A Mobile Service Platform for Trustworthy E-Learning Service Provisioning

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ABSTRACT

Distant e-learning emerges as one of promising means for people to learn online. Although there is a substantial increase in computer and network performance in recent years, mainly as a result of faster hardware and more sophisticated software, there are still problems in the fields of integrating various resources towards enabling distant e-learning. Further, with the advances of technologies in RFID, sensors, GPS, GPRS, IP networks, and wireless networks, mobile learning is becoming a viable means for teaching and learning. In this book chapter, we develop a service platform for mobile learning with trustworthy service provisioning based on an organic integration of our prior research results in service grid, on demand e-learning, and trusted mobile asset tracking. In this platform, the virtual learning services for students, instructors and course providers are provided leveraging on service grid resource management capabilities on group collaboration, ubiquitous data access, and computing power. Challenges and requirements for mobile learning service platform are discussed. An RFID based e-learning data integration is proposed with integrated service networks for intelligent e-learning information access and delivery.

INTRODUCTION

Over the past few decades, Computer Based Training (CBT) solutions evolve from stand-alone to web-based package (Web Based Training – WBT) with rich multimedia content. Today, most of the web-based solutions leverage on various load-balancing techniques to increase their performance, availability and reliability. Such techniques suffer from the fact that the solution must be able to handle the load of the estimated maximum number of participants and the system resources must be powered by homogeneous platform (both hardware and software). On the other hand, most of the CBT and WBT solutions available today advocate “self-learning” (Zemke, R., & Zemke, S. 1995) and provide limited interactivity and instantaneous feedback mechanisms that are provided in traditional teaching environment. The sequencing of the courseware is pre-built and thus it may not be applicable for all types of learning. It also fails to facilitate the learning process by creating learning community.

Furthermore, multimedia rich courseware and community portal demand huge data storage that may growth with time. Flexible data storage scheme is required to tackle the on-demand storage needs.

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The approach of “On-Demand e-Learning” intends to tackle the problems inherited from the inefficient use of data resources of existing database technology and traditional approach in offering e-learning package (Luo, Z., Fei, Y., & Liang, J., 2006). The primary objective is to develop virtual learning service community for all community participants including students, instructors, and courseware providers leveraging on Service Grid technologies (Luo, Z., Zhang, J., & Badia, R. 2005), for e-learning services development and access, ubiquitous data access, group collaboration, and computing resource management.

Furthermore, today’s world has witnessed the trend of convergence of computing and communication, and integration of sensor and mobile technologies for enabling a new generation of e-learning applications in a mobile and pervasive manner. With mobile applications becoming more and more attractive, location awareness is becoming a fundamental requirement in mobile e-learning solutions offering functions for such as mobile e-learning asset management to enable efficient utilization of resources. A key enabling technology for such location awareness is through positioning technologies, of which GPS, global poisoning system, is becoming more and more popular in outdoor environment. Other enabling technologies include Radio Frequency Identification (RFID), which could be used to uniquely identify an object. This RFID technology is particularly helpful in pushing asset management at an even finer granularity, e.g. from case level to item level.

Location aware e-learning applications and services, e.g. track and trace for managing asset, are especially helpful in identification of the move paths of the asset and can help identify e-learning patterns, enabling more efficient e-learning information exchange and asset utilization. However, these features would incur a few problems as well. The feature, if wrongly used, e.g. by an un-authorized party, would lead to leakage of patterns (such as utilization, trend, etc.) about the e-learning asset under management as well as individual’s behavior. The rapid technology advances in business intelligence tools, e.g. data mining and knowledge discovery has made this type of threats even more severe. Thus, to protect the privacy of individuals as well as companies’ trade secret, it is necessary to develop a secure system for managing the e-learning asset, raising the bar for obtaining valuable information to breach the location information integrity for managing the e-learning participant and asset (Zhang, T., Luo, Z., et al., 2008).

All of these require for a holistic view on integrating related technologies, such as position technologies like GPS, sensing and identification technologies like RFID, and security technologies like authentication and authorization. Thus, we need an integrated service network approach that supports sharing, accessing and managing e-learning resources and leverages various positioning, sensing and security services that are available to the network. Through this integrated service network, information about e-learning participants and the e-learning asset shall be made available to the network participants. E-learning participants and asset tracking then could be developed and services could be offered to deliver the information securely to interesting participants.

In the book chapter, we will present a service platform for mobile learning with trustworthy service provisioning, called MiQ-SP, for tracking e-learning participants and managing e-learning asset, developed based on an integrated service network concept. In MiQ-SP location information about e-learning participants and asset could be obtained via several location positioning technologies. Status about the asset could be monitored via sensing technologies. MiQ-SP could be able to deliver the asset information to the interesting parties via integrating various communication technologies. Furthermore, MiQ-SP would ensure asset information integrity in order to provide trusted e-learning services to its service customers.