Chapter 2

Designing an Architecture to Provide Ubiquity in Mobile Learning

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ABSTRACT

Nowadays, mobility offers potential opportunities for student’s learning. The well-known paradigm “learning anywhere anytime” is possible thanks to mobile terminals and wireless technologies that solve the limited access of wired technologies for usage due to lack of mobility. In this scenario, many projects are dealing with the use of mobility to solve specific learning activities in different environments. This chapter presents a project called Campus Ubicuo and its architecture. The novelty of this system is the integration of several wireless technologies in an only mobility learning environment. The development of the project has been divided in four parts, isolating the user interface from the communication model and from the data management. This means that the system is available in different contexts and could be easily adaptable to several organizations such as hospitals, schools, or city councils. We explain how this architecture has been designed and developed to become a solid base of mobility learning systems.

DOI: 10.4018/978-1-60566-882-6.ch002

INTRODUCTION

Although the basic applications and guidelines that make the Internet possible had existed for almost a decade, it wasn’t until the late 1980s and early 1990s that the network began to grow at a dramatic rate, modifying little by little our lives. As the Internet continues with its evolution, there is a parallel phenomenon taking place in wireless communications which is equally influential. Nowadays everyone owns, at least, a mobile device so the current demand of ubiquitous connectivity has turned into a reality that is necessary to satisfy, so those services traditionally offered in wired networks must also

DOI: 10.4018/978-1-60566-882-6.ch002
be offered in mobile network (Koodli & Perkins, 2007).

When we think of why mobility is so important, we can show some data. For example, at present, the number of subscriber connections in mobile telephony is over 3,500,000,000 (GSM World, 2008). This means that if there was one active subscription per person, more than half the world’s population would use a mobile device.

In the field of education, the evolution process has been the same. First of all, education based in computer technology, where no in-person interaction takes place was called e-learning. Then, when mobility devices are essential in our lives, a new paradigm in educational science has arisen to take advantage of learning opportunities offered by portable technologies (Hadzilacos & Tryfona, 2005).

This new learning system has different definitions, depending on who is going to use it because each one of them has its own idiosyncrasy and its scope of application. From the point of view of its conception and development as an educational tool, this kind of learning systems has a pedagogical and technological duality (Georgiev, Georgieva & Trajkovski, 2006).

The aforementioned evolution must be accompanied by the development of new applications, architectures and systems to offer mobility services that can complement the learning process.

In last years the research community has started to focus some attention on this topic and some proposals and contributions have been made. In this sense, GITACA Research Group (Gitaca, 2008) contributes in this subject with a mobility project that takes in account three main features that are the basis of the whole design: User mobility in wireless networks; the Quality of Service (QoS) in the mobile communications; and finally, security issues of the information transmitted across mobile networks. Ubiquitous Campus (hereafter Campus Ubicuo) project proposes to interrelate them by means of free software, which contributes with new some advantages.

This project is the outcome of the experience obtained after some years of research into communications, mobility, educational improvement, free software and applied telematic systems, and comes up to take advantage of the mobile and portability possibilities of PDA (Personal Digital Assistant) devices, mobile phones and laptops. Thanks to these elements as well as technologies like GSM (Global System for Mobile Communications), GPRS (General Packet Radio Service), UMTS (Universal Mobile Telecommunications System), Bluetooth or WiFi (Wireless Fidelity).

The rest of the chapter is organized as follows. First, a brief background about technologies used in the design, as well as, an overview of other mobile learning architectures is presented. Then, in the main section of the chapter, the development is described in detail. Finally, conclusions and future work are discussed.

**BACKGROUND**

**Mobile Computing in the Learning Process**

Learning centers (universities, high schools, training centers,…) and, in general, all kind of organizations (city councils, museums, hospitals, …) are very interested in the emergence of wireless communications. Workers, professionals and learners use their portable devices to be connected to the Internet in their daily activity, using them to address many of the needs of today’s learners.

Mobile communications are the basis that makes possible this new learning method. The scene of an organization is composed by several wireless technologies. Some of them are shown in Figure 1. In this image a hospital (a) and a high school (b) are presented with a network infrastructure that allows user mobility. WLAN (Wireless Local Area Network) or Wi-Fi networks are the most common wireless technologies in a local institution; GPRS and UMTS allows mobility in