

# Chapter 6

## Model–Driven Development of Mobile Information Systems

**Ralf Bruns**

*Hannover University of Applied Sciences and Arts, Germany*

**Jürgen Dunkel**

*Hannover University of Applied Sciences and Arts, Germany*

### ABSTRACT

*Significant improvements in the development of business applications for mobile devices have been made in recent years. However, the state of the art in software development is for mobile computing still not as mature as it is for conventional information systems on desktop computers. Therefore, declarative and code generation approaches should be preferred instead of manually coding. In the BAMOS project an architecture has been designed and implemented for the generic and flexible development of mobile information systems. The architecture is based on the declarative description of the available services and enables the access to service-oriented architecture (SOA) systems for mobile devices. In this chapter, the authors present a model-driven approach for generating almost the complete source code of mobile services. By applying model-driven development, a new service can be conveniently modeled with a graphical modeling tool and the graphical models are then used to generate the corresponding XML descriptions of the mobile user interface and the workflow specification. In order to use such a service no specific source code has to be implemented on the mobile device. In addition, an alternative modeling approach based on a textual representation of the models using a formal grammar expressed in EBNF is presented.*

### 1 INTRODUCTION

Today mobile devices, such as mobile phones, personal digital assistants (PDA) or smart phones, are ubiquitous and accompany their users almost every time and everywhere. Their capability of connecting to local area networks via Bluetooth

or Wireless LAN offers the potential for a new quality of mobile applications expanding by far the limits of present ones. So far, mobile devices do not fully exploit the whole potential of these networks. They are mostly employed only for communication or personal information management purposes.

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While moving with a mobile device, the user enters a large number of different local networks; each might offer different localization-specific services. Examples for such location-based services (Hadig & Roth, 2004) are the timetable and location plan of the next bus stop, the current programs of the local cinemas, or a car reservation service of the car rental agencies nearby.

A major obstacle for the further dissemination of mobile information systems is the fact that the software development for mobile devices is still cumbersome and not as mature as for desktop computers. Therefore, declarative and code generation approaches should be preferred instead of manually coding. In the BAMOS project (**B**ase **A**rchitecture for **M**obile applications in **S**pontaneous networks) (Schmiedel et al., 2005), a software architecture has been designed and implemented for the flexible development of mobile information systems. The BAMOS architecture can serve as a base for code generation approaches. Using the BAMOS platform a mobile device can dynamically connect to a local network and use all the available services offered there. To make this approach successful the development of mobile services should be as easy as possible. In this chapter we present a model-driven approach for generating nearly the complete source code of mobile BAMOS services. Furthermore, on the mobile devices no line of code has to be implemented when the BAMOS platform is employed.

The chapter is organized as follows: in section 2 we outline the architectural approach of the BAMOS platform that provides the target platform for our model-driven architecture. Subsequently, section 3 motivates the usage of a model-driven development and derives a metamodel for a domain specific language (DSL). The DSL extends UML and is described by OMG/MOF. In section 4 an alternative modeling approach is introduced. Models can also be described by a textual representation that is based on a formal grammar using Extended Backus Naur Form (EBNF). In section 5 some implementation issues are addressed.

Finally, section 6 summaries the most significant features of the approach and provides some directions of future research.

## **2 ARCHITECTURE OF MOBILE APPLICATIONS**

An indispensable prerequisite for applying model-driven development is a powerful architectural base providing the target platform for code generation. The BAMOS platform enables the development of mobile applications by providing two software components. The first component is a so-called Adhoc Client that – similar to a Web browser – enables the mobile device to access information services in spontaneous networks. The second component is a so-called Service Broker that – similar to a Web Server – serves as an interface between the Adhoc Client and the services available in the network.

With the BAMOS platform a mobile device can use different services in diverse local networks. The Adhoc Client is a generic software component that does not require any information about the specific services. It loads the declarative descriptions of the services at run-time and generates a service-specific graphical user interface. The core concept underlying this generic approach is the declarative description of the process flow as well as of the graphical user interface.

### **2.1 BAMOS Architecture**

The BAMOS platform serves as the implementation base for the generation of mobile information systems. It consists of three main components. Figure 1 illustrates the architecture and the relationship between the different architectural components.

The Service Provider offers services to other systems. To access these services on a mobile device some requirements have to be fulfilled:

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