

Security Issues in Cloud based e-Learning Part 3(e-Learning Architecture)

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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:

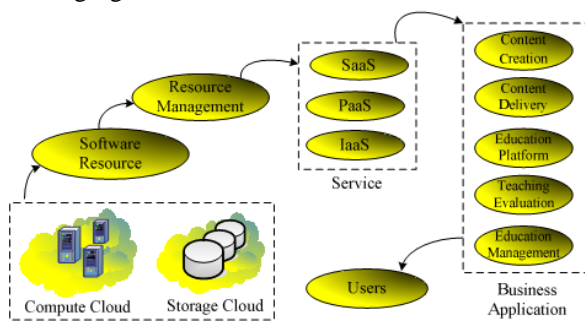


Figure : Architecture of e-learning cloud [1]

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

1) **Hardware resource layer:** This is bottom most layer in the cloud service middleware where it handles the essential computing things like physical memory and CPU for the total system. This layer is most important for the total infrastructure of the system. With the help of virtualization, physical servers, network and storage are grouped and called it as upper software platform. To offer the uninterrupted 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.

Mobile E-Learning

Mobile technologies are one of the fastest going technologies in the current IT world. Mobile phone manufacturers and service providers are introducing new models almost every month with new innovations and technologies in those mobile phones. Like mobile phone development, tablet pc are using mobile technologies and many IT related companies have come forward with new innovation and trends in the tablet pc technology. [1]

Companies like android, Microsoft, apple, etc., are developing operating systems for the tablet machines with attractive user interface. Google's android are used almost every tablet PC's in market now except some machines like Apple's iPad. So with the help of this mobile technology, E-Learning gets the new shape to develop its technology in

mobile phones and tablet PCs platform. With the help of Mobile E-Learning, e-learning users will get accessibility to reach e-learning materials at anytime and anywhere they need to learn from e-learning sources. Mobile E-Learning is especially achieved with the help of cloud computing, because cloud sources are easily able to achieve in anywhere and anytime in any kind of machines like PC, mobile phones, Tablet PCs, PDAs. So e-learners can able to use the e-learning sources from either PC or Mobile phones/Tablet PCs. [1]

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.[1]
- 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.
- 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.
- 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.
- 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.

Current limitations in Cloud based e-learning

While the cloud based e-learning is having numerous advantages, still there are some disadvantages in cloud computing to e-learning technology. Those limitations in cloud based e-learning technology are discussed in this section:

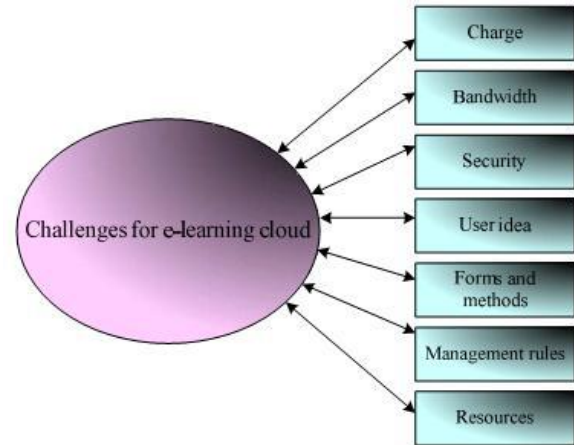


Figure Challenges for E-Learning cloud [1]

□ **Charge:** When cloud computing is used for e-learning systems, charges are very crucial in the overall system - how the cloud vendors charge the schools and individuals. The solution to this problem is not to follow the market oriented charge mechanism. That means, they need to combine the school fees and individual fees instead of charging the school for using general resources and charges the individual for using special resources.

Bandwidth: Since the cloud based e-learning fully depends on the internet sources, bandwidth plays a vital role to deploy the data in internet servers. One way to solve the problem is to develop fibre optical network to provide the better bandwidth for using the cloud resources for e-learning educational environment.

Security: Security plays a vital role as some of the e-learning materials are confidential. If the data is stored in cloud, the question of security of this valuable data on unknown cloud servers arises. So the confidential data needs to be encrypted before storage in cloud servers.

User idea: Infrastructure of cloud computing, IT service delivery, and usage patterns used in cloud based e-learning undermines the traditional way of using computer technology. So it will lead to affect the e-learning user's ideology and their acceptance on further development on cloud based e-learning. To avoid this problem, there is need to build the good case models for cloud based e-learning and need to promote their applications widely to reach more e-learners.

Educational forms and methods: The main challenge for e-learning technology is the replacement of traditional educational forms and methods. But e-learning is not entirely removing the importance of teachers in its

technology; instead it gives more freedom for teachers to build the environment which they like to provide for the students. So to overcome these issues, teachers need to involve themselves in cloud based e-learning applications.

Education management rules: Traditional learning environment varies from e-learning environment. In this case if cloud is used for e-learning systems there may be a chance for new problems on learning environment through cloud based e-learning. So to overcome this problem, suitable management rules are to be maintained for cloud based e-learning. Teaching content management, course management, examination management, performance management, student management, teacher workload management, etc. are to be structured.

Resource development: In any technology, the stakeholders need to be involved in its development to bring the best outcome from its usage. When it comes to cloud based e-learning technology, the teachers, and other educational experts should be involved in its resource development to bring the best set of scientific, interesting, and artistic learning resources.

Refereces:

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