eCloudRFID – A mobile software framework architecture for pervasive RFID-based applications

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A B S T R A C T

In the last few years, RFID technology has become a stimulating and rapidly expanding area of research and development. The technology's ability to precisely identify objects at low cost and without line of sight creates new and emerging opportunities for RFID applications that could become an integral part of our daily lives. Mobile RFID services for the Internet of Things can be created using RFID as an enabling technology in mobile devices. This pervasiveness enables embedded systems to interact with the user continuously, providing data from their sensors and responding to requests from the users too. Humans, devices and things are both the content providers and users of these mobile services. Mobile RFID services can be either provided on mobile devices applications as stand-alone services or combined with legacy and end-to-end systems. However, to develop and deploy this kind of system, it is necessary for an effective software development infrastructure to be able to deal with the restrictions and limitations imposed by related business areas, RFID and pervasive applications. This work presents a software framework architecture for mobile devices that aims to facilitate the development process of embedded RFID applications and the integration process of business applications and EPC Network instances. The framework provides for applications a common communication interface to abstract different devices and reading protocols as well as functions to process and distribute data.

1. Introduction

Radio frequency identification (RFID) is a wireless communication technology that is used in the precise identification of objects. Although RFID has been around for more than half a century (Rieback et al., 2006), it began to call attention only in recent years due to the convergence of lower cost and the increased capabilities of RFID tags.

RFID uses radio-frequency waves to transfer identifying information between tagged objects and readers without line of sight and with no need for physical contact, providing a means for automatic and effective identification, enhancing the speed of information flow by overcoming the limitations of other manual data collection methods (Quan et al., 2008). Currently, RFID is emerging as an important technology for revolutionizing a wide range of applications, becoming essential to many aspects of modern life process such as manufacturing control, distribution logistics, automatic access control, library services, anti-counterfeiting, healthcare and so on (Ngai et al., 2008; Alexander et al., 2002; Uysal et al., 2008; Kuo et al., 2007).

An RFID system is basically composed of three main elements: (1) a tag associated with the item to be identified, (2) a reader device used to read and to extract tags data and (3) an application system, such as the EPC Network, that captures, stores the read data and provides the retrieved information to some high business entity (Leong et al., 2006; Thiesse and Michahelles, 2006).

The EPC Network is composed of several elements that together enable the integration of RFID information between different applications. “RFID Middleware” and “Information Services” are considered the main elements of the EPC Network since they provide the essential infrastructure to deal with the restrictions and limitations imposed by business areas and RFID environments.

RFID technology when combined with some kind of pervasive communication infrastructure enables objects communicating directly with EPC Network elements (consumers, suppliers, employees, etc.) and even with other objects and related systems in order to create some business value. In this way, RFID...