Reusability Constructs in the Web Service Offerings Language (WSOL)

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Abstract. The Web Service Offerings Language (WSOL) is a novel language for the formal specification of classes of service, various types of constraint, and management statements for Web Services. Compared with recent competing works, WSOL has several unique characteristics. One of them is a diverse set of reusability constructs: service offerings, constraint groups, constraint group templates, extension, inclusion, applicability domains, and operation calls. These constructs enable sharing parts of WSOL specifications between classes of service of different Web Services and development of libraries of reusable WSOL specifications. Consequently, they can help in alleviating heterogeneity of Web Services. In addition, reusability constructs are useful for easier development of new WSOL specifications from existing ones, for easier selection of Web Services and their classes of service, and for dynamic (run-time) adaptation of relationships between provider and consumer Web Services. Integration of WSOL reusability constructs into the works competing with WSOL would be beneficial.

1 Introduction and Motivation

The Web Service Description Language (WSDL) version 1.1 is the de-facto standard for the description of Web Services. However, WSDL does not enable the specification of constraints, management statements, and classes of service for Web Service. As discussed in [1], the specification of different types of constraint and management statements is necessary for the management of Web Services and Web Service compositions. In addition, classes of service are a simple and lightweight alternative to contracts, service level agreements (SLAs), and profiles. Therefore, we have decided to develop our own language for the specification of classes of service, various types of constraint, and management statements for Web Service. We have named this language the Web Service Offerings Language (WSOL).

When multiple classes of service are specified, there is often a lot of similar information that differs in some details. For example, classes of service that a telecommunication service provider offers its customers often have similarities. Analogously, two classes of service for the same Web Service can be the same in many elements, but differ only in response time and price. Defining common or similar parts of classes of service once and using these definitions many times simplifies the specification of new classes of service. Next, when it is explicitly stated that two classes of service share common parts, it is much easier to compare them. Such comparisons are
useful in the process of selection and negotiation of Web Services and their classes of service. Further, when monitored classes of service have common elements, the overhead placed on the management infrastructure for the monitoring of Web Services, metering or calculation of quality of service (QoS) metrics, and evaluation of constraints, might be reduced. In addition, manipulation of classes of service can be used for simple dynamic (run-time) adaptation of Web Service compositions. Explicit specification of relationships between classes of service supports their comparison, as well as their manipulation.

For these reasons, we have built into WSOL a diverse set of reusability constructs. These constructs enable reuse of parts of WSOL specifications and easier comparisons of WSOL specifications, even when these WSOL specifications are specified for different Web Services. In this way, WSOL reusability constructs can help in alleviating heterogeneity of Web Services. They also model static relationships between classes of service (relationships that do not change during run-time) and thus support manipulation of classes of service.

WSOL was developed independently of and in parallel with several recent works that address issues somewhat similar to WSOL. However, these related works do not have such a diverse and rich set of reusability constructs. In our opinion, this is one of the advantages of WSOL [2]. We believe that integration of WSOL reusability constructs into the related works, as well as eventual future standards in this area, would be beneficial. Therefore, in this paper, we explain WSOL reusability constructs and their potential influences on related works. We assume that the reader is familiar with WSDL and the Extensible Markup Language (XML).

The paper is organized as follows. In this section, we have summarized the motivation for WSOL reusability constructs and the motivation for writing this paper. In the next section, we give a brief overview of WSOL and the most important related works. The core of the paper is Section 3, where we explain WSOL reusability constructs. Section 4 discusses potential influences between reusability constructs in WSOL and in major related works. In the final section, we summarize how the WSOL reusability constructs are useful for Web Services. The Appendix contains some WSOL examples of the discussed WSOL reusability constructs.

Our other publications on WSOL discuss and illustrate different aspects of WSOL and its management infrastructure, the Web Service Offerings Infrastructure (WSOI). [1] and [2] present WSOL and WSOI, [3] compares WSOL and related works, while [4] contains detailed information about the WSOL syntax and its examples. (Note that WSOL was improved since the publication of [4]). Our research report [5] is an extended version of this paper and contains examples and additional details on the topics we discuss hereafter.

2 A Brief Overview of WSOL and the Related Work

The Web Service Offerings Language (WSOL) is a language for the formal specification of classes of service, various types of constraint, and management statements for Web Services. The syntax of WSOL is defined using XML Schema, in a way compatible with WSDL 1.1. WSOL descriptions of Web Services are specified outside WSDL files.

The crucial concept in WSOL is a service offering (SO). A WSOL service offering is the formal representation of a single class of service of one Web Service [1]. It