

Fourth Workshop on Next Generation Real-Time Embedded Systems

NG-RES 2023, January 18, 2023, Toulouse, France

Edited by

Federico Terraneo

Daniele Cattaneo



Editors

Federico Terraneo 

Politecnico di Milano, Italy
federico.terraneo@polimi.it

Daniele Cattaneo 

Politecnico di Milano, Italy
daniele.cattaneo@polimi.it

ACM Classification 2012

Computer systems organization → Real-time systems; Computer systems organization → Embedded and cyber-physical systems; Software and its engineering → Software notations and tools; Networks

ISBN 978-3-95977-268-6

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at <https://www.dagstuhl.de/dagpub/978-3-95977-268-6>.

Publication date

March, 2023

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <https://portal.dnb.de>.

License

This work is licensed under a Creative Commons Attribution 4.0 International license (CC-BY 4.0): <https://creativecommons.org/licenses/by/4.0/legalcode>.



In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work under the following conditions, without impairing or restricting the authors' moral rights:

- Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/OASlcs.NG-RES.2023.0

ISBN 978-3-95977-268-6

ISSN 1868-8969

<https://www.dagstuhl.de/oasics>

OASlcs – OpenAccess Series in Informatics

OASlcs is a series of high-quality conference proceedings across all fields in informatics. OASlcs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Daniel Cremers (TU München, Germany)
- Barbara Hammer (Universität Bielefeld, Germany)
- Marc Langheinrich (Università della Svizzera Italiana – Lugano, Switzerland)
- Dorothea Wagner (*Editor-in-Chief*, Karlsruher Institut für Technologie, Germany)

ISSN 1868-8969

<https://www.dagstuhl.de/oasics>

■ Contents

Preface <i>Federico Terraneo and Daniele Cattaneo</i>	0:vii
Organizers of the workshop	0:ix

Invited Talk

Control Systems in the Presence of Computational Problems <i>Martina Maggio</i>	1:1–1:1
--	---------

Regular Papers

IRQ Coloring: Mitigating Interrupt-Generated Interference on ARM Multicore Platforms <i>Diogo Costa, Luca Cuomo, Daniel Oliveira, Ida Maria Savino, Bruno Morelli, José Martins, Fabrizio Tronci, Alessandro Biasci, and Sandro Pinto</i>	2:1–2:13
Beyond the Threaded Programming Model on Real-Time Operating Systems <i>Erling Rennemo Jellum, Shaokai Lin, Peter Donovan, Efsane Soyer, Fuzail Shakir, Torleiv Bryne, Milica Orlandic, Marten Lohstroh, and Edward A. Lee</i>	3:1–3:13
Efficient Abstraction of Clock Synchronization at the Operating System Level <i>Alessandro Sorrentino, Federico Terraneo, and Alberto Leva</i>	4:1–4:11
Response Time Analysis for RT-MQTT Protocol Grounded on SDN <i>Ehsan Shahri, Paulo Pedreiras, and Luis Almeida</i>	5:1–5:15
Throughput and Memory Optimization for Parallel Implementations of Dataflow Networks Using Multi-Reader Buffers <i>Martin Letras, Joachim Falk, and Jürgen Teich</i>	6:1–6:13
RAVEN: Reinforcement Learning for Generating Verifiable Run-Time Requirement Enforcers for MPSoCs <i>Khalil Esper, Jan Spieck, Pierre-Louis Sixdenier, Stefan Wildermann, and Jürgen Teich</i>	7:1–7:16

■ Preface

This volume collects the papers presented at the fourth edition of the Workshop on Next Generation Real-Time Embedded Systems (NG-RES 2023). The workshop is co-located with the 2023 edition of the HiPEAC conference and was held on January 18, 2023 in Toulouse, France.

The traditional concept of embedded systems is constantly evolving to address the requirements of the modern world. Cyber-physical systems, networked control systems and Industry 4.0 are introducing an increasing need for interconnectivity. A steadily increasing algorithmic complexity of embedded software is fueling the adoption of multicore and heterogeneous architectures. As a consequence, meeting real-time requirements is now more challenging than ever.

The NG-RES workshop focuses on real-time embedded systems, with particular emphasis on the distributed and parallel aspects. The workshop is a venue for both the networking and multicore real-time communities aiming at cross-fertilization and multi-disciplinary approaches to the design of embedded systems.

Topics of interest include but are not limited to:

- Application of formal methods to distributed and/or parallel real-time systems
- Programming models, paradigms and frameworks for real-time computation on parallel and heterogeneous architectures
- Applications of approximate computing in real-time systems
- Compiler-assisted solutions for distributed and/or parallel real-time systems
- Middlewares for distributed and/or parallel real-time systems
- Networking protocols and services (e.g., clock synchronization) for distributed real-time embedded systems
- Scheduling and schedulability analysis for distributed and/or parallel real-time systems
- System-level software and technologies (e.g. RTOSs, hypervisors, separation kernels, virtualization) for parallel and heterogeneous architectures

In this fourth edition of the workshop six regular papers were accepted, each of which receiving two peer reviews. In addition, we are glad to have an invited talk by Martina Maggio titled “Control Systems in the presence of Computational Problems”. We would like to thank the authors of the NG-RES 2023 papers, the members of our program committee, our publisher Schloss Dagstuhl as well as the HiPEAC organizers for contributing to the success of this workshop.

Federico Terraneo and Daniele Cattaneo



■ Organizers of the Workshop

General Chair

- Federico Terraneo, Politecnico di Milano, Italy

Program Chair

- Daniele Cattaneo, Politecnico di Milano, Italy

Program Committee

- Luís Almeida, Universidade do Porto, Portugal
- Benny K. Akesson, TNO, Netherlands
- Ashik Ahmed Bhuiyan, University of Central Florida, United States
- Roberto Cavicchioli, Università di Modena e Reggio Emilia, Italy
- Khalil Esper, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
- Jaume Abella Ferrer, Barcelona Supercomputing Center, Spain
- Miguel Gutierrez Gaitan, Universidade do Porto, Portugal
- Leandro Soares Indrusiak, University of York, United Kingdom
- Alberto Leva, Politecnico di Milano, Italy
- Marc Pouzet, École normale supérieure, Paris, France
- Christine Rochange, Institut de Recherche en Informatique de Toulouse, France
- Marco Solieri, Università di Modena e Reggio Emilia, Italy
- Jürgen Teich, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany



