Practical Feasibility

The Embedded Systems Engineering section at DTU Informatics and the Department of Computer Science at the University of Aalborg provide the intellectual environment that is needed for an ambitious research project. Furthermore, DTU Informatics provides the infrastructure (e.g., an automatic test environment for regressions tests, web server).

Human Resources

We intend to build a group with a healthy mix of researchers with different education levels and experience, ranging from a PhD student, a post-doctorate researcher, to senior researchers. For the CJ4ES project we request funding of one PhD student (NN) and one post-doc (René Rydhof Hansen) for three years.

Martin Schoeberl (DTU) is an associate professor at DTU Informatics. He is the principal investigator and project lead. He will contribute 2 PM per year of his time to the CJ4ES research project.

Paul Pop (DTU) is an associate professor at DTU Informatics. His research interests are in the area of scheduling and schedulability analysis for safety-critical embedded systems.

NN PhD (DTU) A PhD student will work towards his PhD on the development and implementation of SCJ on JOP and time-predictable libraries.

Anders P. Ravn (AAU) is Professor of Computing at the Department of Computer Science, Aalborg University. One topic of his research interest is application of a safe language and the right profile in the domain of high-integrity systems.

Kim G. Larsen (AAU) is Professor in the Department of Computer Science at Aalborg University and director of the ICT-competence center CISS. His research area is theoretical computer science, more precisely the semantics of nondeterminism and concurrency.

René Rydhof Hansen (AAU) is an assistant professor. His research interests include static analysis and language-based methods for safety and security. He has been applying static analysis methods to Java and Java bytecode since 2000.

Karl Kaas Laursen (GomSpace) has been involved in development, production, and delivery of onboard computer system for various satellites. He is Space Projects Manager and partner at GomSpace ApS.

Experimental Facilities

Development and simulation of the safety-critical Java system and the analysis tools can be performed on standard desktop PCs. For the evaluation on top of JOP, small and cheap FPGA boards (less than DKK 3.000,-) can be used. The needed software (e.g., Java compiler, FPGA compilation) is freely available.

Work Schedule and Timetable

Work package	PM	Person	Description
SCJ-L0	9	PhD	Level 0 implementation of SCJ (cyclic executive)
SCJ-L1	12	PhD	Level 1 implementation of SCJ (fixed priority, preemptive)
Library	12	PhD	Time-predictable Java library
IODev	2	MS	Example device drivers with hardware objects
Visit	1	MS	Research visit at Purdue University
HW	3	MS	Hardware support of SCJ operations and chip-multiprocessor
Sched	3	PP	Adaption of schedulability tools for SCJ
WC	12	RRH	Worst-case resource usage analysis (time and memory)
CC	9	RRH	SCJ compliance checking
Verify	12	RRH	Automated verification and validation of safety and security properties
MoC	3	APR	Computational model for safety-critical systems
MCheck	3	KGL	Merge of model checking with static analysis
Evaluation	2 x 3	All	Feasibility study with industrial use cases

Table 1: Work packages

The project is divided into several work packages which target the execution platform and the development workbench. A researcher will be assigned to each work package as its main developer. A cooperative working-style will be encouraged so, that the experience and knowledge of the different team members will optimally be utilized. For each work package, as shown in Table 1, the time is given in person months (PM), including the development and the evaluation time. Figure 1 shows the Gantt chart for the project schedule. Note that MS, PP, APR, and KGL work only part time on the project. Therefore, the latencies of their tasks are accordingly longer than the PM.

Milestones

For an assessment of the project success we plan following milestones:

M1 12/2011: A prototype of a Level 0 SCJ implementation, including device drivers in Java, is running on JOP. WCET and memory usage can be statically analyzed.

M2 10/2012: A prototype of a Level 1 SCJ implementation finished. The SCJ compliance checker is available.

M3 10/2013: Design and development finalized (including time-predictable libraries, CMP support, and analysis and verifier tools). The platform is ready for industrial evaluation.

M4 12/2013: Assessment of the feasibility of SCJ on top of JOP for future safety-critical applications with two industrial use cases.

ID	Task Name	Resource Names	Start	Finish	Duration
1	SCJ-L0	PhD	03.01.2011	07.10.2011	200d
2	SCJ-L1	PhD	10.10.2011	05.10.2012	260d
3	Library	PhD	08.10.2012	04.10.2013	260d
4	IODev	MS	03.01.2011	30.12.2011	260d
5	Visit	MS	02.01.2012	10.02.2012	30d
6	HW	MS	13.02.2012	09.08.2013	390d
7	Sched	PP	01.07.2011	27.06.2013	520d
8	WC	RRH	03.01.2011	30.12.2011	260d
9	CC	RRH	02.01.2012	05.10.2012	200d
10	Verify	RRH	08.10.2012	04.10.2013	260d
11	MoC	APR	03.01.2011	06.09.2013	700d
12	MCheck	KGL	03.01.2011	06.09.2013	700d
13	Evaluation	All	07.10.2013	27.12.2013	60d

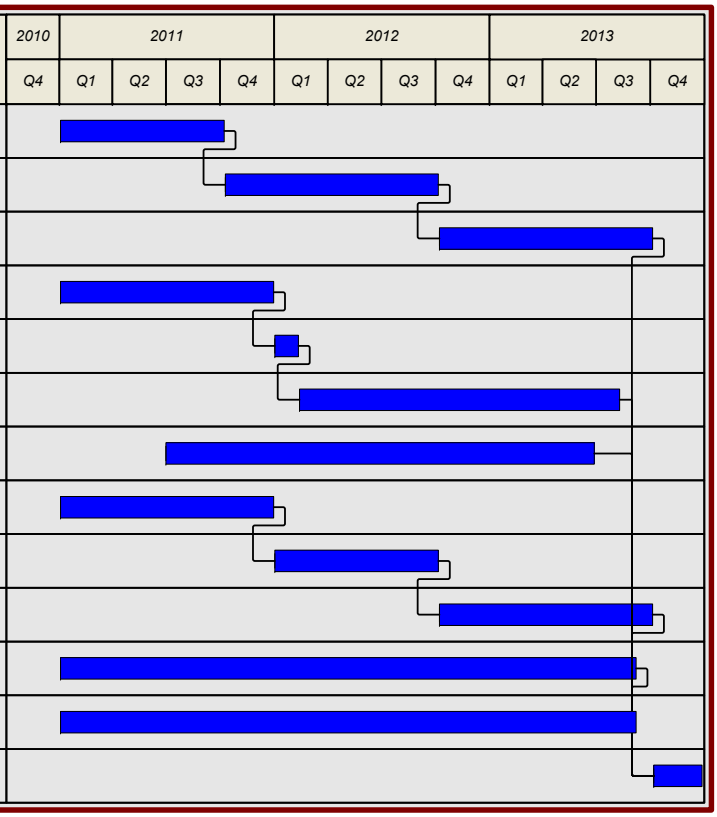

Figure 1: Project schedule (timetable)

Curriculum Vitae Martin Schoeberl

Currently I am associate professor at the Technical University of Denmark, at the Department of Informatics and Mathematical Modelling. I completed my PhD at the Vienna University of Technology in 2005 and turned in the Habilitation in 2009. My research focus is on time-predictable computer architectures and on Java for hard real-time systems. During my PhD, I developed the time-predictable Java processor JOP. This processor is currently being used in industrial projects and is the basis for further research on chip-multiprocessors for real-time systems. JOP enabled my participation in the EU project JEOPARD. Furthermore, my expertise in real-time Java led to my membership of the Expert Group for the standard on Safety Critical Java (JSR 302), which is managed by the Java Community Process and led by Doug Locke.

Teaching Experience In 2006, I established a mandatory course on advanced Computer Architecture that has been part of the Master's program. Furthermore I teach an elective lab on Computer Architecture where Master's students design their own pipelined processor. Since 2005, I have been teaching an elective course with laboratory on JOP named "The Java Virtual Machine in Hardware". In 2006 CBS, Copenhagen invited me to teach embedded systems in Java for Master's students. Additionally, I've supervised six master students in Vienna and in Copenhagen and two PhD students in Vienna.

Industrial Experience Since 1986, I have been working in the computer engineering sector and in the automation industry on distributed soft real-time systems. Since 1994, I have been self-employed and occupied on projects in embedded systems for automation and supervision. Four of the projects were based on the Java processor JOP. My extended experience in research and development for industry provides a good background for research in the area of embedded real-time systems. I returned to academia due to personal interest and to solve some of the fundamental problems I had seen during my industrial work.

Management Experience My industrial experience and leading development projects provides profound knowledge to establish and lead an independent research group. Furthermore, I have experience in leading a work package in the EU project JEOPARD. At the TU Vienna I managed a research group of two PhD students and one master student on System-on-Chip design.

Funding 2004-2007: *Principal Investigator* and funding applicant (self employed) for the national SME funding project: Implementation of the CLDC standard for real-time systems on a Java processor, EUR 80,000.-

2008-2010: FP7 EC project JEOPARD (Java Environment for Parallel Realtime Development) under grant agreement number 216682; EUR 3,170,000.- (total), EUR 167,000.- for the TU Vienna. The JEOPARD consortium consists of 10 partners from academia and industry. I was responsible for the Austrian part of the proposal, representing the TU Vienna in the project, and I am now leading the "Architecture" work package in JEOPARD.

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Education

April 2005	PhD Degree in Computer Engineering with distinction from TU Vienna, date: 11.4.2005
2000 – 2004	PhD Studies of Computer Engineering at the TU Vienna
June 2000	Conservatory Diploma in Jazz guitar at the Gustav Mahler Conservatory, Vienna
Summer 1999	Studies of Jazz guitar at the Berklee College of Music, Boston, USA
November 1994	Master's Degree in Computer Science from TU Vienna
1993 – 2000	Studies of Jazz guitar at the Prayner and Gustav Mahler Conservatory, Vienna
1986 – 1994	Studies in Computer Science at the TU Vienna
May 1986	School leaving examination, with distinction
1980 – 1986	Engineering School for Communications Engineering and Electronics in St. Pölten

Employment

Since 2010	Associate Professor at the Department of Informatics and Mathematical Modelling, Technical University of Denmark
2005 – 2009	Assistant Professor at the Institute of Computer Engineering, TU Vienna
1996	Civilian Service in Vienna
Since 1994	Self-employed with projects in automation and supervision
1992 – 1994	Software engineer at Wirtschafts- und Sozialwissenschaftliches Rechenzentrum
1987 – 1991	Software engineer at COIN Computerentwicklungen GmbH
1986 – 1987	Software engineer at SYSGRAPH Computergraphik GmbH

Summary of Scientific Work

- 7 journal publications, 52 original, peer reviewed publications in proceedings, 2 books, 11 invited talks
- Reviewer for 6 Journals and PC member of 6 conferences
- Member of the Expert Group for the Safety Critical Java Specification (JSR 302)
- General program chair for Java Technologies for Real-time and Embedded Systems 2009
- Guest editor for the special issue on *Java Technologies for Real-Time Distributed and Embedded Systems* in Concurrency and Computation: Practice and Experience

Publications Martin Schoeberl (Since 2005)

I have published two books, three journal articles, one patent, and 52 papers in peer reviewed conferences and workshops, 27 of the papers as main author (18 of the 27 as single author). Two papers are invited papers. Four journal articles are accepted and one under revision. The citation count (CC), as given by Google Scholar,[1] is added to the publication entries.

Books

1. Martin Schoeberl. *JOP: A Java Optimized Processor for Embedded Real-Time Systems*. Number ISBN 978-3-8364-8086-4. VDM Verlag Dr. Müller, July 2008.

2. Martin Schoeberl. *JOP Reference Handbook: Building Embedded Systems with a Java Processor*. Number ISBN 978-1438239699. CreateSpace, August 2009. *CC 5*

Journal Articles

1. Martin Schoeberl. A Java processor architecture for embedded real-time systems. *Journal of Systems Architecture*, 54/1–2:265–286, 2008. ***CC 60***

2. Martin Schoeberl. Time-predictable computer architecture. *EURASIP Journal on Embedded Systems*, vol. 2009, Article ID 758480:17 pages, 2009. *CC 16*

3. Walter Binder, Martin Schoeberl, Philippe Moret, and Alex Villazon. Cross-profiling for Java processors. *Software: Practice and Experience*, 39/18:1439–1465, 2009.

4. Martin Schoeberl and Wolfgang Puffitsch. Non-blocking real-time garbage collection. *Trans. on Embedded Computing Sys.*, 26 pages, accepted 2009.

5. Christof Pitter and Martin Schoeberl. A real-time Java chip-multiprocessor. *Trans. on Embedded Computing Sys.*, 31 pages, accepted 2009. *CC 4*

6. Martin Schoeberl, Stephan Korsholm, Tomas Kalibera, and Anders P. Ravn. A hardware abstraction layer in Java. *Trans. on Embedded Computing Sys.*, 42 pages, accepted 2009. *CC 1*

7. Martin Schoeberl, Wolfgang Puffitsch, Rasmus Ulslev Pedersen, and Benedikt Huber. Worst-case execution time analysis for a Java processor. *Software: Practice and Experience*, 47 pages, accepted 2009.

Patent

1. Martin Schoeberl. Instruction Cache für Echtzeitsysteme, April 2006. Austrian patent AT 500.858.

[1] To retrieve the best result for my publication list in Google Scholar use `"martin schoeberl" author:m-schoeberl` as search string or the following url `http://scholar.google.com/scholar?q=+"martin+schoeberl"+author:m-schoeberl`

PhD Thesis

1. Martin Schoeberl. *JOP: A Java Optimized Processor for Embedded Real-Time Systems*. PhD thesis, Vienna University of Technology, 2005. ***CC 94***

Reviewed Conference and Workshop Papers

2009

1. Martin Schoeberl, Wolfgang Puffitsch, and Benedikt Huber. Towards time-predictable data caches for chip-multiprocessors. In *Proceedings of the Seventh IFIP Workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS 2009)*, 2009. Springer, November 2009.

2. Martin Schoeberl, Peter Puschner, and Raimund Kirner. A single-path chip-multiprocessor system. In *Proceedings of the Seventh IFIP Workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS 2009)*, 2009. Springer, November 2009. *CC 1*

3. Rasmus Ulslev Pedersen and Martin Schoeberl. Educational case studies with an open source embedded real-time java processor. In *Proceedings of the Workshop on Embedded Systems Education (WESE 2009)*. ACM Press, October 2009.

4. Stephen A. Edwards, Sungjun Kim, Edward A. Lee, Isaac Liu, Hiren D. Patel, and Martin Schoeberl. A disruptive computer design idea: Architectures with repeatable timing. In *Proceedings of IEEE International Conference on Computer Design (ICCD 2009)*. IEEE, October 2009. Lake Tahoe, CA.

5. Jack Whitham, Neil Audsley, and Martin Schoeberl. Using hardware methods to improve time-predictable performance in real-time Java systems. In *Proceedings of the 7th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2009)*, Madrid, Spain, September 2009. ACM Press. *CC 1*

6. Martin Schoeberl, Walter Binder, Philippe Moret, and Alex Villazon. Design space exploration for Java processors with cross-profiling. In *Proceedings of the 6th International Conference on the Quantitative Evaluation of SysTems (QEST 2009)*, Budapest, Hungary, September 2009. IEEE Computer Society. *CC 1*

7. Philippe Moret, Walter Binder, Alex Villazon, Danilo Ansaloni, and Martin Schoeberl. Locating performance bottlenecks in embedded Java software with calling-context cross-profiling. In *Proceedings of the 6th International Conference on the Quantitative Evaluation of SysTems (QEST 2009)*, Budapest, Hungary, September 2009. IEEE Computer Society. *CC 1*

8. Philippe Moret, Walter Binder, Martin Schoeberl, Alex Villazon, and Danilo Ansaloni. Analyzing performance and dynamic behavior of embedded Java software with calling-context cross-profiling. In *Proceedings of the 7th International Conference on the Principles and Practice of Programming in Java (PPPJ 2009)*, Calgary, Alberta, Canada, August 2009. ACM.

9. Martin Schoeberl and Peter Puschner. Is chip-multiprocessing the end of real-time scheduling? In *Proceedings of the 9th International Workshop on Worst-Case Execution Time (WCET) Analysis*, Dublin, Ireland, July 2009. OCG. *CC 2*

10. Benedikt Huber and Martin Schoeberl. Comparison of implicit path enumeration and model checking based WCET analysis. In *Proceedings of the 9th International Workshop on Worst-Case Execution Time (WCET) Analysis*, Dublin, Ireland, July 2009. OCG. *CC 2*

11. Thomas Henties, James J. Hunt, Doug Locke, Kelvin Nilsen, Martin Schoeberl, and Jan Vitek. Java for safety-critical applications. In *2nd International Workshop on the Certification of Safety-Critical Software Controlled Systems (SafeCert 2009)*, Mar. 2009. *CC 10*

12. Martin Schoeberl. Time-predictable cache organization. In *Proceedings of the First International Workshop on Software Technologies for Future Dependable Distributed Systems (STFSSD 2009)*, Tokyo, Japan, March 2009. IEEE Computer Society. **Invited paper.** *CC 8*

13. Andy Wellings and Martin Schoeberl. Thread-local scope caching for real-time Java. In *Proceedings of the 12th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2009)*, Tokyo, Japan, March 2009. IEEE Computer Society. *CC 4*

14. Florian Brandner, Tommy Thorn, and Martin Schoeberl. Embedded JIT compilation with CACAO on YARI. In *Proceedings of the 12th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2009)*, Tokyo, Japan, March 2009. IEEE Computer Society. *CC 5*

2008

15. Walter Binder, Alex Villazon, Martin Schoeberl, and Philippe Moret. Cache-aware cross-profiling for Java processors. In *Proceedings of the 2008 international conference on Compilers, architecture, and synthesis forembedded systems (CASES 2008)*, Atlanta, Georgia, October 2008. ACM. *CC 8*

16. Martin Schoeberl and Wolfgang Puffitsch. Non-blocking object copy for real-time garbage collection. In *Proceedings of the 6th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2008)*, September 2008. *CC 7*

17. Wolfgang Puffitsch and Martin Schoeberl. Non-blocking root scanning for real-time garbage collection. In *Proceedings of the 6th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2008)*, September 2008. *CC 8*

18. Walter Binder, Martin Schoeberl, Philippe Moret, and Alex Villazon. Cross-profiling for embedded Java processors. In *Proceedings of the 5th International Conference on the Quantitative Evaluation of SysTems (QEST 2008)*, St Malo, France, September 2008. *CC 7*

19. Martin Schoeberl. Application experiences with a real-time Java processor. In *Proceedings of the 17th IFAC World Congress*, Seoul, Korea, July 2008. *CC 9* **Invited paper.**

20. Peter Puschner and Martin Schoeberl. On composable system timing, task timing, and WCET analysis. In *Proceedings of the 8th International Workshop on Worst-Case Execution Time (WCET) Analysis*, Prague, Czech Republic, July 2008. *CC 5*

21. Christof Pitter and Martin Schoeberl. Performance evaluation of a Java chip-multiprocessor. In *Proceedings of the 3rd IEEE Symposium on Industrial Embedded Systems (SIES 2008)*, Jun. 2008. *CC 14*

22. Stephan Korsholm, Martin Schoeberl, and Anders P. Ravn. Interrupt Handlers in Java. In *Proceedings of the 11th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2008)*, Orlando, Florida, USA, May 2008. IEEE Computer Society. *CC 2*

23. Trevor Harmon, Martin Schoeberl, Raimund Kirner, and Raymond Klefstad. Toward libraries for real-time Java. In *Proceedings of the 11th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2008)*, Orlando, Florida, USA, May 2008. IEEE Computer Society. *CC 1*

24. Martin Schoeberl, Stephan Korsholm, Christian Thalinger, and Anders P. Ravn. Hardware objects for Java. In *Proceedings of the 11th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2008)*, Orlando, Florida, USA, May 2008. IEEE Computer Society. *CC 9*

25. Trevor Harmon, Martin Schoeberl, Raimund Kirner, and Raymond Klefstad. A modular worst-case execution time analysis tool for Java processors. In *Proceedings of the 14th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2008)*, St. Louis, MO, United States, April 2008. *CC 3*

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26. Martin Schoeberl. SimpCon - a simple and efficient SoC interconnect. In *Proceedings of the 15th Austrian Workhop on Microelectronics, Austrochip 2007*, Graz, Austria, October 2007. *CC 13*

27. Martin Schoeberl and Jan Vitek. Garbage collection for safety critical Java. In *Proceedings of the 5th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2007)*, pages 85–93, Vienna, Austria, September 2007. ACM Press. *CC 11*

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29. Martin Schoeberl. Architecture for object oriented programming languages. In *Proceedings of the 5th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2007)*, pages 57–62, Vienna, Austria, September 2007. ACM Press. *CC 7*

30. Wolfgang Puffitsch and Martin Schoeberl. picoJava-II in an FPGA. In *Proceedings of the 5th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2007)*, pages 213–221, Vienna, Austria, September 2007. ACM Press. *CC 12*

31. Christof Pitter and Martin Schoeberl. Time predictable CPU and DMA shared memory access. In *International Conference on Field-Programmable Logic and its Applications (FPL 2007)*, pages 317 – 322, Amsterdam, Netherlands, August 2007. *CC 11*

32. Martin Schoeberl. A time-triggered network-on-chip. In *International Conference on Field-Programmable Logic and its Applications (FPL 2007)*, pages 377 – 382, Amsterdam, Netherlands, August 2007. *CC 4*

33. Raimund Kirner and Martin Schoeberl. Modeling the function cache for worst-case execution time analysis. In *Proceedings of the 44rd Design Automation Conference (DAC 2007)*, pages 471–476, San Diego, CA, USA, June 2007. ACM. *CC 4*

34. Martin Schoeberl. Mission modes for safety critical Java. In *Software Technologies for Embedded and Ubiquitous Systems, 5th IFIP WG 10.2 International Workshop (SEUS 2007)*, volume 4761 of *Lecture Notes in Computer Science*, pages 105–113. Springer, May 2007. *CC 2*

35. Martin Schoeberl, Hans Sondergaard, Bent Thomsen, and Anders P. Ravn. A profile for safety critical Java. In *10th IEEE International Symposium on Object and Component-Oriented Real-Time Distributed Computing (ISORC'07)*, pages 94–101, Santorini Island, Greece, May 2007. IEEE Computer Society. *CC 14*

2006

36. Martin Schoeberl and Rasmus Pedersen. WCET analysis for a Java processor. In *Proceedings of the 4th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2006)*, pages 202–211, New York, NY, USA, 2006. ACM Press. ***CC 38***

37. Rasmus Pedersen and Martin Schoeberl. Exact roots for a real-time garbage collector. In *Proceedings of the 4th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2006)*, pages 77–84, New York, NY, USA, 2006. ACM Press. *CC 2*

38. Rasmus Pedersen and Martin Schoeberl. An embedded support vector machine. In *Proceedings of the Fourth Workshop on Intelligent Solutions in Embedded Systems (WISES 2006)*, pages 79–89, Vienna, Austria, June 2006. *CC 6*

39. Martin Schoeberl. Real-time garbage collection for Java. In *Proceedings of the 9th IEEE International Symposium on Object and Component-Oriented Real-Time Distributed Computing (ISORC 2006)*, pages 424–432, Gyeongju, Korea, April 2006. *CC 17*

40. Martin Schoeberl. A time predictable Java processor. In *Proceedings of the Design, Automation and Test in Europe Conference (DATE 2006)*, pages 800–805, Munich, Germany, March 2006. *CC 19*

2005

41. Martin Schoeberl. Evaluation of a Java processor. In *Tagungsband Austrochip 2005*, pages 127–134, Vienna, Austria, October 2005. *CC 19*

42. Martin Schoeberl. Design and implementation of an efficient stack machine. In *Proceedings of the 12th IEEE Reconfigurable Architecture Workshop (RAW2005)*, Denver, Colorado, USA, April 2005. IEEE. *CC 21*

43. Flavius Gruian, Per Andersson, Krzysztof Kuchcinski, and Martin Schoeberl. Automatic generation of application-specific systems based on a micro-programmed Java core. In *Proceedings of the 20th ACM Symposium on Applied Computing, Embedded Systems track*, Santa Fee, New Mexico, March 2005. *CC 8*

Curriculum Vitae Anders P. Ravn

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Research Areas

- Software Engineering
- Real-Time Programming
- Software Components
- Software Fault Tolerance

Education

1995 dr. techn. at *Technical University of Denmark*
1973 MSc (cand.scient.) from the *Univeristy of Copenhagen*, Denmark

Employment

2005–current Professor of Computing, Department of Computer Science, Aalborg University (AAU)
2005-1999 Professor (research) at AAU
1999-1984 Associate Professor, later Reader at Dept. Computer Sc., Technical University of Denmark
1976-1972 Systems programmer at A/S Regnecentralen, Copenhagen

Also 1994 Visiting Professor, Institut für Praktische Mathematik und Informatik, Kiel, Germany; 1989-90 Visiting Researcher, Computing Lab., Oxford University, UK; 1982-83 Visiting Scientist, IBM T.J. Watson Research Lab, New York, USA.

Supervision

Current 6 phd students, 3 as co-supervisor
Past 7 completed phd studies

Funding

Currently, Anders P. Ravn holds a NorduNet funded research grant within Contracts for Internet Services (AAU part: 2006-2010 1.840.000 DKK).

Academic Services

Joint organizing chair for two international conferences and program chair for four. Former member of the steering committee for the conference series Hybrid Systems: Computation and Control and former member of the steering committee for Euromicro Real-Time Systems Conference. Each year active on the programme committee of several conferences, acts as reviewer for the EU FP 7, Norwegian Research Council, Finnish Academy, and other research councils, journals and conferences. Member of IFIP Working Group 2.2 on Foundations of Programming Concepts.

Publications Anders P. Ravn (Since 2005)

Has (co)authored two books, edited four conference proceedings, and published 23 journal articles, 9 book chapters, and 62 peer reviewed conference papers. Holds one patent.

Books and Edited Volumes

1. Liu, Zhiming and Anders P. Ravn (Eds.). *Proceedings 7th International Symposium on Automated Technology for Verificiation and Analysis: ATVA 2009*. Lecture Notes in Computer Science. Springer Verlag, 2009.

Journal Articles and Book Chapters

1. Miaomiao Zhang, Zhiming Liu, Anders P. Ravn and Charles Morisset. Design and Verication of Fault-Tolerant Components. In *Methods, Models and Tools for Fault Tolerance: State of the Art Survey.* (Eds. Michael Butler, Cliff Jones, Alexander Romanovsky and Elena Troubitsyna) Lecture Notes in Computer Science, Programming and Software Engineering, pp 57-84. Springer Verlag 2009.

2. Zhenbang Chen, Zhiming Liu, Anders P. Ravn, Volker Stolz and Naijun Zhan. Refinement and verification in component-based model-driven design. In *Science of Computer Programming*, 74(4), pp 168-196, 2009.

3. M. E. Cambronero, Joseph C. Okika and Anders P. Ravn. Consistency Checking of Web Service Contracts. In *International Journal on Advances in Systems and Measurements*, 1(1), pp 29-39, 2008.

4. Paolo Giambiagi, Olaf Owe, Anders P. Ravn and Gerardo Schneider. Contract-oriented software development for internet services. In *E R C I M News* (72), pp 47-48. 2008.

5. Zhenbang Chen, Abdel H. Hannousse, Dang V. Hung, Istvan Knoll, Xiaoshan LI, Zhiming Liu, Yang Liu, Qu Nan, Joseph C. Okika, Anders P. Ravn, Volker Stolz, Lu Yang and Naijun Zhan. Modelling with Relational Calculus of Object and Component Systems - rCOS. In *The Common Component Modeling Example: Comparing Software Component Models* (Eds. Andreas Rausch, Ralf Reussner, Raffaela Mirandola and Frantisek Plasil), Lecture Notes in Computer Science; 5153. pp 116-145. Springer Verlag, 2008.

6. John Knudsen, Anders P. Ravn and Arne Skou. Design Verification Patterns. In *Formal Methods and Hybrid Real-Time Systems: Essays in Honour of Dines Bjrner and Zhou Chaochen on the Occasion of Their 70th Birthdays* (Eds. Cliff Jones, Zhiming Liu and Jim Woodcock), Lecture Notes in Computer Science; 4700, pp. 399-413. Springer Verlag, 2007.

7. Ernst-Rdiger Olderog and Anders P. Ravn. Editorial: Hybrid Systems. *Acta Informatica* 43(7). pp 449-450, 2007.

8. Jens P. Holmegaard, John Knudsen, Piotr Makowski and Anders P. Ravn. Formalization in Component Based Development. Ch. 2 in *Component-Based Software Development* (Eds. Zhiming Liu and Jifeng He), pp 255-281. World Scientific, 2006.

Reviewed Conference and Workshop Papers

2009

1. Thomas Bøgholm, Rene R. Hansen, Anders P. Ravn, Bent Thomsen and Hans Søndergaard. A predictable Java profile: Rationale and implementations. In *Proceedings of the 7th International Workshop on Java Technologies for Real-Time and Embedded Systems*, pp 150-159. ACM International Conference Proceedings Series, 2009.

2. Piotr Niemczyk, Palle Andersen, Jan D. Bendtsen, Tom S. Pedersen and Anders P. Ravn. Derivation and validation of a coal mill model for control. In *Proceedings of IFAC Symposium on Power Plants and Power Systems Control*. 2009.

3. Muhammad S. Vighio and Anders P. Ravn. Analysis of collisions in wireless sensor networks. In *Proceedings of NWPT 2009*, Technical University of Denmark, 2009.

4. Joseph C. Okika, Anders P. Ravn, Stephen Fenech, Gordon Pace and Gerardo Schneider. On the Specification of Full Contracts. In *Proceedings of FESCA2009*. Electronic Notes in Theoretical Computer Science; 253, pp 39-55. Elsevier Science, 2009.

5. Istvan Knoll, Anders P. Ravn and Arne Skou. Semantics for Communicating Actors with Interdependent Real-Time Deadlines. In *Proceedings of TASE 2009*, pp 29-35. IEEE Computer Society, 2009.

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6. Istvan Knoll, Anders P. Ravn and Arne Skou. A Semantics for a Real-Time Actor Language. In *Proceedings of NWPT 2008* Department of Computer Science, Tallinn University of Technology, 2008.

7. Joseph C. Okika and Anders P. Ravn. Classification of SOA Contract Specification Languages. In *Proceedings of the 2008 IEEE International Conference on Web Services*, pp 433-440. IEEE Computer Society, 2008.

8. Martin Schoeberl, Stephan Korsholm, Christian Thalinger, and Anders P. Ravn. Hardware objects for Java. In *Proceedings of the 11th IEEE International Symposium on Object/ component/service-oriented Real-time distributed Computing (ISORC 2008)*, pp 445-452. IEEE Computer Society, 2008.

9. Stephan Korsholm, Martin Schoeberl, and Anders P. Ravn. Interrupt Handlers in Java. In *Proceedings of the 11th IEEE International Symposium on Object/component/service-oriented Real-time distributed Computing (ISORC 2008)*, pp 453-457. IEEE Computer Society, 2008.

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10. Martin Schoeberl, Hans Søndergaard, Bent Thomsen, and Anders P. Ravn. A profile for safety critical Java. In *10th IEEE International Symposium on Object and Component-Oriented Real-Time Distributed Computing (ISORC'07)*, pp 94–101, IEEE Computer Society.2007.

11. Zhenbang Chen, Zhiming Liu, Anders P. Ravn, Volker Stolz and Lu Yang. A refinement driven component-based design. In *Proceedings of the 12th IEEE International Conference on Engineering Complex Computer Systems: ICECCS07*, pp 277-289. IEEE Computer Society, 2007.

12. M.-Emilia Cambronero, Joseph C. Okika and Anders P. Ravn. Analyzing Web Service Contracts: an aspect oriented approach. In *Proceedings of UBICOMM'2007*, pp 149-154. IEEE Computer Society, 2007.

13. Daniel Lzaro Cuadrado, Anders P. Ravn and Peter Koch. Automated Distributed Simulation in Ptolemy II. In *Proceedings of PDCN 2007*, pp 139-144. ACTA Press, 2007.

14. Joseph C. Okika and Anders P. Ravn. Compositionality and Compatibility of Service Contracts. In *Proceedings of NWPT'07/FLACOS'07*, pp 101-103. Research Report 366. Department of Informatics, University of Oslo, 2007.

15. Bente D. Thomsen and Anders P. Ravn. How do exhibition visitors describe aesthetic qualities?. In *CCCT 2007: Interactive Communication Design of Information Systems*, pp 155-160. 2007.

2006

16. Bent Thomsen, Anders P. Ravn and Hans Søndergaard. A Ravenscar-Java profile implementation. In *Proceedings of JTRES '06* pp 38-47. ACM Press, 2006.

17. John Knudsen, Anders P. Ravn and Arne Skou. Design Patterns for Control Systems. In *Proceedings of NWUML'06*. Høgskolen i Agder, 2006.

18. Joseph C. Okika, Anders P. Ravn, Lokesh Siddalingaiah and Zhiming Liu. Developing a TTCN-3 Test Harness for Legacy Software. In *Proceedings of AST '06*. pp 104-110. ACM Press, 2006.

19. Zhiming Liu, Vladimir Mencl, Anders P. Ravn and Lu Yang. Harnessing Theories for Tool Support. In *Proceedings of ISoLA 2006*, 2006.

20. Pablo Giambiagi, Olaf Owe, Anders P. Ravn and Gerardo Schneider. Language-based support for service oriented architectures: Future directions. In *Proceedings of ICSOFT*, pp. 339-344, 2006.

2005

21. M. Emilia Cambronero, Anders P. Ravn, and Valentin Valero. Using UPPAAL to Analyze an MPEG-2 Algorithm. In *Proceedings of the of the VII Workshop Brasileiro de Tempo Real*, pp. 73–82, 2005.

22. Daniel L. Cuadrado, Anders P. Ravn and Peter Koch. The Distributed-SDF Domain. In *Proceedings of The Sixth Biennial Ptolemy Miniconference*, Berkeley, CA, USA: EECS Department, University of California, 2005.

Curriculum Vitae for Paul Pop

Personal

Born: June 15, 1974, Oradea, Romania
Address: Technical University of Denmark, Informatics and Mathematical Modelling, Building 322, office 228, DK-2800 Kongens Lyngby; Phone: 4525 3732; Email: paul.pop@imm.dtu.dk

Qualifications

Ph.D. (Computer Systems), Linköping University, Sweden, 2003
Licentiate of Engineering, Linköping University, Sweden, 2000
M.Sc. (Computer Science and Engineering), Politehnica University of Timbisoara, Romania, 1997

Employment

2006–present: Associate professor, Informatics and Mathematical Modelling Dept., DTU
2003–2006: Assistant professor, Computer and Information Science Dept., Linköping University
1997–2003: Ph.D. student, Computer and Information Science Dept., Linköping University

Research interests

Analysis and Design of Embedded Systems
System-Level Design of Systems-on-a-Chip

Awards

2009: Best paper award, International Conference on Compilers, Architecture, and Synthesis for Embedded Systems
2007: "The Most Influential Papers of 10 Years DATE" (DATE—ACM/IEEE Design Automation and Test in Europe Conference; DATE is one of the best and largest conferences in our area)
2007: Best paper award, Real-Time in Sweden Conference
2005: Best paper award, DATE
2004: Best paper award candidate, DATE
2004: ITEA Achievement Award 2004, received due to the involvement in the EAST-EEA project
2001: Best paper award candidate, ACM/IEEE Design Automation Conference (DAC)

Current research activities

"System Level Modeling Environment for SMEs", ARTEMIS EU project (recruited one Ph.D. student, Junhe Gan; main advisor)
"DaNES--Danish Network for Intelligent Embedded Systems" (Højteknologifonden; principal supervisor for a PhD student, Prabhat Kumar Saraswat)
"ArtistDesign Network of Excellence on Embedded Systems Design", FP7, project participant

Supervision, administration

Coordinator of the "Safety-Critical Systems Interest Group", a new interest group attached to the Danish national innovation network InfinIT
Principal supervisor for 5 Ph.D. students (Mirela Alistar, Elena Maftei, Prabhat Kumar Saraswat, Wajid Hassan Minhass, Junhe Gan)
Co-advisor for 2 Ph.D. students (Viacheslav Izosimov—Linköping Univ., Michael Reibel Boesen)
Advisor and co-advisor for 20 M.Sc. students (10 at DTU Informatics)
DTU coordinator for the Nordic Master School in innovative ICT

Publications (2009—2004)

10 journal articles, 15 "journal-quality" articles (in our field, publications at certain conferences have journal-like status; the acceptance rate is 20%-25% and the papers are cited by the research community more often than a journal paper), 5 invited talks, 7 book chapters and one book, 39 peer-reviewed conference papers.

Journal publications

J1. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo. (2008). Analysis and Optimisation of Hierarchically Scheduled Multiprocessor Embedded Systems. International Journal of Parallel Programming: Special Issue on Multiprocessor-based Embedded Systems, 36(1), 37-67

J2. Pop, Paul; Izosimov, Viacheslav; Eles, Petru; Peng, Zebo. (2008). Design Optimization of Time- and Cost-Constrained Fault-Tolerant Embedded Systems with Checkpointing and Replication. IEEE Transactions on Very Large Scale Integration (VLSI) Systems

J3. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo; Andrei, Alexandu. (2008). Timing analysis of the FlexRay communication protocol. Real-Time Systems

J4. Pop, Paul; Eles, Petru; Peng, Zebo; Pop, Traian. (2006). Analysis and Optimization of Distributed Real-Time Embedded Systems. ACM Transactions on Design Automation of Electronic Systems, 11(3), 593-625

J5. Pop, Paul; Eles, Petru; Peng, Zebo. (2005). Analysis and Optimization of Heterogeneous Real-Time Embedded Systems. IEE Proceedings - Computers and Digital Techniques, 152(2), 130--147

J6. Pop, Paul; Eles, Petru; Peng, Zebo. (2005). Schedulability-Driven Frame Packing for Multi-Cluster Distributed Embedded Systems. ACM Transactions on Embedded Computing Systems, 4(1), 112--140

J7. Pop, Paul; Eles, Petru; Peng, Zebo. (2004). Schedulability-Driven Communication Synthesis for Time-Triggered Embedded Systems. Real-Time Systems Journal, 26(3), 297-325

J8. Pop, Paul; Eles, Petru; Peng, Zebo; Pop, Traian. (2004). Scheduling and Mapping in an Incremental Design Methodology for Distributed Real-Time Embedded Systems. IEEE Transactions on VLSI Systems, 12(8), 793--811

Books and book chapters

B1. Eles, Petru; Kuchcinski, Krzysztof; Peng, Zebo; Doboli, Alexa; Pop, Paul. (2008). Scheduling of Conditional Process Graphs for the Synthesis of Embedded Systems. In: Design, Automation, and Test in Europe: The Most Influential Papers of 10 Years DATE Springer Verlag

B2. Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Analysis and optimisation of heterogeneous real-time embedded systems. In: System On Chip: Next Generation Electronics Institution of Engineering and Technology

B3. Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Design Optimization of Multi-Cluster Embedded Systems for Real-Time Applications. In: ARTES - A network for Real-Time research and graduate Education in Sweden 1997-2006

B4. Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Schedulability-Driven Communication Synthesis for Time Triggered Embedded Systems. In: ARTES - A network for Real-Time research and graduate Education in Sweden 1997-2006

B5. Pop, Paul; Ernst, Rolf; Eles, Petru; Peng, Zebo. (2005). (2005). 2005. Automotive Industry, 3436. In: Embedded Systems Design: The ARTIST Roadmap for Research and Development

B6. Pop, Paul; Eles, Petru; Peng, Zebo. (2005). (2005). 2005. Distributed Embedded Real-Time Systems: Analysis and Exploration, 3436. In: Embedded Systems Design: The ARTIST Roadmap for Research and Development (p. 406--422).

B7. Pop, Paul; Eles, Petru; Peng, Zebo. (2004). Analysis and Synthesis of Distributed Real-Time Embedded Systems. Kluwer Academic Publishers.

Conference papers (peer reviewed)

C1. Maftei, Elena; Pop, Paul; Madsen, Jan. Tabu Search-Based Synthesis of Dynamically Reconfigurable Digital Microfluidic Biochips. In: International Conference on Compilers, Architecture, and Synthesis for Embedded Systems

C2. Saraswat, Prabhat Kumar; Pop, Paul; Madsen, Jan. Task Migration for Fault-Tolerance in Mixed-Criticality Embedded Systems, In: 2nd Workshop on Adaptive and Reconfigurable Embedded Systems

C3. Maftei, Elena; Pop, Paul; Madsen, Jan; Stidsen, Thomas K. Placement-Aware Architectural Synthesis of Digital Microfluidic Biochips using ILP. In: International Conference on Very Large Scale Integration

C4. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2008). Scheduling of Fault-Tolerant Embedded Systems with Soft and Hard Timing Constraints. In: Design, Automation, and Test in Europe Conference (p. 915-920)

C5. Eles, Petru; Izosimov, Viacheslav; Pop, Paul; Peng, Zebo. (2008). Synthesis of Fault-Tolerant Embedded Systems. In: Design, Automation, and Test in Europe Conference

C6. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. Synthesis of Flexible Fault-Tolerant Schedules with Preemption for Mixed Soft and Hard Real-Time Systems. In: 11th Euromicro Conference on Digital System Design

C7. Maftei, Elena; Pop, Paul; Popentiu Vladicescu, Florin. Synthesis of Reliable Digital Microfluidic Biochips using Monte Carlo Simulation. In: Annual conference of the European Safety and Reliability Association

C8. Poulsen, Kåre Harbo; Pop, Paul; Izosimov, Viacheslav. (2007). A Constraint Logic Programming Framework for the Synthesis of Fault-Tolerant Schedules for Distributed Embedded Systems. In: Work in Progress Proceedings of 12th IEEE Conference on Emerging Technologies and Factory Automation

C9. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo. (2007). Bus Access Optimisation for FlexRay-based Distributed Embedded Systems. In: Design, Automation, and Test in Europe Conference (DATE'07)

C10. Poulsen, Kåre Harbo; Pop, Paul; Izosimov, Viacheslav. (2007). Energy-Aware Synthesis of Fault-Tolerant Schedules for Real-Time Distributed Embedded Systems. In: Work-In-Progress Proceedings of 19th Euromicro Conference on Real-Time Systems

C11. Pop, Paul; Poulsen, Kåre Harbo; Izosimov, Viacheslav; Eles, Petru. (2007). Scheduling and Voltage Scaling for Energy/Reliability Trade-offs in Fault-Tolerant Time-Triggered Embedded Systems. In: Proceedings of the 5th International Conference on Hardware/Software Codesign and System Synthesis (p. 233-238)

C12. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo; Andrei, Alexandu. (2007). Timing Analysis for the FlexRay Communication Protocol. In: Proceedings of the Real-Time in Sweden Conference

C13. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Mapping of Fault-Tolerant Applications with Transparency on Distributed Embedded Systems. In: Euromicro Conference on Digital System Design

C14. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2006). Optimization of Fault-Tolerant Applications on Distributed Embedded Systems. In: Swedish System-on-Chip Conference (SSoCC'06)

C15. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Synthesis of Fault-Tolerant Embedded Systems with Checkpointing and Replication. In: International Workshop on Electronic Design, Test & Applications (p. 440-447)

C16. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Synthesis of Fault-Tolerant Schedules with Transparency/Performance Trade-offs for Distributed Embedded Systems. In: Design Automation and Test in Europe Conference (p. 706--711)

C17. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo. (2006). (2006). 2006. Timing Analysis of the FlexRay Communication Protocol. In: Euromicro Conference on Real-Time Systems

C18. Izosimov, Viacheslav; Pop, Paul; Eles, Petru; Peng, Zebo. (2005). (2005). 2005. Design Optimization of Time- and Cost-Constrained Fault-Tolerant Distributed Embedded Systems. In: Design Automation and Test in Europe Conference (p. 864--869)

C19. Pop, Traian; Pop, Paul; Eles, Petru; Peng, Zebo. (2005). (2005). 2005. Optimization of Hierarchically Scheduled Heterogeneous Embedded Systems. In: International Conference on Embedded and Real-Time Computing Systems and Applications (p. 67-71)

C20. Pop, Paul; Eles, Petru; Peng, Zebo; Izosimov, Viacheslav; Hellring, Magnus; Bridal, Olof. (2004). (2004). 2004. Design Optimization of Multi-Cluster Embedded Systems for Real-Time Applications. In: (p. 1028--1033)

C21. Pop, Paul; Eles, Petru; Peng, Zebo; Izosimov, Viacheslav. (2004). (2004). 2004. Schedulability-Driven Partitioning and Mapping for Multi-Cluster Real-Time Systems. In: 16th Euromicro Conference on Real-Time Systems (p. 91-100)

Curriculum Vitae Kim G. Larsen

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Research Areas

- Model checking
- Performance Analysis
- Interface Specifications
- Concurrency Theory

Education

1986 PhD Degree from the *University of Edinburgh*, UK
1982 MSc (cand.scient.) from *Aalborg University*, Denmark

Also, Honorary Doctor (Honoris causa) at Uppsala University, Sweden, in 1999 for his contributions to the verification tool UPPAAL. Honorary Doctor at ENS Cachan, France in 2007.

Life-long member of the Royal Danish Academy of Sciences and Letters, Copenhagen, and is member of the Danish Academy of Technical Sciences.

Employment

1993- current Professor of Computing, Department of Computer Science, Aalborg University (AAU)
1986-1993 Associate Professor, Department of Computer Science, AAU
1985-1986 Assistant Professor, Department of Computer Science, AAU

Also, 2002- current: director of CISS, the Centre for Embedded Software Systems, a national centre of excellence. 2001-2208: Industrial Professor (part-time), University of Twente, NL; 1995: Visiting Professor, Uppsala University, Sweden; 1990: Visiting Professor, SICS, Sweden.

Supervision

Currently 7 phd students, more than 20 completed phd studies.

Funding and Academic Services

Kim G. Larsen holds many grants from the EU and national sources. Among others, he is leader of the Modeling and Validation Cluster within the EU/IST Network of Excellence ARTIST Design, and is director of the DaNES project (Danish Network for Intelligent Embedded Systems) funded by the Danish Advanced Technology Foundation as well as co-director of the VKR Center of Excellence MT-LAB, and director of the national ICT Innovation Network InfinIT.

Kim G. Larsen is or has been editorial board member of the journals Formal Methods in System Design, Theoretical Computer Science and Nordic Journal of Computing. He is serving as a member of the steering committee for the ETAPS conference series, and member of the steering committees and was one of the original initiators for the CONCUR conference series, the TACAS conference series and the FORMATS workshop series. He has been key-note speaker at more than 30 international conferences during last 5 years. He has lectured all over the work, including North-America, China, India, and most European countries. He has served as PC member on more than 40 conferences during the last 5 years.

Publications Kim G. Larsen

Kim G. Larsen has published more than 150 publications in international journals and conferences as well as co-authored 6 software-tools. He has received Danish Citation Laureates Award (Thomson Scientific) as the most cited Danish Computer Scientist in the period 1990-2004; his H-index (according to Harzings publish or perish, May 2009) is 46 (the highest in Denmark together with Professor C.S.Jensen, Aalborg) and appears on the exclusive international list of Computer Scientists with H-number above 40 (http://www.cs.ucla.edu/ palsberg/h-number.html).

PUBLICATIONS (2004-present)

Books

1. Luca Aceto, Anna Ingolfsdottir, **Kim G. Larsen**, Jiri Srba: *Reactive Systems: Modelling, Specification and Verification.* ISBN-13: 9780521875462. Cambridge University Press, 2007.

2. Gerd Behrmann, , Béatrice Bérard, Franck Cassez, Thao Dang, Alexandre David, Susanna Donatteli, Jean-Pierre Elloy, Goran Frehse, Antoine Girard, Serge Haddad, Claude Jard, **Kim G. Larsen**, Colas LE Guernic, Didier Lime, Morgan Magnin, Nicolas Markey, Paul Pettersson, Jacob Illum Rasmussen, Olivier H. Roux, Stavros Tripakis, and Wang Yi: *Approches formelles des systèmes embarqués communicant.* ISBN 978-2-7462-1942-7. Hermes Lavoisier, Série Informatique et Systèmes d'Information.

Journal Contributions

3. Patricia Bouyer, Ulrich Fahrenberg, **Kim G. Larsen**, Nicolas Markey: *Quantitative Modeling and Analysis of Embedded Systems.* Invited to Communications of the ACM (to appear)

4. Nikola Benes, Jan Kretinsky, **Kim G. Larsen**, Jiri Srba: *On Determinism in Modal Transition Systems.* Special Issue of Theoretical Computer Science, 2009 (to appear)

5. Claus Thrane, Uli Fahrenberg and **Kim G. Larsen**: *Quantitative simulations of weighted transition systems.* Nordic Workshop on Programming Theory, Tallin, 2008. Extended version invited for publication in Special Issue of Journal of Logic and Algebraic Programming, 2009 (to appear)

6. Adam Antonik, Michael Huth, **Kim G. Larsen**, Ulrik Nyman and Andrzej Wasowski. *EXPTIME-complete Decision Problems for Mixed and Modal Specifications,* EXPRESS'08 15th International Workshop on Expressiveness in Concurrency. Extended version invited to Mathematical Structures in Computer Science, 2009 (to appear).

7. Patricia Bouyer, Ed Brinksma, **Kim G. Larsen:** *Optimal infinite scheduling for multi-priced timed automata.* Formal Methods in System Design 32(1): 3-23, 2008.

8. Patricia Bouyer, **Kim G. Larsen**, Nicolas Markey: *Model Checking One-clock Priced Timed Automata.* Logical Methods in Computer Science volume 4, number 2, , 2008.

9. **Kim G. Larsen**, Jacob Illum Rasmussen: *Optimal Reachability for Multi-Priced timed Automata.* Theoretical Computer Science Volume 390, Issues 2-3, pages 197-213, 2008.

10. **Kim G. Larsen**, Ulrik Nyman, Andrzej Wasowski: *Modeling software product lines using color-blind transition systems.* International Journal on Software Tools for Technology Transfer (STTT) volume 9, number 5-6, pages 471-487, 2007.

11. J. I. Rasmussen, **K. G. Larsen**, K. Subramani**:** *On using priced timed automata to achieve optimal scheduling.* Formal Methods in System Design (FMSD) volume 29, number 1, pages 97-114, 2006.

12. Gerd Behrmann, Patricia Bouyer, **Kim G. Larsen** and Radek Pelánek. *Lower and Upper Bounds in Zone-Based Abstractions of Timed Automata.* International Journal on Software Tools for Technology Transfer*,* 2005. Special issue of STTT as best-paper of TACAS 2004. STTT volume 8, number 3, pages 204-215, 2006.

13. Henrik Schiøler, Jens Dalsgaard Nielsen, **Kim G. Larsen**, Jan Jakob Jessen: *CyNC: A method for real time analysis of systems with cyclic data flows.* In Journal of Embedded Computing volume 2, number 3-4, pages 347-360, 2006.

14. **Kim G. Larsen**, Brian Nielsen: *Testing and Verification.* Chapter in Embedded Systems Design The ARTIST Roadmap for Research and Development Series: Lecture Notes in Computer Science, volume 3436, 2005.

15. Gerd Behrmann, **Kim G. Larsen**, Jacob Illum Rasmussen: *"Optimal scheduling using priced timed automata".* SIGMETRICS Performance Evaluation Review volumen 32, number 4, pages 34-40, 2005.

Refereed Conference Papers

16. Alexandre David, Arild Haugstad, **Kim G. Larsen***: UPPAAL PRO: Tool for Performance Analysis of Probabilistic Timed Automata.* Under submission.

17. Luca Aceto, Anna Ingolfsdottir, **Kim G. Larsen,** Jiri Srba: *Teaching Concurrency: Theory in Practice.* Under submission.

18. Nikola Benes, Jan Kretinsky, **Kim G. Larsen**, Jiri Srba: Checking Thorough Refinement on Modal Transition Systems is EXPTIME-Complete.

19. Ulrich Fahrenberg, **Kim G. Larsen**, Claus Thrane: *Verification, Performance Analysis and Controller Synthesis for Real-Time Systems.* Marktoberdorf 2008 Lecture Notes. NATO ASI series, IOS Press Publishers, 2009 (to appear)

20. Ulrich Fahrenberg **Kim G. Larsen**, Claus Thrane: *A Quantitative Characterization of Weighted Kripke Structures in Temporal Logic.* In Proceedings of Workshop on Quantitative Logic, QUANTLOG, Cypres 2009 (to appear)

21. Alexandre David, **Kim G. Larsen**, Didier Lime: *UPPAAL TIGA 2009 – towards realizable strategies.* In Proceedings of Workshop on Games for Design, Verification and Synthesis, GASICS, Grenoble, 2009 (to appear). In Proceedings of 6th International Colloquium on Theoretical Aspects of Computing, ICTAC, Kuala Lumpur, Malaysia, 2009 (to appear).

22. Ulrich Fahrenberg, **Kim G. Larsen**, Claus Thrane: *Verification, Performance Analysis and Controller Synthesis for Real-Time Systems.* In Proceedings of 3rd International Conference on Fundamentals of Software Engineering, FSEN09, Kish Island, Iran, 2009 (to appear)

23. **Kim G. Larsen**: *Quantitative and Compositional Model Checking.* In Proceedings of Seventh International Andrei Ershov Memorial Conference (PSI),, Novosibirsk, Russia, 2009 (to appear)

24. **Kim G. Larsen**: *Quantitative Verification and Validation of Embedded Systems.* To appear in Proceedings of of 3rd IEEE International Symposium on Theoretical Aspects of Software Engineering, TASE09, Tianjin, China, 2009.

25. Ulrich Fahrenberg, **Kim G. Larsen**: *Discounting in Time.* In proceedings of 7th Workshop on Quantitative Aspects of Programming Languages, QAPL 2009.

26. Franck Cassez, Jan Jacob Jessen, **Kim G. Larsen**: *Automatic Synthesis of Robust and Optimal Controllers - An Industrial Case Study.* In Proceedings of Hybrid Systems: Computation and Control, 12th International Conference (HSCC 2009), Lecture Notes in Computer Science, volume 5469, pages 90-104, 2009.

27. Alexandre David, **Kim G. Larsen**, Shuhao Li and Brian Nielsen: *Timed Testing under Partial Observability.* In Proceedings of 2nd IEEE International Conference on Software Testing, Verification and Validation, ICST 2009.

28. Alexandre David, **Kim G. Larsen**, Shuhao Li, Brian Nielsen: *A Game-Theoretic Approach to Real-Time System Testing.* In Proceedings of the 11th IEEE International Conference on Design Automation and Test in Europe (DATE'08), Munich, Germany, 2008.

29. Alexandre David, **Kim G. Larsen**, Shuhao Li, Brian Nielsen: *Cooperative Testing of Uncontrollable Timed Systems.* In Proceedings of 4th Workshop on Model-Based Testing. March 30, 2008, Budapest, Hungary.

30. Anders Hessel, **Kim G. Larsen,** Marius Mikucionis, Brian Nielsen, Paul Pettersson, Arne Skou: *Testing Real-Time Systems Using UPPAAL*. Formal Methods and Testing, 77-117, FORTEST Network, Lecture Notes in Computer Science 494, 2008.

31. Adam Antonik, Michael Huth, **Kim G. Larsen**, Ulrik Nyman, Andrzej Wąsowski: *20 Years of Modal and Mixed Specifications.* In Bulletin of the European Association for Theoretical Computer Science, May 2008.

32. Adam Antonik, Michael Huth, **Kim G. Larsen**, Ulrik Nyman and Andrzej Wasowski. *Complexity of Decision Problems for Mixed and Modal Specifications.* In Proceedings of 11th International Conference on Foundations of Software Science and Computational Structures, (FOSSACS), Lecture Notes in Computer Science 4962, 2008.

33. Sebastian Kupferschmid, **Kim G. Larsen**, Joerg Hoffmann: *Fast Directed Model Checking via Russian Doll Abstraction.* In Proceedings of Tools and Algorithms for the Construction and Analysis of Systems, 14th International Conference (TACAS). Lecture Notes in Computer Science 4963, 2008.

34. Thomas Chatain, Alexandre David, **Kim G. Larsen**: *Playing Games with Timed Games.* In Proceedings of 2nd International Workshop on Foundations of Interface Technologies (FIT), 200*8.*

35. Alexandre David, **Kim G. Larsen**, Shuhao Li, Brian Nielsen: *Cooperative Testing of Timed Systems.* In Proceedings of the 4th Workshop on Model-based Testing (MBT). Electronic Notes in Theoretical Computer Science, volume 220, number 1, pages 79-92, 2008.

36. Thomas Bøgholm, Henrik Kragh-Hansen, Petur Olsen, Bent Thomsen, **Kim G. Larsen**: *Model-based schedulability analysis of safety critical hard real-time Java programs.* In Proceedings of the 6th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES). ACM International Conference Proceeding Series 343, pages 106-114, 2008.

37. Patricia Bouyer, Ulrich Fahrenberg, **Kim G. Larsen**, Nicolas Markey, Jirí Srba: *Infinite Runs in Weighted Timed Automata with Energy Constraints.* In Proceedings of Formal Modeling and Analysis of Timed Systems, 6th International Conference (FORMATS). Lecture Notes in Computer Science, volume 5215, pages 33-47, 2008.

38. Claus Thrane, Uffe Sørensen and **Kim G. Larsen**: *Slicing for Uppaal,* In Proceedings of Nordic Workshop on Programming Theory (NWPT), Tallinn, 2008.

39. Jacob Illum Rasmussen, Gerd Behrmann, **Kim G. Larsen**: *Complexity in Simplicity: Flexible Agent-Based State Space Exploration.* In Proceedings of Tools and Algorithms for the Construction and Analysis of Systems, 13th International Conference, (TACAS), Lecture Notes in Computer Science 4424, 2007.

40. Patricia Bouyer, **Kim G. Larsen**, Nicolas Markey: *Model-Checking One-Clock Priced Timed Automata.* In Proceedings of Foundations of Software Science and Computational Structures, 10th International Conference, (FOSSACS), Lecture Notes in Computer Science 4423, 2007.

41. Jan Jakob Jessen, Jacob Illum Rasmussen, **Kim G. Larsen**, Alexandre David: *Guided Controller Synthesis for Climate Controller Using Uppaal Tiga.* In Proceedings of Formal Modeling and Analysis of Timed Systems, 5th International Conference, (FORMATS), Lecture Notes in Computer Science 4763, pages 227-240, 2007.

42. Henning Dierks, Sebastian Kupferschmid, **Kim G. Larsen**: *Automatic Abstraction Refinement for Timed Automata.* In Proceedings of Formal Modeling and Analysis of Timed Systems, 5th International Conference, (FORMATS), Lecture Notes in Computer Science 4763, 2007

43. **Kim G. Larsen,** Ulrik Nyman, Andrzej Wasowski: *Modal I/O Automata for Interface and Product Line Theories.* In Proceedings of Programming Languages and Systems, 16th European Symposium on Programming, (ESOP), Lecture Notes in Computer Science 4421, 2007.

44. **Kim G. Larsen**, Ulrik Nyman, Andrzej Wasowski: *On Modal Refinement and Consistency.* In Proceedings of CONCUR 2007 - Concurrency Theory, 18th International Conference. Lecture Notes in Computer Science 4703, 2007.

45. Gerd Behrmann, Agnès Cougnard, Alexandre David, Emmanuel Fleury, **Kim G. Larsen,** Didier Lime: *UPPAAL-Tiga: Time for Playing Games!* In Proceedings of Computer Aided Verification, 19th International Conference, (CAV), Lecture Notes in Computer Science 4590, 2007.

46. Franck Cassez, Alexandre David, **Kim G. Larsen**, Didier Lime, Jean-François Raskin: *Timed Control with Observation Based and Stuttering Invariant Strategies.* In Proceedings of Automated Technology for Verification and Analysis, 5th International Symposium (ATVA), Lecture Notes in Computer Science 4762, 2007,

47. **Kim G. Larsen**, Ulrik Nyman, Andrzej Wasowski: *Interface Input/Output Automata.* In proceedings of Formal Methods, 14th International Symposium on Formal Methods (FM), Lecture Notes in Computer Science 4085, 2006.

48. Alexandre David, John Håkansson, **Kim G. Larsen** and Paul Pettersson: *Model Checking Timed Automata with Priorities using DBM Subtraction.* In Proceedings of Formal Modeling and Analysis of Timed Systems, 4th International Conference (FORMATS), Lecture Notes in Computer Science 4202, 2006.

49. Patricia Bouyer, **Kim G. Larsen**, Nicolas Markey, J. I. Rasmussen: *Almost Optimal Strategies in One Clock Priced Timed Automata.* In Proceedings of Foundations of Software Technology and Theoretical Computer Science, 26th International Conference (FSTTCS), Lecture Notes in Computer Science 4337, 2006.

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54. **Kim G. Larsen**, Jacob Illum Rasmussen*: Optimal Conditional Reachability for Multi-priced Timed Automata".* In Proceedings of Foundations of Software Science and Computational Structures, 8th International Conference, (FOSSACS), Lecture Notes in Computer Science 3441, pages 234-249, 2005.

55. **Kim G. Larsen**, Ulrik Larsen, Andrzej Wasowski: *"Color-Blind Specifications for Transformations of Reactive Synchronous Programs."* In Proceedings of Fundamental Approaches to Software Engineering, 8th International Conference, (FASE), Lecture Notes in Computer Science 3442, pages 160-174, 2005.

56. Franck Cassez, Alexandre David, Emmanuel Fleury, Kim G. Larsen and Didier Lime. *"Efficient On-The-Fly Algorithms for the Analysis of Timed Games".* CONCUR 2005 - Concurrency Theory16th International Conference, CONCUR 2005, San Francisco, CA, USA, August 23-26, 2005, Lecture Notes in Computer Science, Vol. 3653, 2005.

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58. Henrik Schiøler, Jens Dalsgaard Nielsen, **Kim G. Larsen**, Jan Jessen*: CyNC - a method for Real Time Analysis of Systems with Cyclic Data Flows.* In Proceedings of 13th RTS Conference on Embedded Systems, 2005.

59. Henrik Schiøler, Jan Jessen, Jens Dalsgaard Nielsen, **Kim G. Larsen***: CyNC - towards a General Tool for Performance Analysis of Complex Distributed Real Time Systems".* In Proceedings of 17th Euromicro Conference on Real-Time Systems (ECRTS 05), 2005.

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61. Gerd Behrmann*,* Patricia Bouyer, **Kim G. Larsen**, Radek Pelánek: *Lower and Upper Bounds in Zone Based Abstractions of Timed Automata.* In Proceedings of Tools and Algorithms for the Construction and Analysis of Systems, 10th International Conference, (TACAS), Lecture Notes in Computer Science, 2988, pages 312-326, 2004.

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63. Patricia Bouyer, Ed Brinksma**, Kim G. Larsen**: *Staying Alive as Cheaply as Possible. Hybrid Systems.* In Proceedings of Hybrid Systems: Computation and Control, 7th International Workshop, (HSCC), Lecture Notes in Computer Science 2993, pages 203-218, 2004.

64. Gerd Behrmann, Alexandre David, **Kim G. Larsen**: *A Tutorial on Uppaal.* In Proceedings of Formal Methods for the Design of Real-Time Systems, International School on Formal Methods for the Design of Computer, Communication and Software Systems. Lecture Notes in Computer Science 3185, pages 200-236, 2004.

65. Patricia Bouyer, Franck Cassez, Emmanuel Fleury, **Kim G. Larsen**: *Optimal Strategies in Priced Timed Game Automata.* In Proceedings of Foundations of Software Technology and Theoretical Computer Science, 24th International Conference (FSTTCS). Lecture Notes in Computer Science 3328, pages 148-160, 2004.

66. **Kim G. Larsen,** Marius Mikucionis, Brian Nielsen: *Online Testing of Real-time Systems Using Uppaal.* In Proceedings of Formal Approaches to Software Testing, 4th International Workshop, (FATES), Lecture Notes in Computer Science 3395, pages 79-94, 2004.

67. Marius Mikucionis, **Kim G Larsen**, Brian Nielsen: T-UPPAAL*: "Online Model-based Testing of Real-Time Systems".* In Proceedings of the 19th IEEE International Conference on Automated Software Engineering (ASE 2004). IEEE Computer Society 2004.

Curriculum Vitae René Rydhof Hansen

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Research Areas

- Static analysis and model checking
- Language-based safety and security
- Programming languages
- Language issues in operating systems

Education

2002–2005	PhD Degree from the *Technical University of Denmark*
1992–1999	MSc (cand.scient.) from the *Univeristy of Aarhus*, Denmark

Employment

2007–current	Assistant professor at Aalborg University, Denmark
2008	External lecturer (ekstern lektor) at the IT University of Copenhagen
2006–2007	Post Doc. in the TOPPS group at DIKU, University of Copenhagen, Denmark
2005–2006	Temporary lecturer (amanuensis) at the Technical University of Denmark

Supervision

2009–2012	1 PhD student in progress (co-supervised with Kim G. Larsen)
2009–2010	1 Post doc. completed (12 months)

Funding

2008–2010	FTP Rammebevilling grant (2.886.186 DKK, number 274-08-0214) in collaboration with Julia Lawall of the University of Copenhagen.

Academic Services

- Served on four program committees
- Served as reviewer for several journals and 35+ international refereed conferences and workshops
- Co-initiator and co-organiser of the Danish Static Analysis Symposium (DANSAS).

Publications

5 papers in international refereed journals (1 invited), 11 articles in international refereed conferences, 15 articles in international refereed workshops.

Publication List for René Rydhof Hansen (since 2005)

Journal papers

1. Thomas Bolander and René Rydhof Hansen. **Hybrid Logical Analyses of the Ambient Calculus**. To appear in *Information and Computation*. Doi: 10.1016/j.scico.2009.07.009.

2. Rocco De Nicola, Daniele Gorla, René Rydhof Hansen, Flemming Nielson, Hanne Riis Nielson, Christian W. Probst, and Rosario Pugliese. **From Flow Logic to Static Type Systems for Coordination Languages**. To appear in *Science of Computer Programming*. Doi: 10.1016/j.scico.2009.07.009.

3. Christian W. Probst and René Rydhof Hansen. **An extensible Analysable System Model**. *Information Security Technical Report*, 13(4):235–246. Elsevier. **Invited paper**.

Peer-Reviewed Conference and Workshop Papers

1. Julia Lawall, Ben Laurie, René Rydhof Hansen, Nicolas Palix, and Gilles Muller. **Finding Error Handling Bugs in OpenSSL using Coccinelle** (experience report). In Proceedings of The 8th European Dependable Computing Conference (EDCC-2010). To appear.

2009

2. Thomas Bøgholm, René Rydhof Hansen, Anders P. Ravn, Bent Thomsen, Hans Søndergaard. **A predictable Java profile - rationale and implementations**. In Proceedings of The 7th International Workshop on Java Technologies for Real-time and Embedded Systems (JTRES 2009), pages 150–159, September 2009, ACM Press.

3. Christian W. Probst and René Rydhof Hansen. **Fluid Information Systems**. In Proceedings of the New Security Paradigms Workshop (NSPW'09), pages 125–132, September 2009, ACM Press.

4. Christian W. Probst and René Rydhof Hansen. **Analysing Access Control Specifications**. In Proceedings of the Fourth International IEEE Workshop on Systematic Approaches to Digital Forensic Engineering (SADFE-2009), pages 22–33, May 2009, IEEE Computer Society.

5. Julia L. Lawall, Julien Brunel, Nicolas Palix, René Rydhof Hansen, and Gilles Muller. **WYSIWYB: A Declarative Approach to Finding API Protocols and Bugs in Linux Code**. In Proceedings of the IEEE/IFP International Conference on Dependable Systems and Networks (DSN'09), pages 43–52.

6. Julien Brunel, Damien Doligez, René Rydhof Hansen, Julia L. Lawall, and Gilles Muller. **A Foundation for Flow-Based Program Matching Using Logic and Model Checking**. In Proceedings of the ACM Symposium on Principles of Programming Languages (POPL'09), pages 114–126.

2008

7. Andrew D. Gordon, Hans Hüttel, and René Rydhof Hansen. **Type inference for correspondence types**. In Proceedings of the 6th International Workshop on Security Issues in Concurrency (SecCo'08), pages 21–36, volume 242(3) of *Electronic Notes in Theoretical Computer Science (ENTCS)*. August 2008, Elsevier.

8. Rocco De Nicola, Daniele Gorla, René Rydhof Hansen, Flemming Nielson, Hanne Riis Nielson, Christian W. Probst, and Rosario Pugliese. **From Flow Logic to Static Type Systems for Coordination Languages**. In Proceedings of the 10th International Conference on Coordination Models and Languages (Coordination'08), pages 100–116.

9. Yoann Padioleau, Julia Lawall, René Rydhof Hansen, and Gilles Muller. **Documenting and Automating Collateral Evolutions in Linux Device Drivers**. In Proceedings of the European Conference on Computer Systems 2008 (EuroSys 2008), pages 247–260.

10. René Rydhof Hansen, Flemming Nielson, Hanne Riis Nielson, and Christian W. Probst. **Static Validation of License Conformance Policies**. In Proceedings of the First International Workshop on Advances in Policy Enforcement (APE'08), pages 1104–1111, IEEE Computer Society.

2007

11. Neil D. Jones and René Rydhof Hansen. **The Semantics of "Semantic Patches" in Coccinelle: Program Transformation for the Working Programmer**. In Proceedings of the ASIAN Symposium on Programming Languages and Systems (APLAS 2007), pages 303–318, volume 4807 of Lecture Notes in Computer Science.

12. Henrik Stuart, René Rydhof Hansen, Julia L. Lawall, Jesper Andersen, Yoann Padioleau, and Gilles Muller. **Towards Easing the Diagnosis of Bugs in OS Code**. In Proceedings of the Workshop on Linguistic Support for Modern Operating Systems (PLOS'07).

13. Thomas Bolander and René Rydhof Hansen. **Hybrid Logical Analyses of the Ambient Calculus**. In Proceedings of the Workshop on Logic, Language, Information and Computation (WoLLIC'2007), pages 83–100, volume 4576 of Lecture Notes in Computer Science.

2006

14. Yoann Padioleau, René Rydhof Hansen, Julia L. Lawall, and Gilles Muller. **Semantic Patches for Documenting and Automating Collateral Evolutions**. In Proceedings of the Workshop on Linguistic Support for Modern Operating Systems (PLOS'06), page 10.

15. Terkel K. Tolstrup, Flemming Nielson, and René Rydhof Hansen. **Locality-based Security Policies**. In Proceedings of the Workshop on Formal Aspects of Security and Trust (FAST'06), pages 185–201, volume 4691 of Springer Lecture Notes in Computer Science.

16. Christian W. Probst, René Rydhof Hansen, and Flemming Nielson. **Where can an Insider Attack?**. In Proceedings of the Workshop on Formal Aspects of Security and Trust (FAST'06), pages 127–142, volume 4691 of Springer Lecture Notes in Computer Science.

17. Dan Søndergaard, Christian W. Probst, Christian Damsgaard Jensen, and René Rydhof Hansen. **Program Partitioning using Dynamic Trust Models**. In Proceedings of the Workshop on Formal Aspects of Security and Trust (FAST'06), pages 170–184, volume 4691 of Springer Lecture Notes in Computer Science.

18. René Rydhof Hansen, Christian W. Probst, and Flemming Nielson. **Sandboxing in myKlaim**. In Proceedings of the International Conference on Availability, Reliability, and Security (ARES'06). pages 174–181, IEEE Computer Society.

19. René Rydhof Hansen and Christian W. Probst. **Non-Interference and Erasure Policies for Java Card Bytecode**. In Proceedings of the Workshop on Issues in the Theory of Security (WITS'06).

2005

20. René Rydhof Hansen and Christian W. Probst. **Secure Dynamic Program Partitioning**. In Proceedings of the Nordic Workshop on Secure IT-Systems (NordSec'05).

21. René Rydhof Hansen and Igor A. Siveroni. **Towards Verification of Well-Formed Transactions in Java Card Bytecode**. In Proceedings of the Workshop on Bytecode Semantics, Verification, Analysis, and Transformation (BYTECODE'05), pages 145–162, volume 141(1) of *Electronic Notes in Theoretical Computer Science (ENTCS)*. Elsevier.

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Education

2005 M.Sc. E.E. in Control Engineering, speciality in Intelligent Autonomous Systems, Aalborg University, Denmark (AAU)

Professional Experience

2007 – present Space Projects Manager and Partner, GomSpace ApS

2005 – 2007 Employed as PhD student at Aalborg University (on leave):

- Research in Autonomous Formation Flying
- Concept development consultant for the ESA led Global Educational Network for Satellite Operators (GENSO)
- Development, production and delivery of On-Board Computer system for Russian micro-satellite: Baumanetz

2000–2005 Master studies at Aalborg University:

- On-board computer development and launch campaign team-member on the ESA SSETI-Express micro-satellite mission. Launched October 2005.
- AAUSAT-II (pico-satellite project), OBC+SW lead, project management