Semantically enhanced Business Process Modelling Notation

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Abstract. This position paper presents the semantically enhanced Business Process Modelling Notation, namely the sBPMN ontology, developed within the SUPER project. Moreover, it elaborates shortly on drawbacks of the BPMN to BPEL translation and proposes to use semantics to overcome them.

Keywords: Business Process Modelling Notation, ontologies, Business Process Management (BPM)

1 Introduction

Business Process Modelling Notation (BPMN) [1], created by the BPMI group, has emerged as a standard notation for process modelling, joining many other notations e.g. UML ADs, IDEF, ebXML and EPCs. It enjoys fast growing popularity among tool vendors.

BPMN aims at bridging the gap between business process design and process implementation. It was to allow for the automatic translation from the graphical process diagram into the BPEL process representation [4] that may be then executed using a Web services technology.

Although the goal of automatic translation is very appealing, the intention failed in practice for a number of reasons. One of them is that BPMN is a graph-oriented language and its mapping to the block-structured BPEL representation is challenging. In addition, BPMN allows designing ill-formed processes that cannot be translated directly into a set of the BPEL executable instructions [2].

Nowadays (May, 2007), the BPMN modelling is supported by more than 30 tools. Some of them allow also for the translation from BPMN diagrams to BPEL, but this functionality is neither fully automated nor supported with semantics. Creation of the sBPMN (Semantic Business Process Modelling Notation) ontology will add meaning to each of the process elements and make them machine-readable. In addition, it will also allow for reasoning on the process description. Once sBPMN is enhanced with Semantic Web services (SWS) extensions it will be also possible to automatically assign Web service (or their composition) to each task. Having Web services matched to tasks is only one step from generating BPEL process representation that may be deployed on the execution engine. This position paper elaborates shortly on the

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sBPMN ontology created within the SUPER project [3] funded by EC under the 6th Framework Programme.

2 Ontology development and modelling decisions

The sBPMN ontology was developed based on the latest available BPMN Specification [1]. The process of development of the sBPMN ontology was divided into three phases. During the first phase the top-down approach was taken to formalise the ontology using WSML [5]. In the second phase the consistency was tested by describing a number of BPMN diagrams using the designed ontology. The third phase introduced further improvements to the ontology on the basis of the annotated examples as well as requirements of the interested parties.

During the ontology development a number of modelling decisions had to be taken. First, the scope of the notation to be ontologised had to be identified. Then the selected concepts and their properties were modelled. At this stage it had to be decided whether specific occurrences of process model elements are to be subclasses or instances of specific concepts. A decision was to use Class to represent a type of entity, i.e. process, task, gateways. Therefore, core business process diagram elements [1] were modelled as classes having appropriate attributes defined in the BPMN Specification. Therefore, the annotation of processes with sBPMN means creating instances of its concepts, e.g. task ObtainLicense will be an instance of the Task class, and not a subclass of it. Another issue concerns the association of the BPMN elements to a specific process. To make sure that all the elements of a process model refer to it, special property was introduced (named hasProcess) for explicit or implicitly (through recursion) reference.

The sequence flow is modelled using the connection rules attached to the Source and Target properties of the SequenceFlow concepts defining which Flow Objects (e.g. Tasks, Activities, Events, Gateways) may be connected one to another (in line with the BPMN Sequence Flow Connection Rules). The message flow connection rules were implemented analogically.

3 Domain Captured

The core element of the sBPMN ontology is a Business Process Diagram presenting the process model. According to the BPMN specification four basic categories of elements are Flow Objects, Connecting Objects, Swimlanes and Artefacts. However, for the sake of clarity and compatibility to the other SUPER process ontologies [3], the Process concept had to be introduced at the same level. Therefore, the main concepts of the sBPMN ontology are as follows:

- Flow Objects - the main graphical elements defining the behaviour of a Business Process. There are three kinds of Flow Objects: Events, Activities and Gateways.
- Connecting Objects – as there are three ways of connecting the Flow Objects to each other or to other resources, BPMN utilises three types of Connecting Objects: Sequence Flow, Message Flow and Association.

- Swimlanes - utilised when grouping the primary modelling elements (see above). Two kinds of swimlanes were developed in BPMN, namely: Pools and Lanes.
- Artefacts - used to provide additional information about the process. The current set of Artefacts includes: Data Object, Group and Annotation.
- Process - used to group flow objects elements into a set of objects.

The above concepts represent only the core subset of the sBPMN ontology. Each of them has a number of subconcepts and so on. The current sBPMN ontology has 95 concepts and over 50 axioms. It is available at the SUPER project website (http://www.ip-super.org).

4 Competency Questions

The designed sBPMN ontology was verified describing a few exemplary BPMN process diagrams. After successful creation of the semantic descriptions, it was then tested against the competency questions, e.g. what are the elements of a given process, what are the sequence flow connection rules, what is the execution order of activities within the process, which objects can be a source of compensation association, how a certain type of activity can be triggered, etc. As a result the domain coverage as well as reasoning possibilities were proved.

4 Conclusions and future work

sBPMN ontology is to overcome problems with composition and execution of processes based on their models designed by business analysts. It does not enforce well-formedness of the process models in itself. Yet, additional set of axioms could be devised, which, together with semantic business process model, could lead to automatic assessment of well-formedness of the model using standard reasoning techniques. The current version of the sBPMN ontology is used to create the semantic annotation of the processes within the modelling tool proposed by the SUPER project. In the future the ontology will be further incorporated in the ontology stack developed within the project.

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