

Chapter 12

Semantic Annotation of Business Process Templates

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ABSTRACT

Process models represent valuable resources for integration and alignment of business processes. Nowadays, due to networked business and tighter integration along a value chain, the number of enterprises that need to orchestrate their workflows is increasing. These circumstances urge companies to improve management of process models and templates. Machine-readable and interoperable semantics of the process templates facilitate retrieval and reuse. However, the heterogeneity of both model representations and modeling languages makes it difficult to retrieve, comprehend, compare, and reuse the templates. Therefore, in this chapter we elaborate on the semantic annotation of process model templates consisting of three basic parts: meta-model, domain, and goal annotations. For this purpose, we use ontologies representing generic constructs of process models, concepts from a business domain, and business goals. We illustrate application of the approach in OWL and provide a case study with exemplary semantic queries.

INTRODUCTION

Business needs and technology advancement open up for business collaboration and knowledge sharing across different enterprises. Significant efforts are put on aligning and integrating their

business processes that is typically achieved through workflow integration or Web services orchestration. Process models are often used to model, document, execute and analyze workflows and procedures. Moreover, in business integration, legacy process models are reusable assets, providing a documented knowledge about the processes used by particular organizations.

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The legacy models can be retrieved as process templates, thereby facilitating integration of process models. The process templates provide core information about the processes used by organizations. To be useful and usable, retrieval of the process templates should be efficient and effective opening for an easy transformation into target process models across different organizations. One critical issue in this application is the interoperability (Sheth, 1998) of heterogeneous models due to diverse business jargon and different modeling languages. Heterogeneity leads to problems retrieving knowledge about process models and reusing it when integrating them.

The interoperability problem can be decomposed into two levels: a model and a meta-model level. Typically, there are two interoperability problems at the model level: 1) synonyms – different terms are used for the same concept in two models, e.g., ‘Client’ vs. ‘Customer’, ‘purchase’ vs. ‘buy’; 2) mismatch of conceptualization, e.g., ‘City’ as a class vs. ‘City’ as a property, ‘finish’ as an action vs. ‘finish’ as a state. Similar problems also occur at the meta-model level: 1) mismatch of modeling constructs (terminology), e.g., ‘agent’ in ActionWorkflow (Medina-Mora, Winograd, Flores et al., 1992) vs. ‘actor’ in CPR (Core Plan Representation) (Pease & Carrico, 1997); 2) mismatch of conceptualization, e.g., ‘activity’ is an atomic concept in PSL (Process Specific Language) (Schlenoff, Gruninger, Tissot et al., 2000) while it is decomposable in WooRKS (Ader, Lu, Pons et al., 1994).

A common semantic representation of models is needed to solve the above discussed interoperability problems. Therefore, we have developed an approach to annotate process templates with both domain information as well as common process modeling constructs. The underlying assumption is that process modeling languages have sufficient similarities to be sensibly mapped to abstract common constructs. Our approach consists of a common semantic annotation structure for the process templates made of three parts: meta-model annotation, model content annotation and model

goal annotation. Within this structure, semantic heterogeneity at the meta-model level is reconciled by means of mapping the process modeling constructs to the proposed process ontology. The latter is made of the most essential concepts of process modeling languages. At the model level, annotations are made by building semantic relationships between model contents and domain ontologies. The domain ontology is a conceptual model that standardizes the representation of the conceptualization of a certain business domain. The ontology is usually built based on industrial standards of a particular domain. At the pragmatic level, goal annotations are included to encode the purpose and intended use of process models. There business goals are represented in a goal ontology, and linked to fragments of the process model. We have chosen OWL (Web Ontology Language), originally proposed by McGuinness & Harmelen (2004) for semantic annotation. In particular, we have implemented the approach using OWL DL (Description Logic) due to its balanced power of expressiveness and inference.

In the remainder of this chapter we elaborate on our approach. First, we detail an overall structure for the semantic annotation of process templates, where a general process ontology and a set of common process template modeling morphemes are presented. Then, we illustrate application of the semantic annotation structure to a process template transforming the annotated process template into a semantic enriched model in OWL. A case study and exemplary semantic queries are elaborated before we conclude this chapter.

SEMANTIC ANNOTATION STRUCTURE FOR PROCESS TEMPLATES

Semantic annotation of a process model should abstract and communicate (a) the meaning of different modeling constructs, (b) different domain terminology and (c) purpose of the process model. A systematic and comprehensive annotation is a

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