

# CLOUD COMPUTING EDUCATIONAL ENVIRONMENT

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## Abstract

*Cloud computing open new environment to solve particular challenge problems at the e-learning system and to the education systems, where education could be improved by allowing the access to the learning resources anywhere and at any time. Jordan government has made a lot of efforts to enhance the educational system by introducing development initiatives and building several universities. Our paper trying to solve the problem of training and student practicing outside the university and it also tries to solve the problem of the closed system that been used in the lab computer. Cloud computing will provide the university staff with many high points (efficiency, reliability, portability, flexibility, and security) to enhances their knowledge and education. In this paper, we discuss the cloud computing based e-learning, how cloud computing can benefit e-learning education and the challenges to cloud education. We explain some case studies for general educational cloud provider.*

*Keywords: Cloud Computing, E-learning, Cloud Educational Computing, Education Systems.*

## 1 INTRODUCTION

Many universities at Jordan face the problem of managing and improving the lab university classroom. The construction of these labs have a closed system where students could not access them from outside the university. Researches indicate that more computer used; it will lead to a better computer learning achievement. Thus, if students could continue practicing labs lessons after the timetable of lectures, it will be a great help to the learning achievement, also maintaining these labs becomes a burden for labs manager (Wu, 2013).

Cloud computing open new environment to solve several challenge problems at the e-learning system and to the education systems, where education could be improved by allowing the access to the learning resources anywhere and at any time. Free software's ( e.g. Google Education Application, Microsoft Windows Azure, IBM Cloud Academy) are adopted from cloud computing service to provide various education services of information technology, and only a browser is required to connect the cloud computing service for learning. There is no significant difference between the computer attitude and learning behavior of using cloud or without using it (Wu, 2013).

E-learning has been used as a tool in the learning process and most of the Jordan universities. The current education environment in Jordan consists two parts: class equipment and computer labs. The class equipment had an interactive whiteboard, personal computer, projector, network access point. Computer labs are the central place for training student's and incorporate information technology into teaching. Computer labs may use disk or diskless system, where disk system allows the client's computer to equip with hard disk, operation system, and application program where it is installed at local disk. In diskless system the hard disk, operation system, and application program are installed as image files at diskless server, where client's computer can read servers image files through the intranet (Wu, 2013).

E-learning is widely used today on various educational levels. There are several e-learning solutions from open source to commercial. It isn't bounded by geography or time; their course could be taking at any time or place (student no longer restricted by a conventional timetable of lectures or a physical location). With e-learning systems, student can attend live online tutorials, participate in dedicated discussion forums, attend online exams, get feedback about the courses from instructors, send their projects and assignments through online, increase the ability of auto-training, also the student can download course material. With e-learning student can collaborate and communicate with each other and their teachers (Bora&Ahmed,2013) (Alshwaier et al.,2012) (El-Seoud et al.,2013).

## 2 E-LEARNING SYSTEMS

E-learning is a designed model of networked information and communications technology (ICT) for teaching and learning, its growth increased directly related to the increasing access to ICT, where the ICT systems serve as specific media to implement the learning process. Students' learning is no longer confined within the classroom; the environment of ICT could help the student to access learning resources anywhere. E-learning represents the computer and network-enabled to transfer skills and knowledge to other using the control of e-learn administrator of the teachers. Educational organizations relies many benefits in making their programs available via a variety of distributed locations, including on campus, home and other community learning or resource centres (Wu, 2013) (Bora&Ahmed,2013) (Alshwaier et al.,2012). Figure 1 shows a simple structure of the e-learning system.

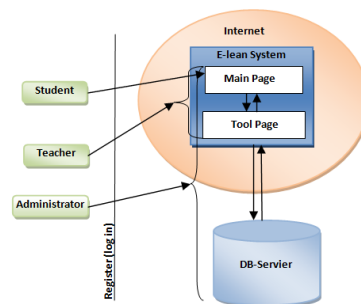


Figure 1. E-learn Structure

Some terms are used to describe e-learning applications and processes such as: online learning, virtual learning, distributed learning, network, web-based learning, virtual education opportunities and digital collaboration. E-learning can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio. E-learn content is delivered via the Internet, audio or video tape, satellite TV, and CD-ROM. While the costs of e-learn infrastructure support are falling, often there are other costs that have not been factored, such as its maintenance and the proper training of staff (Wu, 2013) (Bora&Ahmed,2013) (Alshwaier et al.,2012).

## 3 CLOUD COMPUTING ENVIRONMENT

Cloud computing become an attractive technology that provides an appropriate computing resources (hardware and software) with its dynamic scalability and efficient usage of virtualized resources as a service over Internet, it can be utilized under circumstances where the availability of resources is limited. 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, it needed Internet and central remote servers to maintain centralizing data storage, processing, applications, and bandwidth. Cloud computing allows client to use services without installation and access their personal files at any computer using Internet access. It provides a shared pool of computing resources that can be rapidly and elastically provisioned and released based on client' need to serve a wide range of information processing needs. Due to its

enormous benefits this technology is being adopted in many applications including education (Bora&Ahmed,2013) (Alshwaier et al.,2012) (Karthik&Sri,2013).

Cloud computing provided 1) The utilization of online services with high infinite scalability, 2) Higher throughput and availability, 3) Reduced software, hardware, and launching time, 4) Enhanced collaboration, 5) High quality of service and computing power, 6) It is an abstraction and virtualization construction since it does not require expertise or unique knowledge to manage the infrastructure segment. 7) Every user get enough resources in a well-organized manner, 8) Simultaneously accessed by any variety of users, 9) More efficient computing by consolidate data storage, processing and bandwidth, 10) On demand technology since it offers dynamic and versatile resource allocation for reliable and warranted services in pay as-you-use manner to public, 11) Tremendous fault tolerance capability and accessibility, 12) It supports the work in groups on collaborative projects where project team members are geographically distributed, by providing development infrastructure that include tools and programming languages, 13) Allows to move the processing effort from the local devices to the data center facilities. 14) Possesses lower cost services, re-provisioning of resources and remote accessibility. 15) No more worries about hardware failures and no hardware upgrades needed (everything will be managed virtually, for example,we can increase the hard disk size instantly as you go) (Wu, 2013) (Bora&Ahmed,2013) (Alshwaier et al.,2012) (El-Seoud et al.,2013) (Karthik&Sri,2013).

The cloud can be used by public individuals (public cloud), a single organization (private cloud) or more than one organization that share the same interests and policies (community cloud), it can also be a mixture of public and private clouds (hybrid cloud). Cloud offers services that can be grouped into the following categories (Wu, 2013) (Bora&Ahmed,2013) (Alshwaier et al.,2012) (El-Seoud et al.,2013) (Karthik&Sri,2013) (El-Sofany et al. 2013) :

- A) Infrastructure as a service (IaaS): Hardware resources and computing power are offered as services to customers.
- B) Software as a service (SaaS): software applications are offered as services rather than as packages to be purchased.
- C) Platform as a service (PaaS): support the entire application development lifecycle including design, implementation, debugging, testing, deployment, operation and support of rich web applications and services on the Internet. PaaS enables SaaS users to develop add-ons, and develop standalone web based applications, reuse other services and develop collaboratively in a team.

El-Sofany et al. 2013, shows an addition service models such as:

- D) Hardware as a Service (HaaS): contrarily to the SaaS and PaaS that provide applications and services to the customers, HaaS offers only the hardware.
- E) Database as a Service (DaaS): the aim of a DaaS is to offer a database and the services allowing its management to avoid the complexity and running cost of a database if hosted in the own network of a company or organization.

Mircea and Andreescu, 2011 show the simplified structure of the main users of IT services for any university using the services of cloud computing as illustrated in Figure 2.

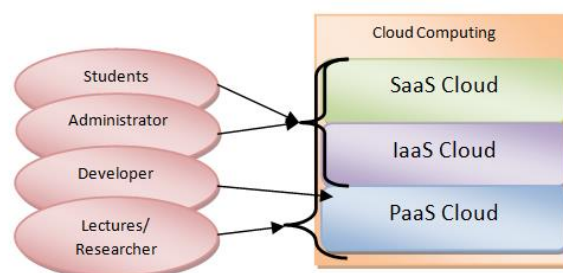


Figure 2. Cloud Computing Services for University

The main problems related to cloud computing are the network bandwidth, response time, minimum delay in data transfer and minimum transfer charge for data. The essential principle of cloud computing is that user data is not stored locally and it is stored in the data centre of internet (Bora&Ahmed,2013) (Alshwaier et al.,2012).

#### **4 BENEFIT OF EDUCATIONAL CLOUD**

One of the most attractive applications of cloud computing are educational cloud. Educational cloud can allowed researchers to search, find models, make fast discoveries, assist to build and create a smarter planet, and develop and test applications immediately. Universities that used cloud computation can open their technology infrastructures to private or public sectors for research advancements, and also help universities to keep pace with ever-growing resource requirements and energy costs. The architecture of the e-learning system is developed as distributed applications, which has a client application, server and a database server. Cloud computing can support the e-learning systems with infrastructure segments and services, platform, network servers, and applications (Bora&Ahmed,2013) (Alshwaier et al.,2012).

Educational cloud computing services represent a growing variety of useful services available on Internet and the most innovative and rapidly developing portion of the technology and education. It also promises to provide a variety of services that will be very helpful for their clients (Alshwaier et al.,2012).

There are many benefits on education cloud technology, such as 1) Provide flexibility and accessibility for the educational institutions, 2) Provides efficient infrastructure and deployment model for their dynamic demands, 3) Resolve cost reduction, 4) Provide quick and efficient communication, also allow users to use any device, 5) Provide security and privacy, 6) Improved performance and document format compatibility, and Instant software updates, 7) Providing educational resource storage and databases, e-mails, educational applications and tools for students and teachers and clients located all over the world involving in an educational program, 8) Cloud background resources are available to the students with no need of having deep knowledge about the cloud computing concepts. The students can start using the cloud environment resources as soon as connecting to the server where applications have been installed to them. 9) Zero maintenance cost is involved since the service provider is responsible for the availability of services and clients are free from maintenance and management problems of the resource machines, so organizations do not need to pay for and look after their internal IT solutions (Bora&Ahmed,2013) (Alshwaier et.al.,2012) (El-Seoud et al.,2013) (Mircea&Andreescu,2011) (El-Sofany et al. 2013).

#### **5 EDUCATIONAL CLOUD CHALLENGES**

Cloud computing is a new design which is threatening by some individuals. It challenges lies on some developers feel uncomfortable to transfer data and services outside their position. These challenges include: 1) Information and visualization security, 2) University will be locked-in to IT companies that will find them difficult to test, deploy and integrate, 3) Unsolicited Advertising where cloud providers will focus on users with unsolicited advertising. 4) Data and Service management and governance. 5) Product and process control and monitoring, 6) Infrastructure and system reliability and availability, 7) Security respect to knowledge, information and data residing on an external service device. 8) Concerns over services' and resources' availability and business continuity. 9) Concerns over data transmission across anticipated broadband speeds (Bora&Ahmed,2013) (Alshwaier et.al.,2012) (El-Sofany et al. 2013).

Cloud service providers should establish accounts for user who should be individually verified and validated by employing usernames and passwords to protect their profiles on the cloud. Priorities, permissions and resource ownerships on the cloud should be controlled. Every individual in the institution is granted privileges based on his account. Encryption techniques should be employed to

protect sensitive data of the institution. Techniques such as digital signatures, timestamps and confirmation receipt services can be deployed in educational cloud for achieving a non-repudiation. Denial of Service is a high source the of threats. It has been suggested that the supply of cloud services through one provider is a single point of failure, and that contract will be available for more than one cloud provider in order to minimize the risk (Bora&Ahmed,2013) (Alshwaier et al.,2012) (El-Sofany et al. 2013).

## **6 POPULAR EDUCATIONAL CLOUD PROVIDERS**

There are many different cloud computing platforms for education in use nowadays. The trend of educational cloud computing has been adopted by many leading IT companies, such as:

Microsoft's cloud computing (Windows Azure) which is an operating system that permits to run Windows applications and stores data by Microsoft server. It is primarily offered as a service that allows establishing user identities, managing workflows, and executing Microsoft's online computing platform. The Microsoft Education Cloud offers the Microsoft Live@edu program at no cost to education accounts that provide them with: Primary email addresses and educational calendar, Academic productivity such as document sharing and creation, developing social networks, hosting public web sites, and testing web services quickly, Word processing and presentation, Resource scheduling, testing and deploying large-scale applications in the different environment, on demand resources for free, giving Mashups of data to meet accountability and assessment needs, porting on-premise line-of-education software to the cloud, coordinating collaborative program development projects that consist of multiple departments, and creating applications that can be shared by several students simultaneously, Identity and relationship management, Evaluating risk and making informed decisions about the use of educational cloud computing<sup>1</sup>(Alshwaier et al.,2012).

Google Education (GE) in cloud computing available to any education institute. Google is considering as one of largest agents in the business of cloud computing. GE includes the following applications: Google Gmail, Google Sites, Google Video for education, Google Calendar, Google Talk and Google Docs Package (Documents, Spreadsheets and Presentations). There are client applications that supply additional functionality. Because all of these applications are web-based, each Google application is inherently cross platform; a modern cloud computing web browser might be supported by the computing platform to provide compatibility, scalability and essentially virtualized models. Google applications generally sets the standard for cloud computing interoperability; each application was designed to interoperate with the suite of Google's offerings. Because of the low cost factor, Google applications are used as a supplementary technology and as the primary technology for any or all of its applications<sup>2</sup> (Bora&Ahmed,2013) (Alshwaier et al.,2012) (El-Seoud et al.,2013) (Herrick,2009).

Amazon Web Services Cloud (AWSC) has produced a variety of benefits for educational institutions as follow: 1) Building any application, manage the resources and fit them into any application using any platform or any programming model, 2) The AWSC gives a number of services incorporate to develop applications. 3) The AWSC cloud is a distributed, secure, resilient, reliable, and massively scalable.

Some comprehensive cloud computing platforms of AWSC are: Amazon Cloud Front, Amazon Elastic Compute Cloud, Virtual Computing Laboratory, Amazon Simple Queue Service, Amazon Simple Notification Service, Amazon Simple Workflow, Amazon Simple Email Service, Amazon Flexible Payments Service<sup>3</sup>(Alshwaier et al.,2012) (Vouk,2008).

IBM Cloud Academy provides an application for educational institutions. They can collaborate with peer member organizations, as well as with the IBM research and development community, to create new approaches and strategies to improve educational services through cloud computing. Some IBM

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<sup>1</sup> <http://www.techrepublic.com/whitepapers/cloud-computing-from-microsoft-empoweringeducation-through-choice/3333523>

<sup>2</sup> <http://www.google.com/a/edu/>

<sup>3</sup> <http://aws.amazon.com/what-is-aws/>



cloud education services are IBM LotusLive collaboration, Virtual Computing Lab, IBM Smart Analytics system, IBM Smart Business desktop cloud (Alshwaier et al.,2012) (El-Seoud et al.,2013).

HP Cloud provides an ecosystem of thought leaders (Alshwaier et al.,2012).

The cloud operation system Cloudo, GlideOS, iCloud and MyGoya were open platform and users may use it after free registration, but program source was not opened. The EyeOS cloud operation system was open source software. The Startforce cloud operation system provides a complete office software and file manager function (El-Seoud et al.,2013).

## 7 CONCLUSION

This paper presents educational cloud computing as a new trend for e-learning in Jordan and shows how universities can take advantage of the cloud. Several examples of cloud computing provider in education were provided, the challenges to cloud computation including problems and risks have been also discussed. It will help universities to allow their faculty, staff and students to accomplish their work better and faster than ever.

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