

Foreword

ETAPS 2003 was the sixth 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 five conferences (FOSSACS, FASE, ESOP, CC, TACAS), 14 satellite workshops (AVIS, CMCS, COCV, FAMAS, Feyerabend, FICS, LDTA, RSKD, SC, TACoS, UniGra, USE, WITS and WOOD), eight invited lectures (not including those that are specific to the satellite events), and several tutorials. We received a record number of submissions to the five conferences this year: over 500, making acceptance rates fall below 30% for every one of them. Congratulations to all the authors who made it to the final program! I hope that all the other authors still found a way of participating in this exciting event and I hope you will continue submitting.

A special event was held to honour the 65th birthday of Prof. Wlad Turski, one of the pioneers of our young science. The deaths of some of our “fathers” in the summer of 2002 — Dahl, Dijkstra and Nygaard — reminded us that Software Science and Technology is, perhaps, no longer that young. Against this sobering background, it is a treat to celebrate one of our most prominent scientists and his lifetime of achievements. It gives me particular personal pleasure that we are able to do this for Wlad during my term as chairman of ETAPS.

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 the 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 2003 was organized by Warsaw University, Institute of Informatics, in cooperation with the Foundation for Information Technology Development, as well as:

- European Association for Theoretical Computer Science (EATCS);
- European Association for Programming Languages and Systems (EAPLS);
- European Association of Software Science and Technology (EASST); and

- ACM SIGACT, SIGSOFT and SIGPLAN.

The organizing team comprised:

Mikołaj Bojańczyk, Jacek Chrząszcz, Piotr Chrząstowski-Wachtel, Grzegorz Grudziński, Kazimierz Grygiel, Piotr Hoffman, Janusz Jabłonowski, Mirosław Kowaluk, Marcin Kubica (publicity), Sławomir Leszczyński (www), Wojciech Moczydłowski, Damian Niwiński (satellite events), Aleksy Schubert, Hanna Sokołowska, Piotr Stańczyk, Krzysztof Szafran, Marcin Szczuka, Łukasz Sznuke, Andrzej Tarlecki (co-chair), Jerzy Tiuryn, Jerzy Tyszkiewicz (book exhibition), Paweł Urzyczyn (co-chair), Daria Walukiewicz-Chrząszcz, Artur Zawłocki.

ETAPS 2003 received support from:¹

- Warsaw University
- European Commission, High-Level Scientific Conferences and Information Society Technologies
- US Navy Office of Naval Research International Field Office,
- European Office of Aerospace Research and Development, US Air Force
- Microsoft Research

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

Egidio Astesiano (Genoa), Pierpaolo Degano (Pisa), Hartmut Ehrig (Berlin), José Fiadeiro (Leicester), Marie-Claude Gaudel (Paris), Evelyn Duesterwald (IBM), Hubert Garavel (Grenoble), Andy Gordon (Microsoft Research, Cambridge), Roberto Gorrieri (Bologna), Susanne Graf (Grenoble), Görel Hedin (Lund), Nigel Horspool (Victoria), Kurt Jensen (Aarhus), Paul Klint (Amsterdam), Tiziana Margaria (Dortmund), Ugo Montanari (Pisa), Mogens Nielsen (Aarhus), Hanne Riis Nielson (Copenhagen), Fernando Orejas (Barcelona), Mauro Pezzè (Milano), Andreas Podelski (Saarbrücken), Don Sannella (Edinburgh), David Schmidt (Kansas), Bernhard Steffen (Dortmund), Andrzej Tarlecki (Warsaw), Igor Walukiewicz (Bordeaux), Herbert Weber (Berlin).

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 Springer-Verlag for agreeing to publish the ETAPS proceedings. The final votes of thanks must go, however, to Andrzej Tarlecki and Paweł Urzyczyn. They accepted the risk of organizing what is the first edition of ETAPS in Eastern Europe, at a time of economic uncertainty, but with great courage and determination. They deserve our greatest applause.

Leicester, January 2003

José Luiz Fiadeiro
ETAPS Steering Committee Chair

¹ The contents of this volume do not necessarily reflect the positions or the policies of these organizations and no official endorsement should be inferred.

Preface

The International Conference on Compiler Construction (CC) is concerned with recent developments in compiler construction, programming language implementation, and language design. It addresses work on all phases of compilation and for all language paradigms, emphasizing practical and efficient methods and tools. The broad area of compiler construction is reflected in these proceedings. The papers cover the full range of compiler topics including compiler tools, parsing, type analysis, static analysis, code optimization, register allocation, and run-time issues.

CC 2003 was held in Warsaw, Poland during 5–13 April 2003 and was the 12th conference in the series. This year, submissions reached a record number of 83 papers of which 77 were regular papers and 6 were short tool demonstration papers. Of these, 20 regular papers and one tool demonstration paper were selected for presentation and are included in these proceedings.

The proceedings also include two invited papers. The CC 2003 invited speaker was Barbara Ryder, whose talk was entitled *Dimensions of Precision in Reference Analysis of Object-Oriented Programming Languages*. In addition, we have the honor of including the paper by Tony Hoare who gave one of the two ETAPS “unifying” invited talks. The title of his talk was *The Verifying Compiler: a Grand Challenge for Computing Research*.

The selection of papers took place at an intense program committee meeting in Lund, Sweden, on December 6th, 2002. Eight of the PC members attended the meeting, and another seven joined in the discussion via a telephone conference call. I wish to thank all my colleagues on the program committee for their hard work, detailed reviews, and friendly cooperation. I am especially grateful to Nigel Horspool, Reinhard Wilhelm, and Evelyn Duesterwald, who, as members of the CC steering committee, gave me prompt advice whenever I needed it throughout the process of being the program chair. Many thanks also to the large number of additional reviewers who helped us read and evaluate the submitted papers.

Many people helped me in the administration of the PC work. In particular, I wish to thank Jonas Wisbrant for being very helpful in the organization of the program committee meeting and arranging a simple but very useful web facility for the PC members participating via telephone. Thanks also to Christian Andersson who helped me assemble these proceedings, and to Tiziana Margaria and Martin Karusseit at METAframe for their support of the electronic online conference system we used for submissions and reviewing. Finally, I wish to thank José Luiz Fiadeiro and the ETAPS team for their excellent organization and coordination of the whole ETAPS event.

Lund, January 2003

Görel Hedin

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