



## Call for Papers

# Journal of Systems Architecture

## Special Issue on

### WORST-CASE EXECUTION-TIME ANALYSIS

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### General Information

The objective of worst-case execution-time (WCET) analysis is to compute upper bounds on the execution times of computer programs. Reliable WCET bounds are a necessary component for the construction and verification of dependable real-time systems. They are an input for doing task CPU allocation, creating task schedules, and performing schedulability analysis.

Deriving reliable WCET bounds is a complex task. Many details of the program itself and the hardware upon which the program is run have to be considered in the WCET analysis. Further, to guarantee the safety of applications the derived WCET bounds must be safe, i.e., guaranteed to not underestimate the WCET. To avoid that resources are wasted, derived bounds must also be tight, i.e., provide little or no overestimation. Moreover, the effort for computing WCET bounds should be moderate, thereby allowing the WCET analysis to be easily (and at a reasonable cost) integrated into the real-time systems development process.

Recent years have brought a number of developments that have dramatically increased the complexity of WCET analysis, thus making a high-quality WCET analysis a tough challenge:

- **Processor design:** Modern high-end processors are highly complex. They use deep pipelines and parallel processing units on various levels of these pipelines, together with dynamic and out-of-order instruction scheduling, speculation, etc.
- **Memory systems:** Processing systems used in embedded applications use heterogeneous memory systems, one or multiple levels of instruction- and data cache memory involving different main-memory update strategies, scratch pad memories, cache locking, etc.
- **Multiprocessor systems on a chip:** Tasks running on different CPU cores compete for shared resources, e.g., memory. Thus the progress and execution time of a task becomes dependent on activities of other CPUs and the conflict resolution protocols implemented on the multi-core system.
- **Large code sizes:** The size of the software used in embedded applications is constantly increasing. Thus, approaches for deriving WCET bounds must be able to scale to large code sizes without losing precision and still derive WCET bounds within moderate time.
- **Diversity of code sources:** A modern embedded application may involve a large variety of code sources, including model-based or component-based development tools, object-oriented programming languages, C, or even assembler. Moreover, to form an executable program, the code source files are compiled and linked together with other object code files and libraries. Thus, to be industrially applicable, a WCET analysis must be able to handle many code sources.

It is the aim of this special issue to provide a collection of mature results in this complex and crucial area of real-time systems research. Specific topics for this issue include, but are not limited to:

- Tool architectures and methods for WCET computation (based e.g., on systematic measurements, static analysis, or hybrid approaches)
- Flow analysis techniques (e.g. for derivation of loop bounds or (in)feasible paths)
- Hardware analysis and hardware modeling for WCET analysis, (e.g., targeting one or more of the challenges described above).
- Methods for WCET calculation, (e.g., new uses of IPET)
- Techniques for finding the WCET by measurements
- Integration and interaction of embedded system software development tools and WCET analysis
- Hardware and software architectures supporting WCET composability and compositionality
- Hardware and software design for timing predictability and repeatability
- Experience reports on using WCET analysis methods and tools in industrial settings

We encourage both submissions of new novel ideas as well as earlier published and mature works. The latter provides an opportunity for authors to present previously published work in more detail, including e.g., more detailed method descriptions, more exhaustive evaluations, complete proofs, and valuable implementation details. Submissions based on previously published work have to include at least 30% new material, as well as a short additional description on how the new work differs from the already published one.

## Submission Information

All manuscripts and any supplementary material should be submitted via the online submission and peer review systems at <http://ees.elsevier.com/jsa>. Follow the submission instructions given on this site.

Please select the article type as “*Special Issue: WCET Analysis*”. All manuscripts should comply with the journal's Guide for Authors. Please refer to the following site:

[http://www.elsevier.com/wps/find/journaldescription.cws\\_home/505616/authorinstructions](http://www.elsevier.com/wps/find/journaldescription.cws_home/505616/authorinstructions).

## Important Dates

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Final Papers: April 30, 2010

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## JSA Editor-in-Chief

Iain Bate

## Guest Editors

- Associate Professor Andreas Ermedahl  
Mälardalen University  
Box 883, 721 23 Västerås, Sweden  
Email: andreas.ernedahl@mdh.se  
Web: <http://www.idt.mdh.se/~ael01/>
- Professor Peter Puschner  
Technische Universität Wien  
Vienna University of Technology, A1040 Vienna, Austria  
Email: peter@vmars.tuwien.ac.at  
Web: <http://ti.tuwien.ac.at/rts/people/puschner>