Linked USDL Extension for Describing Business Services and Users’ Requirements in a Cloud Context

Hind Benfenatki, LIRIS, UMR 5205, CNRS, Univ Lyon, Université Claude Bernard Lyon 1, Lyon, France
Catarina Ferreira Da Silva, LIRIS, UMR 5205, CNRS, Univ Lyon, Université Claude Bernard Lyon 1, Lyon, France
Aïcha-Nabila Benharkat, LIRIS, CNRS, UMR 5205, INSA - Lyon, Lyon, France
Parisa Ghodous, LIRIS, UMR 5205, CNRS, Univ Lyon, Université Claude Bernard Lyon 1, Lyon, France
Zakaria Maamar, Zayed University, Dubai, United Arab Emirates

ABSTRACT

Linked Unified Service Description Language (Linked USDL) provides a comprehensive way for describing services from operational, technical, and business perspectives. However, this description treats services as isolated components that offer functionalities only without emphasis on how they are used. This paper discusses how to extend Linked USDL in a way that permits to describe the services of a marketplace in support of automating the provisioning of service-oriented cloud-based business applications along with satisfying users’ requirements. The marketplace consists of business services that can be composed and specialized services that act on behalf of the infrastructure upon which these applications are deployed. A set of experiments demonstrating the use of the extended Linked USDL are also presented in the paper.

KEYWORDS
Linked USDL, Marketplace, Service Composition, Service Description

1. INTRODUCTION

There is a persistent trend of developing business applications using a set of loosely-coupled services that are selected with respect to their functionalities and then put together in response to specific users’ requirements. Web services usually exemplify these services although other types of services exist such as data services (Lagares Lemos, Daniel, & Benatallah, 2015), user interface services (Lagares Lemos, Daniel, & Benatallah, 2015), human services (Services), and business services (Lüftenegger, 2014). Service classification also exists based on their branches of activities, for instance transport and telecommunications (International classification of goods and services for the purposes of the registration of marks, 2001), tangibility (Bhasin, 2016), and deployability. In this paper, we target business services that are software packages providing business functionalities and subject to

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composition. For instance, Wiki engines and databases could be composed together in response to a request of making the Wiki content stored persistently.

Service description and composition are widely discussed at the operational level with focus on Input/Output (I/O) matching. However, I/O matching cannot be used to evaluate the composability of business services. Some languages like Linked Unified Service Description Language (USDL) (Cardoso & Pedrinaci, 2015) (Linked usdl) allow to describe (non-business) services at the business (e.g., price specification), technical (e.g., message protocol), and operational (e.g., service functionalities) levels. However, (1) these languages do not offer any support to business services composition which is quite different from Web services composition (they are not characterized by their I/O), and (2) they describe what the services do with little regard to how they are used, i.e., environment in which they are deployed, with whom they can be used, etc.

To address the aforementioned two limitations, we build upon our MADONA project standing for Method for Automated provisioning (composition and deployment of services) of cloud-based service-oriented business Applications (Benfenatki et al., 2016) to automate the provisioning of business service-oriented applications on cloud environment. Because composability of business services cannot be evaluated using matching of services’ input/outputs, we consider service description languages that would allow to identify each service’s composition constraints and possibilities (the services with which the described service can be composed). In this paper, we analyse existing languages describing services and user requirements. We target Linked USDL for the description of services and user’s requirements. The choice of Linked USDL is guided by the fact that the latter allows a wide coverage of technical, business, and functional aspects when describing services. Moreover, it allows the description of various services for instance cloud, Web, and business services.

Existing user requirements description languages like Web Service Request Language (WSRL) (Mitra, Zhou, Bouguettaya, & Liu, 2013) and Service Requirement Modelling Ontology (SRMO) (Xiäng, Liu, Qiao, & Yang, 2007) require that users are familiar with the underlying language’s notation, which is quite impossible for non-tech savvy users. Furthermore, these languages describe the requirements in the form of a control flow and/or a data flow. This requires a good knowledge of the business process of the future application to develop, which is quite impossible too when targeting such users. In this paper, we discuss how the necessary support is provided to users by extending Linked USDL.

The rest of this paper is organized as follows. Section 2 describes existing service and user’s requirements description languages. Sections 3 and 4 present respectively an overview of Linked USDL and of its extension. Section 5 evaluates our work. Section 6 draws final conclusions and perspectives.

2. RELATED WORK

This section presents 2 categories of languages for describing services and user requirements, respectively.

2.1. Service Description Languages

Our literature review resulted into classifying service description languages into two categories: (1) those that treat services as isolated components (Christensen, Curbera, Meredith, & Weerawarana, 2001), and (2) those that focus on relationships between services (Cardoso, 2013). Relationships could be either established or potential. The former describes current or past service’s composition forming for instance, a service offering. The latter describes with whom a service can or must be composed. Table 1 classifies these works categories of languages using 5 criteria: C1: type of service, C2: technical description, C3: semantic description, C4: description of Quality of Services (QoS), and C5: description of relationships of a service. These 5 criteria provide an exhaustive coverage of the issues to address, namely limited support to business services composition and limited description of how business services are used.
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