Cross-Platform Mobile Development Framework Based on MDA Approach

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ABSTRACT

This article describes how these days the mobile application market keeps getting bigger because of the different mobile operating systems. So, it has become a challenge for application vendors to provide an application planned for multiple platforms whose operating systems use different technologies. This fragmentation makes the development of mobile applications quite difficult and very expensive. This can be observed at all levels, data storage, software architecture, user interface, access to phone data, communication between applications, etc. To resolve this problem, several solutions exist in the mobile market to develop mobile applications according to the principle “develops once, use everywhere”. In this article, the authors propose a solution based on the MDA approach called “TimPhoneGenerator”. Using TimPhoneGenerator, applications only need to be coded once for all targeted platforms, which reduces development time and costs.

KEYWORDS

Acceleo, Code Generator, Cross Platform Development, EMF, MDA Approach

INTRODUCTION

Recently, the emergence of smart phones has changed the definition of mobile phones. Phone is no longer just a communication tool, but also an essential part of the people’s communication and daily life. Moreover, the authors cannot mention Smartphones without speaking of mobile applications. Propose mobile applications becomes a strategic issue for companies, result, the mobile application market just keeps getting bigger.

The diversity that exists in the mobile area, including the large number of operating systems that use different technologies, produces a “fragmentation” (Charkaoui, 2015). Recognizing the importance of defragmentation and wanting to optimize the design process of mobile applications, the idea of developing a single application that works everywhere (or almost everywhere) became a goal that was much more difficult to achieve - but remains as attractive as ever. This fragmentation makes mobile application development rather difficult, hence the use of cross-platform development framework.

Some work such as PhoneGap, XMLVM, Titanium, etc., have sprung up, each of them is based on an approach. Several approaches exist to address the cross-platform development. In the paper (Charkaoui, 2015) a comparative study is given on the various multiplatform development approaches that exist in the mobile market. Only Web-to-native wrapper and MDA approaches allow realizing
hybrid applications (Charkaoui, 2014). A detailed study of these approaches was made in “Cross-platform mobile development approaches” paper (Charkaoui, 2015).

Model Driven Architecture (MDA) has received attention because it provides abstraction through high level model like UML (Unified Modeling Language) (Kim, 2005), thus it facilitates the design of complicated and complex software. For the time being, limited number of solutions based on models exists in the mobile market (Heitkötter, 2013; Vaupel, 2013). Our research work is based on the MDA approach (Charkaoui, 2015) to achieve a cross-platform development framework targeting the leading platforms of the mobile market, namely, Android, IOS and windows phone. These mobile platforms don’t work in the same way each one has its own language, APIs (Application Programming Interfaces), IDEs (Integrated Development Environment), etc. To realize a cross-platform mobile development framework, different points must be studied in the system architecture of this latter; namely, data storage, software architecture, user interface, access to phone data, Communication between applications, etc.

In this research work the authors propose a cross platform mobile development framework called TimPhoneGenerator based on MDA approach, since Models are the key for all project lifecycle, from requirements capture, through the modeling and developing stage, up to testing (Bernardi, 2012). The rest of the paper is structured as follows. Section II presents some relevant related works concerning the topic of the present work. Sections III gives an overview on the proposed solution. Section IV presents the modeling framework using the MDA approach. Section V is devoted to present the code generation principle using Acceleo plugin. Section VI evaluate de cross platform mobile development framework. The last section concludes the paper and proposes further work.

RELATED WORK

The available solutions for developing cross-platform mobile applications are divided in four major categories, namely, the cross-compilers, the Runtime, the solutions based on the model driven engineering and finally the solutions based on web technologies. There are several cross-platform mobile applications frameworks that have been developed such as PhoneGap, Titanium, Xamarin, Mosync… These frameworks let a developer use one programming language to build mobile applications that support multiple different platforms at once.

The solutions based on cross-compilers such as MoSync, Equela and XMLVM (Puder, 2010) aim the cross-platform application creation through a common language which is translated in native language. In the most cases, the cross-compiler only manages few platforms and is limited to common elements from each platform.

Titanium, Rhomobile and Corona are based on Runtime approach which allows taking advantage of cross-platform functionality through the use of a scripting language. There are many such tools on the market the main difference between them is the choice of the used language (Heitkötter, 2012).

Web technologies such as HTML, CSS, and JavaScript are highly suitable for developing multi-platform applications because they are standardized, popular, reasonably simple but powerful and well-supported. PhoneGap is one of the solutions based on web technologies and the most popular Hybrid Mobile Application frameworks without forgetting Rhomobile. There is also some web framework such as jQueryMobile and Sencha Touch that enables a web developer to create a mobile website with a similar design as mobile platform’s native interface.

Another solution based on MDD (Model driven development) exist for the development of cross-platform mobile apps. The authors find a collection of works linked to this, but they are not numerous, for example, projects like MD2 (Heitkötter, 2013), an approach that focuses on the code generation (for Android and iOS) of data-driven business apps for tablets according to the MVC paradigm. (Vaupel, 2013) defined an infrastructure that supports the specification of different variants of an Android app according to user roles.
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