WSC-06: The Web Service Challenge

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Abstract

In today's businesses, there is a trend that service-oriented architecture (SOA) is evolving into a popular architectural paradigm for IT infrastructure. SOA allows companies' software systems to be shared as network-enabled electronic services with their commonly specified interfaces. Service discovery and composition are two emerging ones which are both fundamental and important to SOA. Service discovery occurs when software modules identify suitable services that meet pre-established requirements based on the service descriptions. Service composition takes one step further to chain up the discovered services as execution plans.

To motivate and promote the research in the areas, the Web Services Challenge 2006 (WSC-06) is organized and will take place at the joint 2006 CEC/EEE conferences. Building upon the success of the first two Web Services Challenges held at EEE-05 and ICEBE-05, WSC-06 contains new challenges that consider not only exact match, but also subsumption relations between input and output types, thus simulating semantic search. The competition solicits academic and industry researchers to develop software systems for discovering Web services and also composing them to create higher-level capabilities.

1 Introduction

In continuation of the software challenges which took place last year at the EEE-05 conference [1] and the ICEBE-05 conference as well [3], Web Service Challenge 2006 (WSC-06) will be held at the IEEE joint Conference on Electronic Commerce (CEC-06) and EEE-06 [2]. The competition series intends to establish a forum where researchers can collaborate on approaches, methods and algorithms in the domain of Web service discovery and automated composition. Furthermore, this forum will provide quantitative evaluation results on the performance of participating matchmaking and automated composition software and will help to disseminate the advances in this field.

WSC-06 represents the third event of the matchmaking and composition challenge series. It extends the original criteria of the first two competitions which focused on service discovery and service composition based on the syntactic matching of WSDL part names. This year's competition includes a slight adoption of semantically defined data types. Since formalisms for representing semantics of services are complex and several competing proposals exist, this competition adheres to a technology-independent traditional approach. The organizers decided to include the additional complexity of semantics in the competition by leveraging the classical XML standards. Input and output messages defined in WSDL are semantically linked via inheritance relationships as implemented by using complex XML Schema types. Based on the inheritance relationships, a matchmaking software is required to determine subsumption relations between different types during service discovery and service composition.

2 The Simulation of Semantics

For the semantic version of the challenge, a simplified version of semantic description of services is considered. Rather than using a full-fledged ontology based on an ontology language like OWL, a simplified type hierarchy defined in XML Schema is used to provide a common definition of domain concepts. In accordance, the required matching of parameter names is extended to the matching of parameter types defined by the XML Schema type hierarchy. The Web Service Challenge does not cover the service semantics (e.g., service category, and pre- and postconditions) as provided by service ontologies like e.g. the OWL-S ontology [4] or the WSMF [5].

2.1 Service Discovery

Service discovery produces a set of services matching a description of the required service interface provided by a requester. The goal of this challenge is to work on efficient algorithms for service discovery based on service interface descriptions. The considered representation of a service consists of a number of input and output parameters, each referring to a type defined in a type system with an inheritance hierarchy. Considering that a service represents a program interface to be invoked (input) or to invoke (output), we need to consider the contravariance of types

for the interfaces which results in the following rules for a successful type match of parameters:

- Regarding the input matching, the types associated to the input parameters of the provided service must be subsumed by the types of the input parameters specified by the requester. If a service parameter type is not provided by the requester the successful execution cannot be guaranteed.

- The requirement of the requester results from the fact that a Web service invocation is processed by a software that further processes the output of the invocation. In order to ensure the successful processing of the output parameters the associated types must be equivalent or subsumed by the required output types.

2.2 Service Composition

In addition, the challenge also considers the case that a single service does not match all input and output parameter types as requested. In this case, the service provider can compose services to fulfill the following constraints:

- The service requester must have all service inputs matched with their equivalent or subsuming types. Otherwise a service call invokes an interface without setting all parameters correctly which leads usually to a malfunction, and

- the service provider must have at least match all required outputs with their equivalent or subsumed types. Otherwise the service does not fulfill the requirements of the requester by not delivering one or more required outputs.

In summary, the new matching challenge not only consider the string equivalence of parameter names, as this was the goal of the previous challenges, but also the contravariance of types to identify successful service matches. The considered type system is encoded using XML Schema. XML Schema is suitable for defining complex data types to establish a type hierarchy. Information expressed according to a type system using XML Schema can facilitate subsequent processing.

In the competition, the type definition specified in XML Schema is provided as a single file to be used in all the WSDL files related to a particular repository. Besides, the specification of the query and the expected result format are equivalent except that the part names are replaced by complex type names defined in the XML Schema file. Competing software solutions are required to parse the XML Schema file as well as the queries expressed in a custom XML format.

3 Organization

WSC-06 attracted 11 international teams which come from universities, research organizations and industry laboratories in countries including Austria, China, Germany, India, Italy, Singapore and the USA. The organization of this event is divided into two phases: The first phase focuses on evaluating the technical viability of the methodologies proposed by the participating teams. A two-page technical description submitted from each team was reviewed by four reviewers. By the time that this report was written, the reviewing and acceptance notification part has finished. The short-listed participating teams will then be asked to submit a version of their software for evaluation. Preliminary tests will be conducted using the evaluation version to ensure the compatibility and applicability during the final competition. The main objective is to avoid in advance the potential format related problems that may otherwise occur when the competition takes place. The second phase is the final competition which is scheduled for two days at the CEC/EEE-06: On the first day, June 27th, all the participating teams will present their approaches. Then, on June 28th, the teams have to run through their software using a data set prepared for the competition.

References

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[2] Home Page of the WSC-06. http://www.ws-challenge.org/ or http://insel.flp.cs.tu-berlin.de/wsc06/

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