Model-Based Relationship Management for Service Networks

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ABSTRACT

With the broad adoption of service-orientation for the realization of business applications and their provisioning and usage over cloud infrastructures, the topology of the resulting service networks is becoming extremely complex. Due to the composition of services for value-added business capabilities and the reusability of a service in multiple compositions, the execution of one service often depends on other services and changes in its provisioning can affect the health of large parts of the service network. The lack of insight on the relationships between the network components makes the management of the service network’s health hard and error prone tasks. This article introduces a service network modeling approach for capturing the topology of a service network at design time. The approach considers the complete modeling process from representation, through collection, to analysis of the relationship information. The major contributions are a generic and adaptable modeling structure, a classification of service network entities and relationships, and a modular management framework automating the modeling process.

Keywords: Adaptability, Evolution Support, Model Analysis, Model Extraction, Model Representation, Service Network Model, Socio-technical Model, Uniformity

INTRODUCTION

While service orientation is broadly adopted for the realization of intra-organizational business applications, the provisioning and usage of services over cloud infrastructures provides access to new markets and introduces new possibilities for application design. With the composition of services for the provisioning of cross-organizational value-added capabilities and the reusability of a service in multiple compositions, complex interconnections are introduced between the loosely coupled services.

In event-driven SOA, the occurrence of an event serves as a trigger to the invocation of one or more business processes and associated services. These services are especially loosely coupled; hence, the need to manage relationships between services as well as between business

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processes and services becomes predominant. Only an explicit and detailed relationship management can satisfy the demand for governance and infrastructure knowledge as well as the specific requirements of service health analysis.

Explicit relationship modeling offers an instrument for tracing and understanding the complex interactions between the actors and the resources involved in the emergence of a service network through the combination of services in the context of applications. It has been recognized as an important factor for analyzing the quality of the network and the applications it comprises. As a result, a number of models have been defined on different abstraction levels to support the various service selection needs of service consumers, the impact analysis for service providers, or the value flow within the network for service network operators. Usually, a single actor can interact with different roles within the network. The lack of standardized vocabulary and modeling notation as well as the rigidity of the modeling concepts make the integration of information for novel analysis purposes impossible.

This article introduces a concept of an explicit relationship model that serves as foundation for understanding the interconnections in service networks and for the purpose of health analysis support. Data originating from different abstraction levels is integrated into an exhaustive service network model to provide a uniform representation of the network topology. The DAME (Dependency Analysis and Management for Evolution) modeling approach is generic enough to provide independence from the modeling notation used for the specification of the service network components. The scope of knowledge captured in the model includes information of interest for the different stakeholder perspectives of service provider, consumer, and operator relevant in the context of service networks. Model view extraction reduces the model content's complexity and provides detailed data based on the specific analysis needs.

A uniform approach for capturing and representation of big amounts of relationships data is required to achieve standardization for describing service network models. It should be expressive enough to enable dynamic adjustment of the sets of entities and relationships between them according to changing needs of the network and its stakeholders. A metamodel-based modeling concept is described that provides a generic language schema to allow the integration of relationship information between the social, business, and technical abstraction levels of a service network. The service network model considers equivalence, associative, and hierarchical relationships between resources and actors contributing to the network.

In detail, the article will discuss three main questions. First, what different types of entities and relationships should be considered for service network modeling? Second, how to present these types of entities and relationships in a common model understandable for stakeholders from different domains of expertise? Third, how to provide automated support for model capturing, validation and representation?

BACKGROUND

As a basis for the metamodel-based modeling approach for service networks, a thorough understanding of terms and related work is required. Therefore, a short overview of the basic structuring approaches of services as well as service networks in an enterprise context will be introduced. Additionally, related work will be discussed and compared to the service network modelling approach presented in this article.
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