Chapter XII
Towards Semantic Business Processes: Concepts, Methodology, and Implementation

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ABSTRACT

The business process execution language for Web services (BPEL4WS, shortly BPEL) is one of the most popular languages and de facto standard for modelling business processes as Web services compositions. However, it only allows using hard-coded syntactical interfaces for partners and the process itself, i.e. semantic descriptions of services cannot be used within a process model. The lacks of an ontological description of the process elements cause limitations in the ways services are used within a process. A service providing the same functionality as the one referenced in the process model, but via a different syntactical interface, cannot be used instead. As a result, a process model cannot find an alternate service that performs the same functionality but exposes a different interface and can crash. Also, another drawback of such business processes is that they expose syntactical interfaces and cannot be discovered and composed dynamically by other semantic enabled systems slowing down the process of interaction between business partners. OWL-S on the other hand is suite of OWL ontologies and can be used to describe the compositions of Web services on the basis of matching semantics as well as to expose semantically enriched interfaces of business processes. Consequently, translating BPEL process
descriptions to OWL-S suite of ontologies can overcome syntactical limitations of BPEL processes enabling them to 1) edit and model the composition of Web services on the basis of matching semantics 2) provide semantically enriched information of business processes. This semantically enriched information helps for dynamic and automated discovery, invocation and composition of business processes as Semantic Web services. Describing an approach and its implementation that can be used to enable business processes for semantic based dynamic discovery, invocation and composition by translating BPEL process descriptions to OWL-S suite of ontologies is the aim of this chapter.

SWSS TECHNOLOGY EMERGENCE AND CURRENT STATUS

Investigating capabilities and limitations of Semantic Web, Semantic Web languages, SWSs and SWSSs languages that can be used to overcome syntactical limitations of process modeling languages (e.g. BPEL (Francisco, et. al., 2003; Matjaz, et. al. 2004)) is the preliminary step to understand the problem and to navigate through possible solutions. Here, we describe that how different workflow modeling languages (e.g. BPEL) can be used to model business processes as compositions of multiple services and what are limitations of such syntax based compositions of Web Services. Then we describe the vision of the Semantic Web and provide a short overview of Semantic Web languages (e.g. RDF (Graham & Jeremy, 2004), RDF-S (Dan, et al., 2004) and OWL (Deborah, & Frank, 2004)). Then we provide some technical details about Semantic Web language (i.e. Web ontology language (OWL)) and how OWL ontologies can be used to provide machine understandable meanings of data. We also describe that how SWS community makes use of Semantic Web language (i.e. OWL) to provide machine understandable meanings of Web services. We also provide short technical descriptions of SWS languages (e.g. OWL-S (David et. al., 2006), WSDL-S (Rama et. al., 2006), WSMO (Sinuhe, 2005)) and compare them with respect to their semantic and workflow modeling capabilities. By analyzing and comparing existing SWS languages we argue that semantic and process modeling capabilities of OWL-S are much better as compare to other SWS languages and it can be used to address syntactical limitations of traditional process modeling languages (e.g. BPEL) by translating BPEL process descriptions to OWL-S suite of ontologies.

Workflow Modeling

Different workflow languages like Web Services flow language (WSFL) (Frank, 2001), MS XLANG (Satish, 2001) and business process execution language for Web services (BPEL4WS, shortly (BPEL)) (Francisco, et. al., 2003; Matjaz, et. al. 2004) have been developed to define workflows. WSFL from IBM addresses workflow on two levels: (1) it takes a directed-graph model approach for defining and executing business processes (2) it defines public interfaces that allows business processes to advertise as Web services (Jun et. al. 2006). XLANG is an XML based business process language that can be used to orchestrate Web services. An XLANG service description is a WSDL (David, & Canyang, 2007) service description with an extension element that describes the behaviour of the service as a part of a business process. MS XLANG is the language that is used in MS BizTalk Server (Microsoft’s business process modeling tool). However, processes modelled in BizTalk server can easily be exported and imported to BPEL (an industry wide accepted standard for modeling business processes).