

## Chapter 2.12

# A Semantic Service–Oriented Architecture for Business Process Fusion

**Athanasios Bouras**

*National Technical University of Athens, Greece*

**Panagiotis Gouvas**

*National Technical University of Athens, Greece*

**Gregoris Mentzas**

*National Technical University of Athens, Greece*

### **ABSTRACT**

Most enterprises contain several heterogeneous systems, creating a fuzzy network of interconnected applications, services, and data sources. In this emerging business context, a clear need appears to link these former incompatible systems by using enterprise application integration (EAI) solutions. We propose a semantically enriched service-oriented business applications (SE-SOBA) framework that will provide a dynamically reconfigurable architecture enabling enterprises to respond quickly and flexibly to market changes. We also propose the development of a pure semantic-based implementation of the universal description, discovery, and integration

(UDDI) specification, called pure semantic registry (PSR), which provides a flexible, extendable core architectural component allowing the deployment and business exploitation of Semantic Web services. The implementation of PSR involves the development of a semantic-based repository and an embedded resource definition framework (RDF)-based reasoning engine, providing strong query and inference capabilities to support effective service discovery and composition. We claim that when SE-SOBAs are combined with PSR and rule-based formalizations of business scenarios and processes, they constitute a holistic business-driven semantic integration framework, called FUSION, applied to intra- and inter-organizational EAI scenarios.

## INTRODUCTION

In today's fiercely competitive global economy, companies are realizing that new initiatives such as e-business, customer relationship management, and business intelligence go hand-in-hand with the proven organization-wide EAI strategy. The goal of EAI is to integrate and streamline heterogeneous business processes across different applications and business units while allowing employees, decision makers, and business partners to readily access corporate and customer data no matter where it resides. More and more, EAI involves integrating information and processes not only across the enterprise but also beyond organizational walls to encompass business-to-business (B2B) integration supporting large scale value-added supply chains across the enlarged worldwide economy.

Business process fusion is the transformation of business activities that is achieved by integrating the interfaces of previously autonomous business processes by pipelining different middleware technologies and enabling the effective (semi-) automated exchange of information between various systems within a company or between enterprises. The development of SOBAs (which constitutes a set of independently running services communicating with each other in a loosely coupled message-based manner) and the publishing of Web services may implement the vision of business process fusion, by providing an abstraction layer for the involved interfaces through the Web service description language (WSDL). While SOBA and Web services have already made headway within large organizations, the technology will start filtering down to small- and medium-sized enterprises (SMEs) and will expand into supply chains. This architecture will also play a significant role in streamlining mergers and acquisitions, by linking previously incompatible systems.

Despite the aforementioned trends, users and professionals have high expectations towards

software applications and enterprise application integration. They want to access the content they need, while this content must be accurate and free of redundancy. So, the enterprise applications must be intuitive and easy to use; reusable and extendable; implemented in a short and inexpensive way; and within the current information technology (IT) legacy environment. Enterprise applications and information systems also need to support a more general notion that involves relating the content and representation of information resources to entities and concepts in the real world.

This need imposes the use and interpretation of semantics in EAI. Semantic interoperability will support high-level, context-sensitive, information requests over heterogeneous information resources, heterogeneous enterprise applications, hiding systems, syntax, and structural heterogeneity. This semantically enriched approach eliminates the problem of knowing the contents and structure of information resources and the structure and architecture of heterogeneous enterprise applications.

Semantics and ontologies are important to application integration solutions because they provide a shared and common understanding of data, services, and processes that exist within an application integration problem domain, and how to facilitate communication between people and information systems. By leveraging this concept we can organize and share enterprise information, as well as manage content and knowledge, which allows better interoperability and integration of inter- and intra-enterprise information systems.

We claim that recent innovations in the development of SE-SOBA—which enlarge the notion of service-oriented architecture (SOA) by applying Semantic Web service technology and using ontologies and Semantic Web markup languages to describe data structures and messages passed through Web service interfaces—combined with the rule-based formalization of business scenarios and processes will provide a dynamically reconfigurable architecture that will enable

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