An Abstract Transaction Model for Testing the Web Services Transactions

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Abstract. This is a summary of the paper published in the Proceedings of the 9th IEEE International Conference on Web Services (ICWS), ranked as CORE A. The work addresses the topic of testing web services transactions using a model-based approach.

Keywords: web services testing, model-based testing

1 Summary

A transaction is defined as a set of operations of an application such that all the operations achieve a mutually agreed outcome. The conventional method for achieving such outcome is the enforcement of the Atomicity, Consistency, Isolation and Durability (ACID) properties. Web Services (WS) transactions are more complex as they involve multiple parties, span many organizations, and may take a long time to finish. Strictly enforcing the ACID properties is not appropriate to a loosely coupled world of WS doing the lock of resources unsuitable. In order to meet the requirements of WS, various extended transaction models have been adapted. So there are a diversity of transaction models and protocols such as Business Transaction Protocol (BTP) or WS BusinessActivity (WS-BA).

Although transactions have been identified as a key issue in WS environments, current research does not focus on a crucial issue of testing them. We proposed a model-based approach to address such gap. Contributions of this work are: (i) an abstract transaction model that serves as a template for modeling current WS transaction standards. (ii) Automatic generation of abstract test scenarios and map them to different WS transactions standards.

1.1 The Abstract Transaction Model

The abstract model has been developed based on main concepts shown in the literature. Its objective is to be easy to understand as well as capable to pattern the

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actual web service transaction models. We have used the UML statecharts notation since the model is event-driven (messages between participants).

A web service transaction (*wT*) is a set of activities (subtransactions) executed by different web services (participants) that can take a substantial amount of time to complete. We identify four different roles between the participants.

- *Executor*: a participant responsible for executing and terminating a subtransaction.
- *Coordinator*: it coordinates the *wT* and manages failures and compensations. It also collects the results from the participants in order to provide system with a consistent state after the execution of *wT*.
- *Initiator*: it starts the *wT*. First it requests the coordinator for a transaction context. Then it asks to the others participants to participate in the *wT*.
- *Terminator*: it decides when and how the *wT* has to be finished. Thus it participates in the coordination tasks so it can be a subcoordinator.

The modeling of WS transaction standards is achieved following these three algorithms:

- *Role identification and modeling*: it identifies the roles of participants in a target WS transaction standard and models it using the roles defined in the abstract transaction models.
- *State transitioning*: it captures the important states of the target WS transaction standards and maps them to the state transitions of the abstract model.
- *Message syntax*: it transforms the messages of abstract transaction models to the specific protocols of the WS transaction standards.

1.2 Model-based Testing

The main goal of testing is failure detection i.e., the observable differences between the behaviors of implementation and what is expected. We use model-based testing since our abstract model allows us to pattern the transaction behavior. The steps used in the process of definition of test scenarios are described as follows:

- *Test criterion selection:* The transition coverage criterion defines that the set of test scenarios must include tests that cause every transition in the model to be taken.
- *Generating abstract test scenarios*: An abstract test scenario is defined as a sequence of states and transitions of a participant using the abstract model.
- *Generating specific test scenarios*: An abstract test scenario is transformed to a sequence of messages between participants using a specific WS transaction standard.

Our prototype tool automatically obtains the set of test scenarios. It applies transition coverage criterion over the abstract model and obtains a set of independent paths. Each path defines an abstract test scenario. The tool also generates the mapping from the abstract test scenario to a specific test scenario (sequence of message using the syntax of BTP or WS-BA).

A Model of User Preferences for Semantic Services Discovery and Ranking
(Published in ESWC 2010)

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Abstract. Current proposals on Semantic Web Services discovery and ranking are based on user preferences descriptions that often come with insufficient expressiveness, consequently making more difficult or even preventing the description of complex user desires. There is a lack of a general and comprehensive preference model, so discovery and ranking proposals have to provide ad hoc preference descriptions whose expressiveness depends on the facilities provided by the corresponding technique, resulting in user preferences that are tightly coupled with the underlying formalism being used by each concrete solution. In order to overcome these problems, in this paper an abstract and sufficiently expressive model for defining preferences is presented, so that they may be described in an intuitively and user-friendly manner. The proposed model is based on a well-known query preference model from database systems, which provides highly expressive constructors to describe and compose user preferences semantically. Furthermore, the presented proposal is independent from the concrete discovery and ranking engines selected, and may be used to extend current Semantic Web Service frameworks, such as WSMO, SA-WSDL, or OWL-S. In this paper, the presented model is also validated against a complex discovery and ranking scenario, and a concrete implementation of the model in WSMO is outlined.

Keywords: User Preferences, Ontology Modeling, Semantic Web Services, Service Discovery, Service Ranking.

Summary of the Contribution

In this paper, published in the 7th Extended Semantic Web Conference (ESWC 2010) [1], we presented a highly expressive model aimed at decoupling user preferences definition from underlying formalisms of discovery and ranking engines. These engines typically offer ad hoc ontologies to define user preferences, constraining the expressiveness and making difficult their combination with other discovery and/or ranking approaches. In order to overcome these issues, we proposed an intuitive preference model based on a strict partial order interpretation of preferences.

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Essentially, our preference ontology offers the user a series of constructs that allow to define (1) concrete *atomic* preference terms, which state preferred values for a particular service property, and (2) *composite* preferences, which allow the composition of different preference terms using intuitive criteria.

Concerning atomic preference terms, our ontology provides both qualitative and quantitative facilities, that can be correspondingly applied to non-numerical and numerical service properties. Each atomic preference term refers to a single property, though they can be combined using composite preferences. Therefore, composite preferences allows the definition of complex preferences regarding several service properties.

In order to evaluate the usefulness of our proposal, we validated our model using a complex scenario about logistics management from the SWS Challenge[1]. This scenario consists on seven logistics service offers, described in natural language in terms of different properties, along with a series of service requests (goals) that contain both hard requirements and user preferences. The performed validation proved that our preference model can be used to define complex user preferences.

Additionally, we discussed the extension of WSMO service goals with preference information using our model. This application allowed a seamless integration of preference definitions in WSMO descriptions, refining the service goal meta-model. Therefore, current discovery and ranking approaches could still be applied to extended goals definitions, whereas specialized ranking engines can be easily implemented to account for preferences.

In conclusion, this research work presented a novel approach to define user preferences for Semantic Web Services that offers a highly expressive, intuitive semantic model, which supports and combines both qualitative and quantitative preference terms. Moreover, our proposal is independent of the underlying discovery and ranking formalisms, allowing its extension and application to any Semantic Web Services framework.

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[1] The complete scenario description can be found at `http://sws-challenge.org/wiki/index.php/Scenario:_Logistics_Management`

Aplicación de la técnica de pruebas metamórficas a una composición de servicios: Metasearch

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Resumen Debido a que las técnicas de prueba tradicionales no están adaptadas a las características peculiares de los servicios web, se hace necesario el diseño de nuevas técnicas que ayuden en este ámbito. En un trabajo previo se propuso las pruebas metamórficas como una técnica válida para aplicar a composiciones de servicios web en WS-BPEL. En este trabajo se aplica la arquitectura propuesta allí a la composición de servicios Metasearch, que por su complejidad requiere un análisis detallado. Se incluye el estudio y especificación de las relaciones metamórficas para esta composición. Así mismo, se añade una comparativa de otras composiciones estudiadas que muestra resultados prometedores.

Keywords: pruebas metamórficas, servicios web, WS-BPEL

1. Introducción

El lenguaje WS-BPEL 2.0 [7] posibilita la creación de nuevos servicios web (WS) diseñando procesos de negocio más complejos a partir de otros existentes. Por tanto, es preciso implementar buenos métodos de prueba de composiciones que sean correctos. Avances en este aspecto se describen en [8].
La *prueba metamórfica* (MT) [4] es una técnica de prueba de software que permite generar casos de prueba para verificar programas de manera automática. Se basa en el concepto de *relación metamórfica* (MR), que es una propiedad esperada o existente del software que se prueba y que está definida sobre un conjunto de entradas y sus correspondientes salidas.
Recientemente, se ha publicado un interesante trabajo basado en el análisis de los modelos de características [9].
Este trabajo presenta la aplicación de MT a composiciones de servicios web WS-BPEL mediante la arquitectura propuesta en [3] a un caso de estudio, y una comparativa en referencia a otra técnica y de aplicación a otras composiciones con resultados esperanzadores.
El artículo está estructurado de la siguiente manera: En la sección 2 se describen los conceptos básicos de MT. En la sección 3 se describe un caso de estudio, la composición *Metasearch* o Metabúsqueda, junto con las MR y los resultados

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