



SOARware¹: Treading through the crossroads of RFID middleware and SOA paradigm

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ABSTRACT

RFID technology finds immense applicability in domains utilizing identification as the base operation such as in access control, localization, etc. It may be designed to work well for either singular or a limited range of applications. However, the strict-coupling between applications and RFID equipment must be relaxed to scale up their usability. In order to do so, RFID middlewares are employed, allowing the applications to become independent of the underlying complexities. In this paper, we present interplay of all that contemporary RFID middlewares provide, and actual expectations from them, in terms of desirable “features” and “aspects”. While the aspects are more business specific, features are implementation specific. We extract implemented features from the study of RFID middlewares, which in turn, realize design aspects. We breakdown these features into respective functions set in order to, (a) unravel functional overlap between these features both horizontally and vertically, and (b) observe that each of these functions implements part of system level business design aspects. We conclude that an appreciation of overlap both at the functional-level and at the design aspects-level allows simpler yet comprehensive implementations of RFID middlewares. We propose SOA-based strategy that helps to consolidate representative design aspects of a well-federated RFID middleware. We present middleware as a service (MaaS) architecture, which encapsulates underlying complexities of RFID systems from the enterprise application while taming² them in two-dimensions, simultaneously. MaaS achieves horizontal taming through exposed services, while vertical taming is achieved through their need-based invocation. We have successfully shown through prototype implementation that MaaS allows modular invocation of services agreed through contract, realizing SOA-based RFID paragon and achieves key design aspects.

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1. Introduction

With the proliferation of various kinds of sensors in our everyday life, specifically RFID sensors, most of the enterprise applications workflows are now relying on data from these sources as a serious and explicit means to derive business contexts. It may also be noticed, however, that large amounts of data generated by these heterogeneous sources is neither always useful nor solicited for a particular application context. There is a burgeoning need to transform this bulk of data into contextual data for optimal processing of business workflows and possibly infer more utility. Likewise, the distributed nature of enterprise applications demands

transactional and message-oriented access to sensor data, mandating that the backend of these enterprise applications must possess and exhibit the business aspects like interoperability, openness, scalability, and controlled accessibility. At a more implementation-specific level, there is a consequent need for such backend sensor softwares that could provide technical features such as filtering and aggregation, routing and notification, etc., according to application needs, and achieve the business aspects in a more dynamic manner. A kind of such sensor softwares, formally referred to as ‘Middleware’ in RFID literature, has emerged in the form of various solutions. The diverging business design aspects of various middleware platforms result into their implementation features becoming oblivious, overlapping and at times conflicting. So much so, that the interactions between two autonomous middlewares becomes exceedingly unwieldy, if not totally impossible. To address their interplay, there is a need to investigate their respective features deep to the functional levels in order to facilitate symbiosis of middlewares, while achieving their respective business design aspects. These business design aspects may include collaboration through

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¹ SOA-based RFID middleware.

² Taming refers to complete customization of RFID technology.