Chapter VIII

Building Sound Semantic Web Frameworks for Scalable and Fault-Tolerant Systems

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Abstract

This chapter introduces hyperservices as a unified application model for Semantic Web frameworks and proposes the WASP model as a framework for implementing them. Hyperservices are based on agent societies, provided with structured information by the Semantic Web, and using Web services as a collaboration and communication interface. The WASP model adds personalization rules to modify the agents' perception and the HIVE architecture as Semantic Information Server infrastructure within this framework. Finally, conceptual model driven software development is proposed as a means of easy adoption to hyperservices.

Overview

The Semantic Web and its effects are a mainstream catalyst for current Web development. Its influence is felt across many areas of research and business development: agent systems, knowledge-management frameworks, ontology definitions, and other areas all are refined by new ideas from Semantic Web research (and vice versa). Since many complex topics now are combined with the goal of building the "Next Generation Internet", it becomes increasingly important to build sound and flexible frameworks lest small research and development teams are overwhelmed by the multitude of choices, complex technologies, and the interfaces between those individual building blocks. Additionally operation-level support needs to be integrated in future architectures at a very basic level in order to provide a stable, scalable, and fault-tolerant basic architecture.

Research shows that the underlying methodology for defining Semantic Web-oriented frameworks can be defined very well. This chapter will explain the main streams which will be integrated towards the Semantic Web and more importantly show—based on a thorough requirements analysis—how Semantic Web-oriented systems must be built in order to create scalable, fault-tolerant, and extensible systems.

The following steps will lead to a refined methodological rules system that should govern all underlying concerns to build Semantic Web-centric frameworks and systems:

- The main research streams and technologies making up the Semantic Web are identified. Their interrelations and resulting requirements for frameworks and systems are shown.

- An in-depth requirements analysis concerning the architecture of Semantic Web systems and the must-have features of such features provides the ground for the definition of the corner stones of future Semantic Web systems. Specifically the requirements to be fulfilled by fault-tolerant, extensible, and scalable systems are shown.

- An approach to build multiplatform Semantic Web frameworks based on the core technologies of agents, ontologies, Web services, and personalization frameworks is explained. This approach is generic enough to encompass most currently existing frameworks and lends itself towards the integration of emerging standards. A new type of service—a hyperservice—is derived from integrating these core technologies into a new type of service infrastructure.

- Hints about using model-driven software development (MDSD) to build complex systems from standards-based simple building blocks will be given. Specifically we will explain the basics of a new MDSD philosophy we have developed (so-called conceptual model-driven software development / CMDSD)

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