



A Study of E-Learning in Cloud Computing

C. JOHN PAUL

Research Scholar

Bharathiyar University, Coimbatore, India

Dr. R. SANTHI

Vice-Principal

Alpha Arts & Science College, Chennai, India

ABSTRACT: *E-learning introduces an entirely new learning environment for all. It had created excitement among researchers and educators towards hope for e-learning leads to a new revolution in education. E-learning systems hardly need of Hardware and software resources. There are many educational institutions that cannot afford such investments, and cloud computing is the best solution. In cloud computing user can access their files or data from anyplace using internet. This paper presents the impact on using cloud computing for e-learning solutions.*

Keywords:

I. INTRODUCTION

Electronic learning (e-learning) represents the extension of face-to-face learning which has been defined as, the training and learning that includes computer-based learning, online learning, Internet based learning, virtual classrooms and digital collaboration. E -Learning is a combination of learning services and technology to provide high value integrated learning, anytime, anyplace.

Normally, there have been two common e-learning modes: Distance learning and Computer assisted instruction. It is being accepted in the marketplace as the next evolution of training and the education industry and the next phase in digital revolution. E-learning is the use of Internet technologies to enhance knowledge and performance. These technologies offer learners control over content, learning sequence, pace of learning, time, and often media, allowing them to tailor their experiences to meet their personal learning objectives. E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. To manage access to e-learning materials, consensus on technical standardization and methods for peer review of these resources.

A. Developments of E-learning

E-learning is widely used today on different educational levels: continuous education, company trainings, academic courses, etc. There are various e-learning solutions from open source to commercial. There are at least two entities involved in an e-learning system: the students and the trainers

<i>Students</i>	<i>Trainers</i>
Using on-line course	Dealing with the contents
Writing Exams	Preparing Tests
Sending Feedbacks	Assessing the tests, homework & projects
Sending Projects	Communicating & sending feedback

These systems are developed as distributed applications, but not limited to. The architecture of an e-learning system is developed as a distributed application. It consists of a client application, an application server and a database server, beside the hardware to support it (client computer, communication infrastructure and servers).

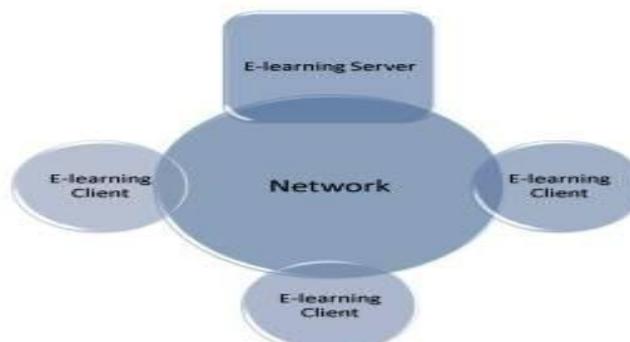


Fig. 1 E-Learning System

The client hardware could be a mobile device or a desktop computer. The client application can be a simple web browser or a dedicated application. Even with the current hardware and software limitations, the mobile devices are supporting multimedia based applications. While comparing with desktop, Mobile & Multimedia applications, the multimedia-based applications, have serious limitations due the processing power and memory constraints. Due to the fact that the data processing is on the server side, the use of mobile devices for learning is growing fast. Still, the mobile applications need to be optimized to be used for e-learning.

B. Advantages

- We can obtain grades from the Web.
- Direct communication with the course instructor.
- Discussions on course content through the discussion-board.
- Easy access to course related materials.
- Submitting assignments through the Web.
- Enhancement of course understanding.
- Communication with in- mates

C. Disadvantages

- Application cannot access with low bandwidth Internet connection
- High Cost
- Developers still have many limitations to consider in developing these platforms.
- Type of content -not all content is suitable for e-learning
- Lack of Learner's motivation and initiative
- Loss of a live (physically presence)
- Portability

II. INTRODUCTION TO CLOUD COMPUTING

Cloud-computing is Internet (“CLOUD”) based development and use of technology (“COMPUTING”). Cloud computing is a general term for anything that involves delivering hosted services over the Internet. The principles of cloud computing mainly imply a change in the way of solving the problems by using computers. Cloud computing in such a way that you do not have to spend any money to build and maintain your IT infrastructure. When you are in need of using computing resources like application software, you just borrow that facility from a third party organization, and access that service via Internet. In return you pay the service provider as you use the computing power. In short, in cloud environment, you don't need to buy any hardware and software to run your business applications thus it helps you minimize your investment on hardware resources

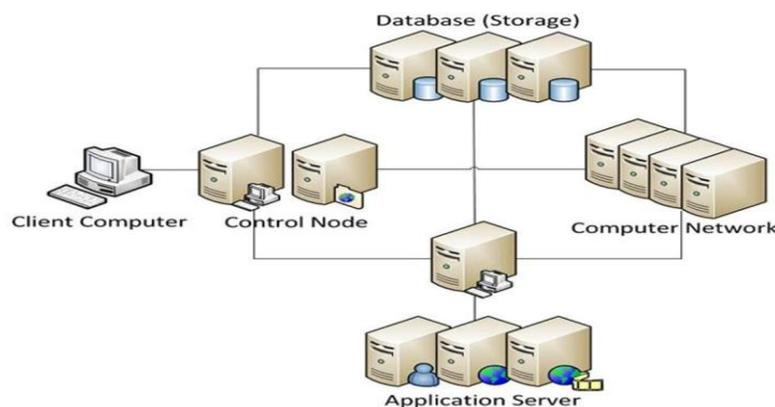


Fig. 2 Principles of Cloud Computing

A. Types of service

- **Private cloud:** It is a proprietary architecture subscribed by an organization, which provides hosted services to the users within the organization. This is protected by the firewall to form a barrier against outside the world to access hosted services from the private cloud.
- **Public cloud:** It is not proprietary of any organization; the services provided in these clouds can be accessed by any organization.
- **Hybrid cloud:** In hybrid cloud, the services are offered to the limited and well defined number of parties.

It can make Internet as a desktop. As we work on desktop, Cloud Computing can be used in the same manner. Many organizations have started implementing cloud computing like Amazon, Google, and Microsoft etc. In Cloud Computing, various service providers participate to provide services like storage, network, CPU, hardware and software etc. If user doesn't have storage on personal computer, he can use cloud computing to take advantage of cloud's storage to store his document without worrying. Same type of service is provided by Flickr.com which can be used to upload images on Flickr's server. User can use it as he is working on his desktop, but he requires Internet when images are to process on desktop. Google Apps is used to create documents online. Such type of services are available in the cloud computing

B. Cloud Computing Layers

Cloud computing employs a service driven business model. Cloud offers services that can be grouped into the following categories:

- **SaaS:** It stands for Software as a Service. Service provider provides software services in the cloud. Users access these services as software and do his work without installing the same in the local machine. Google Apps provides such services to create documents and spreadsheets online without installing any document or spreadsheet application. Salesforce.com also provides software as a service.
- **PaaS:** Platform as a Service allows users to use cloud computing for developing any application using development kit provided by cloud computing. Users are not required to install development kit on local machine, he can use installed software or development kit in cloud computing to develop any program. Oracle involves in providing platform as a Service.
- **IaaS:** Infrastructure as a Service enables us to install and execute the software. Here, users can gain access to virtualized server. IaaS targets operating systems, hardware, CPUs and embedded systems, networks and storage. This enables a homogenous virtualized environment where specific software will be installed and executed. Amazon provides infrastructure as a service.

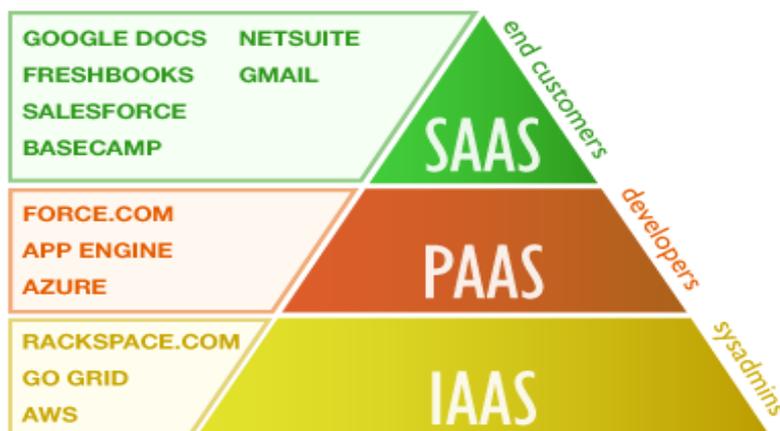


Fig. 3 Cloud computing layers

The e-learning server will use cloud computing, so all the required resources will be adjusted as needed. E-learning systems can use benefit from cloud computing using:

- Infrastructure: use an e-learning solution on the provider's infrastructure
- Platform: use and develop an e-learning solution based on the provider's development interface
- Services: use the e-learning solution given by the provider.

A very big concern is related to the data security because both the software and the data are located on remote servers that can crash or disappear without any additional warnings. Even if it seems not very reasonable, the cloud computing provides some major security benefits for individuals and companies that are using/developing e-learning solutions, like the following:

- improved improbability – it is almost impossible for any interested person (thief) to determine where is located the machine that stores some wanted data (tests, exam questions, results) or to find out which is the physical component he needs to steal in order to get a digital asset.
- virtualization – makes possible the rapid replacement of a compromised cloud located server without major costs or damages. It is very easy to create a clone of a virtual machine so the cloud downtime is expected to be reduced substantially.

- centralized data storage – losing a cloud client is no longer a major incident while the main part of the applications and data is stored into the cloud so a new client can be connected very fast. Imagine what is happening today if a laptop that stores the examination questions is stolen.
- monitoring of data access becomes easier in view of the fact that only one place should be supervised, not thousands of computers belonging to a university, for example. Also, the security changes can be easily tested and implemented since the cloud represents a unique entry point for all the clients. Another important benefit is related to costs. If the e-learning services are used for a relative short time (several weeks, a quarter, a semester), the savings are very important.

C. Technological Challenges in Cloud Computing

Cloud computing has shown to be a very effective paradigm according to its features such as on-demand self-service since the customers are able to provision computing capabilities without requiring any human interaction; broad network access from heterogeneous client platforms; resource pooling to serve multiple consumers; rapid elasticity as the capabilities appear to be unlimited from the consumer’s point of view; and a measured service allowing a pay-per-use business model. However, there are also some weak points that should be taken into account.

Some of these issues are,

- Security, privacy and confidence: Since the data can be distributed on different servers, and “out of the control” of the customer, there is a necessity of managing hardware for computation with encoding data by using robust and efficient methods. Also, in order to increase the confidence of the user, several audits and certifications of the security must be performed.
- Availability, fault tolerance and recovery: to guarantee a permanent service (24x7) with the use of redundant systems and to avoid net traffic overflow.
- Scalability: In order to adapt the necessary resources under changing demands of the user by providing an intelligent resource management, an effective monitorization can be used by identifying a priori the usage patterns and to predict the load in order to optimize the scheduling.
- Energy efficiency: It is also important to reduce the electric charge by using microprocessors with a lower energy consumption and adaptable to their use.

III. CLOUD COMPUTING FOR E-LEARNING

Among the learning technologies, web-based learning offers several benefits over conventional classroom-based learning. Its biggest advantages are the reduced costs since a physical environment is no longer required and therefore it can be used at any time and place for the convenience of the student. Additionally, the learning material is easy to keep updated and the teacher may also incorporate multimedia content to provide a friendly framework and to ease the understanding of the concepts. Finally, it can be viewed as a learner-centered approach which can address the differences among teachers, so that all of them may check the confidence of their material to evaluate and re-utilize common areas of knowledge

E-Learning in the Cloud can be viewed as Education Software-as-a-Service. Its deployment can be performed very easily since the hardware requirements of the user are very low. Further, it reduces the burden of maintenance and support from the educational institution to the vendor. Also it allows them to focus on their core business, obtaining the latest updates of the system without charges and sharing key resources using Web 2.0 technology.

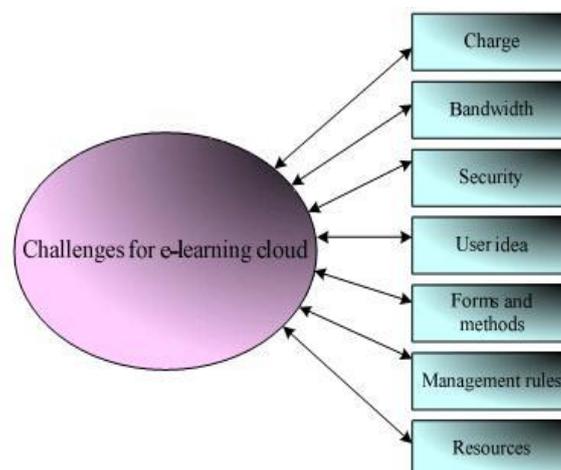


Fig. 4 Challenges for an e-learning cloud

We have summarize the consequences and implications regarding the development of e-Learning services within the Cloud Computing environment, are,

- **Accessed via Web:** It implies an ease of access since anywhere, any time and any one can access the application, greater demand for Web Development skills.
- **No client-side software needed:** It has reduced costs for subscriber, No installation, software maintenance, deployment and server administration costs, and a lower cost of ownership, reduced time-to-value.
- **Pay by subscription based on usage:** This is applicable for Software Model Education market, and gain access to more sophisticated applications.
- **SaaS server may support many educational institutions:** Since this application is running on server side scalability is inherent to the system. Even though the student usage grows, the software performance will not degrade.
- **All subscriber data held on SaaS server:** It requires by SaaS provider in order to gain trust of subscribers and sophisticated multitenant software architecture. The subscriber data is distributed between many providers and it must be integrated in order to gain overview of business, higher demand for system and data integrators.
- There is no need for backing up everything to a thumb drive and transferring it from one device to another. It also means students can create a repository of information that stays with them and keeps growing as long as they want them.
- Crash recovery is not required. If the client computer crashes, there are almost no data lost because everything is stored in the cloud
- Allow students to work from multiple Places (home, work, library, etc), finding their files and edit them through the cloud and browser-based applications can also be accessed through various devices like mobile, laptop and desk top computers, provided internet access is available.
- **Flexibility:** Scale infrastructure to maximize investments. Cloud computing allows user to dynamically scale as demands fluctuate
- **Improved improbability :** It is almost impossible for any interested person (Hacker) to determine where it is located in the machine that stores some wanted data (tests, exam questions, results) or to find out which is the physical component he needs to steal in order to get a digital asset
- **Virtualization:** It makes possible the rapid replacement of a compromised cloud located server without major costs or damages. It is very easy to create a clone of a virtual machine so the cloud downtime is expected to be reduced substantially.
- **Centralized data storage:** losing a cloud client is no longer a major incident while the main part of the applications and data is stored into the cloud so a new client can be connected very fast. Monitoring of data access becomes easier in view of the fact that only one place should be supervised, not thousands of computers scattered over an extensive geographical area, for example. Also, the security changes can be easily tested and implemented since the cloud represents a unique entry point for all the clients

IV. CONCLUSION

In this paper, we have expressed the major components of e-Learning systems, focusing on the flexibility, convenience, easy accessibility, consistency and repeatability of this kind of systems. In this fashion, an E-learning system is facing challenges of optimizing large-scale resource management and provisioning, due to the huge growth of users, services, education contents and media resources, we have settle the better Cloud Computing solution.

The development of e-learning solution cannot ignore the cloud computing trends. There are many benefits from using the cloud computing for e-learning systems. Also, there are some disadvantages that have to be taken into account. The features of the Cloud Computing platform are quite appropriate for the migration of this learning system, so that we can fully exploit the possibilities offered by the creation of an efficient learning environment that offers personalized contents and easy adaptation to the current education model.

Finally, we verified that cloud computing technologies can be used to build the next generation of platform-independent tools and scalable data storage e-learning systems to provide smart formal and informal learning. This method of technologies has clear view to distribute applications across a wider set of devices and greatly reduce the overall cost of computing.

REFERENCES

- [1] M. Armbrust, A. Fox, R. Griffith et al, *Above The Clouds: A Berkeley View of Cloud Computing*, Technical Report No.UCB/EECS 2009 28, University of California at Berkley.
- [2] S. O. Kuyoro, F. Ibikunle and O. Awodele, *Cloud Computing Security Issues and Challenges*, International Journal of Computer Networks (IJCN), Volume-3, Issue-5, 2011
- [3] D. Nurmi, R. Wolski, C. Grzegorzczak, et al, *The Eucalyptus Open-Source Cloud-Computing System*, In Proc. of CCGRID'09,
- [4] *The Utility of Cloud Computing as a New Pricing and Consumption Mode for IT*, David C. Wyld, Department of Management, Southeastern Louisiana University, Hammond, LA USA, International Journal of Database Management Systems (IJDMS), Vol.1, No.1, November 2009
- [5] P. Senthil, N. Boopal and R.Vanathi, *Improving the Security of Cloud Computing using Trusted Computing Technology*, International Journal of Modern Engineering Research (IJMER), ISSN: 2249-6645, Volume-2, Issue-1, Jan-Feb 2012, pp-320-325.
- [6] Ganesh V. Gujar, Shubhangi Sapkal and Mahesh V. Korade, *STEP-2 User Authentication for Cloud Computing*, International Journal of Engineering and Innovative Technology (IJEIT), ISSN: 2277-3754, Volume-2, Issue-10, April 2013.
- [7] *The NIST Definition of Cloud Computing*. National Institute of Science and Technology.
- [8] S. O. Kuyoro, F. Ibikunle and O. Awodele, *Cloud Computing Security Issues and Challenges*, International Journal of Computer Networks (IJCN), Volume-3, Issue-5, 2011.
- [9] Eman AbuKhoussa, Nader Mohamed and Jameela Al-Jaroodi, *e-Health Cloud: Opportunities and Challenges*, *Future Internet* 2012, 4, 621-645; doi: 10.3390/fi4030621
- [10] R. Buyya, C.S. Yeo, and S. Venugopal. *Market-Oriented Cloud Computing: Vision, hype, and reality for delivering it services as computing utilities*, *High Performance Computing and Communications*, 2008,HPCC'08. 10th IEEE International Conference.
- [11] I Foster, Y. Zhao, I. Raicu, S. Lu, *Cloud Computing And Grid Computing 360-Degree Compared*, In Proc. of GCE'08, 2008 , 1-10
- [12] J. Stoess, C. Lang, F. Bellosa, *Energy management for hypervisor-based virtual machines*, In Proc. of USENIX'07, Santa Clara,CA, 2007, 1-14.