

Foreword

The European conference situation in the general area of software science has long been considered unsatisfactory. A fairly large number of small and medium-sized conferences and workshops take place on an irregular basis, competing for high-quality contributions and for enough attendees to make them financially viable. Discussions aiming at a consolidation have been underway since at least 1992, with concrete planning beginning in summer 1994 and culminating in a public meeting at TAPSOFT'95 in Aarhus.

On the basis of a broad consensus, it was decided to establish a single annual federated spring conference in the slot that was then occupied by TAPSOFT and CAAP/ESOP/CC, comprising a number of existing and new conferences and covering a spectrum from theory to practice. ETAPS'98, the first instance of the European Joint Conferences on Theory and Practice of Software, is taking place this year in Lisbon. It comprises five conferences (FoSSaCS, FASE, ESOP, CC, TACAS), four workshops (ACoS, VISUAL, WADT, CMCS), seven invited lectures, and nine 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 natural development from its predecessors. It is a loose confederation in which each event retains its own identity, with a separate programme 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 have hitherto been addressed in separate meetings.

ETAPS'98 has been superbly organized by José Luis Fiadeiro and his team at the Department of Informatics of the University of Lisbon. The ETAPS steering committee has put considerable energy into planning for ETAPS'98 and its successors. Its current membership is:

André Arnold (Bordeaux), Egidio Astesiano (Genova), Jan Bergstra (Amsterdam), Ed Brinksma (Enschede), Rance Cleaveland (Raleigh), Pierpaolo Degano (Pisa), Hartmut Ehrig (Berlin), José Fiadeiro (Lisbon), Jean-Pierre Finance (Nancy), Marie-Claude Gaudel (Paris), Tibor Gyimothy (Szeged), Chris Hankin (London), Stefan Jähnichen (Berlin), Uwe Kastens (Paderborn), Paul Klint (Amsterdam), Kai Koskimies (Tampere), Tom Maibaum (London), Hanne Riis Nielson (Aarhus), Fernando Orejas (Barcelona), Don Sannella (Edinburgh, chair), Bernhard Steffen (Dortmund), Doaitse Swierstra (Utrecht), Wolfgang Thomas (Kiel)

Other people were influential in the early stages of planning, including Peter Mosses (Aarhus) and Reinhard Wilhelm (Saarbrücken). ETAPS'98 has received generous sponsorship from:

Portugal Telecom
TAP Air Portugal
the Luso-American Development Foundation
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the University of Lisbon
the European Association for Theoretical Computer Science
the European Association for Programming Languages and Systems
the Gulbenkian Foundation

I would like to express my sincere gratitude to all of these people and organizations, and to José in particular, as well as to Springer-Verlag for agreeing to publish the ETAPS proceedings.

Edinburgh, January 1998

Donald Sannella
ETAPS Steering Committee chairman

Preface

This volume contains papers selected from WADT'98 the 13th Workshop on Algebraic Development Techniques. Like its predecessors, WADT'98 focused on the algebraic approach to the specification and development of systems, an area that was born around the algebraic specification of abstract data types and encompasses today the formal design of integrated hardware and software systems, new specification frameworks, and a wide range of applications.

WADT'98 was organized as part of the first European Joint Conferences on Theory and Practice of Software (ETAPS). It took place at the Gulbenkian Foundation in Lisbon, Portugal, April 2-4, 1998.

The program of WADT'98 consisted of 43 presentations. The main topics addressed during the workshop were: algebraic and other approaches to system specification; algebraic combination of logics; algebraic structures and logics for concurrency; other algebraic structures and their logics; specification languages and their associated methods and tools; term rewriting and theorem proving.

A committee consisting of Bernd Krieg-Brückner, José Luiz Fiadeiro, Peter Mosses, Fernando Orejas, Francesco Parisi Presicce, Don Sannella, and Andrzej Tarlecki, with the help of Marie-Claude Gaudel and Hélène Kirchner, selected a number of papers based on the abstracts and the presentations at the workshop, and invited their authors to submit a written version of their talks for possible inclusion in this volume. All the submissions underwent a careful refereeing process. The selection committee then made the final decisions. This volume contains the final versions of the contributions that were accepted.

We are very grateful to all the referees that helped the selection committee in reviewing the submissions: Marek Bednarczyk, Michel Bidoit, Tomasz Borzyszkowski, Roberto Bruni, Luca Cardelli, Maura Cerioli, Christine Choppy, Pierpaolo Degano, Alessandro Fantechi, Nicoletta De Francesco, Martin Hofmann, Hans-Jörg Kreowski, Neil Ghani, Jo Hannay, Stefan Kahrs, Manuel Koch, Alfio Martini, Wieslaw Pawlowski, Adolfo Piperno, Gianna Reggio, Horst Reichel, Pino Rosolini, H. Schlingloff, Aleksy Schubert, Patrick Viry, Martin Wirsing, and Uwe Wolter.

Being part of ETAPS'98, the workshop shared the generous sponsorship acknowledged in the foreword and the dedication of the organization committee. As organizing chair of ETAPS'98, I would like to take the opportunity to express my deepest thanks to Antnia Lopes, whose help made it all feel so easy, as well as M.Costa, S.Jourdan, E.Moita, I.Nunes, L.Pires, J.Ramos, P.Resende, O.Torres, and M.Wermelinger.