

# Chapter 7

## Using Device Detection Techniques in M-Learning Scenarios

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### **ABSTRACT**

*Recent studies of mobile Web trends show the continued explosion of mobile-friendly content. However, the wide number and heterogeneity of mobile devices poses several challenges for Web programmers, who want automatic delivery of context and adaptation of the content to mobile devices. Hence, the device detection phase assumes an important role in this process. In this chapter, the authors compare the most used approaches for mobile device detection. Based on this study, they present an architecture for detecting and delivering uniform m-Learning content to students in a Higher School. The authors focus mainly on the XML device capabilities repository and on the REST API Web Service for dealing with device data. In the former, the authors detail the respective capabilities schema and present a new caching approach. In the latter, they present an extension of the current API for dealing with it. Finally, the authors validate their approach by presenting the overall data and statistics collected through the Google Analytics service, in order to better understand the adherence to the mobile Web interface, its evolution over time, and the main weaknesses.*

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## **INTRODUCTION**

In ESEIG (Escola Superior de Estudos Industriais e de Gestão) of the Polytechnic Institute of Porto, we use a Learning Management System (LMS) to provide access to the learning resources and activities. In a recent survey (see section 3), we verify that a large number of students use mobile devices. They are already experienced with mobile technology and are eager to use their devices in e-Learning scenarios. Another argument for the use of mobile devices came from the students' profile since most of them are already employed while studying part-time. This situation decreases the chance to attend virtual events synchronously. Moreover, we also noticed that the students present different mobile devices with different characteristics that difficult the user experience regarding the access to mobile content. Based on these facts, we argue the need to automatically deliver uniform educational content on particular devices, normally referred to as content adaptation.

In this chapter, we explore the use of open source technologies to provide a better design experience regarding mobile learning (m-Learning) content adaptation and promoting the “write once run anywhere” concept.

To understand the needs of our students we based on a survey conducted by a group of teachers at ESEIG. The aim of this study was to characterize the mobile devices usage, namely, the diversity of mobile technologies and services used by students and teachers, and analyze the future expectations concerning the usage of m-Learning platforms.

Based on this survey we obtained the basis for the ESEIG-Mobile system architecture. The ultimate goal of ESEIG-Mobile is to standardize the delivery of e-learning content to the mobile devices of our students. This system uses a three-tier model on a client-server architecture in which the user interface, functional process logic and data access are developed and maintained as independent modules. For each module, our concern was to use emergent and open-source solutions to lever-

age the potential of this new e-Learning paradigm where the characteristics of the mobile device of the student represents an important role and, at the same time, a huge issue. The large number and variety of Web-enabled devices poses challenges for Web content creators who want to automatic get the delivery context and adapt the content to mobile devices. This requires a thorough analysis of the available technologies and knowing good practices to help addressing this issue.

The remainder of this chapter is organized as follows: Section 2 defines context delivery and enumerates several initiatives working on this subject. In the following section, we present a survey made in our School regarding mobile devices. Then, we introduce the architecture of ESEIG Mobile and the design of its internal components. In the next section, we validate the ESEIG-Mobile prototype system based on the students' access statistics. Finally, we conclude with a summary of the main contributions of this work and a perspective of future research.

## **MOBILE CONTENT ADAPTATION**

Mobile learning (m-learning) applications extend the electronic learning (e-learning) experience into the mobile context (Chang & Sheu, 2002; Chen, et al., 2002; Liu, et al., 2002). M-learning uses mobile devices to enhance the teaching-learning process. However, it should not be seen as just another e-Learning channel for delivering the same content. In fact quality M-learning can only be delivered with an awareness of the special limitations and benefits of mobile devices (Parsons & Hyu, 2007). Due to those constraints, the learning content must be adapted to suit the mobile device characteristics. Adaptation means a process of selection, generation or modification of content (text, images, audio, and video) to suit the user's computing environment and usage context (Parupalli, 2009). The concept of Content Adaptation is commonly related to mobile devices. Due to

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