Chapter 70
A Cloud-Based Architecture for Interactive E-Training

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ABSTRACT

Cloud-based technologies play a significant role in the technology-enhanced learning domain. The adoption of cloud technologies in the educational environment has a positive impact on the learning process by offering new tools and services to improve and support the learning life cycle, including interactivity. In specific fields, such as clinical skills training, that involve computer-intensive training scenarios, there is an increased demand to deliver training services to a larger number of learners, therefore the need for cloud services. However, to date there has been a lack of a formalized framework relating to the use of cloud computing for on-demand interactive e-training resources. This paper is to formalize a theoretical framework for an interactive e-training system particularly for clinical skills training, taking into consideration e-training system requirements and with a focus on applying cloud technologies to ensure the dynamic scalability of services and computing power while maintaining QoS and security

INTRODUCTION

Traditionally, clinical skills training involves the use of face-to-face lectures to teach knowledge, skills and behavior. There is growing interest internationally in clinical skills education, especially shortened graduate programmers, also known as "accelerated programmers," which have been introduced to enhance interest in this field in order to increase the number of skilled people and address the recruitment crisis, particularly in nursing (Bloomfield et al. 2013).

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E-learning is widely regarded as a valuable mechanism for the acquisition of clinical skills where flexible access to e-learning resources and the opportunity to engage in independent learning enables students to practice skills at a time of their own choosing and at their own pace (Bloomfield & Jones, 2013). One of the benefits of utilizing the powerful features of e-learning tools is that it provides valuable feedback to the learners throughout the training process, it allows them to select the learning content; and it enables them to engage in self-assessment and to evaluate the results of their learning. However, resources need to be developed to provide an online and realistic training environment. Therefore, it is important to be able to access virtual resources, such as online simulations and virtual lab repositories, to provide on-demand up-to-date training.

Recently, e-learning systems have faced new challenges and limitations for several reasons, including the growing number of users with frequently changing requirements and educational demands. Moreover, accelerated programs which condense coursework into a shortened learning life cycle limit the training opportunities for learners, especially in practical subjects. Also, the growing volume of educational and training materials presents difficulties in terms of adequate storage and ensuring a secure method of data transmission. Consequently, there is an urgent need for new learning models that offer a pragmatic, immersive experience for trainees which utilize different types of resources and which are accessible to many users concurrently, at any place and at any time. There is also a need for a technologically advanced, adaptive virtual environment to support on-demand network access to use the available virtual distributed resources.

A promising solution to the limitations facing e-learning in relation to scalability to enable it to cope with the increasing number of users and resources is cloud computing, which can provide educational institutions with a distance computing infrastructure and data as a service on-demand over the Internet (Fasihuddin et al., 2012). It also offers educational platforms and services, and virtualization by combining all resources and centralized data storage (Ghazizadeh, 2012).

Particularly, for clinical skills learning where services such as virtual labs, simulations, and multimedia provision are computer-intensive and should be offered in a highly scalable way, the cloud-based environment can enable both students and their instructors to access computing resources on-demand for lectures and labs, according to their learning needs (Gonzalez-Martínez et al., 2015).

However, many challenges associated with cloud deployment may arise, such as data privacy, security, availability, consistency, and transmission. Many research studies have proposed solutions to tackle these problems. One solution for educational institutions is for them to build their own private cloud in which to place their sensitive data under their own management. Other research suggests using a cloud backup for important data and information to ensure the requirements of the Service Level Agreement, which specifies the terms of the contract, are met in relation to the provision of the cloud services (Fasihuddin et al., 2012).

Despite the effective solutions which have been applied to cloud models to fit e-learning environments, there is still a growing need for a customized e-training cloud platform that meets the specific needs of training environments. For this reason, the aim of this paper is to introduce a theoretical framework for a cloud-based e-training system, taking into consideration e-training requirements and utilizing the capabilities of cloud computing to address the challenges, such as QoS in terms of resource provisioning and security in terms of data protection in transmission and storage.