

Chapter 2.8

Web-Based Seamless Migration for Task-Oriented Mobile Distance Learning

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ABSTRACT

As a new kind of computing paradigm, pervasive computing will meet the requirements of human being that anybody maybe obtain services in anywhere and at anytime, task-oriented seamless migration is one of its applications. Apparently, the function of seamless mobility is suitable for mobile services, such as mobile Web-based learning. In this article, under the banner of seamless mobil-

ity, we propose a kind of approach supporting task-oriented mobile distance learning paradigm. Web-based seamless migration, which has the capability that task for mobile distance learning (MDL) dynamically follows the learner from place to place and machine to machine without learner's awareness or intervention by active service. Our key idea is this capability can be achieved by architecture of component smart platform and agent-based migrating mechanism. In order to

clarify the approach, firstly, a description of the task for mobile distance learning and migrating granularity of task has been suggested. Then, the mechanism of seamless migration has been described, including solving several important sub-problems, such as transferring delay, transferring failure, residual computation dependency. Finally, our implemented platform for Web-based seamless migration has been explained, the validity comparison and evaluation of this kind of mobile distance learning paradigm is shown by an experimental demo. Suggested Web-based learning paradigm by seamless migration is convenient to distance learn during mobility and is useful for the busy or mobile distance learner.

INTRODUCTION

It is known to all that pervasive/ubiquitous computing (Weiser, 1991) is a new computing paradigm fusing the technologies of computing, communication, and digital multimedia, which integrates information space and physical space of human being's life, so it makes the computing and communication just like the life necessity, such as water, electricity, and air. This paradigm meets the requirements of human being that anybody maybe obtain services in anywhere and at anytime, so it is full of future. Nowadays, many ambitious projects have been proposed and carried on to welcome the advent of pervasive computing. There are a bunch of branch research fields under the banner of it, such as Seamless Mobility (Satyanarayanan, 2001).

For seamless mobility, the history and context of computing task will be migrated with person's mobility, and the computing device and software resource around this task will make adaptive change. The chief function requirement of seamless mobility is on the continuity and adaptability of computing task. The continuity is that the application can pause and continue the work without the loss of the current state and the running

history. The adaptability is that the application is not restricted by computing device and context of service but adaptable to its environment.

Apparently, this function of seamless mobility is suitable for mobile learning paradigm (Taka-sugi, 2001, 2003). For learner, it is necessary and accessible when he or she can NOT complete his or her learning task/courseware, such as video, audio, text, picture, etc., in one specified scene, he or she can go on learning the uncompleted task/courseware in other spots by seamless mobility based on the Web. In our opinion, this is a kind of mobile working paradigm — learning by seamless migration with computing task. But when seamless migration for computing task of learning is realized on PC, laptop, or PDA, there are several difficult problems to be solved: (1) Meet different networked Web environment, such as different OS platform. (2) Manage the seamless-service among multiple machine devices. (3) Describe computing task of learning and only migrate the relative parts of task interested by learner in order to reduce the delay produced by migrated data.

In this article, we propose a test bed of learning by seamless migration for mobile learning, which can be suitable for the required dynamic changes to the network and environment without learner awareness or intervention, and the condition of only sitting in front of the desktop PC for mobile learning is unnecessary. The structure, mechanism, result of experimental evaluation of the test bed is reported. It makes the ultimate mobile system possible by dynamically implementing the changes required to follow the learner from place to place and machine to machine.

The rest of this article will be organized as follows. Firstly, we give formal description of task of mobile distance learning and migrating granularity of task of learning. After that, we design and discuss efficient approach of Seamless Mobility based on agent for task-oriented mobile distance learning, along with the description of our implemented platform for Seamless Mobility.

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