

# Cloud Based E-Learning in Education Sector

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**Abstract**—Education is a continuous process and it gradually expanded with new technology day by day and each of a component of the education has changed with times. Now education is completely associated with the Information Technology on the data exchange, communication & collaboration. The Cloud computing as combination of existed technology is a model for enabling convenient, on demand network access to a shared pool of configurable computing & shared resources. Now education based on cloud computing provides a new solution to establish a unified, open and flexible network teaching platform & reduce the hardware input. Cloud computing will have a significant impact on the educational sector. The Cloud computing is an excellent alternative for educational institutions which are especially under budget shortage in order to operate their information systems effectively without spending any more capital for the computers and network devices. Academic institutions take advantage of available cloud-based applications, which are offered by service providers and enable their own students to perform academic tasks. In this report, I shall discuss on cloud based e learning process in education sector.

**Keywords:** Cloud computing, PaaS, SaaS, E-learning, IaaS, ICT, Education.

## 1. INTRODUCTION

Learning is the most important component of life. No human beings are able to survive properly without education. Now days, there are so many paradigms for getting knowledge. One of the most promising paradigms for education is electronic learning or e-learning. E-learning is commonly referred to intentional use of the information and communications technology (ICT) in teaching and learning. Moreover some other terms are also used to describe the mode of teaching and learning process, virtual learning, distributed learning, network and web based learning. The growth of e learning is directly related to the increasing access to ICT as well as its decreasing cost. Capacity of ICT to support multimedia resource based learning and teaching is also relevant to the growing interest in e learning. Insufficient technology infrastructure can cause more damage than good to teachers, students and the learning experience. While the costs of the hardware and software are falling, often there are other costs that have not been factored into deployment of e learning ventures. The most important of these include the costs of infrastructure support and its maintenance and the appropriate training of staff to enable them to make the most of the technology.

Cloud Computing is a new paradigm that provides an appropriate pool of computing resources with its dynamic scalability and usage of virtualized resources as a service through the Internet. The resources can be network servers, applications, platforms, infrastructure segments and services. Cloud computing deliver services autonomously based on demand and provides sufficient network access, data resource environment and effectual flexibility. This technology is used for more efficient and cost effective computing by centralizing storage, memory, computing capacity of PC's and servers. With the tremendous advantages of cloud computing, we expect this technology to revolutionize the field of e-learning education. Cloud computing applications provide flexibility for all educational universities, schools and institutions. The cloud platform in institutions' campuses provides effective infrastructure and deployment model for their dynamic demands. The benefits of cloud computing can support education institutions to resolve some of the common challenges such as cost reduction, quick and effective communication, security, privacy, flexibility and accessibility. "Cloud computing" is the next accepted action in the evolution of on-demand information technology services and products. Cloud computing allows to move the processing effort from the local devices to the data center facilities. The software is seen as a service and the applications and data are stored on multiple servers that can be accessed from the Internet. 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. Cloud computing has many advantages such as expected performance, reduced upfront investment (i.e., software, hardware, and professional staff to maintain servers and upgrade software), high availability, reduced launching time, infinite scalability, tremendous fault-tolerance capability, and accessibility, enhanced collaboration, and mobility, allow users to use any device, such as a mobile phone, personal computer (PC) etc. 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. This paper presents the impact of using cloud computing upon e-learning solutions development.

## 2. E-LEARNING

E-learning includes all forms of electronically supported learning and teaching. The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. This often involves both out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum. Abbreviations like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms to e-learning. E-learning is the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the Internet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio. It is commonly thought that new technologies can make a big difference in education. In young ages especially, children can use the huge interactivity of new media, and develop their skills, knowledge, and perception of the world, under their parents' monitoring, of course. Many proponents of e-learning believe that everyone must be equipped with basic knowledge in technology, as well as use it as a medium to reach a particular goal. 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. Some benefits of e-learning are discussed below: Time: One of the key benefits of online study is that one can learn or take a course through e-learning at any time as it is convenient for them. Podcasts and downloadable lectures mean that students are no longer constricted by a conventional timetable of lectures. Location: Neither are students restricted by their physical location. With an Internet connection, they can attend live online tutorials, participate in dedicated discussion forums or download course material and notes regardless of where they are. Communication: Another key advantage of online study is that it encourages and enables students to collaborate and communicate with their fellow students as well as their tutors. *Improved training and material costs:* With e-learning, each time the course is accessed our return on investment improves because users are dividing the fixed production costs by number of uses. We also have savings through decreased travel, reduced material, and hopefully improved (and more efficient) performance.

*Increased productivity:* Because e-learning is not bound by geography or time, you can control training's impact on production by training people during down times. In addition, with the current economy, you're asking people to do more

with less. So e-learning is a great way to give them the tools and skills needed to enhance their performance.

## 3. CLOUD COMPUTING

Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing data storage, processing and bandwidth.

Cloud computing is the use of computing resources i.e., (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation.

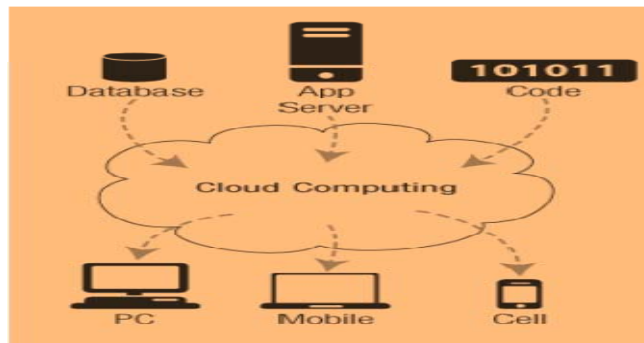


Figure 1: Cloud Computing

According to the official NIST (National Institute of Standards and Technology) definition, "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." The NIST definition lists five essential characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service. It also lists three "service models" (software, platform and infrastructure), and four "deployment models" (private, community, public and hybrid) that together categorize ways to deliver cloud services. The definition is intended to serve as a means for broad comparisons of cloud services and deployment strategies, and to provide a baseline for discussion from what is cloud computing to how to best use cloud computing. Cloud computing employs a service driven business model. Cloud offers services that can be grouped into the following categories:

*A. Infrastructure as a service (IaaS):* Hardware resources (such as storage) and computing power (CPU and memory) are offered as services to customers. This enables businesses to rent these resources rather than spending money to buy dedicated servers and networking equipment. As examples in this category, Amazon1 offers S3 for storage, EC2 for computing power, and SQS for network communication for small businesses and individual consumers.

*B. Software as a service (SaaS):* In this model, software applications are offered as services on the Internet rather than as software packages to be purchased by individual customers. One of the pioneering providers in this category is Salesforce.com offering its CRM application as a service. Other examples include Google web-based office applications (word processors, spreadsheets, etc.),

*C. Platform as a service (PaaS):* This refers to providing facilities to support the entire application development lifecycle including design, implementation, debugging, testing, deployment, operation and support of rich Web applications and services on the Internet. Most often Internet browsers are used as the development environment. Examples of platforms in this category are Microsoft Azure Services platform6, Google App Engine7, Salesforce.com Internet Application Development platform8 and Bungee Connect platform9. PaaS enables SaaS users to develop add-ons, and also develop standalone Web based applications, reuse other services and develop collaboratively in a team.

#### 4. WHY CLOUD COMPUTING FOR E-LEARNING SECTOR?

E-learning is an Internet-based learning process, using internet technology to design, implement, select, Manage, support and extend learning, which will not replace traditional education methods, but will greatly improve the efficiency of education. 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.

The students:

- Take online course
- Take exams
- Send feedback
- Send homework, projects

The teachers:

- Deal with content management
- Prepare tests
- Assess tests, homework, projects taken by students

- Send feedback

Communicate with students (forums) Usually, e-learning systems are developed as distributed applications, but this is not necessary so. The architecture of a distributed e-learning system includes software components, like the client application, an application server and a database server and the necessary hardware components (client computer, communication infrastructure and servers).

#### CLOUD COMPUTING IN EDUCATION

According to the potential of cloud computing for improving efficiency, cost and convenience for educational sector is being recognized by a number of US educational establishments. In China, Prof. Li proposed the Cloud Computing Assisted Instruction which is called CCAI in 2008. Educational institutions are also beginning to use lower level cloud service for purposes such as data storage. This may be attractive where data security is of lower concern such as where video and audio is provided as open educational resources. Another use of cloud computing which is beginning to emerge in education is for the hosting of institutional learning management systems (LMSs) in the cloud.

The three service models differ in the type and extent of resources accessed and managed by users. Connecting to the cloud and using “hidden” resources enables sharing of information always and everywhere, great application scalability, service availability anytime and anywhere, data security, storage, backup copies, and more. The potential benefits of adopting cloud computing can be assessed in both the financial savings and resource management perspectives. At the initial stage of the cloud computing in education special in a university for deployment, public cloud which store many public education resources will build for students who learn search for basic knowledge of that field. And private cloud (also called internal cloud or corporate cloud) is a marketing term for a proprietary computing architecture that provides hosted services to a limited number of people behind a firewall. It is managed by a university and benefits everyone in this university including managers, teachers and students. Primary reason for implementing private cloud is to maximize and utilize existing in-house resources. Secondary reasons include the data privacy and trust for security. Finally, data transfer cost and to have full control over mission-critical activities behind the firewalls. And then many universities and colleges which are in the same city or province will construct the community cloud. It integrates more resources (physical or virtual) from different university. At this time, more teachers from different university will provide services for more students at the same time. It also provides the academic environment for teachers. At any stage, whether the private or the community cloud, they all can develop a hybrid cloud called as “educational cloud”, in which they can share all the resources from the various universities. Private cloud makes use of the local network

whereas the educational cloud makes use of public network to access the services provided by the cloud. In summary, public clouds promote standardization, preserve capital investment, and offer application flexibility. Private clouds attempt to achieve customization and offer higher efficiency, resiliency, security and privacy. Hybrid clouds operate in the middle, with many compromised in terms of resource sharing. Community cloud is supported by specific community.

## 5. BENEFITS OF USING CLOUD COMPUTING IN E-LEARNING

One of the most interesting applications of cloud computing is educational cloud. The educational cloud computing can focus the power of thousands of computers on one problem, allowing researchers search and find models and make discoveries faster than ever. The universities can also open their technology infrastructures to private, public sectors for research advancements. The efficiencies of cloud computing can help universities keep pace with ever-growing resource requirements and energy costs. Students expect their personal mobile devices to connect to campus services for education. Faculty members are asking for efficient access and flexibility when integrating technology into their classes. Researchers want instant access to high performance computing services, without them responsibility of managing a large server and storage farm. The role of cloud computing at university education should not be underestimated as it can provide important gains in offering direct access to a wide range of different academic resources, research applications and educational tools. Usually, E-learning systems are developed as distributed applications, but not limited. The architecture of an e-learning system, developed as a distributed application, includes a client application, an application server and a database server, beside the hardware to support it (client computer, communication infrastructure and servers).

### KEY BENEFITS OF CLOUD BASED E-LEARNING IN EDUCATION

There are numerous advantages when the e-learning is implemented with the cloud computing technology, they are:

- A. *Low cost:* E-Learning users need not have high end configured computers to run the e-learning applications. They can run the applications from cloud through their PC, mobile phones, tablet PC having minimum configuration with internet connectivity. Since the data is created and accessed in the cloud, the user need not spend more money for large memory for data storage in local machines. Organizations also need to pay per use, so it's cheaper and need to pay only for the space they need.
- B. *Improved performance:* Since the cloud based e-learning applications have most of the applications and

processes in cloud, client machines do not create problems on performance when they are working.

- C. *Instant software updates:* Since the cloud based application for e-learning runs with the cloud power, the software's are automatically updated in cloud source. So, always e-learners get updates instantly.
- D. *Improved document format compatibility:* Since some file formats and fonts do not open properly in some PCs/mobile phones, the cloud powered e-learning applications do not have to worry about those kinds of problems. As the cloud based e-learning applications open the file from cloud.
- E. *Benefits for students:* Students get more advantages through cloud based e-learning. They can take online courses, attend the online exams, get feedback about the courses from instructors, and send their projects and assignments through online to their teachers.
- F. *Benefits for teachers:* Teachers also get numerous benefits over cloud based e-learning. Teachers are able to prepare online tests for students, deal and create better content resources for students through content management, assess the tests, homework, projects taken by students, send the feedback and communicate with students through online forums.
- G. *Data security:* 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.

## 6. CONCLUSION

Cloud Computing is an exciting development is a significant alternative today's educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. This automatically reduces the cost of organizational expenses and offers more powerful functional capabilities. There will be an online survey to collect the required data for the use of cloud computing in the universities and other governmental or private institutions in the region. This will help us review the current status and probable considerations to adopt the cloud technology. Beginning with the outsourcing of email service seems attractive. The gradually removal of software license costs, hardware costs and maintenance costs respectively provides great flexibility to the university/corporate management. In this paper we discuss a cloud based e-learning in education. Describe its definition and some benefits. Cloud based education will help the students, staff, Trainers, Institutions and also the learners to a very high extent and mainly

students from rural parts of the world will get an opportunity to get the knowledge shared by the professor on other part of the world. Even governments can take initiatives to implement this system in schools and colleges in future and we believe that this will happen soon.

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