Chapter 15
A Decentralized Framework for Semantic Web Services Discovery Using Mobile Agent

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ABSTRACT

Web services discovery provided by the UDDI registries is relatively primitive. It does not take into account the continuous growth in the number of services on the Web. The UDDI standard has been proposed and used for Web service publication and discovery. However, it does not allow users to choose the best provider. It does not offer a mechanism to choose a Web service based on its quality. The standard also lacks of sufficient semantic description in the content of Web services, this lack makes it difficult to find and compose suitable Web services during analysis, search, and matching processes. In addition, a central UDDI suffers from one centralized point problem and the high cost of maintenance. To get around these problems, the authors propose in this paper a novel framework based on mobile agent and metadata catalogue for Web services discovery. Their approach is based on user profile in order to discover appropriate Web services, meeting customer requirements, in less time and taking into account the QoS properties.

1. INTRODUCTION

Nowadays the Web services and semantic Web domains are growing tremendously. Web services (WS) have enabled the Web to move from the usual role of information networks to an applications middleware due to the increasing use of XML technologies. In fact, Web service has been defined as modular, self-describing, loosely-coupled application that can be published, located and invoked through the Internet.

The wide spreading of Web Services is due to its simplicity and the data interoperability provided by its components namely SOAP (Simple Object Access Protocol) (Egli, 2012), UDDI (Universal Description, Discovery and Integration) (Newcomer, 2002) and WSDL (Web Service Description Language) (Egli, 2012). SOAP is used to transfer the data; UDDI is used for the discovery of services; WSDL is used for describing the services.

Traditional UDDI supports only keywords based discovering mechanisms. Keywords are insufficient in expressing semantic concepts and semantically different concepts could possess identical representation, which will further lead to low precision. With the development of the semantic web, services can be annotated with metadata for enhancement of service discovery. The current trend in the research community is to exploit semantic Web technologies, such as RDF (Resource Description Framework) (Daconta, Obrst, & Smith, 2003), RDFS (Resource Description Framework Schemas) (Daconta, Obrst, & Smith, 2003), OWL (Ontology Web Language) (Hendler, et al., 2004) in order to enrich the semantic Web services descriptions.

If the discovery engine returned multiple candidate Web services provide the same functionality, then Quality of Service (QoS) is becoming an important criterion for selection of the best available Web service. As users are not clearly aware of the functional and non-functional (QoS) information of the existing Web services, it is usually quite confusing for them to make a decision in choosing an appropriate service matching their requirements. Therefore, it is very important to extend the existing model to support quality of Web service and establish a Web service evaluation approach to solve the problem. Meanwhile user preference is also important in Web service selection in that a Web service, which has the best evaluation value, is not necessarily always matching user individual requirements (Thangavel & Palanisamy, 2011). Therefore, when we design the Web service discovery approach, we must consider user preference simultaneously as a key factor.

In this paper, the researchers present a novel framework for Web services discovery based metadata catalogue, agent mobile and user profile. This framework is based on a distributed architecture composed of three layers: service requester layer, middleware layer, service provider layer. The Web service discovery process became more efficient and more dynamic by exploiting the parallelism and the distribution given by agent technology.

Our work aims at simplifying and optimizing the Web services discovery using metadata, QoS information and user profile, in order to reduce the search space and increase the number of relevant services.

The rest of the paper is organized as follows. Section 2 presents preliminaries and the necessary concepts to elaborate our work. Section 3 presents the proposed framework indicating the general model architecture, and then we express the architectural and behavioral aspect of each component in section 4. Our implementation of the prototype is described in section 5, and then we provide an illustrative example in section 6. Section 7 shows some related works. Finally, a conclusion is to assess this approach and present the envisaged perspectives.

2. PRELIMINARIES

This section gives an overview of the background concepts that form the basis of the work presented in this article.

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