Reliable Software Technologies - Ada-Europe 2004

9th Ada-Europe International Conference on Reliable Software Technologies
Palma de Mallorca, Spain, June 14-18, 2004
Proceedings
Foreword

The Ninth International Conference on Reliable Software Technologies, Ada-Europe 2004, took place in Palma, Spain, June 14–18, 2004. It was sponsored by Ada-Europe, the European federation of national Ada societies, and Ada-Spain, in cooperation with ACM SIGAda. It was organized by members of the University of the Balearic Islands (UIB).

As in past years, the conference comprised a three-day technical program, during which the papers contained in these proceedings were presented, along with vendor presentations. The technical program was bracketed by two tutorial days, when the attendees had the opportunity to catch up on a variety of topics related to the field, at both introductory and advanced levels. Furthermore, the conference was accompanied by an exhibition where vendors presented their products for supporting reliable-software development.

Invited Speakers

The conference presented four distinguished speakers, who delivered state-of-the-art information on topics of great importance, both for now and for the future of software engineering:

– S. Tucker Taft, SoftCheck Inc., USA
  \textit{Fixing software before it breaks: using static analysis to help solve the software quality quagmire}
– Martin Gogolla, University of Bremen, Germany
  \textit{Benefits and problems of formal methods}
– Antoni Olivé, Polytechnical University of Catalonia, Spain
  \textit{On the role of conceptual schemas in information systems’ development}
– Stephen Vinoski, IONA Technologies in Waltham, USA
  \textit{Can middleware be reliable?}

We would like to express our sincere gratitude to these distinguished speakers, well known to the community, for sharing their insights with the conference participants.

Submitted Papers

A large number of papers were submitted, from as many as 15 different countries. The program committee worked hard to review them, and the selection process proved to be difficult, since many papers had received excellent reviews. Finally, the program committee selected 23 papers for the conference. The final result was a truly international program with authors from Australia, Austria, China, Czech Republic, France, Germany, India, Portugal, Spain, the UK, and the USA, covering a broad range of software technologies: static analysis, testing, real-time systems, scheduling, distributed systems, formal methods, critical systems, UML, XML, fault tolerance and middleware, language issues, teaching and Ravenscar.
Tutorials

The conference also included an interesting selection of tutorials, featuring international experts who presented introductory and advanced material in the domain of the conference:

- Jean-Pierre Rosen, *Developing a Web server in Ada with AWS*
- Matthew Heaney, *Programming with the Charles container library*
- Guillem Bernat, *Probabilistic worst case execution time analysis*
- Mário A. Alves, *No pointers, great programs*
- Alfred Strohmeier, *Requirements analysis with use cases*
- Peter Amey and Roderick Chapman, *Practical experiences of safety and security-critical technologies*
- Bruce Lewis and Ed Colbert, *Developing fault-tolerant, time-critical systems with AADL, UML and Ada*
- Ben Brosgol, *Real-time Java for Ada programmers*

Acknowledgements

Many people contributed to the success of the conference. The program committee, made up of international experts in the area of reliable software technologies, spent long hours carefully reviewing all the papers and tutorial proposals submitted to the conference. A subcommittee comprising Dirk Craeynest, Albert Llamosi, Erhard Ploedereder, M.-Ribera Sancho, Alfred Strohmeier and Tullio Vardanega met in Barcelona to make the final paper selection. Some program committee members were assigned to shepherd some of the papers. We are grateful to all those who contributed to the technical program of the conference.

We would also like to thank the members of the organizing committee, with special thanks to Javier Miranda, whose dedication was key to the preparation of the attractive tutorial program and to Miquel Mascaro-Portells, who did a great job in preparing the Web pages and all the Internet facilities. Also to Dirk Craeynest, who worked hard to make the conference prominently visible and Peter Dencker who was in charge of the conference exhibition. Erhard Plödereder and Janet Barnes played an important role in the financial assessment and the liaison with Ada-Europe.

A great help in organizing the submission process and the paper reviews was the START Conference Manager, provided graciously by Rich Gerber.

Finally, we would like to express our appreciation to the authors of the papers submitted to the conference, and to all the participants who helped in achieving the goal of the conference, providing a forum for researchers and practitioners for the exchange of information and ideas about reliable software technologies. We hope they all enjoyed the technical program as well as the social events of the Ninth International Conference on Reliable Software Technologies.

June 2004

Albert Llamosí
Alfred Strohmeier
Organizing Committee

Conference Chair
Albert Llamosí, University of the Balearic Islands, Spain

Program Co-chairs
Albert Llamosí, University of the Balearic Islands, Spain
Alfred Strohmeier, Swiss Fed. Inst. of Technology Lausanne, Switzerland

Tutorial Chair
Javier Miranda, University of Las Palmas de Gran Canaria, Spain

Exhibition Chair
Peter Dencker, Aonix GmbH, Germany

Publicity Chair
Dirk Craeynest, Offis, Belgium

Local Organization Co-chairs
Miquel Mascaró-Portells, University of the Balearic Islands, Spain
Gabriel Fontanet, University of the Balearic Islands, Spain

Ada-Europe Conference Liaison
Laurent Pautet, ENST, France

Program Committee
Alejandro Alonso, Universidad Politécnica de Madrid, Spain
Ángel Álvarez, Universidad Politécnica de Madrid, Spain
Lars Asplund, Mälardalens Högskola, Sweden
Neil Audsley, University of York, UK
Janet Barnes, Praxis Critical Systems Limited, UK
Pierre Bazex, IRIT, France
Guillem Bernat, University of York, UK
Johann Blieberger, Technical University Vienna, Austria
Maarten Boasson, University of Amsterdam, The Netherlands
VIII Organizing Committee

Ben Bros gol, ACT, USA
Bernd Burgstaller, TU Vienna, Austria
Ulf Cederling, Vaxjö University, Sweden
Roderick Chapman, Praxis Critical Systems Limited, UK
Dirk Craeynest, Aubay Belgium & K.U. Leuven, Belgium
Alfons Crespo, Universitat Politècnica de València, Spain
Juan A. de la Puente, Universidad Politécnica de Madrid, Spain
Peter Dencker, Aonix GmbH, Germany
Raymond Devillers, Université Libre de Bruxelles, Belgium
Gabriel Fontanet, Universitat de les Illes Balears, Spain
Ana García, Universitat Politècnica de València, Spain
Wolfgang Gellerich, IBM, Germany
Michael González-Harbour, Universidad de Cantabria, Spain
Jesús M. González-Barahona, Universidad Rey Juan Carlos, Spain
Thomas Gruber, Austrian Research Centers Seibersdorf, Austria
Helge Hagenauer, University of Salzburg, Austria
Andrew Hately, Eurocontrol, Belgium
Günter Hommel, TU Berlin, Germany
Wolfgang Kastner, TU Vienna, Austria
Stefan Kauer, EADS, Friedrichshafen, Germany
Hubert B. Keller, Institut für Angewandte Informatik, Germany
Yvon Kermarrec, ENST Bretagne, France
Jörg Kienzle, School of Computer Science, McGill University, Montreal, Canada
Fabrice Kordon, UPMC, France
Michel Lemoine, ONERA, France
Pascal Leroy, Rational Software, France
Kristina Lundqvist, Massachusetts Institute of Technology, USA
Franco Mazzanti, Istituto di Elaborazione della Informazione, Italy
Silvia Mazzini, Intecs HRT, Italy
John W. McCormick, University of Northern Iowa, USA
Thierry Millan, IRIT, France
Pierre Morere, Aonix, France
Pascal Obry, EdF, France
Laurent Pautet, ENST Paris, France
Erhard Plödereder, University of Stuttgart, Germany
Werner Pohlmann, University of Salzburg, Austria
Gerhard Rabe, TÜV Nord e.V., Germany
Ceri Reid, CODA Technologies
Jean-M. Rigaud, Université Paul Sabatier, France
Alexander Romanovsky, University of Newcastle, UK
Jean-P. Rosen, Adalog, France
M. Ribera Sancho, Universitat Politécnica de Catalunya, Spain
Bo I. Sandén, Colorado Technical University, USA
Bernhard Scholz, TU Vienna, Austria
Edmond Schonberg, New York University & ACT, USA
Gerald Sonneck, *ARC Seibersdorf research, Austria*
Tullio Vardanega, *University of Padova, Italy*
Andy Wellings, *University of York, UK*
Jürgen Winkler, *Friedrich-Schiller-Universität, Germany*
Thomas Wolf, *Paranor AG, Switzerland*
# Table of Contents

## Invited Papers

- Benefits and Problems of Formal Methods ........................................... 1  
  *Martin Gogolla*

- On the Role of Conceptual Schemas in Information Systems Development 16  
  *Antoni Olivé*

- An Overview of Middleware ............................................................... 35  
  *Steve Vinoski*

## Static Analysis

- Static Deadlock Detection in the Linux Kernel .......................... 52  
  *Peter T. Breuer, Marisol García Valls*

- Extracting Ada 95 Objects from Legacy Ada Programs .................. 65  
  *Ricky E. Sward*

- On the Tree Width of Ada Programs ............................................... 78  
  *Bernd Burgstaller, Johann Blieberger, Bernhard Scholz*

## Distributed Systems

- The Chance for Ada to Support Distribution and Real-Time in Embedded Systems ......................... 91  
  *Juan López Campos, J. Javier Gutiérrez, Michael González Harbour*

- PolyORB: A Schizophrenic Middleware to Build Versatile Reliable Distributed Applications .................. 106  
  *Thomas Vergnaud, Jérôme Hugues, Laurent Pautet, Fabrice Kordon*

- Event Language for Real-Time On-the-Fly Control According to the Initial Requirements ............................................. 120  
  *Stepan P. Nadrchal*

## Real-Time Systems

- Implementing Execution-Time Clocks for the Ada Ravenscar Profile .... 132  
  *Juan Zamorano, Alejandro Alonso, José Antonio Pulido, Juan Antonio de la Puente*
Extending the Capabilities of Real-Time Applications by Combining MaRTE-OS and Linux
Miguel Masmano, Jorge Real, Ismael Ripoll, Alfons Crespo ............................................ 144

Supporting Deadlines and EDF Scheduling in Ada
Alan Burns, Andy J. Wellings, S. Tucker Taft .......................................................... 156

Reflection and XML
OpenAda: Compile-Time Reflection for Ada 95
Patrick Rogers, Andy J. Wellings .......................................................... 166

XML4Ada95 Accessing XML Using the DOM in Ada95
Zdenko Vrandečić, Daniel Simon .......................................................... 178

Testing
A Randomised Test Approach to Testing Safety Critical Ada Code
Sukant K. Giri, Atit Mishra, Yogananda V. Jeppu, Kundapur Karunakar ............................ 190

Good Random Testing
Kwok Ping Chan, Tsong Yueh Chen, Dave Towey .......................................................... 200

Teaching Real-Time Systems Around a Digital Model Railroad
Bárbara Álvarez, Juan A. Pastor, Francisco Ortiz, Pedro Sánchez, Pedro Navarro .............. 213

Critical Systems Modeling
High Integrity Ada in a UML and C World
Peter Amey, Neil White .................................................................................. 225

Ada Meets Giotto
Helge Hagenauer, Norbert Martinek, Werner Pohlmann ................................................. 237

High-Integrity Interfacing to Programmable Logic with Ada
Adrian J. Hilton, Jon G. Hall .................................................................................. 249

Scheduling
Dynamic Ceiling Priorities: A Proposal for Ada0Y
Jorge Real, Alan Burns, Javier Miranda, Edmond Schonberg, Alfons Crespo .................... 261

Mixing Scheduling Policies in Ada
Agustín Espinosa Minguet, Ana García-Fornes, Vicente Lorente Garcés, Andrés Terrasa Barrena .......................... 273
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementing an Application-Defined Scheduling Framework for Ada Tasking</td>
<td>283</td>
</tr>
<tr>
<td>Mario Aldea, Javier Miranda, Michael González Harbour</td>
<td></td>
</tr>
<tr>
<td>Application Programming Interfaces</td>
<td></td>
</tr>
<tr>
<td>A Theory of Persistent Containers and Its Application to Ada</td>
<td>297</td>
</tr>
<tr>
<td>Mário Amado Alves</td>
<td></td>
</tr>
<tr>
<td>Shortcuts: A Critical Look</td>
<td>309</td>
</tr>
<tr>
<td>Matthew Heaney</td>
<td></td>
</tr>
<tr>
<td>Vector Processing in Ada</td>
<td>321</td>
</tr>
<tr>
<td>Franco Gasperoni</td>
<td></td>
</tr>
<tr>
<td>Author Index</td>
<td>333</td>
</tr>
</tbody>
</table>