecture. Each application deployment environment and physical platform is not related. It is managed, expensed, migrated, and backup through virtualization platform. It put the underlying hardware, including servers, storage and networking equipment, comprehensive virtualization, in order to build a resources pool of shared, distributed on-demand.

e) Advantage: The major advantage of the proposal is that it aims at providing easy access to costly software running on high performance processors to rural students at institutions which lack considerable facilities. Considerable investment would be required to implement this architecture, but the benefits would easily justify the cost. This advantage can be visualised from the following Fig. 5 which illustrates the connectivity tier.

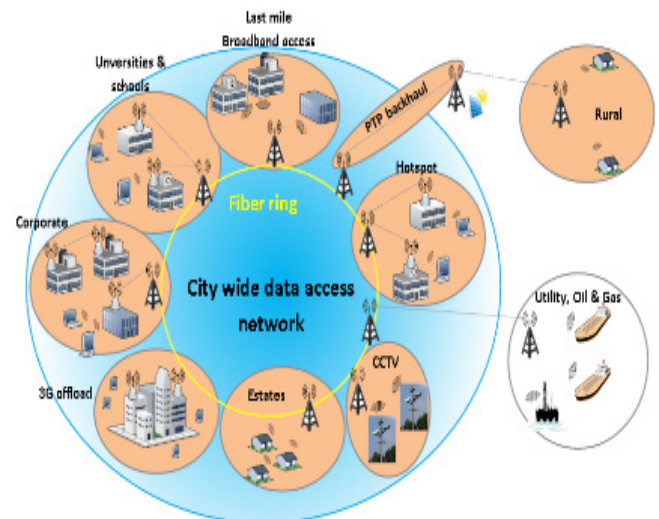


Figure 5 Connectivity Scenario of the Institutions in the proposed architecture

f) In the classic e- learning model, teachers assign teaching tasks, conduct regular lectures, or train students skills. The students attend the online autonomous learning act and cooperative learning sessions, or accomplish teachers’ assignments. But in the proposed architecture teachers also answer students’ questions and offer essential teaching to major and difficult points.

In addition, teachers can also use multimedia to enhance teaching content. Students work out their own learning plans, determining learning methods autonomously. They conduct on-line autonomous learning when they study each unit, finish its test via Internet and do some statistics to the test results. Teachers also encourage students to cooperate with each other to finish simple learning tasks or complex group-based projects. Through cooperative learning, students cannot only acquire knowledge, their team spirit and coordination will also be fostered, skills in dealing with people will be improved and abilities to express themselves will be enhanced. Thus the learning and teaching will be more interactive which the demand of the age is. The interactive mode of the proposed architecture is furnished in the Fig 6

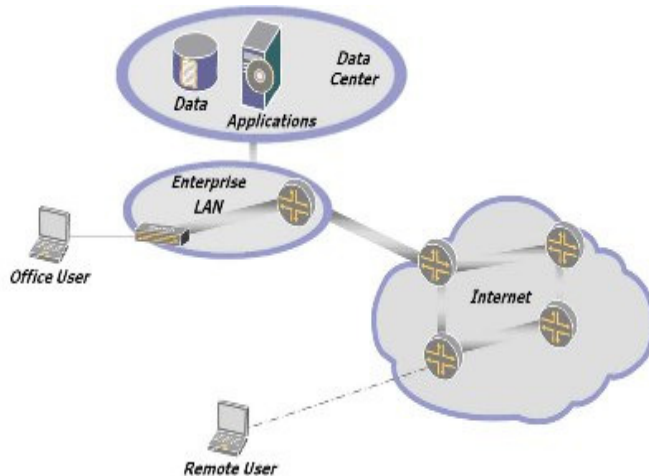


Figure 6 Interactive mode of the proposed architecture in cloud computing between client and cloud

VI. CONCLUSION

In this paper cloud based e-learning system are emerging as an attractive method for providing e-learning services. They can be reduces cost due to lower requirements of hardware and software less than need for on site maintenance. They are also easier to deploy across multiple locations as they are centrally administered. Present economic situation will force different educational institutions and organizations to consider adopting a cloud solution. Universities have begun to adhere to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of cloud solutions. The aim of our work was to identify an architecture which will be using Cloud Computing within higher education. Mainly, we have considered the benefits of cloud architecture. Future research will include a study regarding the attitude and strategy for migration to the proposed architecture based on clouds.

ACKNOWLEDGEMENT

I express my deep gratitude and sincere thanks to my supervisor for his valuable, suggestion, innovative ideas, constructive, criticisms and inspiring guidance had enabled me to complete the work successfully.

REFERENCES

- [1]. F. Jian, "Cloud computing based distance education outlook", China electronic education, 2009.10, Totally 273, pp.39-42.
- [2]. R.Hua, "Teaching Information System Based on Cloud Computing", Computer and Telecommunications, 2010.02, pp. 42-43.
- [3]. Y. Juan, S. Yi-xiang, "The Initial Idea of New Learning Society which Based on Cloud Computing", Modern Educational Technology, Vol.20, No.1, 2010, pp.14-17.
- [4]. T. Jian, F. Lijian, G. Tao, "Cloud computing-based Design of Network Teaching System", Journal of TaiYuan Urban Vocational college, Mar. 2010, pp.159-160.
- [5]. Z. Zhong-ping, L. Hui-cheng , "The Development and Exploring of E- Learning System on Campus Network", Journal of Shanxi Teacher's University (Natural Science Edition), Vol.18, No.1, Mar. 2004, pp.36-40.
- [6]. W. Jianmin, "Campus Network's E-learning Mode", New Curriculum Research, 2007.08, pp.84-86.
- [7]. Y. Wei, Y. Rong, "Research of an E-learning System Model Based on Agent", Computer Engineering and Applications, Nov. 2004, pp.156-158.
- [8]. Z. Chengyun, "Cloud Security: The security risks of cloud computing, models and strategies", Programmer, May.2010, pp.71-73.
- [9]. B. Hayes, "Cloud computing," vol. 51, no. 7, pp. 9-11, 2008.
- [10]. E. Tuncay, "Effective use of Cloud computing in educational institutions," Procedia Social Behavioral Sciences, p. 938-942, 2010.