

# Chapter 4

## Principles and Experiences: Designing and Building Enterprise Information Systems

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### ABSTRACT

*The data requirements of e-business applications have been increased over the years. These applications present an environment for acquiring, processing, and sharing data among interested parties. To manage information in such data-intensive application domain, independent enterprise e-business applications have developed their own solutions to information services. However, these solutions are not interoperable with each other, target vastly different systems, and address diverse sets of requirements. They require greater interoperability to enable communication between different systems, so that they can share and utilize each other's resources. To address these challenges, we discuss principles and experiences for designing and building of a novel enterprise information system. We introduce a novel architecture for a hybrid information service, which provides unification, federation, and interoperability of major Web-based information services. The hybrid information service is designed as an add-on information system, which interacts with the local information services and assembles their metadata instances under one hybrid architecture. It integrates different information services using unification and federation concepts. In this chapter, we summarize the principles and experiences gained in designing and building the semantics, architecture, and implementation for the hybrid information service.*

### INTRODUCTION

The data requirements of e-business applications have been increased over the years. These applications present an environment for acquiring,

processing and sharing data among interested parties. In order to manage data in such data-intensive enterprise business application domain, Service Oriented Architecture (SOA) principles have gained great importance. A Service Oriented Architecture is simply a collection of services that are put together to achieve a common goal and that communicate

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with each other for either data passing or coordinating some activity. There is an emerging need for Web-based Enterprise Information Systems (EIS) that manage all the information that may be associated with wide-scale SOA-based e-business applications.

Over the years, independent enterprise e-business applications have developed their own customized implementations of Information Service Specifications. These EIS solutions are not interoperable with each other, target vastly different systems and address diverse sets of requirements (Zanikolas & Sakellariou, 2005). They require greater interoperability to enable communication between different systems, so that they can share and utilize each other's resources. Furthermore, they do not provide uniform interfaces for publishing and discovery of information. In turn, this creates a limitation on the client-end (e.g. fat client-end applications), as the users have to interact with more than one EIS implementation.

For example, large-scale e-business applications require management of large amounts of relatively slowly varying metadata. Another example, dynamic Web service collections, gathered together at any one time to perform an e-business operation, require greater support for dynamic metadata. Previous solutions do not address management requirements of both large-scale, static and small-scale, highly-dynamic metadata associated to Web Services (Zanikolas & Sakellariou, 2005). None of the existing solution enables communication between different e-business applications, so that they can share, utilize each other's resources, have unified access interface and address diverse sets of application requirements (OGF GIN-CG). We therefore see this as an important area of investigation especially for enterprise e-business applications domain.

This chapter introduces a Hybrid Service as a EIS that addresses metadata management requirements of both large-scale, static and small-scale, highly-dynamic metadata domains. The main nov-

erty of this chapter is to describe the semantics, architecture, and implementation of a EIS integrating different Information Services by using unification and federation concepts. The implications of this study are two-fold. First is to describe a generic Information Service architecture, which supports one-to-many information service implementations as local data sources and integrates different kinds of Web Service metadata at a higher conceptual level, while ignoring the implementation details of the local data-systems. Second is to describe the customized implementations two widely-used Web Service Specifications: the WS-I compatible Web Service Context (WS-Context) (Bunting, et al., 2003) and Universal Description, Discovery and Integration (UDDI) (Bellwood, Clement, & von Riegen, 2003) Specifications.

The organization of this chapter is as follows. Section 2 reviews the relevant work. Section 3 gives an overview of the system. Section 4 presents the semantics of the Hybrid Service. Sections 5-6 present the architectural design details and the prototype implementation of the system. Finally, Section 7 contains a summary of the chapter.

## **RELEVANT WORK**

Unifying heterogeneous data sources under a single architecture has been target of many investigations (Ziegler & Dittrich, 2004). Information integration is mainly studied by distributed database systems research and investigates how to share data at a higher conceptual level, while ignoring the implementation details of the local data systems (Ozsu, 1999; Valduriez & Pacitti, 2004). Previous work on merger between the heterogeneous information systems may broadly be categorized as global-as-view and local-as-view integration (Florescu, Levy, & Mendelzon, 1998). In former category, data from several sources are transformed into a global schema and may be queried with a uniform query interface. Much work has been done on automating information

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