Chapter 84
From User's Goal to Semantic Web Services Discovery: Approach Based on Traceability

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ABSTRACT

The growing number of the Web Services available on the Web without explicit associated semantic descriptions raises a new and challenging research problem: How to discover efficiently the relevant Web Services that fulfill the user expectations. However, many services that are relevant to a specific user service request may not be considered during the service discovery process. In this paper, the authors address the issue of the Web Service discovery given nonexplicit service description semantics that match a specific service request. Their approach is based on a captured user goal from an HTML form and the traceability and involves semantic-based service categorization, semantic discovery and selection of the best Web Service. Furthermore, the authors' proposal employs ontology matching algorithms to match a specific goal to an existing Web Service. An experimental test of the proposed framework related to the Medical Analysis domain is reported, showing the impact of the proposal in decreasing the time and the effort of the discovery process as a whole.

1. INTRODUCTION

The Web is moving from being a collection of pages toward a collection of services that interoperate through the Internet. These Web Services offer various functionalities in the areas of communications, data enhancement e-commerce, marketing, utilities among others.

Some of the Web Services are published and invoked by various organizations. However, the

DOI: 10.4018/978-1-4666-8751-6.ch084

growing number of Web Services available within an organization and on the Web raises a new and challenging research problem: locating the desired Web Services and searching the appropriate Web Services that fulfill the user expectations become increasingly important.

According to De Paoli et al. (2008): "Web Service Discovery (WSD) is the process of finding Web Services requests and their concrete Web Service offered for achieving the user's goal". The task of Web Service discovery is supposed to enable seamless interoperation between systems, whereby human intervention is kept at a minimum.

Web Service discovery in particular is the action of searching and matchmaking between available offered Web Services and a service requester. Due to the increasing existing Web Services with similar functionalities, the ability for the user to find the most relevant Web Services that meet his request has become even more difficult and hence, challenging.

Web Services standards, in their present format use classical mechanisms and support only keyword based search of Web Service, thus the discovery is based on the sweeping of all available registries to respond to a client request. With the increase number of available Web Services, these methods are no longer relevant because the discovery time becomes considerable and many services which can fulfill the user's preferences are not retrieved.

In fact, to address this problem, several approaches have been recently proposed to simplify the Web Service discovery. However, the lack of machine readable semantics necessitates human intervention for automated Service Discovery within open systems. Thus, hampers the Web Services usage in complex business contexts.

In this paper, we survey of the main approaches related to the Web Services Discovery. Further, we propose a novel approach for Web Service discovery based on capturing a Goal from a user query, matching such Goal with the available Web Services and finding the suitable Web Service that fulfill the user requirements.

The proposal is based on traceability and employs WordNet-based matching algorithms and domain ontologies as based knowledge to enable more efficient and accurate discovery process.

Our approach involves three basic steps: Semantic-based service categorization, semantic discovery and selection of the best Web Service, starting from the formulation of the user Goal within the needs to finding the Web Service suitable to the user request.

The rest of the paper is structured as follows. We describe in the second section some concept definitions and methodologies utilized in our framework. In section three, we give an overview of the main works related to the Web Services Discovery then we provide a critical analysis of these approaches. Section four presents our proposal in detailed. An empirical study of our approach is presented in section five to evaluate its performance and efficiency. Finally, Section six depicts a conclusion with the main research directions.

2. BACKGROUND

The Web Service technologies bring a dynamic aspect to overall Web usage. However, the current understanding of the Web Services fails to capture enough semantic data. Therefore, Semantic Services deal with such limitation by augmenting the service description with a semantic layer in order to achieve an automated discovery, composition, monitoring, and execution, which are all highly desirable processes (Suganthy et al., 2010).

There are multiple frameworks placed to enable the technologies of Semantic Web Services. Some tools allow the annotation of semantics to Web Services; others describe services using