

Lecture Notes in Computer Science 2391
Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Tokyo

Lars-Henrik Eriksson
Peter Alexander Lindsay (Eds.)

FME 2002: Formal Methods – Getting IT Right

International Symposium of Formal Methods Europe
Copenhagen, Denmark, July 22-24, 2002
Proceedings



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Lars-Henrik Eriksson
Uppsala University, Department of Information Technology
P.O. Box 337, 751 05 Uppsala, Sweden
E-mail: lhe@csd.uu.se
Peter Alexander Lindsay
The University of Queensland, Software Verification Research Centre
Queensland 4072, Australia
E-mail: Peter.Lindsay@svrc.uq.edu.au

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Formal methods - getting IT right : proceedings / FME 2002, International Symposium of Formal Methods Europe, Copenhagen, Denmark, July 22 - 24, 2002. Lars-Henrik Eriksson ; Peter Alexander Lindsay (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Tokyo : Springer, 2002
(Lecture notes in computer science ; Vol. 2391)
ISBN 3-540-43928-5

CR Subject Classification (1998): F.3, D.2, D.3, D.1, J.1, K.6, F.4.1

ISSN 0302-9743

ISBN 3-540-43928-5 Springer-Verlag 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-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH
© Springer-Verlag Berlin Heidelberg 2002
Printed in Germany

Typesetting: Camera-ready by author, data-conversion by PTP-Berlin, Stefan Sossna e.K.
Printed on acid-free paper SPIN: 10873502 06/3142 5 4 3 2 1 0

Preface

This volume contains the proceedings of the 2002 symposium Formal Methods Europe (FME 2002). The symposium was the 11th in a series that began with a VDM Europe symposium in 1987. The symposia are traditionally held every 18 months. In 2002 the symposium was held at the University of Copenhagen, as part of the 2002 Federated Logic Conference (FLoC 2002), which brought together in one event seven major conferences related to logic in computer science, as well as their affiliated workshops, tutorials, and tools exhibitions.

Formal Methods Europe (www.fmeurope.org) is an independent association which aims to stimulate the use of, and research on, formal methods for software development. FME symposia have been notably successful in bringing together a community of users, researchers, and developers of precise mathematical methods for software development.

The theme of FME 2002 was “Formal Methods: Getting IT Right”. The double meaning was intentional. On the one hand, the theme acknowledged the significant contribution formal methods can make to Information Technology, by enabling computer systems to be described precisely and reasoned about with rigour. On the other hand, it recognized that current formal methods are not perfect, and further research and practice are required to improve their foundations, applicability, and effectiveness.

FME 2002 covered many aspects of the use of formal methods for development of software in many different application areas. As with previous FME symposia, FME 2002 covered a wide range of activities, from development of fundamental theory of description and reasoning, to particulars of practice and experience.

A total of 31 papers were accepted out of 95 submissions from 30 countries, half of which are outside Europe, making this a truly international event. In addition to authors of submitted papers, Natarajan Shankar, Anthony Hall, and David Basin were invited to give keynote presentations at the symposium.

A symposium session on Semantics and Logic was dedicated to the memory of John Dawes, who was a founding member of VDM Europe and a long-time active contributor to FME.

Organization

FME 2002 was organized by Formal Methods Europe and the third Federated Logic Conference (FLoC 2002). It was hosted jointly by the IT University of Copenhagen, the Technical University of Denmark, and the University of Copenhagen. We would like to thank the FME Board (John Fitzgerald, Nico Plat, and Kees Pronk) for their support, and the FLoc Organizing Committee for making local arrangements. Moshe Vardi was FLoc General Chair and Neil Jones was FLoc Conference Chair. We particularly thank Henning Makhholm, Andrzej Filinski, and Sebastian Skalberg of the FLoc Local Committee for their help in organizing the web pages, the printed program, and the tool demonstration facilities.

Organizing Committee

Organizing Chair: Dines Bjørner (Technical University of Denmark)
Program Co-chairs: Lars-Henrik Eriksson (Industrilogik, Sweden)
Peter Lindsay (University of Queensland, Australia)
Tool Demonstrations: Paul Mukherjee
(Systematic Software Engineering A/S, Denmark)

Program Committee

Bernhard Aichernig	Graz University of Technology, Austria
Juan Bicarregui	Rutherford Appleton Laboratory, UK
Ernie Cohen	Microsoft Research, Cambridge, UK
Ben Di Vito	NASA Langley Research Center, USA
Cindy Eisner	IBM Haifa Research Laboratory, Israel
Lars-Henrik Eriksson (co-chair)	Industrilogik, Sweden
John Fitzgerald	Transitive Technologies Ltd, UK
Jim Grundy	Intel Corporation, USA
Yves Ledru	IMAG Grenoble, France
Peter Lindsay (co-chair)	University of Queensland, Australia
Markus Montigel	University of New Orleans, USA
Richard Moore	IFAD, Denmark
Tobias Nipkow	Technische Universität München, Germany
Colin O'Halloran	QinetiQ, UK
Jose Oliveira	Universidade do Minho, Portugal
Nico Plat	West Consulting, The Netherlands
Jeannette Wing	Carnegie Mellon University, USA
Jim Woodcock	University of Kent, UK
Joakim von Wright	Åbo Akademi University, Finland
Pamela Zave	AT&T Laboratories, USA

External Referees

All submitted papers were peer reviewed by at least three referees. In addition to the Program Committee, the following people contributed reviews:

Referees

Parosh Aziz Abdulla	Alan Hartman	Kees Pronk
James M Armstrong	David Hemer	Xu Qiwen
Clemens Ballarin	Dang Van Hung	S Riddle
Luís S. Barbosa	Tomasz Janowski	Brian Ritchie
Sharon Barner	He Jifeng	Ken Robinson
Leonor Barroca	Robert B. Jones	Alexander Romanovsky
Shoham Ben-David	Jan Jürjens	Kaisa Sere
Pierre Berlioux	Steve King	W. Simmonds
Didier Bert	Andre S. E. Koster	David Sinclair
Eerke Boiten	Linas Laibinis	Graeme Smith
Roland Bol	K. Lano	M. A. Smith
Gregory Bond	Johan Lilius	Baruch Sterin
Michael Butler	Zhiming Liu	Martin Strecker
Martin Büchi	Anthony MacDonald	Kim Sunesen
Orieta Celiku	Ricardo J. Machado	Francis Tang
Michel Chaudron	Brian Matthews	Jan Tretmans
David Clark	C. A. Middelburg	John Turner
Pieter Cuipers	Anna Mikhailova	Rachel Tzoref
Anat Dahan	Tim Miller	Shmuel Ur
John Derrick	N. Moffat	Gertjan van Oosten
Jeremy Dick	Paul Mukherjee	Marcel Verhoef
Theo Dimitrakos	Markus Müller-Olm	Arjan Vermeij
Lydie du Bousquet	Marco Nijdam	M. Voorhoeve
Steve Dunne	John O'Leary	Jos Vrancken
Sophie Dupuy-Chessa	Jeff Z. Pan	Hagen Völzer
Andy Evans	P. K. Pandya	Marina Waldén
João M. Fernandes	Joachim Parrow	Heike Wehrheim
Jean-Claude Fernandez	Stephen Paynter	Markus Wenzel
Arnaud Fevrier	Paul Pettersson	Alan Cameron Wills
Colin Fidge	Sibylle Peuker	Guido Wimmel
Daniel Geist	Andrej Pietschker	Kirsten Winter
Anna Gerber	Ivan Porres	Jin Yang
Rob Gerth	Marie-Laure Potet	Emmanuel Zarpas
Stephen Gilmore	Viorel Preoteasa	
Stefan Gruner	Alex Pretschner	

Table of Contents

Little Engines of Proof	1
<i>Natarajan Shankar</i>	
Automated Boundary Testing from Z and B	21
<i>Bruno Legeard, Fabien Peureux, Mark Utting</i>	
Improvements in Coverability Analysis	41
<i>Gil Ratsaby, Baruch Sterin, Shmuel Ur</i>	
Heuristic-Driven Test Case Selection from Formal Specifications. A Case Study	57
<i>Juan C. Burguillo-Rial, Manuel J. Fernández-Iglesias, Francisco J. González-Castaño, Martín Llamas-Nistal</i>	
UniTesK Test Suite Architecture	77
<i>Igor B. Bourdonov, Alexander S. Kossatchev, Victor V. Kuliamin, Alexander K. Petrenko</i>	
Hoare Logic for NanoJava: Auxiliary Variables, Side Effects, and Virtual Methods Revisited	89
<i>David von Oheimb, Tobias Nipkow</i>	
Do Not Read This	106
<i>Juan C. Bicarregui</i>	
Safeness of Make-Based Incremental Recompilation	126
<i>Niels Jørgensen</i>	
An Algorithmic Approach to Design Exploration	146
<i>Sharon Barner, Shoham Ben-David, Anna Gringauze, Baruch Sterin, Yaron Wolfsthal</i>	
Mechanical Abstraction of CSP _Z Processes	163
<i>Alexandre Mota, Paulo Borba, Augusto Sampaio</i>	
Verifying Erlang Code: A Resource Locker Case-Study	184
<i>Thomas Arts, Clara Benac Earle, John Derrick</i>	
Towards an Integrated Model Checker for Railway Signalling Data	204
<i>Michael Huber, Steve King</i>	
Correctness by Construction: Integrating Formality into a Commercial Development Process	224
<i>Anthony Hall</i>	

VAlloy – Virtual Functions Meet a Relational Language.....	234
<i>Darko Marinov, Sarfraz Khurshid</i>	
Verification Using Test Generation Techniques	252
<i>Vlad Rusu</i>	
Formal Specification and Static Checking of Gemplus' Electronic Purse Using ESC/Java	272
<i>Néstor Cataño, Marieke Huisman</i>	
Development of an Embedded Verifier for Java Card Byte Code Using Formal Methods	290
<i>Ludovic Casset</i>	
Deriving Cryptographically Sound Implementations Using Composition and Formally Verified Bisimulation	310
<i>Michael Backes, Christian Jacobi, Birgit Pfitzmann</i>	
Interference Analysis for Dependable Systems Using Refinement and Abstraction	330
<i>Claus Pahl</i>	
The Formal Classification and Verification of Simpson's 4-Slot Asynchronous Communication Mechanism	350
<i>N. Henderson, S.E. Paynter</i>	
Timing Analysis of Assembler Code Control-Flow Paths	370
<i>C.J. Fidge</i>	
Towards OCL/RT	390
<i>María Victoria Cengarle, Alexander Knapp</i>	
On Combining Functional Verification and Performance Evaluation Using CADP	410
<i>Hubert Garavel, Holger Hermanns</i>	
The Next 700 Synthesis Calculi	430
<i>David Basin</i>	
Synthesizing Certified Code	431
<i>Michael Whalen, Johann Schumann, Bernd Fischer</i>	
Refinement in <i>Circus</i>	451
<i>Augusto Sampaio, Jim Woodcock, Ana Cavalcanti</i>	
Forward Simulation for Data Refinement of Classes	471
<i>Ana Cavalcanti, David A. Naumann</i>	
A Formal Basis for a Program Compilation Proof Tool	491
<i>Luke Wildman</i>	

Property Dependent Abstraction of Control Structure for Software Verification	511
<i>Thomas Firley, Ursula Goltz</i>	
Closing Open SDL-Systems for Model Checking with DTSpin	531
<i>Natalia Ioustinova, Natalia Sidorova, Martin Steffen</i>	
A Generalised Sweep-Line Method for Safety Properties	549
<i>Lars Michael Kristensen, Thomas Mailund</i>	
Supplementing a UML Development Process with B	568
<i>Helen Treharne</i>	
Semantic Web for Extending and Linking Formalisms	587
<i>Jin Song Dong, Jing Sun, Hai Wang</i>	
A Language for Describing Wireless Mobile Applications with Dynamic Establishment of Multi-way Synchronization Channels	607
<i>Takaaki Umedu, Yoshiki Terashima, Keiichi Yasumoto, Akio Nakata, Teruo Higashino, Kenichi Taniguchi</i>	
Author Index	625