

# **15th Workshop on Parallel Programming and Run-Time Management Techniques for Many-Core Architectures**

# **13th Workshop on Design Tools and Architectures for Multicore Embedded Computing Platforms**

PARMA-DITAM 2024, January 18, 2024, Munich, Germany

Edited by

João Bispo

Sotirios Xydis

Serena Curzel

Luís Miguel Sousa



*Editors*

**João Bispo** 

University of Porto, Portugal  
jbispo@fe.up.pt

**Sotirios Xydis** 

National Technical University of Athens, Greece

**Serena Curzel**

Politecnico di Milano, Italy

**Luís Miguel Sousa** 

University of Porto, Portugal  
lm.sousa@fe.up.pt

*ACM Classification 2012*

Computer systems organization → Multicore architectures; Computer systems organization → Reconfigurable computing; Software and its engineering → Compilers

**ISBN 978-3-95977-307-2**

*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/978-3-95977-307-2>.

*Publication date*

March, 2024

*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.PARMA-DITAM.2024.0

ISBN 978-3-95977-307-2

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>João Bispo, Sotirios Xydis, Serena Curzel, and Luís Miguel Sousa</i> .....	0:vii
List of Authors	
.....	0:ix

### Invited Talk

High-Level Synthesis Developments in the Context of European Space Technology Research	
<i>Fabrizio Ferrandi, Michele Fiorito, Claudio Barone, Giovanni Gozzi, and Serena Curzel</i> .....	1:1–1:12

### Regular Papers

Accelerator-Driven Data Arrangement to Minimize Transformers Run-Time on Multi-Core Architectures	
<i>Alireza Amirshahi, Giovanni Ansaloni, and David Atienza</i> .....	2:1–2:13
Zero-Copy, Minimal-Blackout Virtual Machine Migrations Using Disaggregated Shared Memory	
<i>Andreas Grapentin, Felix Eberhardt, Tobias Zagorni, Andreas Polze, Michele Gazzetti, and Christian Pinto</i> .....	3:1–3:13
Precision Tuning the Rust Memory-Safe Programming Language	
<i>Gabriele Magnani, Lev Denisov, Daniele Cattaneo, Giovanni Agosta, and Stefano Cherubin</i> .....	4:1–4:12
Embedded Multi-Core Code Generation with Cross-Layer Parallelization	
<i>Oliver Oey, Michael Huebner, Timo Stripf, and Juergen Becker</i> .....	5:1–5:13
Accelerating Large-Scale Graph Processing with FPGAs: Lesson Learned and Future Directions	
<i>Marco Procaccini, Amin Sahebi, Marco Barbone, Wayne Luk, Georgi Gaydadjiev, and Roberto Giorgi</i> .....	6:1–6:12





## ■ Preface

This volume collects the papers presented at the 15th Workshop on Parallel Programming and Run-Time Management Techniques for Many-core Architectures, and the 13th Workshop on Design Tools and Architectures for Multicore Embedded Computing Platforms (PARMA-DITAM 2024). The workshop is co-located with the 2024 edition of the HiPEAC conference and was held on the 18th of January, 2024, that took place in Munich, Germany.

The current trend towards many-core and the emerging accelerator-based architecture requires a global rethinking of software and hardware design, which turn out to be more than ever before strongly entangled.

The PARMA-DITAM workshop focuses on many-core architectures, parallel programming models, design space exploration, tools and run-time management techniques to exploit the features and boost the performance of such (possibly heterogeneous, (re-)programmable and/or (re-)configurable) many-core processor architectures from embedded to high performance computing platforms and cyber physical systems.

The scope of the PARMA-DITAM workshop include the following topics:


- T1: Parallel programming models, languages, and applications for many-core platforms
- T2: Compiler and virtualization techniques for novel computing architectures
- T3: Run-time modeling, monitoring, adaptivity, power and memory management
- T4: Design of heterogeneous and reconfigurable many-core architectures
- T5: Methodologies, design tools, and high-level synthesis for heterogeneous architectures
- T6: Hardware/software co-design and design space exploration
- T7: Case studies, success stories and applications applying T1–T6









## ■ List of Authors

Giovanni Agosta  (4)  
DEIB – Politecnico di Milano, Italy


Alireza Amirshahi  (2)  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland


Giovanni Ansaloni  (2)  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland


David Atienza  (2)  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland


Marco Barbone  (6)  
Imperial College London, UK


Claudio Barone (1)  
Pacific Northwest National Laboratory,  
Richland, WA, USA

Juergen Becker  (5)  
Karlsruhe Institute of Technology, Germany

Daniele Cattaneo  (4)  
DEIB – Politecnico di Milano, Italy

Stefano Cherubin  (4)  
NTNU – Norwegian University of Science and  
Technology, Trondheim, Norway

Serena Curzel  (1)  
Politecnico di Milano, Italy

Lev Denisov  (4)  
DEIB – Politecnico di Milano, Italy


Felix Eberhardt (3)  
Operating Systems and Middleware Group,  
Hasso Plattner Institute, University of Potsdam,  
Germany


Fabrizio Ferrandi  (1)  
Politecnico di Milano, Italy


Michele Fiorito  (1)  
Politecnico di Milano, Italy

Georgi Gaydadjiev  (6)  
Delft University of Technology, The Netherlands

Michele Gazzetti  (3)  
IBM Research Europe, Dublin, Ireland


Roberto Giorgi  (6)  
University of Siena, Italy


Giovanni Gozzi  (1)  
Politecnico di Milano, Italy

Andreas Grapentin  (3)  
Operating Systems and Middleware Group,  
Hasso Plattner Institute, University of Potsdam,  
Germany

Michael Huebner  (5)  
BTU Cottbus – Senftenberg, Germany


Wayne Luk  (6)  
Imperial College London, UK


Gabriele Magnani  (4)  
DEIB – Politecnico di Milano, Italy

Oliver Oey  (5)  
Karlsruhe Institute of Technology, Germany;  
emmtrix Technologies GmbH, Karlsruhe,  
Germany

Christian Pinto  (3)  
IBM Research Europe, Dublin, Ireland

Andreas Polze (3)  
Operating Systems and Middleware Group,  
Hasso Plattner Institute, University of Potsdam,  
Germany

Marco Procaccini  (6)  
University of Siena, Italy

Amin Sahebi  (6)  
University of Siena, Italy

Timo Stripf  (5)  
emmtrix Technologies GmbH, Karlsruhe,  
Germany

Tobias Zagorni (3)  
Operating Systems and Middleware Group,  
Hasso Plattner Institute, University of Potsdam,  
Germany

15th Workshop on Parallel Programming and Run-Time Management Techniques for Many-Core Architectures and  
13th Workshop on Design Tools and Architectures for Multicore Embedded Computing Platforms (PARMA-DITAM  
2024).

Editors: João Bispo, Sotirios Xydis, Serena Curzel, and Luís Miguel Sousa



OpenAccess Series in Informatics

Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

