

# Foreword

ETAPS 2002 was the fifth instance of the European Joint Conferences on Theory and Practice of Software. ETAPS is an annual federated conference that was established in 1998 by combining a number of existing and new conferences. This year it comprised 5 conferences (FOSSACS, FASE, ESOP, CC, TACAS), 13 satellite workshops (ACL2, AGT, CMCS, COCV, DCC, INT, LDTA, SC, SFEDL, SLAP, SPIN, TPTS, and VISS), 8 invited lectures (not including those specific to the satellite events), and several tutorials.

The events that comprise ETAPS address various aspects of the system development process, including specification, design, implementation, analysis, and improvement. The languages, methodologies, and tools which support these activities are all well within its scope. Different blends of theory and practice are represented, with an inclination towards theory with a practical motivation on one hand and soundly-based practice on the other. Many of the issues involved in software design apply to systems in general, including hardware systems, and the emphasis on software is not intended to be exclusive.

ETAPS is a loose confederation in which each event retains its own identity, with a separate program committee and independent proceedings. Its format is open-ended, allowing it to grow and evolve as time goes by. Contributed talks and system demonstrations are in synchronized parallel sessions, with invited lectures in plenary sessions. Two of the invited lectures are reserved for “unifying” talks on topics of interest to the whole range of ETAPS attendees. The aim of cramming all this activity into a single one-week meeting is to create a strong magnet for academic and industrial researchers working on topics within its scope, giving them the opportunity to learn about research in related areas, and thereby to foster new and existing links between work in areas that were formerly addressed in separate meetings.

ETAPS 2002 was organized by the Laboratoire Verimag in cooperation with

Centre National de la Recherche Scientifique (CNRS)  
Institut de Mathématiques Appliquées de Grenoble (IMAG)  
Institut National Polytechnique de Grenoble (INPG)  
Université Joseph Fourier (UJF)  
European Association for Theoretical Computer Science (EATCS)  
European Association for Programming Languages and Systems (EAPLS)  
European Association of Software Science and Technology (EASST)  
ACM SIGACT, SIGSOFT, and SIGPLAN

The organizing team comprised

Susanne Graf - General Chair  
Saddek Bensalem - Tutorials  
Rachid Echahed - Workshop Chair  
Jean-Claude Fernandez - Organization

Alain Girault - Publicity  
Yassine Lakhnech - Industrial Relations  
Florence Maraninchi - Budget  
Laurent Mounier - Organization

Overall planning for ETAPS conferences is the responsibility of its Steering Committee, whose current membership is:

Egidio Astesiano (Genova), Ed Brinksma (Twente), Pierpaolo Degano (Pisa), Hartmut Ehrig (Berlin), José Fiadeiro (Lisbon), Marie-Claude Gaudel (Paris), Andy Gordon (Microsoft Research, Cambridge), Roberto Gorrieri (Bologna), Susanne Graf (Grenoble), John Hatcliff (Kansas), Görel Hedin (Lund), Furio Honsell (Udine), Nigel Horspool (Victoria), Heinrich Hußmann (Dresden), Joost-Pieter Katoen (Twente), Paul Klint (Amsterdam), Daniel Le Métayer (Trusted Logic, Versailles), Ugo Montanari (Pisa), Mogens Nielsen (Aarhus), Hanne Riis Nielson (Copenhagen), Mauro Pezzè (Milan), Andreas Podelski (Saarbrücken), Don Sannella (Edinburgh), Andrzej Tarlecki (Warsaw), Herbert Weber (Berlin), Reinhard Wilhelm (Saarbrücken)

I would like to express my sincere gratitude to all of these people and organizations, the program committee chairs and PC members of the ETAPS conferences, the organizers of the satellite events, the speakers themselves, and finally Springer-Verlag for agreeing to publish the ETAPS proceedings. As organizer of ETAPS'98, I know that there is one person that deserves a special applause: Susanne Graf. Her energy and organizational skills have more than compensated for my slow start in stepping into Don Sannella's enormous shoes as ETAPS Steering Committee chairman. Yes, it is now a year since I took over the role, and I would like my final words to transmit to Don all the gratitude and admiration that is felt by all of us who enjoy coming to ETAPS year after year knowing that we will meet old friends, make new ones, plan new projects and be challenged by a new culture! Thank you Don!

January 2002

José Luiz Fiadeiro

# Preface

This volume contains the papers selected for presentation at the 11th European Symposium on Programming (ESOP 2002), which took place in Grenoble, France, April 8-10, 2002. ESOP is an annual conference devoted to the design, specification, and analysis of programming languages and programming systems. Special emphasis was placed on research that bridges the gap between theory and practice.

The contributions of ESOP 2002 can be classified in three main categories:

- Typing and modularity.
- Programming paradigms (including distributed programming, lambda calculus, and domain specific languages).
- Program analysis (principles and applications) and program verification.

The volume begins with an invited contribution by Greg Morrisett. The remaining 21 papers were selected by the program committee from 73 submissions, and include one short paper which accompanied a tool demonstration.

Each submission was reviewed by at least three referees, and papers were selected during the latter stage of a two-week discussion phase. I would like to express my gratitude to the program committee and their referees (see below) for their care in reviewing and selecting the submitted papers. I am also very grateful to Tiziana Margaria, Martin Karusseit, and the Metaframe team for their support of the conference management software. Last but not least, many thanks to José Luiz Fiadeiro, Susanne Graf, and the ETAPS team for providing a well-organized framework for the conference.

January 2002

Daniel Le Métayer

# Organization

## Program Chair

Daniel Le Métayer

Trusted Logic, France

## Program Committee

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University of Bologna, Italy

Pieter Hartel

University of Twente, The Netherlands

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Chalmers and Göteborg University, Sweden

David Schmidt

Kansas State University, USA

Jan Vitek

Purdue University, USA

Dennis Volpano

Naval Postgraduate School, USA

## Additional Referees

Alessandro Aldini	Günter Karjoth	Jens Palsberg
Lorenzo Bettini	Jan Kuper	Lawrence C. Paulson
Stefano Bistarelli	Marta Z. Kwiatkowska	Luciano Porto Barreto
Lydie du Bousquet	Yassine Lakhnech	François Pottier
Mario Bravetti	Cosimo Laneve	Morten Rhiger
Nadia Busi	Peeter Laud	Olivier Ridoux
Bogdan Carbunar	Didier Le Botlan	Jon Riecke
Jordan Chong	Chin Soon Lee	Hanne Riss Nielson
Catarina Coquand	James Leifer	Francesca Rossi
Radhia Cousot	Xavier Leroy	Vlad Rusu
Olivier Danvy	Francesca Levi	Marie-France Sagot
Xavier Delord	Luis Lopez	Ivano Salvo
Nurit Dor	Roberto Lucchi	Alan Schmitt
Benoît Escrig	Ian Mackie	Peter Schmitt
Sandro Etalle	Angelika Mader	Ran Shaham
Andrej Felinski	Heiko Mantel	Gerard Smit
Jean-Claude Fernandez	Fabio Martinelli	Geoffrey Smith
Riccardo Focardi	Ricardo Massa	Scott Smolka
Pascal Fradet	Fabio Massacci	Axel Spriestersbach
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Rosella Gennari	David Monniaux	Stavros Tripakis
Rajeev Goré	Ugo Montanari	Pim van den Broek
Christian Grothoff	Alberto Montresor	Harald Vogt
Jörgen Gustavsson	Laurent Mounier	Eran Yahav
Jochen Haller	Jon Mountjoy	Francesco Zappa Nardelli
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Jaap-Henk Hoepman	Lasse Neilsen	
Bertrand Jeannot	Karol Ostrovsky	

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