

16th International Workshop on Worst-Case Execution Time Analysis

WCET 2016, July 5, 2016, Toulouse, France

Edited by

Martin Schoeberl



Editor

Martin Schoeberl
Department of Applied Mathematics and Computer Science
Technical University of Denmark
Lyngby
Denmark
masca@dtu.dk

ACM Classification 1998

B.8.2 Performance Analysis and Design Aids, C.3 Real-Time and Embedded systems, D.2.4 Software/-
Program Verification, D.4.7 [Organization and Design] Real-time Systems and Embedded Systems

ISBN 978-3-95977-025-5

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern,
Germany. Online available at <http://www.dagstuhl.de/dagpub/978-3-95977-025-5>.

Publication date

December, 2016

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 <http://dnb.d-nb.de>.

License

This work is licensed under a Creative Commons Attribution 3.0 Unported license (CC-BY 3.0):
<http://creativecommons.org/licenses/by/3.0/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/WCET.2016.0

ISBN 978-3-95977-025-5

ISSN 1868-8969

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

OASlcs – OpenAccess Series in Informatics

OASlcs aims at a suitable publication venue to publish peer-reviewed collections of papers emerging from a scientific event. 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 2190-6807

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

■ Contents

Preface	
<i>Martin Schoeberl</i>	vii
List of Authors	
.....	ix
Committee	
.....	xi

Regular Papers

Mitigating Software-Instrumentation Cache Effects in Measurement-Based Timing Analysis	
<i>Enrique Díaz, Jaume Abella, Enrico Mezzetti, Irune Agirre, Mikel Azkarate-Askasua, Tullio Vardanega, and Francisco J. Cazorla</i>	1:1–1:11
TACLeBench: A Benchmark Collection to Support Worst-Case Execution Time Research	
<i>Heiko Falk, Sebastian Altmeyer, Peter Hellinckx, Björn Lisper, Wolfgang Puffitsch, Christine Rochange, Martin Schoeberl, Rasmus Bo Sørensen, Peter Wägemann, and Simon Wegener</i>	2:1–2:10
Expressing and Exploiting Conflicts over Paths in WCET Analysis	
<i>Vincent Mussot, Jordy Ruiz, Pascal Sotin, Marianne de Michiel, and Hugues Cassé</i>	3:1–3:11
Continuous Non-Intrusive Hybrid WCET Estimation Using Waypoint Graphs	
<i>Boris Dreyer, Christian Hochberger, Alexander Lange, Simon Wegener, and Alexander Weiss</i>	4:1–4:11
Eager Stack Cache Memory Transfers	
<i>Amine Naji and Florian Brandner</i>	5:1–5:11
The Variability of Application Execution Times on a Multi-Core Platform	
<i>Vincent Nélis, Patrick Meumeu Yomsí, and Luís Miguel Pinho</i>	6:1–6:11
BEST: a Binary Executable Slicing Tool	
<i>Armel Mangean, Jean-Luc Béchenec, Mikaël Briday, and Sébastien Faucou</i>	7:1–7:10
Dynamic Branch Resolution Based on Combined Static Analyses	
<i>Wei-Tsun Sun and Hugues Cassé</i>	8:1–8:10
Measurement-Based Timing Analysis of the AURIX Caches	
<i>Leonidas Kosmidis, Davide Compagnin, David Morales, Enrico Mezzetti, Eduardo Quinones, Jaume Abella, Tullio Vardanega, and Francisco J. Cazorla</i> ...	9:1–9:11
Employing MPI Collectives for Timing Analysis on Embedded Multi-Cores	
<i>Martin Frieb, Alexander Stegmeier, Jörg Mische, and Theo Ungerer</i>	10:1–10:11



0:vi **Contents**

Parallel Real-Time Tasks, as Viewed by WCET Analysis and Task Scheduling Approaches
Christine Rochange 11:1–11:11

Understanding Shared Memory Bank Access Interference in Multi-Core Avionics
Andreas Löfwenmark and Simin Nadjm-Tehrani 12:1–12:11

■ Preface

It is a great pleasure to welcome you to the 16th International Workshop on Worst-Case Execution Time Analysis (WCET 2016). This year we had 20 paper submitted. Each paper was reviewed by four members of the program committee. From those 20 papers we selected 12 papers for presentation at the workshop and publication in the proceedings. The proceedings of WCET 2016 will be published through the Schloss Dagstuhl's OASICS online proceedings series, as they were in the last years.

I would like to thank all authors for their contribution to WCET 2016 and all program committee members for their insightful and helpful reviews. This year's WCET workshop received financial support by the EU COST Action IC1202: Timing Analysis on Code-Level (TACLe) and by the COST Office, which is highly appreciated. WCET 2016 is being organized as satellite workshop of the 28th Euromicro Conference on Real-Time Systems (ECRTS 2016). I am therefore grateful to the ECRTS 2016 general chair, Christian Fraboul, his local team, and the Real-Time Technical Committee Chair of Euromicro, Gerhard Fohler, for their support.

I hope that you will find this program interesting and maybe triggering new ideas. I wish you informative and exciting sessions and stimulating discussions during and between the sessions to share ideas with other researchers and practitioners.

Martin Schoeberl

Program Chair, July, 2016



■ List of Authors

Jaume Abella
Irene Agirre
Mikel Azkarate-Askasua
Sebastian Altmeyer
Jean-Luc Béchenne
Florian Brandner
Hugues Cassé
Francisco J Cazorla
Davide Compagnin
Enrique Diaz
Boris Dreyer
Heiko Falk
Sebastien Faucou
Martin Frieb
Peter Hellinckx
Christian Hochberger
Leonidas Kosmidis
Alexander Lange
Bjorn Lisper
Andreas Löfwenmark
Armel Mangean
Enrico Mezzetti
Marianne de Michiel
Briday Mikaël
Jörg Mische
David Morales
Vincent Mussot
Simin Nadjm-Tehrani
Amine Naji
Vincent Nelis
Luis Miguel Pinho

Wolfgang Puffitsch
Eduardo Quiñenones
Christine Rochange
Jordy Ruiz
Martin Schoeberl
Pascal Sotin
Alexander Stegmeier
Rasmus Bo Sørensen
Wei-Tsun Sun
Theo Ungerer
Tullio Vardanega
Peter Waegemann
Simon Wegener
Alexander Weiss
Patrick Meumeu Yomsi

16th International Workshop on Worst-Case Execution Time Analysis (WCET 2016).
Editor: Martin Schoeberl



Open Access Series in Informatics

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

■ Committee

Program Chair

- Martin Schoeberl, Technical University of Denmark

Program Committee

- Sebastian Altmeyer, University of Luxembourg, Luxembourg
- Guillem Bernat, Rapita Systems, UK
- Hugues Casse, IRIT – Universite de Toulouse, France
- Francisco J. Cazorla, Barcelona Supercomputing Center, Spain
- Heiko Falk, TU Hamburg-Harburg, Germany
- Damien Hardy, IRISA, France
- Raimund Kirner, University of Hertfordshire, UK
- Jens Knoop, Vienna University of Technology, Austria
- Bjorn Lisper, University College of Malardalen, Sweden
- Claire Maiza, Grenoble INP/Verimag, France
- Enrico Mezzetti, University of Padua, Italy
- Wolfgang Puffitsch, Technical University of Denmark, Denmark
- Isabelle Puaut, IRISA, France
- Peter Puschner, TU Wien, Austria
- Harini Ramaprasad, University of North Carolina at Charlotte, USA
- Christine Rochange, IRIT, France
- Martin Schoeberl, Technical University of Denmark, Denmark
- Tullio Vardanega, University of Padua, Italy



