



## Business-aware framework for supporting RFID-enabled applications in EPC Network

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### ABSTRACT

Automatic object identification and distributed computing technology have recently been investigated in order to realize a ubiquitous computing environment. Radio-frequency identification (RFID) technology has been applied to many business areas such as logistics and supply chains. The Electronic Product Code (EPC) Network, an open global standard proposed by EPCglobal, links RFID to the Internet to enable immediate, automatic identification and secure sharing of information about items. Useful RFID business applications can be developed on this Network.

The RFID technology has been applied to many business areas to simplify complex processes. However, RFID applications are difficult to develop because there are many components, interfaces, and protocols to be considered in the EPC Network. To exploit the real advantages of RFID, systems should be able to rapidly implement functions to process the large amount of event data generated by RFID operations, and these systems should be configured dynamically for changing businesses. Consequently, developers have to implement systems to derive meaningful high-level events from simple RFID events and bind them to various business processes. Although applications can directly consume and act on RFID events, extracting the business rules from the business logic leads to improve the decoupling of the system, which consequently improves maintainability.

We propose a business-aware framework for developing RFID business applications cost-effectively on the EPC Network. The framework also supports the operation and maintenance of RFID applications as middleware to process RFID events.

The proposed framework can be used for developing business applications for business services. The term “business services” refers to the generated events that can be used in business applications without additional data collection and processing. The framework provides business rules related to data collection, processing, and management, and supports the rapid development and easy maintenance of business applications based on business services.

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### 1. Introduction

Radio-frequency identification (RFID) is a technology employed to identify objects using radio-frequency transmission (Laran RFID, 2004). Recently, the RFID technology has been applied to many business areas such as logistics and supply chains (Walmart Supplier Information, 2005; RFID Journal News, 2005).

A non-profit organization, EPCglobal (EPCglobal Inc., 2009a), has proposed an open global standard called the Electronic Product Code (EPC) Network for the practical application of RFID. The EPC Network links RFID to the Internet to enable immediate automatic identification and secure sharing of information about items in the supply chain using EPCs that represent unique products (EPCglobal Inc., 2009b). The Network provides an architecture that collects and filters EPCs and references product

information. The EPC Network architecture consists of many components such as the EPC tag, RFID reader, RFID middleware system, EPC Information Service (EPCIS) system, EPCIS Discovery Service (EPCIS DS) system, and Object Naming Service (ONS) system (EPCglobal Inc., 2009c, 2007, 2008).

However, problems have been encountered during the development of RFID applications for business processes in this environment. First, developers have to learn to manage various interfaces and protocols to use the services of many components on the EPC Network and also interactive modules. Therefore, RFID applications are difficult to develop.

Second, it is difficult to maintain the implemented RFID business applications. Because the communication modules are combined with the business logic of the applications, it is considerably difficult to maintain them.

Finally, developers cannot concentrate on the main business task while running RFID business applications because they have to handle large volumes of EPCs and retrieve reference information about products related to the business task.

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