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Marieke Huisman · António Ravara
Editors

Formal Techniques for Distributed Objects, Components, and Systems

43rd IFIP WG 6.1 International Conference, FORTE 2023
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on Distributed Computing Techniques, DisCoTec 2023
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Proceedings

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Foreword

The 18th International Federated Conference on Distributed Computing Techniques (DisCoTec) took place in Lisbon, Portugal, from June 19 to June 23, 2023. It was organized by the Department of Computer Science of NOVA School of Science and Technology, NOVA University Lisbon. The DisCoTec series is one of the major events sponsored by the International Federation for Information Processing (IFIP). It comprises three conferences:

- COORDINATION, the IFIP WG 6.1 25th International Conference on Coordination Models and Languages
- DAIS, the IFIP WG 6.1 23rd International Conference on Distributed Applications and Interoperable Systems
- FORTE, the IFIP WG 6.1 43rd International Conference on Formal Techniques for Distributed Objects, Components and Systems

Together, these conferences cover a broad spectrum of distributed computing subjects, ranging from theoretical foundations and formal description techniques to systems research issues. In addition to the individual sessions of each conference, the event also included plenary sessions that gathered attendees from the three conferences. These included joint invited speaker sessions and a joint session for the best papers and artefacts from the three conferences. The keynote speakers of DisCoTec 2023 are listed below:

- Azalea Raad, Imperial College London, UK
- Frank Pfenning, Carnegie Mellon University, USA
- Peter Pietzuch, Imperial College London, UK

Associated with the federated event were also the following satellite events:

- ICE, the 16th Interaction and Concurrency Experience
- BehAPI Tutorial Day, a series of three tutorials covering results from the BehAPI project

in addition to other short tutorials on relevant topics to DisCoTec.

I would like to thank the Program Committee chairs of the different events for their help and cooperation during the preparation of the conference, and the Steering Committee and Advisory Boards of DisCoTec for their guidance, patience, and support. The organization of DisCoTec 2023 was only possible thanks to the work of the Organizing Committee, including João Costa Seco, João Leitão, Mário Pereira, Carlos Baquero (publicity chair), Simão Melo de Sousa (workshops and tutorials chair), Joana Dâmaso (logistics and finances), as well as all the students who volunteered their time to help. Finally, I would like to thank IFIP WG 6.1 and NOVA LINCS for sponsoring this event,

Springer's Lecture Notes in Computer Science team for their support and sponsorship, and EasyChair for providing the reviewing infrastructure.

June 2023

Carla Ferreira

Preface

This volume contains the papers presented at the 43rd IFIP WG 6.1 International Conference on Formal Techniques for Distributed Objects, Components, and Systems (FORTE 2022), held as one of three main conferences of the 18th International Federated Conference on Distributed Computing Techniques (DisCoTec 2023) during June 19–23, 2023. The conference was organized by the NOVA University Lisbon.

FORTE is a well-established forum for fundamental research on theory, models, tools, and applications for distributed systems. It solicits submissions focused on foundational aspects of distributed software systems, presenting approaches or tools to formally model, soundly implement, and rigorously validate these demanding but ever more necessary systems and applications. As our dependency on such software systems grows, also our responsibility as researchers grows to provide both trustworthy and usable solutions.

The main topics of interest include:

- Language concepts for concurrency and distribution, supported by rigorous semantics, well-supported pragmatics, and/or expressive illustrative use-cases.
- Analysis techniques, methodologies, and/or algorithms, using testing and/or verification, to validate (aspects of) the soundness of various types of concurrent and distributed systems, including communication and network protocols, service-oriented systems, adaptive distributed systems, cyber-physical systems, and sensor networks.
- Principles for qualitative and quantitative security analysis of distributed systems.
- Applications of formal methods and techniques for studying the quality, reliability, availability, and safety of concrete distributed systems. We are especially interested in “real-life” case studies and industrial applications involving real distributed systems.
- Emerging challenges and hot topics in distributed systems (broadly construed), such as software-defined networks, distributed ledgers, smart contracts, and blockchain technologies, etc.

Papers in three different categories were solicited: regular research papers, long tool papers, and short papers describing innovative and promising ideas. For tool papers, artefact submission was required, and artefact acceptance was mandatory. For regular papers, artefact submission was also enabled.

The Program Committee received a total of 26 submissions, written by authors from 15 different countries. Of these, 13 papers were selected for inclusion in the scientific program (an acceptance rate of 50 %). Each submission was single-blind reviewed by at least three Program Committee members with the help of 15 external reviewers. In addition, 4 description paper were submitted, and 3 of them were accepted. These papers are marked with a badge in the proceedings. For the first time, FORTE introduced a partial rebuttal phase, for papers that raised questions that the reviewers would like to clarify before deciding about acceptance. The option to rebut was provided to the authors of 9 papers. The selection of accepted submissions was based on electronic discussions via the EasyChair conference management system.

As program chairs of FORTE 2022, we actively contributed to the selection of the keynote speakers for DisCoTec 2023:

- Azalea Raad, Imperial College London, UK
- Frank Pfenning, Carnegie Mellon University, USA
- Peter Pietzuch, Imperial College London, UK

We are most grateful to Azalea Raad for accepting our invitation to be the FORTE-related keynote speaker. This volume contains the abstract of her talk entitled “Principles of Persistent Programming”.

We wish to thank all the authors of submitted papers, all the members of the Program Committee for their thorough evaluations of the submissions, and the external reviewers who assisted the evaluation process. We would also like to express our appreciation to the Steering Committee of FORTE for their advice and suggestions. Last but not least, we thank the DisCoTec General Chair, Carla Ferreira, and her organization team for their hard, effective work in providing an excellent environment for FORTE 2023 and all other conferences and workshops.

June 2023

Marieke Huisman
António Ravara

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Principles of Persistent Programming (Keynote Talk)

Azalea Raad 

Imperial College London, UK

Persistent programming is the art of developing programs that operate on persistent (non-volatile) states that survive program termination, be it planned or abrupt (e.g. due to a power failure). Persistent programming poses several important challenges: 1) persistent systems have complex—and often unspecified—semantics in that operations do not generally persist in their execution order; 2) software bugs in persistent settings can lead to permanent data corruption; and 3) traditional testing techniques are inapplicable in persistent settings. Can formal methods come to the rescue?

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