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An E-Learning System Architecture Based on New Business Paradigm Using Cloud Computing

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Abstract

Cloud computing is becoming an adoptable technology for many of the organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. Cloud computing and its applications in almost any area, including education. Now a day, e-learning is also becoming very popular and powerful trend, which is also broad. E-learning systems usually require many hardware and software resources. This paper presents the benefits of using cloud computing for e-learning. There are many educational institutions that cannot afford these investments, and the cloud computing is the best solution, especially in the universities where the use of computers are more intensive and what can be done to increase the benefits of common applications for students and teachers. In this paper we can introduce the characteristics of the current e-Learning and then analysis of the concept of cloud computing and describes the architecture of cloud computing platform by combining the features of the e-learning. And the authors have tried to introduce the cloud computing to e-learning, and it is building an e-learning cloud, and make it as active research and exploration of the architecture, and it has the construction method and, external interface within the business model, and the challenges and solutions etc. In our results can be suggested that the introduction of cloud computing into e-learning is feasible and it can greatly improve the efficiency of investment and power of the management, which can make it the e-learning system will be developed into the virtuous circle and it can be achieve the win-win situation for suppliers and customers.

Keywords: cloud computing; e-learning; business mode

Introduction

E-learning is an Internet-based on the e-learning process, using Internet technology to design, and implement, and extend learning, which will not replace with traditional education methods, but it will greatly improve the efficiency of the education. Now a day, there are lots of paradigms for getting knowledge or learn something. One of the most promising paradigms for education is e-learning. E-learning is commonly referred to the intentional use of networked information and communications technology (ICT) in teaching and learning. Some other terms are also used to describe this mode of teaching and learning including these is the online learning and virtual learning and then 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. The capacity of ICT to support multi-media resource- based learning and teaching is also relevant to the growing interest in e-learning. Poor or insufficient technology infrastructure

can cause more damage than the learning experience for good teachers, students. When our costs of the hardware and software are often there are no other costs that have not been factored into the deployment of the e-learning ventures. And the most important of these 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 networked servers, applications, platforms, infrastructure segments and services. Cloud computing delivers 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 educational institutions to resolve some of the common challenges such as cost reduction, quick and effective communication, security, privacy, flexibility and accessibility. 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 applications and data are stored on multiple servers that can be accessed from the Internet. However, in traditional web based system construction and maintenance and then the e-learning mode, are located in interior of educational institutions which results are having the problems can be existed. While the 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 such as a mobile phone, personal computer (PC) etc. Cloud computing is becoming an attractive technology due to its dynamic scalability and effective use of the resources; it can be utilized under circumstances where the availability of resources it can be limited. For this paper can be presented the impact of using cloud computing upon e-learning solutions development.

From the above we can see that until now, scholars have made a lot of researches on the following two aspects: cloud computing used in the field of education, and integration of network and e-learning. The former places the emphasis on the online course-building, etc. The latter's emphasis is placed on construction of campus e-learning system based on agent model and now the research applying cloud computing to e-learning and it is not significantly reported. In this paper, we can try to attach cloud computing to make an active research and exploration of it. When the following aspects are external interface and with the business model, challenges and solutions and other issues for e-learning cloud computing.

Cloud Computing Educational Environment

Cloud computing is a rapidly growing subject that attracts many people from different disciplines. It transforms how computing resources (for example storage, servers, processing, networking and

applications) are provisioned, managed and delivered to users [5, 9, 6, 7]. The National Institute of Standards and Technology (NIST) defined five essential characteristics of cloud computing which include: Cloud providers may offer tremendous applications to their customers. These applications may vary widely to provide many services in education, government, banking and healthcare. The hardware and systems software in the datacenters that deliver those services. Users of cloud applications do not require expertise and knowledge to control the infrastructure segment of clouds, so abstraction and Virtualization [5] might be provided to utilize the services of an internet with high scalability, higher throughput, quality of service and high computing power, this is known as Infrastructure as a Service (IaaS). Cloud computing providers deliver common online services which are accessed on the Internet through a web browser. These services have long been referred to as Software as a Service (SaaS). The service being sold is called utility computing. Thus, cloud computing is the sum of SaaS and utility computing [5]. It supports work in groups on collaborative projects where project team members are geographically distributed, this is known as Platform as a Service (PaaS). PaaS provides a development infrastructure including tools and programming languages. The cloud can be used by public individuals (public cloud), a single organization (private cloud) or more than one organization that shares the same interests and policies. It can also be a mixture of public and private clouds [5, 6].

One of the most interesting applications of cloud computing is educational cloud [2, 3, 7, 9]. The educational cloud computing can focus the power of thousands of computers on making discoveries faster than ever and assist build a technology can help universities keep pace with ever-growing resource requirements and energy costs [8]. Students expect their personal mobile devices to connect to campus services access and flexibility when integrating technology into high performance without the responsibility of managing a large server it can be represent a growing variety of useful services available on the internet and the most innovative and rapidly developing portion of the technology of services that will be very useful to faculty, staff and students [11]. 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 tools [12]. Educational cloud computing is quickly taking the education community by storm as for academic are already using a type of cloud computing based applications are heavily investing in cloud computing as the future of the academic learning and research [10].

There are many different cloud computing platforms for use in education nowadays. Justin et al. [1] Has proposed Seattle an educational networking, free, portable, and lightweight platform using donated networking and distributed systems on computers spread through the peer-to-peer computing and it can be classified computing within a simple area. Computers running Seattle are protected from malicious and misbehaving code, making it safe to contribute resources from multiuse computers. Seattle has resources available for academics to use on about a thousand computers worldwide. Al Noor et al. [4] have proposed architecture of cloud computing for education on the availability of widespread resources to all around Bangladesh. This architecture simply gives an effective and flexible way to match the resources with the current economical condition by utilization of unused resources and abstraction of third party involvements. It also provides a more flexible environment so that the client can also configure his own security policy. Sultan [6] has demonstrated how institutions and universities are likely to embrace cloud computing as many of them are bound to suffer from under-funding due to the global economic crisis. In conclusion educational cloud computing environment offers a wide range of services in application, platform, and infrastructure levels to students, faculty, researchers, and academic staff.

Case Studies

Many education institutions do not have the resources and infrastructure needed to run top e-learning solution. This is why Blackboard and Model, the biggest players in the field of e-learning software that are cloud oriented. It is widely used today on different educational level continuing education, academic courses, etc. And there are at least two entities involved in an e-learning system: the students and the trainers.

The students:

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

The trainers:

- Deal with content management
- Prepare tests
- Assess tests, homework, projects taken by students
- Send feedback
- Communicate with students (forums)

The trend of educational cloud computing has been adopted by many leading IT companies. Microsoft software and services strategy are about the power of choice-a hybrid model of resources that enables the

students and researcher to move as much or as little as they want to the cloud. Google Apps education in cloud computing is available at no cost to colleges, universities and educationally focused groups. Amazon Web Service has provided the universities and institutions of all sizes with an infrastructure web services platform in the educational cloud. The IBM Cloud Academy provides an application for educational institutions that are actively integrating IBM cloud computing technologies into their infrastructures for production and technical projects. HP Cloud provides an ecosystem of thought leaders who can share best practices, ideas and technology around the design and use of cloud computing capabilities for education. The following are case studies for educational clouds provided by the most popular cloud providers.

Microsoft Education Cloud

The Microsoft educational cloud enables researchers to flow workloads across the infrastructures and complement their existing IT assets with Web-based services [7]. Microsoft cloud services for education offers great programs such as Microsoft Live@edu at no cost to education accounts. Additionally, all services offer greater financial flexibility to educational institutions and enable that are distributed between the cloud and the datacenter [4]. The workplace is changing and the desktop applications that researchers and students use today will evolve to desktop applications combined with technical services. Moreover, Educators prepare the workforce to partner with Microsoft for example, that can give them affordable access to those tools. Microsoft Live@edu is an application that provides students, researchers, and staff, faculty that can offer flexibility, collaboration and online communication all at no cost to education institutions. Are shows in below the features of Microsoft Live@edu.

| Microsoft Live@edu | |
|--------------------|----------------------------------|
| ✓ | Website Creation |
| ✓ | File sharing |
| ✓ | Word processing and presentation |
| ✓ | Desktop sharing |
| ✓ | Resource scheduling |
| ✓ | VOIP |

Features of Microsoft Live@edu

Microsoft products will be used by the students similar to those used in many workplaces that assist to prepare them for jobs after college [8]. Thus, Microsoft education cloud computing considers the following needs:

- Instant Message, Email and Educational Calendar
- Academic productivity such as document sharing and creation
- Flexibility and collaboration

- On demand resources for free Identity and relationship management
- Coordinating collaborative program development projects that consist of multiple departments
- Creating applications that can be shared by many students simultaneously
- Developing social networks or communities according to grade, school, or study area Porting on-premise, line-of-educational software to the cloud
- Testing Web services quickly
- Providing Mashups of data to meet accountability and assessment needs
- Hosting public web sites
- To evaluating the risks and making informed decisions about the use of educational cloud computing.
- Testing and deploying large-scale applications in a different environment Microsoft’s cloud computing solution is also called Windows Azure [6], an operating system that permits institutions, schools and universities to run Windows applications and stores data from Microsoft server. Moreover, the Azure Services Platform (ASP) is basically offered as services that allow the students and researchers to establish user identities, manage workflows, execute other functions such as Microsoft’s online computing platform. Can be shown below illustrates the different key components of ASP.

| ASP Components | |
|----------------|--------------------------------|
| ✓ | Windows Azure |
| ✓ | Micosoft.NET services |
| ✓ | Live services |
| ✓ | Microsoft dynamic CRM services |
| ✓ | Microsoft SOL services |

Key components of ASP

Google Education Cloud

Google Apps Education (GAE) in cloud computing available at no cost to colleges, universities and educationally focused groups. GAE includes the following applications: Google Mail (also known as Gmail), Google Sites, Google Video for education, Google Calendar, Google Talk and Google Docs Package (Documents, Spreadsheets and Presentations) allow the workflow to proceed seamlessly among different types of documents. Each of these applications is entirely web-based, although there are client applications that supply additional functionality.

Google Mail: one of the key components of Google Apps is Google Mail, also called Gmail which is administered by the organization’s IT administrator in the institution, schools and universities. It has 7GB of storage per user, built-in chat, and IMAP capability that frees students from concerns about email quotas or spam.

Google Sites: easy-to-use web publishing tools let students on campus create and publish information and media, without having to learn any programming languages.

Google Video: provides secure and private video sharing for faculty and students.

Google Calendar: is a shared calendar management that puts everyone on campus “on the same page” when it comes to organizing schedules.

Google Talk: is the instant messaging (IM) component of Google Apps. IM is helpful for immediate, limited conversation with a colleague in a remote location in the classroom.

Google Docs Package: a real-time collaboration on documents, spreadsheets, and presentations that lets researchers and students work together across campus or around the world.

As a goal of replacing old application hosting solution with an outsourced hosting solution for students, the transition to Google Apps has been very productive. In general, students, researchers and faculty are very satisfied with the variety and consistency of service offerings. It is also best viewed as one of a suite of tools that campus IT can provide to its students and faculty. Although the cost is extremely competitive with some educational cloud computing, GAE is a clear choice which is considered a success at some universities and institutions around the world and is recommended as a replacement for existing collaboration and communication systems which may already be in place. Table 1 illustrates the features of GAE as an education edition.

Table 1: Features of GAE

| Feature | Education Edition |
|-----------|---------------------------------|
| Support | Phone support: 24 hours |
| Service 1 | Resource scheduling |
| Service 2 | 3rd party applications |
| Service 3 | Google Video |
| Cost | Free |
| Storage | Same storage space as gmail.com |
| Users | No limit |

Amazon Web Services (AWS) Cloud

AWS has provided the universities and institutions of all sizes with an infrastructure web services platform in the educational cloud. With AWS students, researchers and faculty can requisition compute power, storage, number of users and other services-obtaining access to a suite of elastic IT infrastructure services as an educational demand. With AWS, students, researchers, and faculty have the flexibility to select whichever development service or model of programming makes the most sense for finding the solutions for any problem. The Amazon global

computing infrastructure that is the backbone of Amazon multi-billion retail business and transactional enterprise that's scalable, flexible, reliable, and secure distributed computing infrastructure [4]. AWS provides a variety of benefits for educational institutions, IT organizations and developers alike as the following:

- **Flexible:** to build any application, control the resources and fit them into any application using any platform or any programming model.
- **Comprehensive:** The AWS gives a number of services that students, researchers and faculty can incorporate into them to develop applications.
- **Dependable:** The AWS cloud is a distributed, secure, resilient, reliable, and massively scalable.

AWS enables the academic community to inexpensively and rapidly build on global computing infrastructure to seek course material such as projects and intensify their productivity and results of research, while enjoying the same benefits of flexibility, reliability, elasticity, and cost effectiveness used by industry. The AWS in Education program provides [4, 5, 6, 8]:

- It can be accessed to selected course content resources
- Teaching Grants for faculty based on AWS
- The research Grants for academic researchers using AWS in their work
- When the project Grants for student organizations pursuing entrepreneurial endeavors
- For the student tutorials that want to use AWS for self-directed learning
- Solutions for institution administrators looking to use educational cloud computing to provide efficient and cost-effective services in the institution's IT Infrastructure. AWS also manages the infrastructure that enables students, researchers and faculty deploy highly scalable and reliable IT solutions.

| Efficient services of AWS | |
|---------------------------|--------------------|
| ✓ | No contracts |
| ✓ | No hidden fees |
| ✓ | Better economics |
| ✓ | Time management |
| ✓ | Better environment |

Efficient and cost effective services of AWS

Although AWS consists of more than a collection of infrastructure services, educator can save time by incorporating compute, storage, database, messaging, payment and other services that will give educators a head start on delivering to their business. Some comprehensive cloud computing platforms of AWS are the following:

• **Amazon Cloud Front:** is a web service that offers a high performance and globally distributed content delivery. The distribution stream content to the users can be easily generated with high data transfer speeds and low latency, and then no commitments.

• **Amazon Elastic Compute Cloud (Amazon EC2):** is a web service that generates resizable compute capacity in the educational cloud. The Virtual Amazon EC2 environment can be generally defined to the educators with the databases and the application platform stack required for hosting applications. Amazon EC2 also provides a full management console and APIs to manage the data resources. It presents a true virtual computing environment, allowing the educators to use web service interfaces for launching instances with a difference of systems, load them into the environment with the custom application, manage the network's access permissions, and run the image using as many or few systems [7]. Some features of Amazon EC2 are illustrated in shows in below.

• **Virtual Computing Laboratory (VCL):** is an open source implementation of a secure production level on-demand utility computing and services oriented technology for accessing wide-area to solutions based on virtualized resources including computational resources, storage and software. VCL pilots are implemented with a number of universities around the world. The VCL implementation [8] has most of the characteristics and functionalities and is considered desirable in an educational cloud computing. Functionally, it has a large intersection with Amazon Elastic Cloud [3].

| Features of Amazon EC2 | |
|------------------------|-----------------------|
| ✓ | Flexible |
| ✓ | Elastic |
| ✓ | Completely controlled |
| ✓ | Inexpensive |
| ✓ | Secure |
| ✓ | Reliable |

Features of Amazon EC2

IBM Cloud Academy

The benefit of IBM Cloud Academy form access to a broad portfolio of IBM cloud computing projects, offerings and services that are designed for education and learning. They can collaborate with peer member institutions, as well as with the IBM research and development community, to create new approaches and strategies to improve educational services through cloud computing. The higher educational institutions pursue cloud computing for reducing operating costs while improving quality and access to education. In the educational environment such as students, faculty and administrators", to gain immediate access to a wide range of new educational resources and research

software and tools [10]. IBM Cloud Academy members also can [9]:

- Implement IBM cloud technology solutions for education based on our world-class cloud technology for public and private clouds.
- Participate cloud services and technologies for IBM faculty, researchers, developers and partners in the definition of emerging cloud technologies.
- Collaborate with peers and developers-work with colleagues from around the globe in an accessible cloud-based collaboration forum to share good practices, ideas and insights.

The IBM solution divides IT workloads with many different services that make implementation and development easier. This gives academic institutions and universities an accessible indication for transitioning campuses over to the cloud. Each of these services is powered by IBM techniques and results in new benefits such as connecting and empowering the academic life [3]. Some IBM cloud education services are:

- **IBM Lotus Live collaboration:** Lotus Live offers easy-to-use communication and collaboration tools that connect students, colleagues, researchers and administrative staff for collaborative learning inside or outside the campus. Silanis and IBM have joined together to integrate e-Sign Live with Lotus-Live. These cloud computing services enable students, researchers and faculty to electronically sign document deals, legal contracts and other documents over the internet to reduce the time and cost [3, 2].

- **Virtual Computing Lab (VCL) education solution:** VCL provides open source software and a technical infrastructure trim for the needs of educational institutions. The VCL provides solutions for many problems such as reduced cost, increased power cuts, application contention and the demand for learning software.

- **IBM Smart Analytics system:** delivers query response times that are faster and better in more quality than older systems and a single source of secure data for intelligence workloads.

- **IBM Smart Business desktop cloud:** allows virtualized schools and universities access environment. Thin clients and internet devices have full access to independent, hosted applications and full client image.

HP Cloud Computing

The HP Cloud System is the product of HP's experience in delivering industry and education-leading automation, application management, and converged infrastructure capabilities. It enables clients such as students, faculty and researchers build, manage, and consume across traditional IT environments for the

private clouds, public clouds and without having to know for the cloud services, or care, whether those services come from the HP cloud system is the only singular platform system that provides a lot of applications and services from an extensive range of sources and easily scales on demand. It's a complete cloud system that integrates the control and delivery of cloud assets whether their provenance is the datacenter, an HP hosted cloud, or an external source such as Amazon EC2 services. With the HP Cloud System, students, faculty and researchers cloud solution that:

- Manages and delivers End-to-End automated application
- Unifies and controls self-service portal with a built in service catalog
- Completes Lifecycle management
- Tracks the development of a cloud service catalog
- Supports for multiple departments like students, faculty such as clients researchers
- Provides scalability in time provisioning and the one-click, just yet
- Innovates open standards to support multiple types of applications
- Provides security, privacy and compliance

Students, faculty and researchers can add mission critical computing with HP and heterogeneous management of their existing environment with HP Software. In addition, the HP cloud solution is designed to help educators develop and implement their hybrid cloud services. The core cloud system consists of the followings:

- **HP Blade System Matrix:** delivers an automated, common modular architecture that can provision virtual infrastructure and physical resources applications
- **HP Cloud Service Automation software:** includes a template designed for, along with a common self-service portal for the cloud services
- **Cloud Maps:** can track the creation of a cloud service and application catalog
- **HP Storage:** a utility to storage technology that can deliver virtually unlimited tiered storage capacity
- **HP Security Point:** the main purpose of this point is to secure, detect and protect spanning applications are virtual and physical infrastructures as well as cloud
- **HP Networking:** provides flexible, high-performance networking from edge to core
- **The Mission-Critical Computing:** with solutions such as HP Blade System Matrix

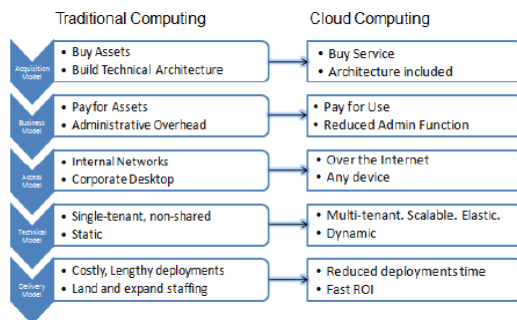
Cloud Computing

Cloud Computing is a technology that uses the internet and central remote servers to maintain data and

applications. The cloud computing allows consumers and businesses to use this application without installation and access their personal files on any computer having with internet access. In this technology we can allow for much more efficient computing by centralizing data storage, processing and bandwidth. But the cloud computing is the use of computing resources (hardware and software) that are delivered as a service over the network (typically the Internet). After the name comes from the use of the cloud-shaped symbol as an abstraction for the complex infrastructure for the cold computing.

Cloud computing is the highly scalable and creates virtualized resources that can be made and it can be available to users. These users do not require any special knowledge about the concept of cloud computing to connect their computers to the server where applications have been installed and use them. When the users can communicate through internet with remote servers. At these servers can exchange their computing slots themselves [3]. Cloud computing is one of the new technology trends likely to have a significant impact on the teaching and learning environment [4].

In Cloud computing, resources can be either externally owned or internally owned private cloud. To the external users who are typically billed on a pay-as-you-use basis. And to build for the access within the enterprise where the users can utilize the facility without any charge [5]. The methods of meeting challenges such as user interface; the application of cloud in universities. The current state of enterprise knowledge management and how it would turn into dependable and efficient infrastructure with cloud computing. As well as applications. And the attributes can be visualized from the following comparison.



From Traditional E-Learning Network to Cloud E-Learning

The traditional e-learning network is located in a campus network or an Intranet with its construction, maintenance, and investment being made by schools or enterprises of all.

There are six parts in its components including intelligent IP network infrastructure, operation and

development of curriculum, content creation, and content management, teaching management, delivery and expansion. Among them, the intelligent IP network infrastructure constitutes the foundation of digital campus network load platform, mainly to meet the service quality requirements. Data, voice and video integration, multicast technology, security, manageability, caching, content distribution technology in a new generation intelligent network of facilities provides a highly available and controlled infrastructure. Traditional e-learning network is shown in Fig. 1.

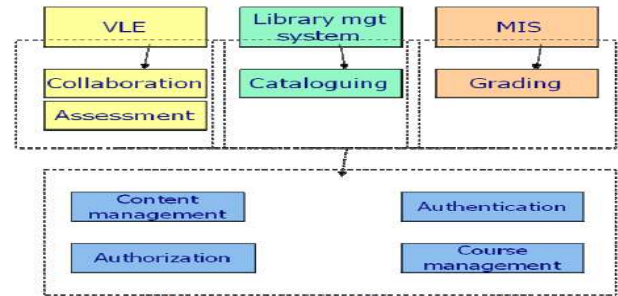


Fig. 1 Architecture of a simplified Learning System

In the traditional web-based system construction, maintenance and e-learning modes are located inside the educational institutions or enterprises, such as significant investment needed but without capital gains. The cloud-based environment supports the creation of a new generation of e-learning systems, to be able to run on the wide range of hardware devices, while storing the data in the cloud.

The e-learning ecosystem based on cloud computing and Web 2.0 technologies. The article analyses the most important cloud-based services such as highlights the advantages of deploying. 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.

In the current e-learning architecture model and on issues in current e-learning applications. For this 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 existing e-learning systems are not dynamically scalable and hard to extend the integration with other e-learning systems are very expensive. The hybrid cloud delivery model that can help in fixing the mentioned problems.

When the new paradigm is highlighted in the educational area by introducing the cloud computing in order to increase. The separation of entity roles and cost effectiveness can be considered important advantages. When the institutions will be responsible for the

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

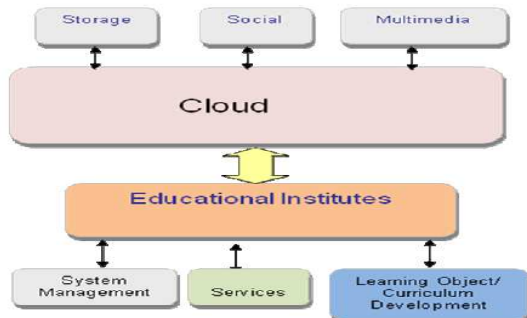


Fig. 2 Modified E-learning System Architecture.

Cloud Based E-Learning Architecture

E-learning cloud is a migration of cloud computing technology in the field of e-learning, which is a future e-learning infrastructure, that are including all the necessary hardware and software computing resources engaging in e-learning. After these computing resources are virtualized, for the students and businesses to rent educational institutions, computing resources and the e-learning cloud architecture. 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 that are including all the necessary hardware and software computing resources engaging in e-learning. After these computing resources are they can be fertilized in the form of services for educational institutions, for the students and businesses to rent computing resources. And the E-learning cloud architecture is shown in Fig.3.

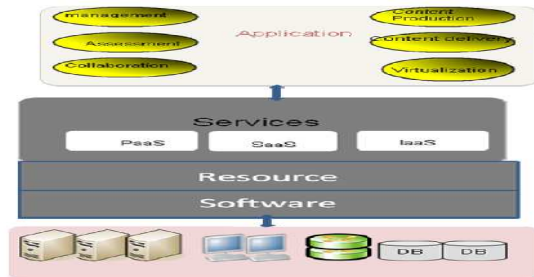


Fig. 3 E-learning Cloud Architecture.

E-learning cloud architecture logically it is divided into four layers, namely, Infrastructure layer, software resource layer, and the resource layer. The

proposed e- learning cloud architecture can be divided into the following layers:

A. Infrastructure layer is composed of information infrastructure and teaching resources. Information infrastructure contains the software, information management system and some common software and hardware; teaching resources are accumulated mainly in traditional teaching model and distributed in different departments and domain. This layer is located at the lowest level of cloud service and the basic computing power like physical memory, CPU, memory is provided by the lawyer. From the Virtualization group for being called by upper software platforms. When the physical host pool is dynamic and scalable, in order to enhance physical computing power for cloud middleware services. The following Fig. 4 depicts this in a clearer view.

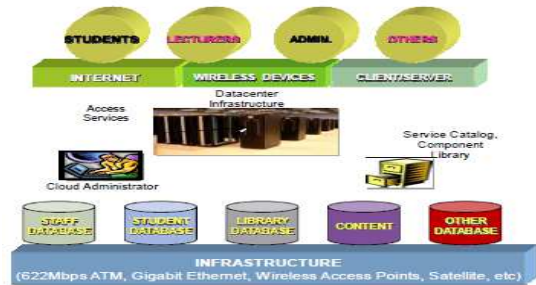


Fig. 4 Proposed Infrastructure Layer in an expandable view

B. Software resource layer mainly is composed by the middleware operating system. Through the middleware technology, a software resources are integrated to provide the unified interface for the software developers, so they can easily develop a lot of applications based on the software resources and, making them available for cloud computing users.

C. Resource management layer is the key to achieve loose coupling of software and hardware resources to them. Through the integration of Virtualization and cloud computing for, on-demand free flow and distribution of software over various hardware resources can be achieved.

D. The service layer has three levels of services namely, SaaS (Software as a service), Paas (Platform as a service), and IaaS (Infrastructure as a service). It can be provided SaaS, cloud computing services to the customers. As it is different from traditional software, to need a one-time purchase for software and hardware, and need not to be maintained and simply paying the monthly fee.

E. Business application layer: The key e-learning is different from other cloud is located in e-learning application layer, which represents the major e-learning business logic, composed of expanded upon a group of e-

learning components. E-learning application layer mainly consists of educational and management component [7].

Expected Benefit From The Architecture

One of the most interesting applications of educational cloud computing. And the educational cloud computing can be focused on the power of thousands of computers and only one problem, will be allowed researchers search and find models and make discoveries faster than ever. The universities can also open their technology for research advancements. And efficiencies of the cloud computing can be a help for universities keep pace with ever-growing resource requirements and energy costs. Students expect their personal mobile devices to connect to campus services for education. When we are asking for efficient access and faculty members are flexible when the integrating technology into their classes. To the 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, and educational tools. The intended advantages derived from the proposed architecture are as follows:

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 the 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 machines. For the organizations are 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 the 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 the 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. And the cloud computing provides some major security benefits for individuals and companies that are using/developing e-learning solutions.

H. 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 of requirements to be implemented this architecture, and the benefits can be easily justified the cost. This is followed Fig. 5 which can be illustrates the connectivity tier of the proposed architecture

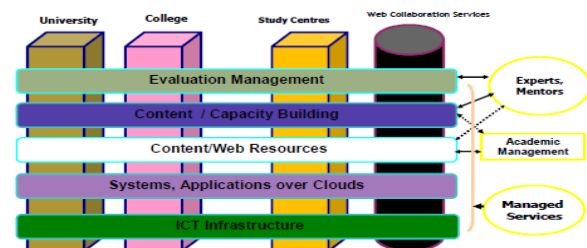


Fig. 5 Connectivity Scenario of the Institutions in the proposed architecture

I. In the classic e-learning model, teaching tasks, conduct regular lectures, and train for the students' skills. The students attend the online autonomous learning activities 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. We can also use multimedia to enhance teaching content. Students work out their own learning plans, and they will conduct on-line autonomous learning t and do some statistics to the test results. When the 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 knowledge, the coordination will also be fostered, and abilities to express themselves will be enhanced. Thus the learning and teaching will be the interactive mode of the proposed architecture is furnished in the Fig. 6.

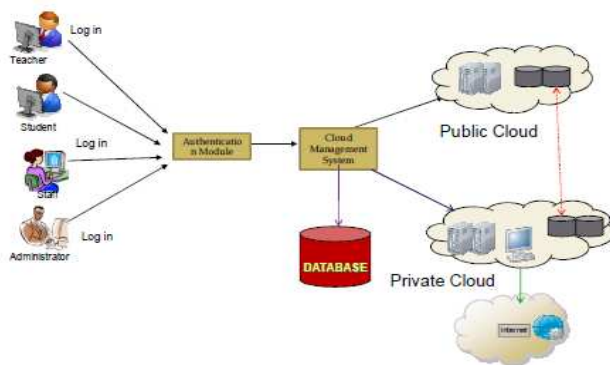


Fig. 6 Interactive mode of the proposed architecture

Conclusions

Cloud computing has recently emerged as a compelling paradigm for managing and delivering services over the internet. It is rapidly changing by the landscape of Information technology and ultimately turning to the long-held promise of utility computing. The cloud computing it can help for the communities and nations, can transform education. E-learning is an Internet-based learning process, using this Internet technology and to design, implement, and extend learning. The present economic situation will force different educational institutions and organizations to consider being cloud solution. The universities have to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of cloud solutions. To identify this work for the architecture this will be using Cloud Computing within higher education. And mainly, we have to consider the benefits of the cloud architecture. Our results suggest that the introduction of cloud computing into e-learning is feasible and it can greatly improve the efficiency of investment which can make e-learning system develops into a virtuous circle and achieve a win-win situation for suppliers and customers.

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