

Chapter 10

Scripting Mobile Devices with AmbientTalk¹

Elisa Gonzalez Boix

Vrije Universiteit Brussel, Belgium

Christophe Scholliers

Vrije Universiteit Brussel, Belgium

Andoni Lombide Carreton

Vrije Universiteit Brussel, Belgium

Tom Van Cutsem

Vrije Universiteit Brussel, Belgium

Stijn Mostinckx

Vrije Universiteit Brussel, Belgium

Wolfgang De Meuter

Vrije Universiteit Brussel, Belgium

ABSTRACT

This chapter is about programming mobile handheld devices with a scripting language called AmbientTalk. This language has been designed with the goal of easily prototyping applications that run on mobile devices interacting via a wireless network. Programming such applications traditionally involves interacting with low-level APIs in order to perform basic tasks like service discovery and communicating with remote services. We introduce the AmbientTalk scripting language, its implementation on top of the Java Micro edition platform (J2ME) and finally introduce Urbiflock, a pervasive social application for handheld devices developed entirely in AmbientTalk.

INTRODUCTION

For the past five years, we have been researching coordination abstractions to structure mobile com-

puting applications. These applications are typically deployed on mobile devices (e.g. cellular phones, PDAs, ...) equipped with wireless communication technology (e.g. WiFi, Bluetooth,...) (Mascolo, Capra, & Emmerich, 2002). Such devices form

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so-called *mobile ad hoc networks* which have two discriminating characteristics: the connectivity between devices is often intermittent (connections drop and are restored as devices move about) and there is little or no fixed support infrastructure, such that devices can often communicate *only* with physically proximate devices, favouring a peer-to-peer architecture rather than a client-server approach.

Traditionally, developing, testing and deploying mobile computing applications is laborious. One of the major reasons for this difficulty is that the programming languages that are commonly used for this task (e.g. C, C++, Java) have not been designed to deal with the hardware characteristics of mobile ad hoc networks. Especially on runtime platforms for handheld devices such as J2ME or the .NET compact framework, programmers have little more than a low-level socket API to work directly on top of supported networking protocols. Consequently, more high level abstractions such as service discovery, remote messaging, failure handling, asynchronous event handling, etc. must all be dealt with manually by the programmer.

In this chapter, we will describe AmbientTalk: an experimental scripting language for mobile devices (Dedecker, Van Cutsem, Mostinckx, D'Hondt, & De Meuter, 2006; Van Cutsem, Mostinckx, Gonzalez Boix, Dedecker, & De Meuter, 2007). To the best of our knowledge, AmbientTalk is the first high-level distributed object-oriented programming language that specifically targets mobile devices connected via an ad hoc wireless network. While the language features the standard toolbox of any object-oriented scripting language (similar to popular languages such as Ruby, Python or Groovy), it also integrates built-in support for service discovery (built on top of UDP), remote messaging (built on top of TCP/IP), failure handling, asynchronous event processing and publish/subscribe coordination between remote services. AmbientTalk is implemented entirely in Java and thus benefits from the platform-independence of the Java Virtual Machine. In addition, AmbientTalk can interoperate with

Java applications. This allows concerns related to distribution (service discovery, asynchronous communication, failure handling) to be handled in the scripting language, while still enabling the reuse of existing Java libraries (e.g. for XML parsing, GUI construction, encryption etc.)

After having presented AmbientTalk, we introduce Urbiflock, an application that we have built using the language. Urbiflock is a framework for the development of so-called “pervasive social applications”: applications that allow people to interact by means of handheld devices (such as their cell phones). Such applications aim to extend the so successful web-based social network services (e.g. Facebook, MySpace, etc.) to mobile services, opening new possibilities for mobile commerce. They enable spontaneous interaction between groups of people: people may broadcast announcements to each other, they can browse one another’s profile, launch interactive polls, etc.

BACKGROUND

The hardware characteristics of mobile devices introduce certain phenomena that must be dealt with when writing mobile computing applications. In this section, we summarize these hardware phenomena. Subsequently, we discuss related work in the field of programming languages and middleware that has influenced the design of AmbientTalk.

Hardware Phenomena

There are two discriminating properties of mobile networks, which clearly set them apart from traditional, fixed computer networks: applications are deployed on *mobile* devices connected by *wireless* communication links with a limited communication range. Such networks exhibit two phenomena which are rare in their fixed counterparts:

Volatile Connections. Mobile devices equipped with wireless media possess only a limited communication range, such that two

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