The Design and Implementation of an Adaptive Mobile Learning Mechanism

Hsu-Yang Kung & Ming-Yao Wu
Department of Information Management,
The National Pingtung University of Science & Technology, Taiwan, ROC
kung@mail.npust.edu.tw, hinco@mail.cwjh.ptc.edu.tw

Abstract

The great challenges on traditional electronic learning system are the lack of real-time interactivity and adaptive learning. In this paper we present a framework of mobile learning system to overcome above challenges. The proposed framework includes the distributed computing capability offered by Access Grid. Furthermore, framework also integrates synchronous / asynchronous learning system to create a novel hybrid leaning environment.

1. Introduction

The development of information technology is more and more widespread in the domains of computer devices, broadband and wireless network. Learners can easily retrieve necessary learning materials in any time and from any places by connecting to the network.

How to resolute interaction between students and teachers distributed in different places? How to support mobility on learning activities? It has become a great challenge to the learners and system developers. A well-designed electronic learning system not only has to offer digital learning materials, but also have the capability of real-time interaction and mobile learning.

2. Related work

General speaking, mobile learning is considered the combination of mobile computing and electronic learning. Mobile learning holds the following properties including dynamic contents, real-time interactive and collaborative and so on. [1]

The Access Grid project is a system of video conference developed by the Future Laboratory of Argonne. [2] It focuses on larger scale room-oriented collaboration and semi-immersive visualization system for simulating the environment to face-to-face. [3] Access Grid system can apply to variable researches that require interaction with and multicasting the media streaming to distributed sites or groups to work together. [4]

In this paper, we integrate the presented learning management system (LMS) with Access Gird to create the learning environment or asynchronous and synchronous learning. [5]

3. System framework

The framework contains three important components: server cluster, real-time video learning, mobile users and learning environment. It also creates two learning environments: infrastructure and Ad Hoc learning environment, furthermore be combined into one hybrid environments. Figure 1 illustrates the design of framework.

3.1. Server cluster

This component consists of multiple servers with different tasks and can provide the ability of adaptivity. Venue server is responsible to serve video conference learning using multicasting. Bridge server can unicast the video streaming to distributed Access Grid nodes. Media server can provide the media services to those nodes that are not Access Grid enabled. Learning content management system (LCMS) and LMS are responsible to manage the most of learning activities.

3.2. Real-time video conference

The component creates a real-time learning environment throughout all distributed Access Grid nodes that consist of room-based nodes and single nodes. The component is also flexible to   transfer the

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media streaming to nodes that is not Access Grid enabled via media server.
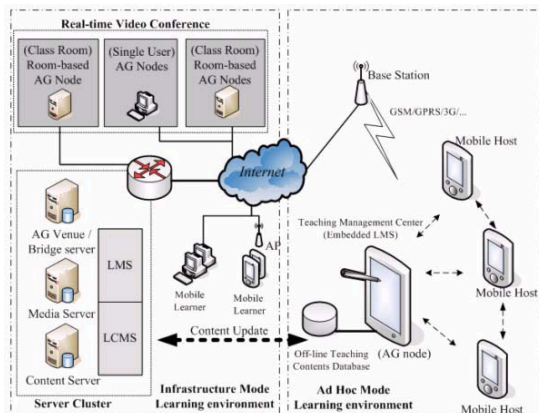

Figure 1: The framework of mobile learning system.

3.3. Mobile users

Mobile user is the center of mobile learning. Users can be the Access Grid nodes or single users by using any kinds of computer devices attached to the local area network or internet.

3.4. Infrastructure learning environment

This environment consists of wired local area network and wireless network with access point attached to the Ethernet. Because higher and more stable available network bandwidth, users can retrieve higher quality learning materials.

3.5. Ad Hoc learning environment

Although the topologies are changed frequently in this environment, but all mobile hosts have higher mobility. LMS offer adaptive contents for various learning tools with limited network bandwidth. All participates create the wireless network environment together called Mobile Ad Hoc network (MANET). Teacher's Tablet PC built-in a lightweight embedded LMS to become the temporary teaching management center (TMC). TMC also provides learning materials and streaming media immediately. All of the learning profiles can be recorded and collected into offline database within teacher's Tablet PC, and updates them to the server side after tablet PC is online again.

4. Implementation

We applied the framework recently to the natural scientific experiment course in senior high school. We

have implemented a GUI on Asus A716 PDA using Python language for CE. Figure 2 illustrates the design of PDA and LMS. The PDA not only can join the venue server of Access Grid easily, but also can retrieve the learning materials from the LMS.

Figure 2: The snapshots of PDA and LMS.

5. Conclusion

In this paper, we present a flexible and hybrid framework of adaptive mobile learning system. The system is still under developed now. We hope it can work well and fit to learning task. The future work is to add more advanced features of learning technology and learning theory into the design.

6. Reference

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