A Service-Based Approach to Connect Context-Aware Platforms and Adaptable Android for Mobile Users

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ABSTRACT

Many companies include in their Information Systems (IS) several communicating heterogeneous middleware according to their technical needs. The need is the same when IS require the use of context aware platforms for different aims. Moreover, users may be mobile and would like receiving and send services with their PDAs that emphasize further the need to Android based human man interface. In this chapter, the authors show how they extend Android to make it adaptable and interoperable. They also present how we communicate between different heterogeneous context-aware platforms as WComp and OpenORB by using Android and Web Services. The usefulness of the proposed approach is demonstrated through a concrete case study.

INTRODUCTION

Economical context influences companies and their Information System (IS). Companies acquire other competitors or develop new business skills, delocalize the whole or a part of their organization. Moreover they are faced to powerful competitors, and they have to shortly develop new products that fit to customer needs. New functional needs are not the only changes to take into account by the architects because technologies are constantly moving forward which impacts seriously architectures. It is the reason why architectures have to
be flexible enough to take into account changes and to reduce impacts that are costly in terms of time and resources.

Service Oriented Architecture (SOA) offers a great flexibility to IS. Each application owns interfaces masking the implementation details. Applications are seen as black boxes independently connected to each other as Enterprise Application Integration (EAI) bus with its adapters (connecting the bus to the applications). However, this integration solution does not allow connecting heterogeneous applications or infrastructures as distant IS.

Web services (O’Reilly, 2005), (Ferrara, 2004), (Staab & vander & Benjamins, 2003) represent the cheapest and simplest solution to resolve this problem. They offer interoperability because they are based on standards as XML (XML, 210) and allow loose coupling. We proposed aspects-based solutions to gain in terms of simplicity and flexibility without re-deploying code with a non intrusive manner (Hmida & Tomaz & Monfort, 2006), (Tomaz & Hmida & Monfort, 2006). We based our more recent approach on extended BPEL (Business Process Execution Language) and temporized automatons (Alur & Drill, 1994) (Hennicker & Knapp, 2007), that we prototyped by providing client, and server adaptability. Moreover, these are also used to manage contextual data coming from different equipments as supervision infrastructure for instance. Current middleware (EAI and ESB as Enterprise Service Bus) are not fitted to deal with these kinds of information such as sending alarms and taking decision. Context adaptation (Sanchez-Loro, 2008), (Addison-Wesley, 1995) platforms such as WCOMP (Tigli & Lavrirote & Rey & Houdrin & Cheung-Foo-Wo & Callegari & Riveill, 2009), OpenORB (Cheung-Foo-Wo & Riveill & Tigli, 2009), Aura (Garlan & Siewiorek & Smailagic & Steenkiste, 2002), Cortex (Biegel & Cahill,2004) and OpenCom (Cheung-Foo-Wo & Riveill & Tigli, 2009)aim to manage contextual data.

On top of all, users are most of the time mobile and they want to access specific and fitted services according to their profile and their location with push and pull manners. Unfortunately, Human Man Interface platforms as Android do not allow adaptability. Concretely, Android (Burnette, 2009) is one of the most famous environments used for PDA. The Android platform uses many different technologies. Some of them are new, and some have been seen before in other settings such as: i) Location awareness, through inexpensive GPS devices, ii) Handheld accelerometers, such as those found on the Nintendo Wii remote, iii) Mashups, often combining maps with other information. Several popular Android programs use these concepts to create a more compelling and relevant experience for the user. For example, the Locale application can adapt the settings on the user’s phone based on where he is.

Introducing such platforms in IS shows some problems as: i) Interoperability between context aware platforms as WComp and OpenORB, ii) Interoperability with other applications and other middleware, iii) using Human Man Interface that communicates with any platform by message sending, iv) making current Human Man Interface technologies such as Android adaptable according to context, v) processes are supported by all platforms. In this chapter we propose an Aspects and Web Services approach to make Android adaptable according to context and to communicate between Android, WComp and OpenORB. This chapter is structured as followed. Firstly, we present main technologies we used in our research work. Secondly, we present a case study. Thirdly, we show how we introduce aspects in Android. Fourthly, we propose to add aspects in Android code to increase adaptability. In the Fifth section we show how to bridge the gap between heterogeneous platforms as Android, WComp and OpenORB. Then, we present related works, future works. Then, we conclude. First of all, let us describe now the main technologies we use.
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