Elsevier special issue on foundations and applications of model driven architecture

1. Introduction

Model Driven Architecture (MDA) is an approach for software development proposed by Object Management Group (OMG). The basic principle of MDA is the separation of the specification of system functionality from the specification of the implementation of that functionality on a specific platform. The goal of the approach is to produce software assets that are more resilient to changes caused by the emerging technologies. MDA makes the role of modeling and models in the current software development much more important. It builds upon the existing OMG standards such as UML and UML profiles, MOF, CWM, and OCL. In addition, the MDA approach puts forward the need for additional technologies that support the realization of this vision for software development. As a result we have witnessed the emergence of several new OMG standards related to model-to-model transformations (the QVT transformation language), model-to-text transformations (MOF Model-to-Text transformation language), Architecture-Driven Modernization (ADM), and others.

The MDA initiative covers a wide spectrum of research areas, some of them already well established and some are newly emerged. Further efforts are required to bring them into a coherent approach based on open standards and supported by matured tools and techniques.

2. Selected papers

This special issue includes papers originally submitted to the Workshop on Model Driven Architecture: Foundations and Applications (MDAFA) that took place in June 2003. The goal of the workshop was to understand the foundations, to analyze the state-of-the-art, to identify problems and solutions, to outline future research directions and to share experience in applying MDA techniques and tools.

The major topics covered in the call for papers are:

- Ontologies and domain-specific models
- MDA development processes
- Metamodeling and metamodels
- Model transformations
- Model composition
- Aspect-oriented modeling
- Model validation and model checking
- MDA technologies (e.g. UML, OCL, XMI)
- Executability of models
- MDA tools
- Experience reports.

The call resulted in 31 submissions. Every paper went a thorough two-rounds peer reviewing process performed by at least three reviewers. 4 papers were selected for publication.

The paper “GREAT: UML Transformation Tool for Porting Middleware Applications” by Alexander Christoph and Matthias Muller addresses the difficulties in porting enterprise applications to a new middleware layer. This process requires a lot of manual work and adjustments that are labor intensive and error-prone. The paper presents a rule-based transformation language called GREAT that supports transformations between models at the same level of abstraction. The language is applied to solve a system migration from EJB1.1 to EJB2.0 technology.
In many cases MDA relies on domain-specific languages (DSLs) to specify models. Vasian Cepa and Mira Mezini propose language platform based on Generalized Annotated ASTs (GAAST). Their paper entitled “Language Support for Model-Driven Software Development” argues that explicit meta-representations of programs as AST structures and support of user annotations of programs can facilitate the developers in fast prototyping of DSLs.

There is a strong interest in applying model-driven techniques to the domain of real-time and embedded systems. Two of the accepted papers address issues in this domain. The paper “Model-Driven Architecture for Embedded Software: a Synopsis and an Example” by Gabor Karsai, Sandeep Neema, and David Sharp explores the benefits that MDA can provide to embedded software development. The paper motivates the need for extending the MDA approach to handle embedded systems and describes a tool set for mission computing software.

Distributed real-time and embedded systems (DRE) are becoming more and more complex and interconnected. A critical issue observed in these systems is ensuring a certain Quality of Service. In the paper “Model-Driven Middleware: A New Paradigm for Developing Distributed Real-time and Embedded Systems” the authors Aniruddha Gokhale, Krishnakumar Balasubramanian, Arvind S. Krishna, Jaiganesh Balasubramanian, George Edwards, Gan Deng, Emre Turkay, Jeffrey Parsons, and Douglas C. Schmidt describe CoSMIC (Component Synthesis using Model Integrated Computing): a toolsuite for DRE applications and middleware.

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