Chapter 96
Open Source Object Directory Services for Inter-Enterprise Tracking and Tracing Applications

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ABSTRACT

Despite the proliferation of RFID (Radio Frequency Identification) applications, there are still only a limited number of open-loop inter-enterprise applications that address global supply chains. The implementation of such inter-enterprise applications hinges on standards and techniques for discovering and accessing RFID tagged objects across different repositories of RFID information residing across different administrative domains. In this chapter, the authors introduce an open and novel implementation of an ONS (Object Naming Service) solution for inter-enterprise tracking and tracing RFID applications. The solution is part of the open source AspireRFID project and provides a sound basis for integrating tracking ("google-of-things" like) applications for the RFID and the Internet-of-Things (IoT). As part of the presentation of the solution, this chapter illustrates the main challenges associated with the integration of inter-enterprise applications, along with strategies for confronting them.

1. INTRODUCTION

During the last decade we are witnessing a constant increase in the use and integration of RFID (Radio Frequency Identification) technologies in more and more fields of everyday life and across various industries. Industry sectors such as livestock management, ticketing, retail billing and supply chain management take advantage of RFID technology to lower their costs, streamline processes

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and increase their efficiency. Indeed, RFID technology presents proven benefits for supply chain management and inventory management systems, especially when it comes to managing complex logistics processes spanning multiple enterprises and stakeholders. In particular, it is wireless and contactless, so products can be scanned en masse even while they are inside shipping containers. The namespace is huge and it can be considered virtually infinite for most applications. The tag itself is small and durable, and can be embedded inside an object or otherwise protected from physical ware and harm. And while there are proprietary of industry specific coding schemes, most of the tags are based in a few well defined and interoperable standards.

Nevertheless, RFID deployments are also associated with a host of technical and organizational challenges such as the need to filter out information that is not useful for a given application context, the need to interface to multiple heterogeneous readers, as well as the need to identify and route application events to the appropriate enterprise applications (such as Enterprise Resource Planning -ERP, Warehouse Management Systems -WMS and other corporate applications) (Kefalakis, 2009). These technical challenges are usually addressed by RFID middleware and related middleware standards. Prominent places among these standards hold those specified by EPCglobal Architecture Review Committee (2013), including:

- The EPC Tag Data Specification (EPCglobal, 2013c), which defines the overall structure of the Electronic Product Code (EPC), including mechanisms for federating between different coding schemes.
- The EPC Reader Interface (EPCglobal, 2013e), which provides a group of standards that define the means to command an RFID reader to read, write and access other features of tags, and also provide access to RFID reader management functions.
- The Filtering and Collection standards (EPCglobal, 2013a), which provide the means for client applications to request EPC data from one or more data sources. It also specifies mechanisms for filtering, grouping and counting EPC data.
- The Electronic Product Code Information Service (EPCIS) (EPCglobal, 2013b), which provides a path where EPCIS events, generated from capturing applications, can be stored with enhanced business context (Dimitropoulos 2010) to a repository. These events provide the stored data on demand, to enterprise systems through some connector application (Leontiadis, 2009).

These standards specify functionalities that are useful to applications deployed within an enterprise. However, the full potential of RFID enabled supply chains will be realized in the scope of inter-enterprise applications involving multiple stakeholders/organizations across value chains and supply chains (Vijayaraman, 2006).

At this point it worth's to mention that by inter-enterprise applications we refer to applications that involve multiple companies and are executed throughout the lifecycle of a supply chain. For instance, an inter-enterprise application refers to a supply chain whose objects of interest move from any location in the factory till a retail store shelf regardless to whether these business locations belong to the same company or no. Whereas by open-loop intra-enterprise applications we refer to applications that involve a single company and are executed throughout the lifecycle of its supply chain. For instance, an intra-enterprise application refers to a supply chain whose objects of interest move from any location in the factory till the retail store where business locations belong to the same company.

Seamless collaboration and automatic integration, which is the basic nature of such inter-enterprise applications is the key to realizing emerging concepts such as «The Internet of