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Braga, Portugal, March/April 2007, Proceedings

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Volume Editors

Orna Grumberg
Technion
Israel Institute of Technology
Haifa 32000, Israel
E-mail: orna@cs.technion.ac.il

Michael Huth
Imperial College London
United Kingdom
E-mail: M.Huth@doc.imperial.ac.uk

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Foreword

ETAPS 2007 is the tenth instance of the European Joint Conferences on Theory and Practice of Software, and thus a cause for celebration.

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.

History and Prehistory of ETAPS

ETAPS as we know it is an annual federated conference that was established in 1998 by combining five conferences [Compiler Construction (CC), European Symposium on Programming (ESOP), Fundamental Approaches to Software Engineering (FASE), Foundations of Software Science and Computation Structures (FOSSACS), Tools and Algorithms for Construction and Analysis of Systems (TACAS)] with satellite events.

All five conferences had previously existed in some form and in various colocated combinations: accordingly, the prehistory of ETAPS is complex. FOSSACS was earlier known as the Colloquium on Trees in Algebra and Programming (CAAP), being renamed for inclusion in ETAPS as its historical name no longer reflected its contents. Indeed CAAP's history goes back a long way; prior to 1981, it was known as the Colleque de Lille sur les Arbres en Algebre et en Programmation. FASE was the indirect successor of a 1985 event known as Colloquium on Software Engineering (CSE), which together with CAAP formed a joint event called TAPSOFT in odd-numbered years. Instances of TAPSOFT, all including CAAP plus at least one software engineering event, took place every two years from 1985 to 1997 inclusive. In the alternate years, CAAP took place separately from TAPSOFT.

Meanwhile, ESOP and CC were each taking place every two years from 1986. From 1988, CAAP was colocated with ESOP in even years. In 1994, CC became a "conference" rather than a "workshop" and CAAP, CC and ESOP were thereafter all colocated in even years.

TACAS, the youngest of the ETAPS conferences, was founded as an international workshop in 1995; in its first year, it was colocated with TAPSOFT. It took place each year, and became a "conference" when it formed part of ETAPS 1998. It is a telling indication of the importance of tools in the modern field of informatics that TACAS today is the largest of the ETAPS conferences.

The coming together of these five conferences was due to the vision of a small group of people who saw the potential of a combined event to be more than the sum of its parts. Under the leadership of Don Sannella, who became the first ETAPS steering committee chair, they included: Andre Arnold, Egidio Astesiano, Hartmut Ehrig, Peter Fritzson, Marie-Claude Gaudel, Tibor Gyimothy, Paul Klint, Kim Guldstrand Larsen, Peter Mosses, Alan Mycroft, Hanne Riis Nielson, Maurice Nivat, Fernando Orejas, Bernhard Steffen, Wolfgang Thomas and (alphabetically last but in fact one of the ringleaders) Reinhard Wilhelm.

ETAPS today is a loose confederation in which each event retains its own identity, with a separate programme committee and 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 1998–2006

The first ETAPS took place in Lisbon in 1998. Subsequently it visited Amsterdam, Berlin, Genova, Grenoble, Warsaw, Barcelona, Edinburgh and Vienna before arriving in Braga this year. During that time it has become established as the major conference in its field, attracting participants and authors from all over the world. The number of submissions has more than doubled, and the numbers of satellite events and attendees have also increased dramatically.

ETAPS 2007

ETAPS 2007 comprises five conferences (CC, ESOP, FASE, FOSSACS, TACAS), 18 satellite workshops (ACCAT, AVIS, Bytecode, COCV, FESCA, FinCo, GT-VMT, HAV, HFL, LDTA, MBT, MOMPES, OpenCert, QAPL, SC, SLA++P, TERMGRAPH and WITS), three tutorials, and seven invited lectures (not including those that were specific to the satellite events). We received around 630 submissions to the five conferences this year, giving an overall acceptance rate of 25%. To accommodate the unprecedented quantity and quality of submissions, we have four-way parallelism between the main conferences on Wednesday for the first time. Congratulations to all the authors who made it to the final programme! I hope that most of the other authors still found a way of participating in this exciting event and I hope you will continue submitting.

ETAPS 2007 was organized by the Departamento de Informática of the Universidade do Minho, in cooperation with

- European Association for Theoretical Computer Science (EATCS)
- European Association for Programming Languages and Systems (EAPLS)
- European Association of Software Science and Technology (EASST)
- The Computer Science and Technology Center (CCTC, Universidade do Minho)
- Camara Municipal de Braga
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ETAPS 2007 received generous sponsorship from Fundação para a Ciência e a Tecnologia (FCT), Enabler (a Wipro Company), Cisco and TAP Air Portugal.

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

Perdita Stevens (Edinburgh, Chair), Roberto Amadio (Paris), Luciano Baresi (Milan), Sophia Drossopoulou (London), Matt Dwyer (Nebraska), Hartmut Ehrig (Berlin), José Fiadeiro (Leicester), Chris Hankin (London), Laurie Hendren (McGill), Mike Hinchey (NASA Goddard), Michael Huth (London), Anna Ingólfsdóttir (Aalborg), Paola Inverardi (L'Aquila), Joost-Pieter Katoen (Aachen), Paul Klint (Amsterdam), Jens Knoop (Vienna), Shriram Krishnamurthi (Brown), Kim Larsen (Aalborg), Tiziana Margaria (Göttingen), Ugo Montanari (Pisa), Rocco de Nicola (Florence), Jakob Rehof (Dortmund), Don Sannella (Edinburgh), João Saraiva (Minho), Vladimiro Sassone (Southampton), Helmut Seidl (Munich), Daniel Varro (Budapest), Andreas Zeller (Saarbrücken).

I would like to express my sincere gratitude to all of these people and organizations, the programme committee chairs and PC members of the ETAPS conferences, the organizers of the satellite events, the speakers themselves, the many reviewers, and Springer for agreeing to publish the ETAPS proceedings. Finally, I would like to thank the organizing chair of ETAPS 2007, João Saraiva, for arranging for us to have ETAPS in the ancient city of Braga.

Edinburgh, January 2007

Perdita Stevens
ETAPS Steering Committee Chair

Preface

This volume contains the proceedings of the 13th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2007) which took place in Braga, Portugal, March 26-30, 2007.

TACAS is a forum for researchers, developers and users interested in rigorously based tools and algorithms for the construction and analysis of systems. The conference serves to bridge the gaps between different communities that share common interests in, and techniques for, tool development and its algorithmic foundations. The research areas covered by such communities include but are not limited to formal methods, software and hardware verification, static analysis, programming languages, software engineering, real-time systems, communications protocols and biological systems. The TACAS forum provides a venue for such communities at which common problems, heuristics, algorithms, data structures and methodologies can be discussed and explored. In doing so, TACAS aims to support researchers in their quest to improve the utility, reliability, flexibility and efficiency of tools and algorithms for building systems. The specific topics covered by the conference included, but were not limited to, the following: specification and verification techniques for finite and infinite-state systems; software and hardware verification; theorem-proving and model-checking; system construction and transformation techniques; static and run-time analysis; abstraction techniques for modeling and validation; compositional and refinement-based methodologies; testing and test-case generation; analytical techniques for secure, real-time, hybrid, critical, biological or dependable systems; integration of formal methods and static analysis in high-level hardware design or software environments; tool environments and tool architectures; SAT solvers; and applications and case studies.

TACAS traditionally considers two types of papers: research papers that describe in detail novel research within the scope of the TACAS conference; and short tool demonstration papers that give an overview of a particular tool and its applications or evaluation. TACAS 2007 received 170 research and 34 tool demonstration submissions (204 submissions in total), and accepted 45 research papers and 9 tool demonstration papers. Each submission was evaluated by at least three reviewers. Submissions co-authored by a Program Committee member were neither reviewed, discussed nor decided on by any Program Committee member who co-authored a submission. After a 35-day reviewing process, the program selection was carried out in a two-week electronic Program Committee meeting. We believe that this meeting and its detailed discussions resulted in a strong technical program. The TACAS 2007 Program Committee selected K. Rustan M. Leino (Microsoft Research, USA) as invited speaker, who kindly agreed and gave a talk entitled "Verifying Object-Oriented Software: Lessons and Challenges," reporting on program verification of modern software from the

perspective of the Spec# programming system. These proceedings also include the title and abstract of an ETAPS "unifying" talk entitled "There and Back Again: Lessons Learned on the Way to the Market," in which Rance Cleaveland reports about his experience of commercializing formal modeling and verification technology, and how this has changed his view of mathematically oriented software research.

As TACAS 2007 Program Committee Co-chairs we thank the authors and co-authors of all submitted papers, all Program Committee members, subreviewers, and especially our Tool Chair Byron Cook and the TACAS Steering Committee for guaranteeing such a strong technical program. Martin Karusseit gave us prompt support in dealing with the online conference management service. The help of Anna Kramer at the Springer Editorial Office with the general organization and the production of the proceedings was much appreciated. TACAS 2007 was part of the 10th European Joint Conference on Theory and Practice of Software (ETAPS), whose aims, organization and history are detailed in the separate foreword by the ETAPS Steering Committee Chair. We would like to express our gratitude to the ETAPS Steering Committee, particularly its Chair Perdita Stevens, and the Organizing Committee — notably João Saraiva — for their efforts in making ETAPS 2007 a successful event.

Last, but not least, we acknowledge Microsoft Research Cambridge for kindly agreeing to sponsor seven awards (2000 GBP split into seven parts) for students who co-authored and presented their award-winning paper at TACAS 2007. The quality of these papers, as judged in their discussion period, was the salient selection criterion for these awards.

January 2007 Orna Grumberg and Michael Huth

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Eric Koskinen
Daniel Kroening
Wouter Kuijper
Marcel Kyas
Anna-Lena Lamprecht
Richard Lassaigne
Tal Lev-Ami
Yoad Lustig
Thomas Mailund
Jelena Marincic
Radu Mateescu
Marius Mikucionis
Alan Mycroft
Shiva Nejati
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Ulrik Nyman
Ernst-Rüdiger Olderog
Matthew Parkinson
Lee Pike
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Gwen Salaün
Wolfgang Schubert
Koushik Sen
Sharon Shoham
Jocelyn Simmonds

Ana Sokolova
Maria Sorea
Bernhard Steffen
Greogoire Sutre
Hayo Thielecke
Christian Topnik
Rachel Tzoref
Somsak Vanit-Anunchai
Jacques Verriet
Horst Voigt
Uwe Waldmann
Martin Wehrle
Georg Weissenbacher
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