

Chapter 3.10

The Semantic Side of Service-Oriented Architectures

Catarina Ferreira da Silva

University of Lyon 1, France

Paulo Rupino da Cunha

University of Coimbra, Portugal

Parisa Ghodous

University of Lyon 1, France

Paulo Melo

University of Coimbra and INESC Coimbra, Portugal

ABSTRACT

In Service-Oriented Architectures (SOA), service descriptions are fundamental elements. In order to automatically execute SOA tasks, such as services discovery, it is necessary to capture and process the semantics of services. We review several Semantic Web Services frameworks that intend to bring semantics to Web Services. This chapter depicts some ideas from SOA and Semantic Web services and their application to enterprise application integration. We illustrate an example of logic-based semantic matching between consumer services and provided services, which are described in ontologies.

INTRODUCTION

A new paradigm of information systems design – the service-oriented architecture (SOA) – has been

consistently gaining acceptance. It is an architectural paradigm aiming at dealing with business processes distributed over a large landscape of former and newer heterogeneous systems that are under the control of different owners (Josuttis, 2007). The goal of SOA is to structure large distributed systems based on the abstractions of business rules and functions.

In SOA approach, traditional business logic is extracted from inside silo applications and exposed as reusable services. These, in turn, can be easily composed into higher-level business processes using graphical tools. Changes become much easier and the gap between needs and IT support is narrowed. The organizations become more agile and flexible.

However, some challenges remain in assembling business processes from services. Business processes carry semantics, which are usually neither explicitly nor formally expressed. To represent semantic content in an explicit way can be a hard task because it requires domain experts to formalise the

DOI: 10.4018/978-1-60566-804-8.ch005

implicit knowledge about services or processes. Still, representing semantics explicitly through formal ontologies of products, processes or services, may help describe, compose and match services, such as between consumer-required services and provider-specified services.

The concepts of SOA may be applied to provide for several tasks, and among those the ones usually associated with Enterprise Application Integration (EAI). Web Services and SOA technology can be used to support EAI tasks, like process modelling, process execution, message routing, transformation and delivery among systems (Haller, Gomez & Bussler, 2005). The use of a common representation for data (usually XML) however does not preclude mismatches between systems, and while syntactic and structural mismatches may be solved using common Web Service standards, semantic mismatches are usually solved in an ad-hoc fashion. Similarly, process modelling using common tools does not guarantee the easy or automatic selection of adequate services (from a pool of common or domain-specific services).

This chapter intends to explain how semantically SOA and its technologies can be used to perform some integration tasks. The goal is more to depict some ideas from SOA and Semantic Web Services and their application to EAI than to provide new research. On the practical side, we show how we can use formal domain ontologies to describe and to match services. We review several semantic web services frameworks that intend to bring semantics to Web Services. We discuss the loose coupling aspect of SOA regarding semantic enrichment of Web Services description. Then we illustrate our approach related to the discovery of services in the context of a product catalogue using semantic web services represented in OWL-S. We then use a logic-based matchmaker to detect if services match. The use of reasoning is intended to be a consistent way to verify matching services.

BACKGROUND

By nature, all large systems are heterogeneous, *i.e.* they lack uniformity. These systems were initially developed with different purposes, and evolved towards accretions of different platforms, programming languages and even middleware. SOA paradigm aims at dealing with heterogeneous systems in a decentralised way as much as possible. Decentralisation helps to obtain loose coupling. SOA key technical concepts are services, loose coupling and interoperability. We briefly describe these three concepts below.

Although several definitions exist, in short, a service is an information technology (IT) representation of self-contained business functionality.

Loose coupling minimises dependencies and thus helps scalability, flexibility and fault tolerance. When dependencies are reduced, modifications have minimised effects and the systems still run when part of them are down. When problems occur, it is important to decrease their effects and consequences. Josuttis (2007) elaborates on several strategies to apply loose coupling.

The ISO/IEC 2382-01 (1993) states that interoperability is the capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units. Thus, interoperability enables systems to communicate, understand each other and exchange information. Syntactic and structural interoperability is already set up with transformations, for instance, using standards like XML and XML Schema and associated tools. Syntactic and structural transformations are used to convert schema representations into a target format. Approaches that target at enhancing interoperability based on structure and on syntax can only produce improvements when a certain conceptual homogeneity between graphs to compare exists. Solving mismatches on the semantic

14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/semantic-side-service-oriented-architectures/43975

Related Content

Perceptual Metrics Quality: Comparative Study for 3D Static Meshes

Nessrine Elloumi, Habiba Loukil Hadj Kacem, Nilanjan Dey, Amira S. Ashourand Med Salim Bouhlel (2017). *International Journal of Service Science, Management, Engineering, and Technology* (pp. 63-80). www.irma-international.org/article/perceptual-metrics-quality/169752

On the use of the Hybrid Cloud Computing Paradigm

Carlos Martín Sánchez, Daniel Molina, Rafael Moreno Vozmediano, Ruben S. Monteroand Ignacio M. Llorente (2012). *Achieving Federated and Self-Manageable Cloud Infrastructures: Theory and Practice* (pp. 196-218). www.irma-international.org/chapter/use-hybrid-cloud-computing-paradigm/66234

Assessment of Contributions of the Methodology for the Construction of a Catalog of Information Technology Services Aimed at Public Entities

Cristian Mera Macíasand Igor Aguilar-Alonso (2022). *International Journal of Service Science, Management, Engineering, and Technology* (pp. 1-28). www.irma-international.org/article/assessment-of-contributions-of-the-methodology-for-the-construction-of-a-catalog-of-information-technology-services-aimed-at-public-entities/287911

Service-oriented Collaborative Business Processes

Lai Xu, Paul de Vrieze, Athman Bouguettaya, Peng Liang, Keith Phalpand Sherry Jeary (2012). *Performance and Dependability in Service Computing: Concepts, Techniques and Research Directions* (pp. 116-132). www.irma-international.org/chapter/service-oriented-collaborative-business-processes/55515

Robo-Advisory Services in India: A Study to Analyse Awareness and Perception of Millennials

Arti Chandani, Sriharshitha S., Ankita Bhatia, Rizwana Atiqand Mita Mehta (2021). *International Journal of Cloud Applications and Computing* (pp. 152-173). www.irma-international.org/article/robo-advisory-services-in-india/288779