# Chapter 3.6
# Technical Evaluation of Wireless Communications in a Mobile Learning Architecture

**Javier Carmona-Murillo**
*University of Extremadura, Spain*

**Jaime Galán-Jiménez**
*University of Extremadura, Spain*

**José-Luis González-Sánchez**
*University of Extremadura, Spain*

## ABSTRACT

*Due to the high growth of mobile networks and portable devices, learning process is evolving from desktop computer to mobile devices. In this sense, technologies and services that support this change are also evolving. The appearance of portable devices has made users to take part in this process from anywhere. On the other hand, architectures used in a mobile learning environment are designed to offer users the ability of participate in learning activities from its embedded devices. Campus Ubicuo is a mobile architecture over which learning services can be developed. The successful of any mobile learning platform fundamentally depends on the quality in learning services and also in the good operation of wireless technologies. In this chapter, we focus on this second aspect. We have evaluated the behaviour of wireless technologies in a mobile learning architecture when different services are offered through diverse networks.*

## INTRODUCTION

Mobile learning is defined as the type of learning characterized by the usage of mobile communications technologies. M-learning also takes advantage of portable devices such as mobile phones, laptops or PDAs. The development of mobile learning is not intended to replace the traditional classroom learning, but to enhance the value of wireless communications networks (Yu-Liang, 2005). Mobile learning scope is not only focused on learning centers. In fact, over the last years, mobile learning popularity has grown significantly and many projects about this subject have been

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developed in schools, workplaces, hospitals, museums, cities and rural areas.

We have designed an architecture called Campus Ubicuo (Carmona-Murillo, 2007) and several telematic applications to provide mobility in a university campus environment which is being adapted to other organizations with mobility needs. In fact, starting from Campus Ubicuo architecture, we are working in two projects focused on offer mobility services in a hospital and in a city for tourist industry. These projects are called MESEAS (Meseas, 2008) and Libre Movicuidad (Gitaca, 2008) respectively.

In Campus Ubicuo, several technologies are involved, such as GSM (Global System for Mobile communications), GPRS (General Packet Radio Service), UMTS (Universal Mobile Telecommunications System), Bluetooth, Wi-Fi; portable devices such as laptops, mobile phones and PDAs; and some applications developed to offer mobility and learning services to the users.

Usually, when mobile learning architectures are evaluated, the model is analyzed from a learning process point of view. Obviously, this is a main aspect, however there is another point of view based on mobile technologies. We are talking about a mobility platform over which offer m-learning services, and the most important feature in the mobile environment is mobility itself. That is why in this chapter we show a performance evaluation of wireless communication in Campus Ubicuo. We have done this evaluation from two points of view: Local wireless networks such as Bluetooth or Wi-Fi, and global mobility communications such as GSM, GPRS or UMTS.

If mobile learning platforms are used by lots of users in a localized area, technologies that use the ISM (Industrial, Scientific and Medical) bands of the electromagnetic spectrum are exposed to interferences that can diminish the quality of the communication up to suspend the connection (Farpoint Group, 2006; Fairpoint Group, 2003). For that reason, it is important for a m-learning administrator to have some information about the state of the wireless connections. With the analytical study presented in this chapter, an administrator has all the information needed to avoid, or at least, to know the problems caused by this situation.

On the other hand, global mobile communications are used a lot in multimedia communications like virtual classes or other similar advanced services. We have done an evaluation of collaborative communications in next generation mobile networks. This will show a real scene useful to those developers who need to know the capacity of the network over which the services will be deployed.

The rest of the chapter is organized as follows. First, a brief explanation of theoretical content related to this chapter is given in the background section. Then, the main section is focused on the analytical study and performance evaluation of the proposed mobile learning architecture. Finally the main conclusions of this work are exposed.

## BACKGROUND

In this section, we present important topics necessaries to understand the rest of the chapter. First of all, we introduce multimedia communications applied to mobile learning platforms and the environment in which they work. After this, it is shown a brief description about the physical knowledge necessary to understand the analytical study carried out to evaluate the technical performance of the mobile learning architecture. In this way, if the technical performance has a high level, the educational performance of the platform would be analyzed.

### Multimedia Communications

In multimedia communications we must look for different quality parameters. With these parameters we can make an evaluation of the multimedia communication. These parameters are: