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Movida Studio : a modeling environment to create viewpoints and manage variability in views

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RESUMÉ. Dans de nombreux domaines tels que les industries automobiles ou aérospaceales, les ingénieurs se basent sur les Domain Specific Modeling Language (DSML) pour résoudre les problèmes de l'ingénierie de la sûreté des systèmes critiques. La difficulté de comprendre la complexité globale des points de vues et la difficulté de gérer leurs inter-relations a augmenté l'intérêt de la communauté pour l'ingénierie dirigée par les points de vues ("concern driven engineering"). Ce problème est étudié par la communauté scientifique au travers de l'exploration des technologies de la modélisation des points de vues (viewpoint modeling). Le but de ce tutoriel est d'utiliser des outils existants pour créer des points de vues (viewpoints) et leur environnement DSML associé. Nous illustrons la simplicité conceptuelle de cette approche multi-vue en utilisant l'exemple d'un petit langage de composants dans lequel l'implémentation est définie en utilisant des automates d'états finis (Finite State Machine) avec différents outils intégrés dans le contexte du projet ANR MOVIDA (MOdeling Views and Decision support for Architects).

ABSTRACT. In many domains such as aerospace and automotive industries, engineers rely on Domain Specific Modeling Languages (DSML) to solve the complex issues of engineering safety critical software. The difficulty to embrace the whole complexity of the concerns and the difficulty to manage their inter-relations has raised the interest of the engineering community for "concerns driven" engineering. This is addressed today in the model driven engineering research community through the exploration of "viewpoint modeling" technologies. The goal of this tutorial is to practice existing tools to create viewpoint and their associated DSMLs environment. We illustrate the conceptual simplicity and elegance of this multi-viewpoint approach using the running example of a small component based language in which component implementation are defined using Finite State Machine developed with a set of tools that has been integrated in the context of the French ANR project MOVIDA (MOdeling Views and Decision support for Architects)

MOTS-CLÉS : Ingénierie multi-vues, Lignes de Produits, Ingénierie Dirigée par les modèles, Contraintes, Outils

KEYWORDS: Multi-View Engineering, Software Product Lines, Model Driven Engineering, Constraints, Tools

1. Presenters

Marie Gouyette received a master degree in Computer Science at the University of Rennes, France in september 2009. Since January 2010, she works as research engineer at the INRIA Triskell group in the context of the project MOVIDA funded by ANR.

Olivier Barais is an Associate Professor at the University of Rennes 1, member of the Triskell INRIA research team. He received an engineering degree from the Ecole des Mines de Douai, France in 2002 and a PhD in computer science from the University of Lille 1, France in 2005. After having been a PhD student in the Jacquard INRIA research team, he is currently associate professor at University of Rennes 1 and a member of the Triskell INRIA group. His research interests include Component Based Software Design, Model-Driven Engineering and Aspect Oriented Modelling. Olivier Barais has co-authored 6 journals, 30 international conference papers, 2 book chapters and 23 workshop papers in conferences and journals such as Sosym, IEEE Computer, ICSE, MoDELS and CBSE.

2. Duration

Half day. However, the duration could be reduced if necessary. That would imply a reduced scope, leaving out most of the practical sessions.

3. Goal and Objectives

The goal of this tutorial is to provide the fundamentals of Model Driven Viewpoint Engineering and give hands-on experience on :

- how to design the meta-model of the language of a viewpoint with Eclipse EMF ?
- how to ensure consistency between views using praxis constraints ?
- how to deal with graphical concrete syntax issues at the model level using Obeo designer ?
- how to capture variation point within views (viewpoint instances) using a feature diagram and to specialize/derive those variation points ?

4. Scope

The intended audience is both software engineers and master or PhD students wanting to get a direct exposition to recent MDE technologies helping them to build full environments for viewpoint engineering. The level is quite basic, but participants should be familiar with OO modeling (e.g. with the UML) and OO design.

5. Summary of contents

In many domains such as aerospace and automotive industries, engineers rely on Domain Specific Modeling Languages (DSML) to solve the complex issues of engineering safety critical software. The difficulty to embrace the whole complexity of the concerns and the difficulty to manage their inter-relations has raised the interest of the engineering community for "concerns driven" engineering. This is addressed today in the model driven engineering research community through the exploration of

"viewpoint modeling" technologies [SOM 97]. The goal of this tutorial is to practice existing tools to create viewpoint and their associated DSMLs environment. We illustrate the conceptual simplicity and elegance of this multi-viewpoint approach using the running example of a small component based language in which component implementation are defined using Finite State Machine developed with a set of tools that has been developed and integrated in the context of the French ANR project MOVIDA (MOdeling Views and Decision support for Architects). We will also show how this approach support the capitalization for a given view of variation point and how we could specialize these variation points.

6. Movida studio

Five partners take part of the MOVIDA project, two academics (UPMC (Université Pierre et Marie Curie) and INRIA Rennes-Bretagne Atlantique), two industrials (Thales Reasearch and Technology and Thales EPM) and one SME (Obeo). Three Movida studio tools will be presented on this tutorial (see [INR 11] MOVIDA web site for tools videos) :

– **Obeo Designer** : Obeo Designer [OBE 11] from the Obeo society is a commercial tool to create easily an Eclipse-integrated graphical editor for a given DSML and define different representations on a given metamodel.

– **Praxis** : Praxis [SIL 10] is an integrated-Eclipse tool developed by UPMC based on Prolog to check inconsistencies between two or several models. A textual syntax is used to describe unexpected situation on some rules. All actions from the model are saved and undesired pattern expressed thanks to the Praxis rules can be retrieved.

– **Variability tool** : This tool is composed by two parts, a Feature Diagram Editor to express variability using a feature diagram approach defined by Kang et al [KAN 90] with a metamodel based on [PER 08] and a Product Derivation tool. The Product derivation tool permits to obtain the final product model according to user 's feature choices. This tool was presented in a demonstration in [GOU 10].

7. Structure of content

The aim of this tutorial is presenting viewpoints and variability modeling through Movida studio tools, in order to create viewpoints models, check its consistencies and use variability tool to create a new viewpoint product model. The figure 1 details tutorial practical contents. This tutorial will be organized into four parts :

– **Overview presentation (1 hour)** This an overview presentation of the context of viewpoint engineering and variability, Movida project and the different tools that will presented on the tutorial.

– **EMF and Obeo Designer (1 hour)** : On this part we will install the tutorial environment, use EMF to create new metamodel for a Finite State Machine and use Obeo Designer to create the associated graphical modeler (see 1,2,3 in figure 1). Then, we study layers on a given viewpoints with the Component Editor (4 in 1) .

– **Praxis (45 mn)** To start with, we will propose to write some constraints on the Finite State Machine metamodel and another little metamodel for components with Praxis. (see 5 in figure 1).

– **Variability tool (35 mn)** On this part of the tutorial we will model variability on a given viewpoint and we will derive it (see 6 and 7 in figure 1).

– **Conclusion and wrap-up (10 mn)**

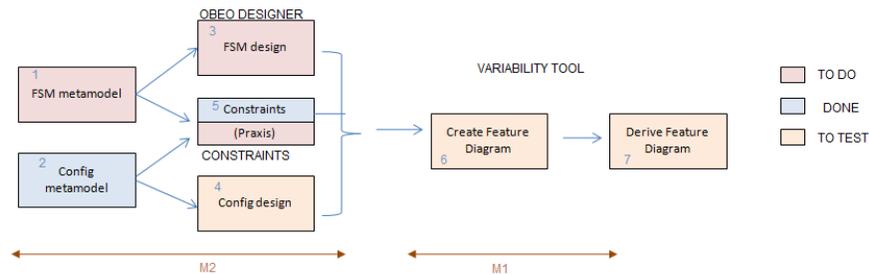


Figure 1 – Tutorial Dashboard

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