Cloud Computing Issues and Benefits Modern Education

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GJCST-B Classification : C.2.1

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Strictly as per the compliance and regulations of:

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I. Introduction

Since 2007, cloud computing has become hot issue, many companies began to attempt to use cloud computing services. With the convenience, economy, high scalability and other advantages, cloud computing enables the enterprise liberation from the heavy pressure of the IT infrastructure management and maintenance. Cloud computing change the Internet into a new computing platform, is a business model that achieve purchase on-demand and pay-per-use in network, has a broad development prospects [1].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. As e-learning has a lot of advantages like flexibility, diversity, measurement, opening and so on, it will become a primary way for learning in the new century[2]. In traditional web-based e-learning mode, system construction and maintenance are located in interior of educational institutions or enterprises, there left a lot of problems such as significant investment needed but without capital gains for them, which leads lack of development potential. In contrast, cloud-based e-learning model introduces scale efficiency mechanism, i.e. construction of e-learning system is entrusted to cloud computing suppliers, which

can make providers and users to achieve a win-win situation: on the one hand, the supply companies can use their own technological advantages to build an e-learning system with more stable performance, more comprehensive functions, and more secure features. Meanwhile, suppliers can take charge in some way so as to earn a reasonable profit to return funds. On the other hand, users can be free from the building and maintenance for e-learning system and specifically focus on the application of e-learning system in order to improve teaching quality and management level. In this model, the construction of cloud computing systems is separated from their usage, and through economic leverage there are sufficient back-up and maintenance funds to build and feed an e-learning system, which can make e-learning system development into a virtuous circle. Thus, emergence of cloud computing opens a new idea to further development for e-learning.[3] But the development of cloud computing is facing many critical issues, the most prominent is the security issue, with the growing popularity of cloud computing, the importance of security show gradual upward trend, become an important factor in the development of cloud computing. The purpose of this paper is attempted to bring greater clarity landscape about cloud computing security.

II. Cloud Computing

a) Definitions

Cloud computing is such a type of computing where you don't have to spend any money to build and maintain your IT infrastructure. When you need to use computing resources like application software, you just borrow that facility from a third party organization, and access that service via Internet. In return you pay the service provider as you use the computing power. In short, in cloud environment, you don't need to buy   any hardware and software to run your business applications   thus   it   helps   you   minimize your investment on   hardware   resources   and   IT maintenance team. [4]

b) Types of Cloud Computing Service

Currently,   cloud   computing   customers   can expect to get three types of services from cloud service providers and those three are:

1. Cloud infrastructure as a service- All the required hardware to run a business is provided

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by cloud service providers and the customers manage their own application software.[4]
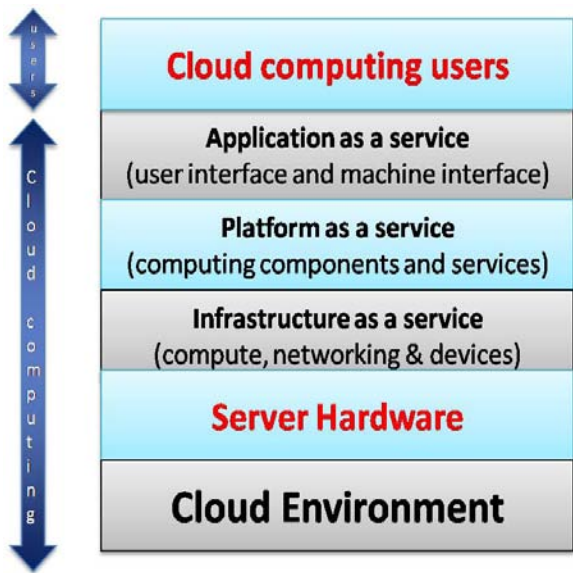

Figure 1: Cloud Computing

2. Could platform as a service-In this type of cloud computing, a customer pays to the service provider to use their platform as their IT solution. For example, if you need email system or database software for your business, you can use a third party's computing service that prove email and database solutions.
3. Application software as a service- If you only need to use a specific kind of software to get a output or to perform an analysis, then it is much cheaper to use that software service from a cloud service provider rather than buying, installing and maintaining it.

c) *Cloud Service Providers*

Unlike web hosting solutions, there is only a limited number of clouding computing service providers. But the good news is that all the major hardware and software brands of the world including Google and Microsoft are already providing cloud solutions. The other major cloud service providers are HP, DELL, Amazon and IBM.[4]

III. KNOWLEDGE ON E-LEARNING

Web based training (WBT). These terms express the way of E-Learning teaches them with the advancement of computer technologies day by day, work becomes simplified with the help of preprogrammed software applications. E-Learning is one of the most famous technologies discovered to make the traditional way of education learning easier with the help of software applications and virtual learning environment. The word ―E‖ means the electronic way of learning in the E-Learning. There are various names that

are used to express the term E-Learning in a technology world such as Computer based training (CBT), Internet based training (IBT), and lesson to the e-learner. E-learning comes through a network enabled computer and transfers the knowledge from the internet sources to end users machine. Usually the E-Learning works with the help of software applications and usually the information is transferred with the help of internet, audio/video files, satellite TV, media disks. These materials are having the contents like text, image, animation, audio/video to deliver the learning materials to E-Learning users. Many universities and institutions are implementing the e-learning for their distance education programmers and also used it to enhance the ability of other educational degree programmers. Cloud computing, mobile learning, communication technology, etc. are of help to bring the E-Learning to next level of IT world. (Welsh et al., 2003). [5]
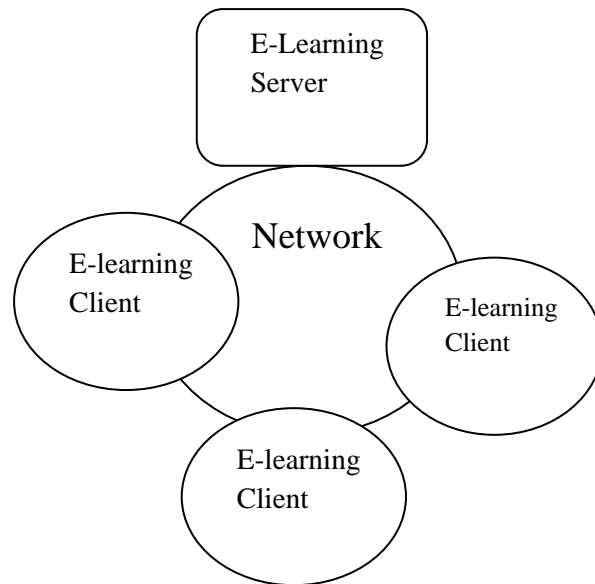

Figure 2: E-Learning systems (Pocatilu et al., 2009)

a) *E-Learning Cloud Computing Model*

Clearly, the traditional e-learning network is built and maintained by schools or enterprises, and their applications are also developed by themselves. Therefore, the costs of equipment investment, development and maintenance are afforded by schools or enterprises themselves, which would take a lot of expenditure. If moving e-learning system going out of schools or enterprises, entrusting its construction, maintenance, development and management to vendors, opening it up to multiple users through the Internet and letting them use on-demand and payment is based on the amount of used servers, it can not only reduce charges for schools or enterprises, but for suppliers it can also achieve economies of scale. This business model of e-learning system is called e-learning cloud model on cloud computing. [3]

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b) E-learning Cloud Computing Business Model

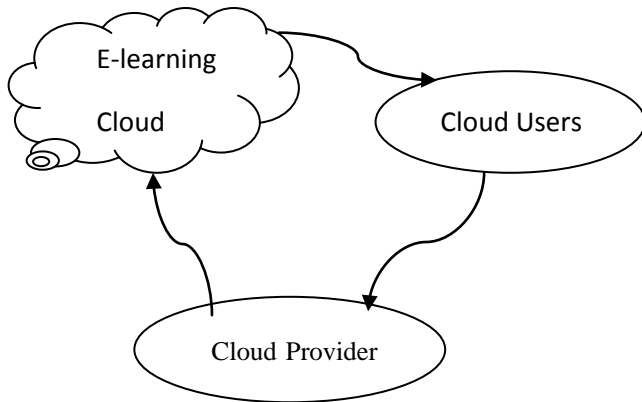E-learning cloud computing business model is shown in Figure 3.

Figure 3: Business model of e-learning cloud computing

In e-learning cloud computing business model, cloud provider is responsible for building and maintaining elearning cloud, providing technical support to e-learning cloud. Cloud users paid to cloud provider for services from e-learning cloud, services accessed on-demand. In Figure 2, during the cycle, servers support users, funds support provider, technologies support e-learning cloud, what is a business cycle is a virtuous cycle. [3]

IV. 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:
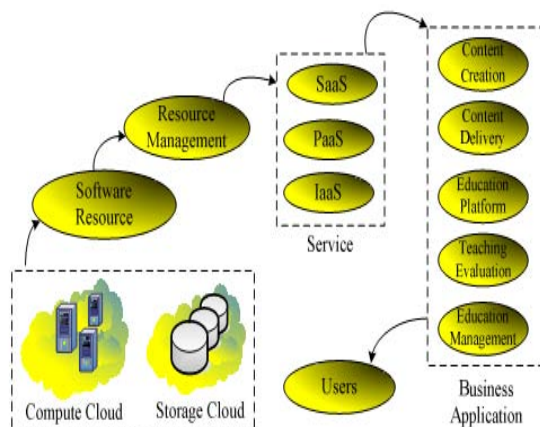

Figure 4: Architecture of e-learning cloud

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. [5]

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.

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.

a) Key Benefits of Cloud Based E-Learning

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

1) Lower costs

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. (Al-Jumeily et al., 2010)

2) 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.(Rao et al., 2010)

3) 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. (ibid)

4) 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. (ibid)

5) 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. (Pocatilu et al., 2009)

6) 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. (ibid).

V. Cloud Computing Issues

In the last few years, cloud computing has grown from being a promising business concept to one of the fastest growing segments of the IT industry. Now, recession-hit companies are increasingly realizing that simply by tapping into the cloud they can gain fast access to best-of-breed business applications or drastically boost their infrastructure Resources, all at negligible cost. But as more and more information on individuals and companies is placed in the cloud, concerns are beginning to grow about just how safe an environment it is [6].

a) Security

Where is your data more secure, on your local hard driver or on high security servers in the cloud? Some argue that customer data is more secure when managed internally, while others argue that cloud providers have a strong incentive to maintain trust and as such employ a higher level of security. However, in the cloud, your data will be distributed over these individual computers regardless of where your base repository of data is ultimately stored. Industrious hackers can invade virtually any server, and there are the statistics that show that one-third of breaches result from stolen or lost laptops and other devices and from employees' accidentally exposing data on the Internet, with nearly 16 percent due to insider theft [8].

b) Privacy

Different from the traditional computing model, cloud computing utilizes the virtual computing technology, users 'personal data may be scattered in various virtual data center rather than stay in the same physical location, even across the national borders, at this time, data privacy protection will face the controversy of different legal systems. On the other hand, users may leak hidden information when they accessing cloud computing services. Attackers can analyze the critical task depend on the computing task submitted by the users [9].

c) Reliability

Servers in the cloud have the same problems as your own resident servers. The cloud servers also experience downtimes and slowdowns, what the difference is that users have a higher dependent on cloud service provider (CSP) in the model of cloud computing. There is a big difference in the CSP's service model, once you select a particular CSP, you may be locked-in, thus bring a potential business secure risk.

d) Legal Issues

Regardless of efforts to bring into line the lawful situation, as of 2009, supplier such as Amazon Web Services provide to major markets by developing restricted road and rail network and letting users to choose "availability zones" [10]. On the other hand, worries stick with safety measures and confidentiality from individual all the way through legislative levels.

e) Open Standard

Open standards are critical to the growth of cloud computing. Most cloud providers expose APIs which are typically well-documented but also unique to their implementation and thus not interoperable. Some vendors have adopted others' APIs [11] and there are a number of open standards under development, including the OGF's Open Cloud Computing Interface. The Open Cloud Consortium (OCC) is working to develop consensus on early cloud computing standards and practices.

f) Compliance

Numerous regulations pertain to the storage and u se of data require regular reporting and audit trails, cloud providers must enable their customers to comply appropriately with these regulations. Managing Compliance and Security for Cloud Computing, provides insight on how a top-down view of all IT

resources within a cloud-based location can deliver a stronger management and enforcement of compliance policies. In addition to the requirements to which customers are subject, the data centers maintained by cloud providers may also be subject to compliance requirements.

g) Freedom

Cloud computing does not allow users to physically possess the storage of the data, leaving the data storage and control in the hands of cloud providers. Customers will contend that this is pretty fundamental and affords them the ability to retain their own copies of data in a form that retains their freedom of choice and protects them against certain issues out of their control whilst realizing the tremendous benefits cloud computing can bring.

h) Long-term Viability

You should be sure that the data you put into the cloud will never become invalid even your cloud computing provider go broke or get acquired and swallowed up by a larger company. "Ask potential providers how you would get your data back and if it would be in a format that you could import into a replacement application," Gartner says.

i) Solution

To advance cloud computing, the community must take proactive measures to ensure security. The Berkeley paper's solution is the data encryption. Before storing it at virtual location, encrypt the data with your own keys and make sure that a vendor is ready for security certifications and external audits. Identity management, access control, reporting of security incidents, personnel and physical layer management should be evaluated before you select a CSP. And you should minimize personal information sent to and stored in the cloud. CSP should maximize the user control and provide feedback. Organizations need to run applications and data transfer in their own private cloud and then transmute it into public cloud. While there are many legal issues exist in the cloud computing, Cloud Security Alliance should design relevant standards as quickly as possible.

VI. Conclusion

Cloud computing is a recently developed advanced Internet-based computing model. By combination of cloud computing and e-learning, building cloud-based e-learning system opens up new ideas for the further development of e-learning.in this paper we discuss a cloud computing based elearning. Describe its definition, benefits & some issues. There is no doubt that the introduction of cloud computing into elearning is feasible & brings us the approximately infinite computing capability, good scalability, benefits & so on.

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