Chapter 4
Service Provisioning through Real World Objects

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ABSTRACT

The last few years have seen two parallel trends emerge. The first of such trends is set by technologies such as Near Field Communication, 2D Bar codes, RFID and others that support the association of digital information with virtually every object. Using these technologies ordinary objects such as coffee mugs or advertisement posters can provide information that is easily processed. The second trend is set by (semantic) Web services that provide a way to automatically invoke functionalities across the Internet lowering interoperability barriers. The PERCI system, discussed in the chapter, provides a way to bridge between these two technologies allowing the invocation of Web services using the information gathered from the tags effectively transforming every object in a service proxy.

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INTRODUCTION

In recent years, tagging technologies, such as Near Field Communication (hereafter NFC) (ECMA 2006), Radio Frequency Identification (RFID) (EPC Global 2006) and 2-dimensional bar codes (Adams, 2007) have received a great deal of attention because of their ability to associate digital information with arbitrary objects. In principle everything can be cheaply tagged, from coffee mugs to advertisement posters, and applications can be invoked on the basis of the information that is gathered from the tags on the object.

Japan has seen initial commercial deployments of these technologies. There 2D tagging of advertisements is quite common as shown by the banner in Figure 1. By taking a picture of the tag, a mobile user would immediately gain access to an airline Web page and there buy tickets to fly anywhere in the world. NFC tagging in combination with mobile phones is also widely used in Japan through iMode-FeliCa (Yoshinaga, 2003). Tagging technologies are also becoming increasingly common in Europe and the US. For example, the German railroad operator Deutsche Bahn uses 2D bar codes to store train tickets directly on the phone (Deutsche Bahn, 2007). Furthermore, tagging is also widely used in B2B solutions to monitor stock inventory, logistics and transport to track moving goods (Meloan, 2003). By tagging containers as well as single products, companies can easily manage their inventory, keep track of the goods that have been received and monitor their position during the delivery process (IDTechEx, 2007)(Tohamy, 2005).

Whereas tagging is entering the computer science main stream, it also provides new challenges. The first one is that tags, by and large, do not have any processing abilities, rather they always passively return the same value. Even when active tags exists, as in the case of NFC and RFID, their cost is approximately 100 times higher than the corresponding passive tags making the broad use of active tags very costly. The second challenge is that tags have very limited memory storage, which ranges from a few bytes to a few Kbytes. The third challenge is that the range of the "network" to read a tag is also very limited, spanning from a few centimeters in the case of NFC tags, to a few meters in the case of RFID tags. The fourth challenge, which is important for this chapter, is that tags break the traditional structure of SOA-based applications which assumes that services are always available and discoverable through a registry.

Figure 1. A banner with a 2D bar code in Tokyo

In this chapter, we attempt to tackle the challenge of providing a general Web service infrastructure to support the user to interact with advertisement posters (UsingRFID.com, 2007). Through the chapter, we will use the movie poster displayed in Figure 2 as our main example. The goal of the poster is to advertise movies that are playing in town. But the poster achieves more than that, the little squares on the side of the