

Business Rules Separation and Reuse Using MDA, OWL and AspectJ

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Abstract— Two important challenges for MDA designers are to make business rules independent of the specific platform model and to ensure the resulting implementation does not violate the specified properties in the application domain. In this paper we present an approach that allows developers to both describe and corroborate domain properties at run time. In our approach, an ontology specifies domain properties and translates it to aspect-oriented code. The implementation code could be automatically merged. As a result, we will be able to perform approval tests at runtime and to create business rules reused in other MDA specific models. This novel approach shall be evaluated in a toolkit for reengineering an industrial furnace management application.

I. INTRODUCTION

The Model-Driven Architecture [7] is a boarding of software development directed for models (MDD or Model-Driven Development). The MDA has different levels of abstraction and aims to separate the specific implementation of the architecture. The main focus is on controlling of software variability (e.g. use cases, functional requirements, business rules) unlike technology details (non-functional requirements).

Thus, are building multiple viewpoints (transformation mechanisms) in accordance with PIM model, in a high-level language and translates one or more models to executable code, what simplify the reuse and maintenances of systems. Therefore, such advantages has improve the MDA adoption as method for development in several applications domains on the last years. Conversely, a MDA-based software not warranted the business rules, or application-specific properties could not have been cared by the implementation code produced automatically.

To assure it, is usual for developers to insert code in the specific platform model (PSM) directly and it can be tedious and subject to errors. The lack these mechanisms becomes one important trouble for model, reuse and maintenance trustworthy of a MDA-based software.

Trustworthiness and security in the functioning (dependability) are characteristic essentials for existing critical applications in the industry. This wants and therefore, needs tools for guaranty of the software approval, in a prior phase, before its use in real environments. Such needs still are impediments for more effective and modern techniques of software engineering adoption, the MDA in industrial environments is an example.

This work presents a proposes to separate the business rules within the platform specific model (PSM) and allows

its sinking in the implementation code. In this boarding, the business rules writes in Ontology Web Language (OWL) [8] are translated for aspects. These are, in turn, combined and compiled to create the final application code. To certify own propose, will be made reengineering of industrial furnace management application that currently controls pyrometry of ovens, it demands critical needs for its functioning.

II. SEPARATION AND REUSE PROCESS OVERVIEW

The Figure 1 presents the development process used in this work, in four main steps:

- (1) An ontology about application domain is conceived with the domain properties formed by the functional requirements found after domain analysis of software. In its original conception, the MDA defines business rules in the platform specific models, causing some problems reported in section 1. Own proposes defines the business rules on ontology level and confirm its semantics validation in a conceptual domain before PIM generation model.
- (2) The domain ontology is generated into a platform independent model (PIM) using an ontology edition tool [6] and then is converted to UML language.
- (3) The PIM business rules will be transformed in a PSM model across of OWLtoAspectJ [8]. Diverse PSMs models can be generated, being: one representing the business rules and the others for specific platforms (e.g. Java IF, Java EE, RMI, Corba).
- (4) Finally, the final application combines the business rules and application PSMs using a composition process of models.

A time taken care of the wished properties about application domain, the UML tool imports XMI file produced by the ontology tool and creates a platform independent model (PIM) on M1 level. Thus, any MDA tool can generates one or more application PSM models, only importing the XMI file. These work uses a set of tools with an extra one: OWLtoAspectJ [7]. This tool translates the business rules from OWL automatically to aspects on Java platform ready for composition, no needs for manual changes of business rules.

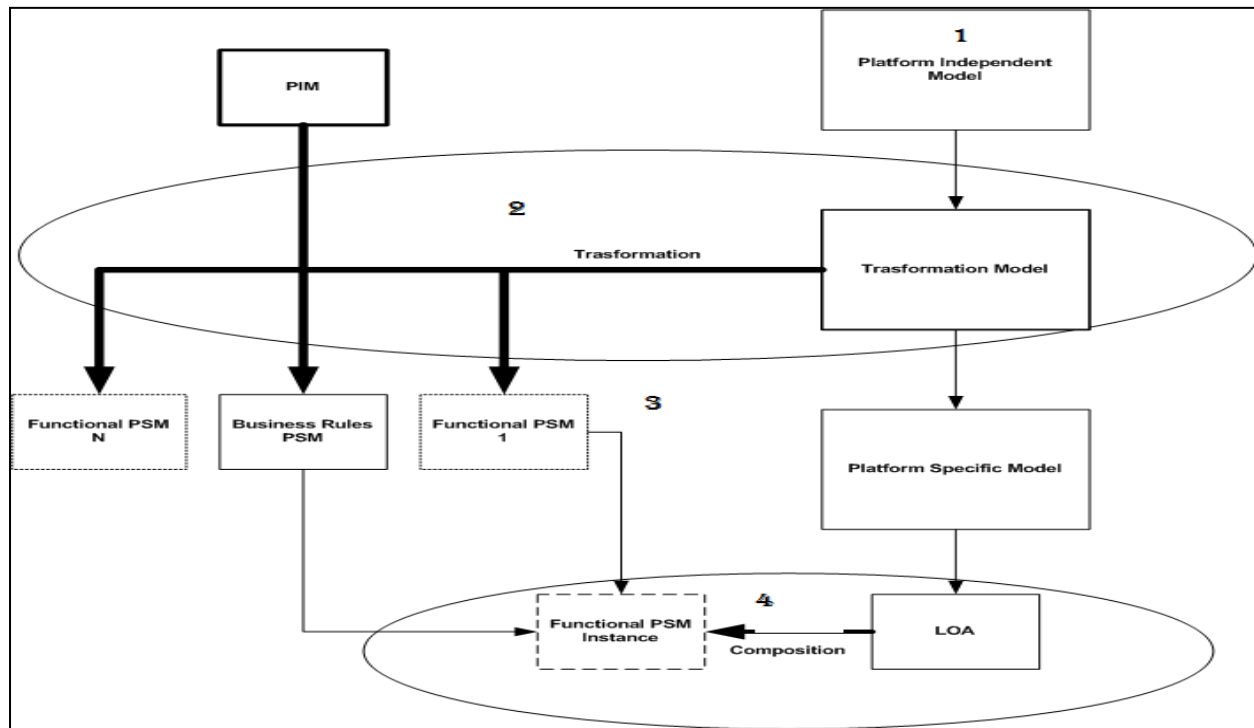


Figure 1. Development Process Outline.

III. RELATED WORKS

Some works seen in literature use the approaches between MDA and ontology [5] or MDA and AOP (Aspect-Oriented Programming) [4]. Such projects have focus about uses of metamodel for UML profile thought domain ontology creation. Thus, a domain ontology describes class, attributes and properties, with the objective to facilitate or use its transformation to other UML profiles and or new models.

Dhondt [4] is pioneering when it is treated using aspect-oriented programming and knowledge representation. In one of its works uses the aspect-oriented programming to instrument the business rules in form of high-level aspects for models of application domain. Recent works detach aspect-oriented programming and MDA. Braga [2] has considered one framework settled for product software lines with goal to capture functional requirements. This work, however, specifically does not deal with the use of aspects in verification or validation procedures. Alves [1], in turn, use aspects to guide the models transformation activities.

IV. CONCLUSION

Although its increasing adoption as development method and the existing tools spread, the systems MDA-based demand additional mechanisms for validation and verification. This work considers the properties definition of domain through described business rules by an ontology and, later, to effect the fusing of check routines of these properties with the use of the aspect-oriented programming. This boarding originally aims at to separate the business rules of the platform specific models. In the next experiment, through with a real industrial furnace

management application, verify if this boarding simplifies the software development. If it excuses the writing code for the business rules in the methods into the involved class since aspects will manage its functionality. Also, if in other Java platforms, for example CORBA and RMI, is possible increase the reuse of the business rules in distributed systems.

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