Chapter 8
Toward Introducing Semantic Capabilities for WSRP

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ABSTRACT

The emergence of web services technology has introduced a problem: how can we ensure that requests are successfully matched with advertisements when consumers and producers may use different terminology to describe the same service or the same terminology to describe different ones? Popular approaches to solving this problem are reviewed which involve the use of ontologies to improve the semantic content of the matchmaking process. When services are presentation-oriented rather than merely data-oriented, another layer of difficulty is introduced. The architecture of Web Services for Remote Portlets is discussed extensively, including the interaction cycle between the client and the producer to maintain state variables for each remote session of a portlet to provide sufficient background for readers. A comparison is made between the way concepts are implemented in two different portlet specifications – IBM Portlet API and JSR168 specification. Architecture is proposed to support the automated use of dynamic services for remote portlets, the motivation for which is the lack of expressivity of the current standards to represent the semantic requirements and capabilities of data and user-facing web services.

LITERATURE REVIEW

The potential benefits and current problems of web services are often discussed in academic articles and, less commonly, in books. In this section, we give a brief summary of the progress that has been made in achieving the vision of web services and of the outstanding research issues, focussing on the particular challenges posed by presentation-oriented services.

The vision is quite simply that software functionality can be made available over the Internet
and consumed as a service by clients regardless of their architecture, language, or communication protocol. Standards have been agreed to enable this vision to be realized, principally UDDI for publishing and discovering services, SOAP for communication, and WSDL as the description language. OWL-S is emerging as the standard for capturing the semantics of service operations and BPEL4WS for composing atomic services into workflows. Many accounts of these standards exist. A good recent summary can be found in (Fan & S. Kambhampati (2005)).

The web service lifecycle consists of publication followed by discovery, invocation, interoperating, composition, verification, execution, and monitoring (Ankolekar, M. Burstein, J.R. Hobbs, O. Lassila, D. Martin, D. McDermott, S.A. McIlraith, S. Narayanan, M. Paolucci, T. Payne & K. Sycara (2002)). Standards for the later phases are still emerging, but even the earlier phases of publishing and discovery have recognized problems despite the fact that their standards are agreed. Most of the problems concern how to improve the semantic content of service advertisements and requests so that matchmaking can be more successful. In this paper, we are concerned mainly with this issue of semantic matchmaking and how it extends to presentation-oriented services mediated by portlets.

Discovering the service that best suits a given request is obviously important and it is a problem that will grow more critical as the number of available services increases. The UDDI standard specifies a web-based registry that allows services to be discovered by keyword search, which is a hit-or-miss affair. The challenge is to automate the discovery of services without imposing the unrealistic condition that service providers and consumers must use identical vocabularies when describing service features.

The registry contains only a description of a service, not the service itself. One can adopt an index approach instead of relying on a registry and write a crawler to search for services directly (M. Jaeger, G. Rojec-Goldmann, C. Liebetruth, G. Muhl & K. Geihs (2005)). While this bypasses the publisher’s terminology, it requires each client to code his own search algorithm. Obviously, it would be better to use a standard declarative approach if that can be made to work.

A popular approach to solving the terminology problem is to express service details using the OWL-S framework for web service descriptions and ontological reasoning techniques derived from AI to match requests with advertisements. This allows semantically equivalent terms to be treated as such despite syntactic differences and matching to be a matter of degree rather than an all-or-nothing affair. For a literature review of some of the discovery algorithms involving UDDI registries enhanced with OWL-based semantics, see section 9 of (N. Srinivasan, M. Paolucci & K. Sycara (2005)).


DAML-S (now called OWL-S) provides an upper ontology of service profiles that allows information about the provider, functional descriptions, and functional attributes to be mapped to and embedded in UDDI service representations. The UDDI T-Model mechanism is used to accommodate attributes that are specific to DAML-S including those that give a semantically marked-up description of a service’s capabilities, such as
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