

# An information-centric and REST-based approach for EPC Information Services

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**Abstract:** Radio Frequency Identification (RFID) techniques are considered relevant building blocks for the Internet of Things. The interoperability across different RFID software and hardware infrastructures is a key requirement for achieving effective and wide-scale Internet of Thing deployments. In this context, the EPC Information Service (EPCIS) is a set of standard specifications for sharing RFID-related data (i.e., EPC events) both within and across enterprises. Although the EPCIS specifies a set of HTTP and Web Service interfaces for querying and adding EPC events, interoperability and easiness of use is hindered by the fact that client applications should be aware of the repositories that are authoritative for one or more given queries and links among related events are not explicitly represented in response messages. In this paper we argue that, by leveraging emerging REST and Linked Data paradigms, EPC events can be handled as a graph of globally-addressable information resources that can be navigated, queried, and aggregated through a uniform interface and seamlessly across organization domains. To validate this approach, we have developed a prototype that exposes the EPCIS interfaces as a set of REST APIs. The prototype implementation exploits the information modeling and management capabilities provided by a framework, called InterDataNet (IDN), that we conceived and developed to ease the realization of the Web of Data and Linked Data applications.

**Index Terms**— Web Services, Representational State Transfer, RFID, EPC, Linked Data, HTTP, Web of Data.

## I. INTRODUCTION

The Internet of Things vision implies the creation of large-scale networks of “smart things” made possible by of RFID and wireless sensor and actuator networks nodes distributed in the physical environment [1], [2]. According to this vision,

*data of real world objects and events will be available globally and in vast amounts. These data will be stored in widely distributed, heterogeneous information systems, and will also be in high demand by business and end user applications.”* [3]. Therefore, mechanisms allowing to easily access, retrieve and manage information resources, while guaranteeing scalability and interoperability, are required [4].

Standards play a key role in achieving these objectives. As far as RFID technologies are concerned, the EPCglobal Network specifies an architecture of hardware and software components and interfaces to efficiently handle logistic processes [5]. The Electronic Product Code (EPC) is a universal identifier used for physical objects. It can take the form of a Uniform Resource Identifier (URI), thus enabling information systems to refer to physical objects. The EPCIS [6] specifies a distributed system of information repositories that store RFID-related events and data. These repositories can be accessed through an HTTP-based Capture Interface for adding new events and through a Query interface based on Web Services (WS) [7] for querying and accessing stored events.

WS specifications represent state-of-the art solutions for enabling data exchange across technological and organizational boundaries in heavy and complex business applications [7]. Nonetheless, we argue that, by leveraging emerging Web Science paradigms [8], EPC events can be handled as a graph of globally-addressable information resources that can be navigated, queried, and aggregated through a uniform interface and seamlessly across organization domains. This information-centric approach help in explicitly model relations among EPC events and data and relies on widely adopted Web standards, thus improving interoperability and data exchange both within and across enterprises.

Our approach relies on the Representation State Transfer (REST) architectural style and Linked Data, which are two paradigms characterizing the emerging interdisciplinary field of Web Science. The REST architectural style was proposed by Roy Fielding in his doctoral dissertation [9] as an architectural style for building large-scale distributed hypermedia systems. The term “Linked Data” refers to a set of best practices for publishing and connecting structured data on the Web [10] via standard technologies (e.g. HTTP URIs [11], RDF [12], SPARQL [13]). Thanks to links connecting data

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