

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Alfred Kobsa

University of California, Irvine, CA, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Richard F. Paige Alan Hartman
Arend Rensink (Eds.)

Model Driven Architecture - Foundations and Applications

5th European Conference, ECMDA-FA 2009
Enschede, The Netherlands, June 23-26, 2009
Proceedings



Springer

Volume Editors

Richard F. Paige
University of York
Department of Computer Science
Heslington, York, U.K.
E-mail: paige@cs.york.ac.uk

Alan Hartman
IBM India Research Laboratory
Bangalore, India
E-mail: alan.hartman.gm@gmail.com

Arend Rensink
University of Twente
Department of Computer Science
Enschede, The Netherlands
E-mail: rensink@cs.utwente.nl

Library of Congress Control Number: Applied for

CR Subject Classification (1998): C.2, D.2, D.3, F.3, C.3, H.4

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN 0302-9743
ISBN-10 3-642-02673-7 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-02673-7 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

springer.com

© Springer-Verlag Berlin Heidelberg 2009
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 12706525 06/3180 5 4 3 2 1 0

Preface

The fifth edition of the European Conference on Model-Driven Architecture Foundations and Applications (ECMDA-FA 2009) was dedicated to furthering the state of knowledge and fostering the industrialization of Model-Driven Architecture (MDA) and Model-Driven Engineering (MDE). MDA is an initiative proposed by the Object Management Group for platform-generic systems development; MDA is one of a class of approaches under the umbrella of MDE. MDE and MDA promote the use of models in the specification, design, analysis, synthesis, deployment, and evolution of complex software systems.

It is a pleasure to be able to introduce the proceedings of ECMDA-FA 2009. ECMDA-FA 2009 addressed various MDA areas including model transformations, modelling language issues, modelling of behavior and time, traceability and scalability, model-based embedded systems engineering, and the application of model-driven development to IT and networking systems.

ECMDA-FA 2009 focused on engaging key European and international researchers and practitioners in a dialogue which will result in a stronger, more efficient industry, producing more reliable software on the basis of state-of-the-art research results. ECMDA-FA is a forum for exchanging information, discussing the latest results and arguing about future developments of MDA and MDE. Particularly, it is one of the few venues that engages both leading academic researchers and industry practitioners, with the intent of creating synergies.

The Program Committee accepted, with the help of additional reviewers, research papers and industry papers for ECMDA-FA 2009. We received 72 submissions. Of these, a total of 23 were accepted: 16 research papers and 7 industrial papers. We thank the Program Committee for their thorough reviews and detailed discussion during the selection process.

There are so many people who deserve warm thanks and gratitude. The fruitful collaboration of the Organization, Steering and Program Committee members and the vibrant MDE/MDA community led to a successful conference: ECMDA-FA 2009 obtained excellent results in terms of submissions, program size, and attendance.

The Steering Committee members helped with various issues and we enjoyed continuous and constructive interactions with them. Arend Rensink, the Conference Chair, led a highly responsive and very organized local team. In addition, ECMDA-FA 2009 was complemented by a varied and successful set of workshops and tutorials: for this we would like to thank the Workshops and Tutorials Chair, Luís Ferreira Pires.

We would like to thank the University of Twente, MODELPLEX, the Centre for Telematics and Information Technology (CTIT) and the European Association of Software Science and Technology (EASST) for their support.

Finally, we would like to thank all the authors who spent valuable time in preparing and submitting papers to ECMDA-FA 2009, our keynote speakers – David Harel, Tim Trew, Akira Ohata and Laurent Balmelli – and the sponsors of ECMDA-FA 2009.

June 2009

Richard Paige
Alan Hartman

Organization

ECMDA-FA 2009 was organized by the University of Twente, Enschede, The Netherlands, with the support of the IBM Corporation and the Software and Systems Modelling Team at the University of York, UK.

Conference Committee

Conference Chair	Arend Rensink (Twente, The Netherlands)
Program Chairs	Richard Paige (University of York, UK) Alan Hartman (IBM, India)
Workshop and Tutorial Chair	Luis Ferreira Pires (Twente, The Netherlands)
Tools and Demos Chair	Regis Vogel (IHG, USA)
Organization Chair	Ivan Kurtev (Twente, The Netherlands)
Publicity Chair	Andrey Sadovykh (Softeam, France)

Steering Committee

Terry Bailey	Vicinay Cadenas, Spain
Philippe Desfray	Softeam, France
Alan Hartman	IBM, India
Richard Paige	University of York, UK
Arend Rensink	University of Twente, The Netherlands
Andy Schürr	T.U. Darmstadt, Germany
Regis Vogel	IHG, USA

Program Committee

Jan Aagedal	Telenor
David Akehurst	Thales
Terry Bailey	Vicinay Cadenas
Mariano Belaunde	France Telecom
Xavier Blanc	Universite de Paris-6
Marc Born	IKV
Phil Brooke	University of Teesside
Zhen Ru Dai	Philips
Jean-Luc De Keyser	LIFL
Miguel De Miguel	Polytechnical University of Madrid
Birgit Demuth	Technical University Dresden
Juergen Dingel	Queens University, Canada
Gregor Engels	University of Paderborn
Miguel Angel Fernandez	Telefonica

VIII Organization

Luís Ferreira Pires	University of Twente
David Frankel	SAP
Mathias Fritzsche	SAP
Alan Hartman	IBM
Andreas Hoffmann	Fraunhofer Fokus
Frederic Jouault	INRIA and EMN
Gabor Karsai	Vanderbilt University
Olaf Kath	IKV
Ingolf Krueger	University of California at San Diego
Ivan Kurtev	University of Twente
Ralf Laemmel	University of Koblenz
Tiziana Margaria	University of Potsdam
Erhan Mengusoglu	IBM
Parastoo Mohagheghi	SINTEF
Nanjagud Narendra	IBM
Tor Neple	SINTEF
Bjorn Nordmoen	Western Geco
Richard Paige	University of York
Christoph Pohl	SAP
Arend Rensink	University of Twente
Laurent Rioux	Thales
Tom Ritter	Fraunhofer Fokus
Julia Rubin	IBM
Bernhard Rumpe	RTWH Aachen
Andrey Sadovskyh	Softeam
Houari Sahraoui	University of Montreal
Ina Schieferdecker	Technical University Berlin
Doug Schmidt	Vanderbilt University
Andy Schürr	Darmstadt University of Technology
Bran Selic	Malina
Bikram Sengupta	IBM
Alin Stefanescu	SAP
Juha-Pekka Tolvanen	Metacase
Tim Trew	NXP
Andreas Ulrich	Siemens
Pieter van Gorp	University of Eindhoven
Marten van Sinderen	University of Twente
Regis Vogel	IHG
Jos Warmer	Ordina
Jules White	Vanderbilt University
Steffen Zschaler	University of Lancaster

External Reviewers

R. Bendraou
L. Daniele
B. Demchak
C. Dumoulin
A. Etien

D. Kolovos
M. Meisinger
M. Menarini
J.-M. Mottu
A. Muller

J. Polowinski
S. Richly
L. Santos
D. Zhou

Table of Contents

Creating Embedded Platforms with MDA: Where's the Sweet Spot?	1
<i>Tim Trew</i>	
Foundations	
Comparison of Three Model Transformation Languages	2
<i>Roy Grønmo, Birger Møller-Pedersen, and Gørán K. Olsen</i>	
On the Use of Higher-Order Model Transformations	18
<i>Massimo Tisi, Frédéric Jouault, Piero Fraternali, Stefano Ceri, and Jean Bézivin</i>	
Managing Model Adaptation by Precise Detection of Metamodel Changes	34
<i>Kelly Garcés, Frédéric Jouault, Pierre Cointe, and Jean Bézivin</i>	
A Pattern Mining Approach Using QVT	50
<i>Jens Kübler and Thomas Goldschmidt</i>	
A Language-Theoretic View on Guidelines and Consistency Rules of UML	66
<i>Zhe Chen and Gilles Motet</i>	
A Domain Specific Language for Extracting Models in Software Modernization	82
<i>Javier Luis Cánovas Izquierdo and Jesús García Molina</i>	
Challenges in Combining SysML and MARTE for Model-Based Design of Embedded Systems	98
<i>Huascar Espinoza, Daniela Cancila, Bran Selic, and Sébastien Gérard</i>	
Derivation and Refinement of Textual Syntax for Models	114
<i>Florian Heidenreich, Jendrik Johannes, Sven Karol, Mirko Seifert, and Christian Wende</i>	
Uniform Random Generation of Huge Metamodel Instances	130
<i>Alix Mougenot, Alexis Darrasse, Xavier Blanc, and Michèle Soria</i>	
Establishing Correspondences between Models with the Epsilon Comparison Language	146
<i>Dimitrios S. Kolovos</i>	

Dependent and Conflicting Change Operations of Process Models	158
<i>Jochen M. Küster, Christian Gerth, and Gregor Engels</i>	
Enabling Automated Traceability Maintenance through the Upkeep of Traceability Relations	174
<i>Patrick Mäder, Orlena Gotel, and Ilka Philippow</i>	
Temporal Extensions of OCL Revisited	190
<i>Michael Soden and Hajo Eichler</i>	
An MDA-Based Approach for Behaviour Modelling of Context-Aware Mobile Applications	206
<i>Laura M. Daniele, Luís Ferreira Pires, and Marten van Sinderen</i>	
A Model Driven Approach to the Analysis of Timeliness Properties	221
<i>Mohamed A. Ameedeen, Behzad Bordbar, and Rachid Anane</i>	
A Hybrid Graphical and Textual Notation and Editor for UML Actions	237
<i>Anis Charfi, Artur Schmidt, and Axel Spriestersbach</i>	
Applications	
Mapping Requirement Models to Mathematical Models in Control System Development	253
<i>Dominik Schmitz, Ming Zhang, Thomas Rose, Matthias Jarke, Andreas Polzer, Jacob Palczynski, Stefan Kowalewski, and Michael Reke</i>	
On Study Results: Round Trip Engineering of Space Systems	265
<i>Andrey Sadovskyh, Lionel Vigier, Eduardo Gomez, Andreas Hoffmann, Juergen Grossmann, and Oleg Estekhin</i>	
MoPCoM/MARTE Process Applied to a Cognitive Radio System Design and Analysis	277
<i>Ali Koudri, Joël Champeau, Denis Aulagnier, and Philippe Soulard</i>	
Managing Flexibility: Modeling Binding-Times in Simulink	289
<i>Danilo Beuche and Jens Weiland</i>	
Experiences of Developing a Network Modeling Tool Using the Eclipse Environment	301
<i>Andy Evans, Miguel A. Fernández, and Parastoo Mohagheghi</i>	
MBT4Chor: A Model-Based Testing Approach for Service Choreographies	313
<i>Alin Stefanescu, Sebastian Wieczorek, and Andrei Kirshin</i>	

Model-Based Interoperability of Heterogeneous Information Systems: An Industrial Case Study	325
<i>Nikola Milanovic, Mario Cartsburg, Ralf Kutsche, Jürgen Widiker, and Frank Kschonsak</i>	
Author Index	337