The BIZWARE Research Project

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Abstract. BIZWARE is a three-years research collaboration of two academic partners with eight software SMEs in different domains like healthcare, manufacturing/production, finance/insurance, publishing and facility management. To investigate the different requirements arising from different domains, abstracting them into a general methodology, and then providing flexible domain support by dedicated domain specific languages (DSLs) under a general roof of joint meta-DSL framework and the combination of different DSL paradigms is the research perspective of this project.

Key words: Domain-Specific Language, Modeling Guidance, Lifecycle Management, Terminology Extraction

1 Introduction

BIZWARE[1] is a follow-up of BIZYCLE [5] in the years 2007 to 2010, establishing a standardized methodology for model-based integration of heterogeneous distributed software components. Learning from these experiences, BIZWARE now investigates the potential of domain-specific languages and model-driven engineering for small and medium enterprises by developing a systematic and standardized process of DSL-based software construction and, including deployment, runtime and lifecycle aspects, and operation of such domain software. Participative modeling between software professionals and domain experts shall be enabled by dedicated (graphical and textual) languages in the given domains.

BIZWARE research consequently addresses the development of domain specific languages (DSLs) for the given domains, and of a DSL-framework, including meta-DSL management, the so-called "BIZWARE model and software factory". Outputs of the factory are software components with a built-in plug-and-play mechanism for easier integration, as well as software generating tools, plus semantic support for DSL modeling to all participating groups: stakeholders involved in a DSM development lifecycle, domain experts and DSL designers. Finally, support for the software lifecycle management will be provided on the

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basis of a dynamic repository, keeping track of all models, metamodels, derived artifacts, and their consistent evolution over time.

2 Research Topics

In the following sections we describe the main research topics and challenges in the focus of the BIZWARE team at TU Berlin.

2.1 Language Workbench Guidance and Integration

The industrial partners of the BIZWARE project develop domain-specific languages in their respective business domains. The design of these languages comprises definition of abstract syntax/metamodels, at least one concrete syntax for textual or graphical representation, semantic constraints and tooling to use the languages. One of the main challenges for them is the diversity of language workbenches and meta-DSLs to choose from [3]. On the one hand, the companies want to work with DSL tools that are most appropriate for the respective problem domain. On the other hand, developed DSL solutions shall be interoperable with other partners and shall integrate into the existing company infrastructure.

The task of the academic partners is to support multiple strategies and tools inside of the BIZWARE model and software factory. Currently, Xtext, Ecore, GMF, Protégé, DIESEL and Microsoft Modeling Tools are used to describe the different parts of the DSLs. We provide guidelines, best practices and examples for each tool to support usage of the respective meta-DSL and tool infrastructure. To ensure interoperability we develop bridges between the different technical spaces and manage development artifacts within the lifecycle management.

2.2 Lifecycle Management for DSL Development

During the development of domain-specific languages several artifacts are created with multiple conformance and consistency dependencies on each other (e.g., metamodels, models, transformation rules, configuration files, and source code). These artifacts are only partially interconnected, thus changes made in one place cause inconsistencies at several other places [6].

The main focus of our work is to deal with transparent artifact persistence, version control, consistency management and metadata management of DSL development projects. Transparent persistence is achieved by automatically choosing appropriate connected storage system depending on artifact types. Consistency management deals with making the relations between artifacts explicit and providing change impact visualization to the user. Metadata management keeps tracks of all the necessary artifact information. The lifecycle management relies on integration of existing tools, such as EMFStore, EDAPT, Subversion, Maven and Nexus plus providing plug-ins for different DSL tools.

2.3 Semantic Modeling Support

The development of new software languages is an important task of domain-specific modeling. It involves the definition of the concepts, attributes and relationships of the language. In this early development phase tool support for identifying domain elements is very limited [4]. Our research work aims at developing knowledge-based services to supporting domain-specific modeling with automated modeling suggestions [1]. Suggestions, such as related classes, possible sub- or super-classes or aggregations, can be given in multiple scenarios, e.g., for domain models in UML class diagram notation or for abstract syntax models for domain-specific languages. We call this support semantic modeling support because the suggestions shall be semantically related to the terminology used in the developed model.

We apply the following two strategies to achieve our goals: First, we exploit existing structured knowledge sources to acquire the required domain knowledge. We use semantic web technology (RDF(S) and SPARQL) to automatically query large semantic knowledge bases and ontologies, such as WordNet and DBpedia, for terms of a model to retrieve related terminology [2]. A research challenge is to deal with the heterogenous schemata and data models of the ontologies. Secondly, in many cases existing knowledge bases do not contain enough information or do not exist at all for the respective target domains. To cope with that, we address the enrichment of existing knowledge bases and the automated creation of own semantic terminology networks from natural language datasets. We use n-gram statistics and part-of-speech tagging to identify related terms in text corpora.

References

1. Agt, H.: Supporting Software Language Engineering by Automated Domain Knowledge Acquisition. In: MODELS 2011 Workshops. LNCS, vol. 7167. Springer, Wellington, New Zealand (2012)
2. Agt, H., Kutsche, R.D., Wegeler, T.: Guidance for Domain Specific Modeling in Small and Medium Enterprises. In: SPLASH '11 Workshops. ACM (2011)
3. Kern, H., Hummel, A., Kühne, S.: Towards a Comparative Analysis of Meta-Metamodels. In: SPLASH '11 Workshops. ACM (2011)
4. Mernik, M., Heering, J., Sloane, A.M.: When and how to develop domain-specific languages. ACM Comput. Surv. 37, 316–344 (December 2005)
5. Milanovic, N., Cartsburg, M., Kutsche, R., Widiker, J., Kschonsak, F.: Model-based Interoperability of Heterogeneous Information Systems: An Industrial Case Study. In: Proceedings of the ECMDA (2009)
6. Pfeiffer, R.H., Wasowski, A.: TexMo: A Multi-language Development Environment. In: ECMFA. pp. 178–193 (2012)