

parMERASA

Dissemination Event

Address of Welcome

Prof. Dr. Theo Ungerer, parMERASA Project
Coordinator, University of Augsburg

Prof. Dr. Jesús Labarta, Director of Computer
Sciences Department of Barcelona
Supercomputing Centre

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Project Overview and State of Project

Theo Ungerer
University of Augsburg
parMERASA Dissemination Event
September 23, 2014

- **Hard real-time:**
 - a deadline must never be missed
 - if missed it may cause harm to humans or equipment
- **Soft real-time:**
 - a deadline could be missed without harm
- **Mixed criticality in multi-cores:**
 - combining functionalities with different levels of criticality within multi-core systems
 - e.g. sub-systems to be combined that have different automotive safety integrity levels (ASIL)



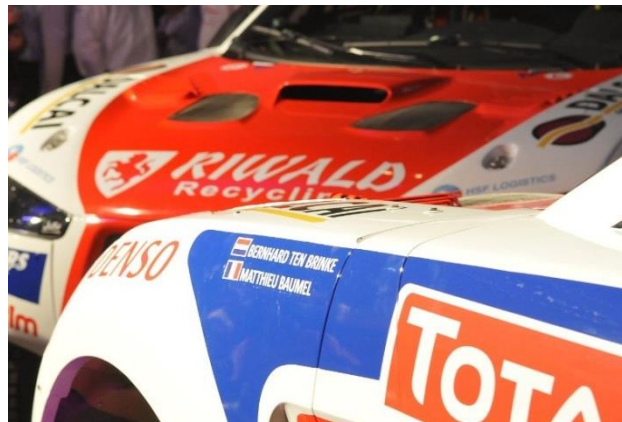
is important in real life...

soft real-time vs. hard real-time demands



source: The HiPEAC roadmap slides
www.hipeac.net/roadmap

- **Increasing demand** for functionality in embedded systems
- Demand for **mixed criticality application** execution
- Demand for **more performance**
- **Our solution is based on timing-predictable multi-cores**



parMERASA goes one step beyond mixed criticality demands:

We target future complex control algorithms by parallelising hard real-time programs to run on predictable multi-core processors.

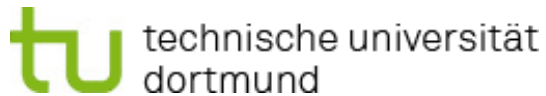
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Multi-Core Execution of *parallelised* Hard Real-Time Applications Supporting Analysability

EC FP-7 project Sept. 1, 2011 – Sept. 30, 2014

3.3 Mio EC contribution

Project webpage: <http://www.parmerasa.eu>



Industrial Advisory Board:

Benoit Triquet, Airbus, Toulouse, France

Glenn Farrall, Infineon Technologies UK Ltd, Bristol, UK

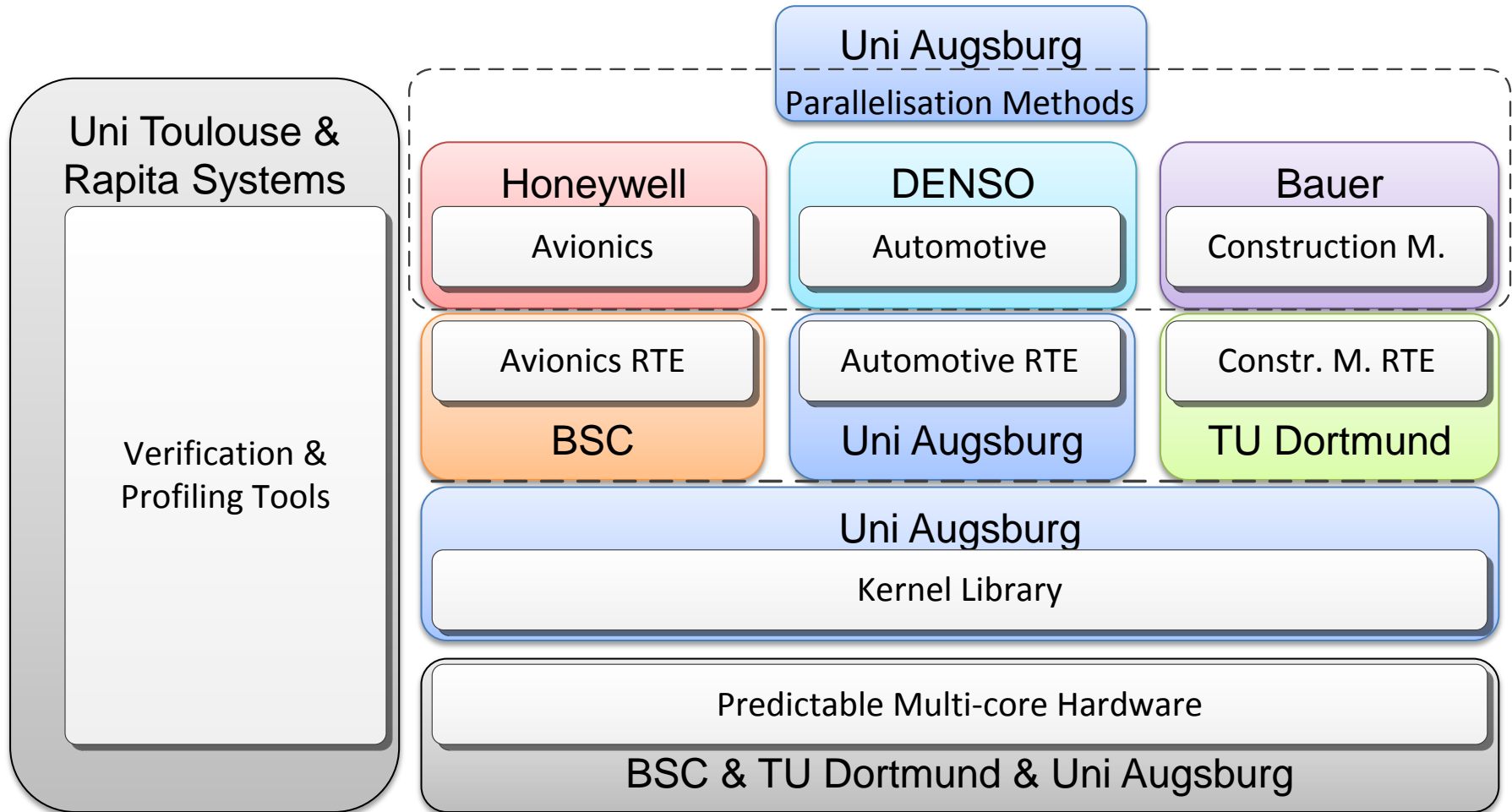
Rafael Zalman, Infineon Technologies AG, Munich, Germany

Andre Lajtkep, BMW Group, Munich, Germany

Hakan Sivencrona, DELPHI, Sweden

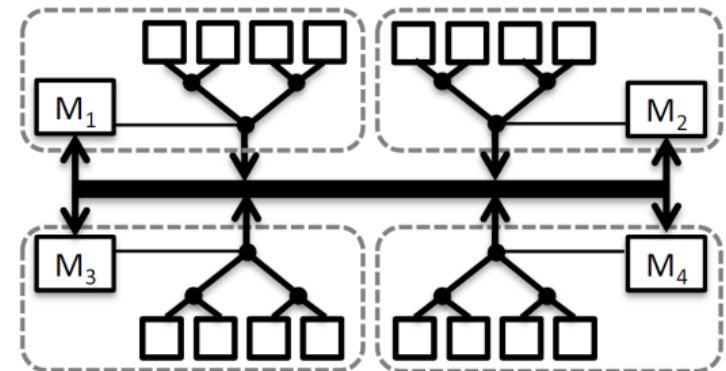
Claus Stellwag, Elektrobit Automotive GmbH, Erlangen, Germany

Heinz Hille, Daimler AG, Germany



- Pattern-based approach to efficiently parallelise industrial applications for embedded real-time systems.
- Parallelisation of four industrial hard real-time applications:
 - stereo navigation,
 - 3D path planning,
 - diesel engine management system,
 - control of crawler crane
- Hard real-time support in system software
 - Common Kernel Lib
 - TinyAUTOSAR
 - TinyIMA
 - pBIOS4CM for crawler crane code

- WCET analysis and verification tools for multi-cores:
static WCET tool OTAWA and
measurement-based WCET tool RapiTime
both extended for parallel programs
four further verification and profiling tools
- Time predictable clustered multi-core with > 8 cores
predictability of NoC designs
predictable new cache
all integrated into a single
multi-core simulator
- Contributions to AUTOSAR and
ARINC Standards and to Open Source Software.



- 9:45 The parMERASA Predictable Multi-core Processor
Dr. Eduardo Quiñones, Barcelona Supercomputing Centre Spain
Prof. Dr. Sascha Uhrig, University of Dortmund, Germany
- 10:15 System Software and TinyAUTOSAR,
Dr. Florian Kluge, University of Augsburg, Germany
- 10:40 Static WCET Analysis of Parallel Programs
Prof. Dr. Christine Rochange, University of Toulouse, France
- 11:00 Coffee Break*
- 11:30 Verification and Profiling Tools
Dr. Nick Lay and Dave George, RAPITA Systems Ltd., York, UK
- 12:00 Experiences with Pattern-based Software Development
Dr. Ralf Jahr, University of Augsburg, Germany
- 12:30 Buffet Lunch and Supercomputer Visit*

Parallelization of Applications

- 13:45 Parallelisation of Construction Machinery Control Code,
Andreas Hugl, BAUER Maschinen GmbH
- 14:05 Parallel Stereo Navigation and Collision Avoidance Algorithms
Dr. Pavel Zaykov, Honeywell International s.r.o., Brno, Czech Rep.
- 14:35 Parallelization of a Diesel Engine Management System
Sebastian Kehr, DENSO AUTOMOTIVE Deutschland GmbH
- 15:00 Coffee Break*
- 15:30 Memorandum and Post parMERASA Vision
Prof. Dr. Theo Ungerer, University of Augsburg, Germany
Discussion Forum on Requirements of Future Hard Real-Time
Processors, Tools and Applications
Moderator: Prof. Dr. Theo Ungerer, University of Augsburg, Germany
- 16:30 End of meeting*