Chapter XI

Proactively Composing Web Services as Tasks by Semantic Web Agents

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Abstract

This chapter presents the framework for agent-enabled dynamic composition of Semantic Web services. The approach and the framework have been developed in several research and development projects by ISRG and IOG. The core of the methodology is the new understanding of a Semantic Web service as a capability of an intelligent software agent supplied with the proper ontological description. It is demonstrated how diverse Web services may be composed and mediated by dynamic coalitions of software agents collaboratively performing tasks for service requestors. Middle agent layer is introduced to conduct the transformation of a...
Web service request to the corresponding task, agent-enabled cooperative task decomposition and performance. Discussed are the formal means to arrange agents’ negotiation, to represent the semantic structure of task-activity-service hierarchy and to assess fellow-agents’ capabilities and credibility factors. It is argued that the presented technique is applicable to various application domains. Presented is the ongoing work on designing and implementing agent-based layered architecture for intelligent rational information and document retrieval. Finally, the discussion of the OntoServ.Net framework for the development of P2P mobile service infrastructures for industrial asset management provides the extension of the Web service composition approach.

Introduction

Semantic Web services are the emerging technology promising to become one of the future key enablers of the Semantic Web. There are strong prerequisites that, being self-described and self-contained modular active components, Web services will appear to be the key elements in assembling intelligent software infrastructures in the near future.

There is the emerging consensus that the ultimate challenge is to make Semantic Web services automatically tradable and usable by artificial agents in their rational, proactive interoperation on the next generation of the Web. It may be solved by creating frameworks, standards, and software for automatic Web service discovery, execution, composition, interoperation and monitoring (McIlraith et al., 2002). The personal opinion of the authors is that the list should be extended by the means-making services to the subject of automated negotiation and trade. It is also important for future service enabled Semantic Web infrastructures to cope with business rules, the notions and mechanisms of reputation and trust with respect to services and service providing agents, dynamic character, flexibility, re-configurability of partial plans (Ermolayev & Plaksin, 2002), workflows, and modeled business processes.

Current industry landscape provides only initial and very partial solutions to the ultimate problem. Existing de-facto standards for Web service description (WSDL), publication, registration and discovery (UDDI), binding, invocation, and communication (SOAP) provide merely syntactical capabilities and do not fully cope with service semantics. Known industrial implementations, such as HP E-speak (Karp, 2003), are based on these standards and do not completely solve the challenge of semantic interoperability among Web services. It should be mentioned that major industrial players realize the necessity of further targeted joint research and development in the field (Layman, 2003).
Authentication Techniques for UDDI Registries
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