Location-based Selection of Services in Web Service Composition

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웹 서비스 조합에서 서비스의 위치기반 선택

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Abstract

Since in web service composition, the same service may be offered by different providers with different Quality of Services (QoS) attributes, selection criteria are needed to select which Web Services will be considered for composition. Location of provider can be one of these criteria and intends to decrease the number of remote interactions between providers as well as reducing waiting time of service consumer. Therefore in this paper, we present technique for composing web services according to their location by semantically describing customer's goals and provider's web service capability by means of carefully designed ontology and logical expression.

1. Introduction

Web services popularity is increasing due to the numerous advantages they provide to organizations upon their utilization. Usually web services can be exploited in an isolated form, however when no single Web service can satisfy the functionality required by a user, there should be a possibility to compose existing services together in order to fulfill the request. Since in this composition, there are Web services in common, selection criteria are needed to select a proper service for composition [1]. Execution time, cost and reputation, just to cite a few are among the selection criteria that have commonly been used in various projects.

In this paper, we consider location of service provider as another criterion that is meaningful to integrate in the selection process of services. Because knowing location of provider can bring several advantages such as decreasing the number of remote interactions between providers also reducing waiting of service consumer. Therefore here, we present technique for composing web services according to their location by semantically describing customer's goals and provider's web service capability by means of carefully designed ontologies and logical expressions in Web Service Modeling Ontology (WSMO).

2. Related Studies

As far as we know location based composition of Web services has not been directly addressed in any work yet. However similar classification and functional relationships were explored in various discovery working groups [2, 3, 4].

In [2], researches propose approach with development of time efficient web service in order to improve timeliness of communication between service requester and provider. The main point of this research was to establish communication through alternative web services. In other words, service requester sends request to service provider located in the same area within some predefined time. If there is no response from nearest providers, system had to redirect messages to next nearest area. The disadvantage of this approach is that it relies on individual services. If service provider within the same area can fulfill user's request partially, it's considered as fail and system redirect message to the next nearest area in order to find a suitable service which could fully fulfill customer's request.

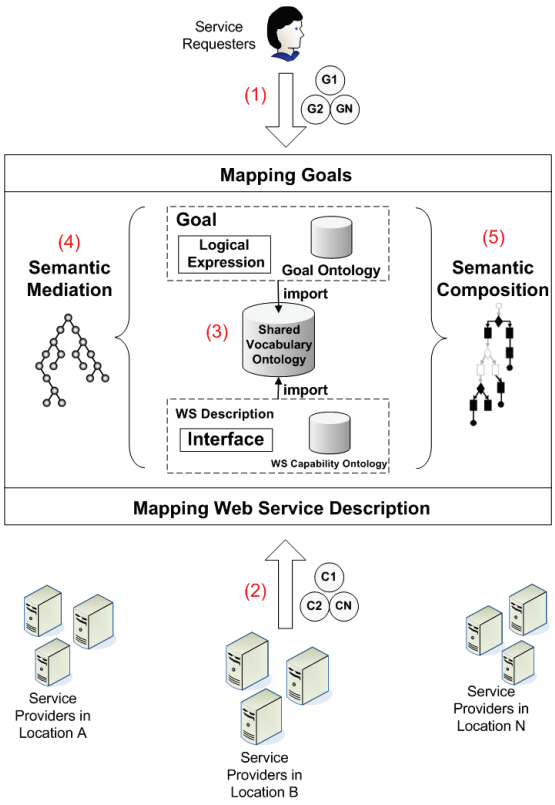
In [3, 4], the authors describe their approach for semantic Web services matchmaking while composing. They argue that hybrid approaches to semantic matching that exploit both formal and implicit semantics may improve the retrieval performance of semantic service matching over purely logic-based ones. According to our observation, this approach employs only exact matmaking technique. On contrast, our system currently supports matchmaking based on full set of matching such as exact, plugin, subsumption and fail relationships.

3. System Design

Figure 1 represents the general design of the proposed system. We subdivided explanation into four parts to make it more comprehensible.

(1) The Service Requesters have multiple goals (G1, G2, G3) that are mapped through an intermediary mapping component into WSMO goals expressed in WSML in Broker.

(2) The Service Providers which are divided according to location provide multiple services that are also mapped by means of intermediary mapping component to WSMO web services expressed in WSML



(Figure 1) General System Design

(3) The Broker itself implements the mentioned above intermediary mapping components that use WSMO Shared Vocabulary Ontology that represents the shared vocabulary of the terms used in this business case. This Shared Vocabulary Ontology is imported into each WSML Goal and web service description.

(4) The proposed architecture has been tested in WSMX execution environment, where we carefully mapped the Auto Repair Service business case participants into corresponding Web Services, Goals and Ontologies and established links between by means of ontology that allowed a decentralized discovery of the needed web service based on goal specification. The matching between goals and web services can fall into one of the following cases:

- Exact Match – all functionality provided by web services match what the goal requires
- Plug-in Match – web services provide more functionality than goal requires
- Subsumption Match – when part of functionality of web services match with part of requirements defined in goal
- Fail - any web services cannot fulfill user's goal

(5) In our design, the possible compositions are obtained by checking semantic similarities among individual services. Then these compositions are ranked considering their functional QoS such as location and an optimum composition is selected. Then from this composition the user selects a service from a ranked list at certain stages.

4. System Implementation

We have selected WSMO for the reason is that, WSMO clearly models main components as well as provide enough flexibility to specify web service capabilities via decentralized ontologies interconnected via logical axioms, by means of which services can be discovered to match a goal. We have designed all mentioned concept (ontology, web services description, goals description) using WSMO. Here is how we did it:

- As the first step of the development of proposed prototype, ontology using concepts and attributes of car parts is developed. This ontology represents a common vocabulary used in Auto Part Shops and by the customer to describe the item for sale/purchase.
- We carefully designed each auto part shop capability in order to enable testing of various customer goal specification scenarios.
- The requester goals are mapped in WSML to represent different possible scenarios for demonstration of match between goal and web service. Goals were purposefully varied to demonstrate different cases, such as exact match, plug-in match and no-match.

5. Conclusion

In this research, we achieve composing web services according to their location by semantically describing customer's goals and provider's web service capability by means of carefully designed ontology and logical expression in Web Service Modeling Ontology. We believe that implementation of proposed method could decrease the number of remote interactions between providers as well as reducing waiting time of service consumer.

Acknowledgment

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