Cloud computing based e-learning system to provide easy access of e-contents and web resources for educational institutes in developing countries

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Abstract
In Cloud computing technology based e-Learning system all the academic institutions of a Country or State can be connected globally and they can share the resources and e-contents for e-learning process. To connect the academic institutes for e-Learning system we can think e-Cloud model. The proposed e-Cloud provides the opportunity of flexibility and adaptability to use the computing resources on-demand without physical purchasing or installation at user site. Contrary to having only one service provider in present e-Learning models where the software has to install on each system, different providers use different interfaces to their computing resources utilizing varied architectures and implementation technologies for customers (University or Institutes). Although this can creates a management problem, a common architecture facilitates the management of computing resources from different Cloud providers in a homogenous manner this research have a proposal to reengineer the existing learning architectures, and how educational institutions can manage the cloud computing resources.

Keywords: Cloud Computing, E-Learning, E-Contents, Network Resources, Global Competitiveness

1 Introduction
Education is a main factor for sustainable development. The importance of education, especially in developing countries like India, is increasing because of advancing pressure to catch up with the developed world regarding, for example, global competitiveness. Typically, educational settings are different in developing countries than in developed countries, such as low quality of education and narrow possibilities in attending schools in rural areas because of far distances and high opportunity costs. In Cloud computing technology based e-Learning system all the academic institutions of a Country or State can be connected globally and they can share the resources and e-contents for e-learning process. To connect the academic institutes for e-Learning system we can think e-Cloud model. The proposed e-Cloud provides the opportunity of flexibility and adaptability to use the computing resources on-demand without physical purchasing or installation at user site. Contrary to having only one service provider in present e-Learning models where the software has to install on each system, different providers use different interfaces to their computing resources utilizing varied architectures and implementation technologies for customers. Although this can creates a management problem, a common architecture facilitates the management of computing resources from different Cloud providers in a homogenous manner this research have a proposal to reengineer...
the existing learning architectures, and how educational institutions can manage the cloud computing resources. The researcher also brought reasonable explanations for the challenge of indexing web resources for optimum discoverability by students and educators. This study aims to propose an ICT enable ‘e-Learning Service system based on cloud computing model”. It elaborates the workflow of the developed service and focuses on ‘e-Learning as an On Demand Service stored in cloud environment, thereby moving on to the new concept of ‘Cloud Learning’ which will benefit the learners worldwide. Thus, this concept would lead to a fundamental shift in the education sector of any country or state by providing a new way for storing and hosting the e-Learning materials in cloud environment, which gives a better opportunity for the learners to enhance their skills and to attain hands on experience in various fields in a cost effective way.

2 Research Background

Many universities and institutions are implementing the e-learning for their distance education programmes and also used it to enhance the ability of other educational degree programmes. Cloud computing, mobile learning, communication technology, etc. are of help to bring the e-Learning to next level of ICT world. (Welsh et al., 2003). Second generation e-Learning models utilize the power of Web 2.0, cloud computing and open source options to give users choices in how they receive information, interact with people, and express themselves online. Individuals control how they create, engage, collaborate, research, and communicate with the Web. Jafari, McGee, and Carmean (2006) provide a useful visual model illustrating this second generation. Second generation e-learning models require educators to expand their skills. Alec Couros (2008) provides a useful visual model illustrating the networked educator operating in the Web 2.0 world. “Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the infrastructure Provider by means of customized SLAs.” (Vaquero et al., January 2009).

3 Objectives of the study

The primary objective of this research is to propose and develop a cost-effective cloud computing based e-Learning model for storing and fetching e-Learning modules including text, audio, Videos and to deploy the same in cloud environment, thus making ‘e-Learning on Demand as a Service’ more secure and scalable. The present study aims to analyse, design and to develop an e-Learning model in the Cloud Environment, which can be easily accessed by everyone without any constraints on geographical location. The study materials are stored in the cloud and through a progressive download approach and without having costly hardware or software infrastructure the learner will use the contents in real time environment. The e-Learning model on cloud will be developed similar to the real classroom environment, wherein a learner has to be present on time to get the complete study of the relevant course he/she has registered for. By providing a smooth and lively streaming of multimedia based e-Learning materials, the learners are benefited with a cost-effective and Virtual Classroom environment. Comparison between the traditional e-learning services and the proposed hypothesis will shows that, the net savings for a particular case is approximately 30% of hardware and maintenance cost. The model will be scalable and cost effective.
and therefore provides benefit to modern Educational Institutions of any country or state in terms of investment and helps in smooth functioning of e-Universities and e-schools.

4 Cloud based e-Learning

Cloud based e-learning is the sub division of cloud computing on educational field for e-learning systems. It is the future for e-learning technology and its infrastructure. Cloud based e-learning has all the provisions like hardware and software resources to enhance the traditional e-learning infrastructure. Once the educational materials for e-learning systems are virtualized in cloud servers these materials are available for use to students and other educational businesses in the form of rent base from cloud vendors. Cloud based e-learning architecture is explained in the following figure:

![Figure 1: Architecture of e-learning cloud](image)

Cloud based e-learning architecture is mainly divided into five layers called hardware resource layer, software resource layer, resource management layer, server layer and business application layer.

1) **Hardware resource layer**: This is bottom most layer in the cloud service middleware where it handles the essential computing things like physical memory and CPU for the total system. This layer is most important for the total infrastructure of the system. With the help of virtualization, physical servers, network and storage are grouped and called it as upper software platform. To offer the uninterruptable power to the cloud middleware services for the cloud based e-learning systems, physical host pool is expanded dynamically and memory is scalable at any time to add additional memory.

2) **Software resource layer**: This layer is created with the help of operating systems and middleware. With the help of middleware technology, many software solutions combine to offer the grouped interface for the software developers. So, software developers can create many applications for e-learning system and able to embed those in cloud, which helps the cloud users to compute those applications through cloud.

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3) **Resource management layer:** This layer plays an important role on get loose coupling of software and hardware resources. With the help of virtualization and scheduling idea of cloud computing, it brings the uninterrupted on-demand software distribution for different hardware resources.

4) **Service layer:** Service layer is divided into three levels namely IAAS, PAAS, and SAAS. These service layers help to cloud customers to use the various forms of cloud resources for their products like software resource, hardware resource, and infrastructure resource.

5) **Business application layer:** Business application layer differs from all other layers in cloud based e-learning architecture, because this layer acts as important business logic of e-learning, and frames the expansion of group of components for e-learning. Business application layer mainly consists of content creation, content delivery, education platform, teaching evaluation and education management.

### 5 Reasons to use Cloud in e-Learning

I. Provides a flexible, scalable, cost effective model that does not force the institute or university to use out-of-date infrastructure or software application.

II. Offers the flexibility to meet rapidly changing software requirements for today's and tomorrow’s teachers and students.

III. Allows software standardization, a shared pool of applications for use in a e-learning system for school, college or university, and easier maintenance through centralized licensing and updates.

IV. Enables rapid development and deployment of complex solutions without the need for in-house expertise

V. Can eliminate the upfront financial burden of deploying new technologies through a pay-as-you-go model.

VI. Supports multiple client platforms both inside and outside the school infrastructure

### 6 Study of e-Learning and Cloud computing

E-Learning is a means of education that incorporates self-motivation, communication, efficiency, and technology. Because there is limited social interaction, students must keep themselves motivated. The isolation intrinsic to e-learning requires students to communicate with each other and the instructor frequently to accomplish their assigned tasks. E-learning is efficient as it eliminates distances and subsequent commutes. Distance is eliminated because the e-learning content is designed with media that can be accessed from properly equipped computer terminals, and other means of Internet accessible technology.

Technology used to implement instruction is not limited to web-based materials. E-learning can be achieved by utilizing any form of technology that sustains information yielding media. Video/Audio

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tape, aside from being an obsolete technology is a viable means to implement instruction. More current technology aids the learning experience because there are more means to convey the information. Technology is the most variable element in e-learning. The more advanced the technology becomes, the more options there are to further e-learning. The creation of the Internet subsequently created e-learning, as dial-up connections were replaced by cable modems, speed and bandwidth increased; correlatively the quality of on-line instruction improved because computers were able to support the media. As speed increases and devices become smaller and more mobile; training will become more flexible and further boost the growth and popularity of e-learning.

First generation e-Learning models focused on the institution providing all the necessary tools to manage teaching and learning in the online space. Institutions wanted to host it all, control it all, and manage it all. Then along came the creative, collaborative Web community and everything changed. Second generation e-Learning models utilize the power of Web 2.0, cloud computing and open source options to give users choices in how they receive information, interact with people, and express themselves online e-Learning environment is nothing but the environment which offers through e-Learning applications to the students to get the access the materials and tools relating their studies. Virtual learning environment and personal learning environment are two important E-learning environments which offer the wide range of facilities to students through e-learning applications for their studies.

Figure 2: E-Learning system with cloud

7 Developing Cloud Computing Strategies for e-Learning

Based on the literature review and some other data collection in e-learning, we are going to analyze some insights for developing cloud computing strategies for e-learning. Since every distance learning unit has its own considerations and accompanying goals, the insights that are offered in this paper are general in nature and do not comprise a set of specific instructions about what to do or how to do it in terms of the adoption of cloud computing. It is unlikely that cloud computing can address all of the IT problems, but it could be the answer to some very specific ones [13]. Every distance learning unit will need to use its own due diligence to determine whether the benefits of cloud computing...
outweigh the risks, based on its unique institutional environment and circumstances. Researchers at Infosys Corporation suggest that a series of steps are needed for cloud adoption. Among these are assessment, validation, preparation, and execution. Furthermore, those e-Learning units that have determined to adopt cloud computing need to take the time and effort to design a cloud computing strategy along with a plan that will work best for their own needs. In case of distance learning administrators and practitioners must be diligent about protecting institutional data and must sharpen their contract writing skills (Blanton & Schiller, 2010; Trappler, 2010) with cloud service providers.

3 Study of Cloud campus

Cloud campus is a phenomenon of the 21st century, which takes you beyond the traditional classroom based education system allowing you to learn on the move. It can be used to simplify the provision of various educational resources to teachers and students. Cloud campus is a term derived from cloud computing where you can store your data on cloud and retrieve it from any device connected to that cloud. Cloud allows you to share any files such as education books, software etc with anyone connected to that cloud. Cloud campus is a term derived from cloud computing where you can store your data on cloud and retrieve it from any device connected to that cloud. Cloud allows you to share any files such as education books, software etc with anyone connected to that cloud. Cloud CampusTM empowers the student to learn on his own terms, at his own pace, wherever and whenever he wants it. Students enjoy higher mobility as they can easily access educational services using a Netbook or a Mobile device that connects them to NIIT’s Cloud CampusTM network. These services will be managed by NIIT centrally using the power of Cloud Computing. One of the most important initiatives of NIIT in recent times, the new GNIIT syllabus is based on a revolutionary educational paradigm called collaborative learning which takes students’ beyond the traditional classroom based student-teacher relationship. Students enrolling for the programme will be provided with technically robust netbook, a well-designed digital courseware and a fully paid data card. Furthermore, the technology backed learning environment of NIIT’s Cloud Learning Methodology supports group learning through interactive features like 24x7 lab and e-library access, instant tech updates, interaction with faculty and peers and access to online video streams. Thus the learning process is not just limited to textbooks but is enhanced through group learning.

Figure 3: A sample of cloud campus
9 Findings of Strategic Analysis

There are a variety of cloud service providers in the marketplace. Careful evaluation is needed to compare these cloud service providers’ capabilities. The purpose of the evaluation is to choose a cloud service provider which can provide a cloud designed to meet each specific distance learning unit’s needs and requirements. Many cloud service providers have teams of developers who can provide customized services to meet the specific needs of their clients. Requires of a suggestions to help users deal with contract issues with cloud service providers, including: codifying the specific parameters and the minimum levels required for each element of the service and the remedies for failure to meet those requirements; affirming the institution’s ownership of its data stored on the service provider's system and specifying the institution’s rights to get it back; detailing the system infrastructure and security standards to be maintained by the service provider along with the institution’s rights to audit compliance; and specifying the institution’s rights and costs to continue or discontinue using the service. Conversations among e-Learning system administrators and practitioners are needed, in order to set up a set of specific criteria for the selection and evaluation of cloud service providers. It might be best if existing professional associations take the initiative in this regard. For small colleges serving a small number of students in an e-Learning environment, the straightforward adoption the public cloud might be the best method to use. For example, some small colleges may lack the dedicated in-house servers and/or staff to support their distance learning courses. Thus, it might be better for them to consider the adoption of a public cloud for their distance learning courses, considering the benefits such as cost savings and reduced setup and maintenance burdens that cloud computing can offer. Large colleges or universities which already have invested in their own IT infrastructures over the years should consider maximizing existing assets by building a hybrid cloud

10 Conclusion

We as researchers feel that this should be an overarching goal, in order to build a distance learning community cloud that will offer the most benefits to both students and faculty. Such a shared distance learning community cloud, once established, would allow online learning resources and applications to be shared across the whole distance learning community. That also means that students and faculty (either at small community colleges or at large prestigious research universities) would have equal access to online learning and teaching resources. To that end, existing professional associations in distance learning should take a leadership role in working with their member institutions to set up cloud adoption, implementation, and evaluation standards and criteria, and should develop agreements and information policies for distance learning to address various shared issues such as educational resources, copyright, security, and the privacy protection of personal and financial information. Resources (such as forums and wikis) can be used to support and facilitate discussions among DL administrators and practitioners. A community cloud in distance learning will also make it easier to secure federal and state financing and grants, to reduce the overall cost of development and operation, and to avoid the wasting of costly resources.

11 References

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