



IST-214373 ArtistDesign Network of Excellence on Design for Embedded Systems

Jointly-executed Programme of Activities for

Spreading Excellence

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with inputs from all NoE participants

Policy Objective (abstract)

The visibility of the ArtistDesign research effort in embedded systems design is now worldwide. This has clearly creating a significantly stronger European embedded systems design community, as witnessed by the positive evolution of major conferences in the area, stronger involvement with industry, and interaction between research teams.

The Jointly-executed Programme of Activities for Spreading Excellence (JPASE) is a cornerstone in this effort.

Changes with respect to Y1 deliverable: entirely new texts throughout the document, except for 1.1., 6.1, 6.2.



Versions

number	comment	date
1.0	First version delivered to the reviewers	Feb 3 rd 2010

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1. Vision and Strategy for Spreading Excellence - Executive Summary

1.1 Overall Vision and Strategy

Our actions for Spreading Excellence are at 2 levels:

• Targeted towards affiliated partners

Affiliated partners are not core members in the consortium, but receive support for travelling to ArtistDesign meetings, and actively contribute to the implementation of the Joint Programme of Activities (JPA). These affiliated partners include industrial, SME, academic, and international collaboration affiliates.

- *Targeted towards the scientific and technical community in the large* This is achieved mainly bottom-up through the organisation of scientific events, publications, distribution of tools and components, industrial partnerships (not funded by ArtistDesign), education; and through the ArtistDesign web pages.
- Targeted towards students
 A particular focus has been placed on the ARTIST Summer Schools this year with a truly
 outstanding programme of lecturers, and the innovation of providing the lectures in video
 form on the Artist website.

Regarding Scientific events, we distinguish between conferences and workshops, schools, and high-level events mainly for International Collaboration.

High Level Events for International Collaboration

High-level Events are intended to gather together the very best world-leading experts from academia and industry, to discuss progress on the state of the art, relevant work directions.

Three ArtistDesign members are on the steering board for the ARTEMIS European Technology Platform. In this capacity, they participate in working groups for defining the overall European long term strategy in the area.

Publications

The ArtistDesign community has pusrsued a very active publishing policy, with a strong presence in scientific journals and conferences, as attested by the extensive list of publications provided in this document. Publication of research is a bottom-up process, which may seem chaotic – but this is intrinsic to research.

Tools and Components

The ArtistDesign community plays a leading role in the distribution of software tools and components, on verification/validation tools. Some tools are distributed free of charge, such as UPAAL, IF. Others are commercialised, such as AbsInt, SymTA/S. For many other tools used in the platforms, and shared between the Artist partners, a common dissemination policy has not yet been defined.

Industrial Liaison

ArtistDesign has a wide array of affiliated industrial and SME partners (see the Thematic and Transversal Activity deliverables). Most of these partners have participated in some way in the ArtistDesign technical meetings and the overall effort. There is strong, high-level industry participation through the various Spreading Excellence events organised by ArtistDesign. Our active involvement in the European Technology Platform ARTEMIS also could have a significant and long-term impact.



We believe that the strong involvement of four main ArtistDesign partners in the SPEEDS Integrated Project has a very positive impact on progress in the state of the art, in component-based embedded systems engineering.

1.2 Affiliated partners

Affiliated partners are not core members in the consortium, but receive support for travelling to ArtistDesign meetings, and actively contribute to the implementation of the Jointly-executed Programme of Activities (JPA). These affiliated partners include industrial, SME, academic, and international affiliates.

Just after the Y1 review, we will implement cleaner mechanisms for presenting the affiliated partners on the website (including their specific links to the JPRA activities).

1.3 Scientific and Technical Community in the Large

A description of the ArtistDesign's community's interaction with other research teams is visibile in section 2.4 ("2.4 Interaction of the Cluster with Other Communities") of each Cluster deliverable, and in section 2.3 ("2.3 Other Research Teams") in the Transversal Integration Activity deliverable.

Interaction with these other scientific communities is achieved mainly bottom-up through the organisation of scientific events, publications, distribution of tools and components, industrial partnerships (not funded by ArtistDesign), education; and through the ArtistDesign web pages.

Our sponsoring policy aims specifically at enforcing integration of existing scientific events in the area. This is sought in particular through the Embedded Systems Week (<u>http://www.esweek.org/</u>), in which we play a crucial role.

Another concrete example is our action within the DATE conference (<u>http://www.date-conference.com/</u>), in which we are working to shift the emphasis towards becoming the central European conference on embedded systems design, in collaboration with the ARTEMIS European Technology Platform.

Regarding Scientific events, we distinguish between conferences and workshops, schools, and high-level events mainly for International Collaboration.

The ARTIST community now clearly leads the initiatives for organizing the most significant conferences in the area. In Europe, it has a very strong presence in the DATE conference, which is becoming the main conference on embedded systems within Europe. Over the past 8 years, 7 general chairs of DATE have been leading ARTIST members, and the general chair of DATE 2010 will be Prof. Giovanni De Micheli, a prominent ARTIST member.

In international conferences, the ACM's flagship conference, EmSoft, has been initiated by leading members of ArtistDesign. Artist partners are also in leading positions for conferences as RTSS (Real-Time Systems Symposium), CODES/ISS, Workshop on Languages, Compilers, and Tools for Embedded Systems (LCTES). Further details regarding sponsoring, as well as specific events and publications are given in this document.

Artist partners are also active members of the ACM's SIGBED, and the IEEE's upcoming Special Interest Group on Embedded Systems currently being set up. Artist members actively work for structuring international events on embedded systems.



This year the 5th edition of the Embedded Systems Week, including EmSoft and CODES/ISS has taken place Oct 11-16 in Grenoble (France).

1.3.1 International Collaboration

International Collaboration has been one of the central activities pursued within ARTIST since 2003.

All of the recurring ARTIST International Collaboration events (many initiated in Artist2) continue and be expanded within ArtistDesign in 2010. Further details about the schools are available in the section "Organisation of Schools".

1.3.2 Publications

The ArtistDesign community is extremely active in publishing in scientific journals and conferences, as attested by the list of joint publications provided in this document.

Joint publications seem to be a reliable measure of integration and building excellence between the partners.

1.3.3 Industrial Liaison

ArtistDesign has a wide array of affiliated industrial and SME partners, as described in the activity deliverables' sections "Affiliated Partners". Most of these partners participate in some way in the ArtistDesign technical meetings and the overall effort. There is strong, high-level industry participation through the various Spreading Excellence events organised by ArtistDesign.

Our active involvement in the European Technology Platform ARTEMIS also could have a significant and long-term impact. Several ArtistDesign partners, including OFFIS, PARADES, VERIMAG; and TU Vienna, are actively involved in the ARTEMIS ETP.

In addition, each ArtistDesign partner has an outstanding track record for interaction with industry. Globally, the ArtistDesign consortium has a very strong impact on European R&D in embedded systems. This impact is visible via the achievements in Integrated Projects and STREPs (see below).

1.3.4 Course Materials

ArtistDesign disseminates recent, high-quality Course Materials via its web portal. We currently have materials

http://www.artist-embedded.org/artist/-Course-Materials-.html

This includes materials generated in ArtistDesign events, as well as pointers to high-quality materials from other sources.



2. International Collaboration

International Collaboration has been one of the central activities pursued within ARTIST since 2003.

JPASE

All of the recurring ARTIST International Collaboration events (many initiated in Artist2) continue and be expanded within ArtistDesign in 2010. Further details about the schools are available in the section "Organisation of Schools".

- <u>Summer School in Europe</u> A flagship event for Artist, now in it.
- <u>Summer School in China</u> This will be the fifth edition of the school, to be held again in Beijing, but at Beida University, July 17-25th 2010.
- <u>SouthAmerican School for Embedded Systems Design</u> This will be the fourth edition of this popular school.
- <u>Workshop on Embedded Systems Education</u> (WESE) This will be the sixth edition of this workshop, now headed by Peter Marwedel of TU Dortmund.
- <u>Foundations of Component-based Design</u> One of the top events in this key area – regularly held during Embedded Systems Week 2010 will be the fifth edition.

International Collaboration events organized by the ArtistDesign NoE in Y2 include:

WESE'09 – Workshop on Embedded Systems Education

October 15th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-WESE-09-.html

As embedded system designs grow more complex and the time to market diminishes, quality embedded systems education becomes more and more important. This fifth workshop on the subject aims to bring researchers, educators, and industrial representatives together to assess needs and share design, research, and experiences in embedded systems education.

WFCD - Foundations and Applications of Component-based Design 2009

October 11th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-WFCD-2009-.html

The workshop aims to discuss recent results on component-based design with emphasis on design frameworks for real-time systems encompassing heterogeneous composition and models of computation. The focus is not only on fundamental results but also on their implementation in methods and tools and their concrete application in areas such as automotive, avionics, consumer electronics and automation.



IRTAW-14

October 7-9, 2009 Portovenere, Italy http://www.artist-embedded.org/artist/-IRTAW-14-.html

For over 20 years the series of International Real-Time Ada Workshop meetings has provided a forum for identifying issues with real-time system support in Ada and for exploring possible approaches and solutions, and has attracted participation from key members of the research, user, and implementer communities worldwide.

ARTIST Summer School in Europe 2009

September 7-11, 2009 Autrans (near Grenoble), France http://www.artist-embedded.org/artist/-ARTIST-Summer-School-in-Europe-.html

The Summer School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

ARTIST School in South America 2009: Embedded Systems Design

August 3-7, 2009 Buenos Aires, Argentina http://www.artist-embedded.org/artist/-ARTIST-SummerSchool-SouthAmerica-.html

The School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

ARTIST Summer School in China 2009

July 19-24, 2009 Tsinghua, China http://www.artist-embedded.org/artist/-ARTIST-Summer-School-in-China-2009-.html

The Summer School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

Runtime Verification 2009

June 26-28, 2009 Grenoble, France (within <u>ESWeek</u>) http://www.artist-embedded.org/artist/-Runtime-Verification-.html

The objective of RV'09 is to bring scientists from both academia and industry together to debate on how to monitor and analyze the execution of programs, for example by checking conformance with a formal specification written in temporal logic or some other form of history tracking logic.

The following international collaboration events have been organised in the past by ARTIST:

WESE'08: WS on Embedded Systems Education October 23rd, 2008 Atlanta, Georgia - USA (within <u>ESWEEK</u>) http://www.artist-embedded.org/artist/-WESE-08-WS-on-Embedded-Systems-.html

As embedded system designs grow more complex and the time to market diminishes, quality embedded systems education becomes more and more important. This fourth workshop on the



subject aims to bring researchers, educators, and industrial representatives together to assess needs and share design, research, and experiences in embedded systems education.

JPASE

Workshop on Foundations and Applications of Component-based Design (WFCD'2008)

October 19th, 2008 Atlanta, Georgia (USA) http://www.artist-embedded.org/artist/-Components-2008-.html

The workshop aims to discuss recent results on component-based design with emphasis on design frameworks for real-time systems encompassing heterogeneous composition and models of computation. The focus is not only on fundamental results but also on their implementation in methods and tools and their concrete application in areas such as automotive, avionics, consumer electronics and automation.

ARTIST2 Summer School 2008 in Europe

September 8-12, 2008 Autrans (near Grenoble), France http://www.artist-embedded.org/artist/-ARTIST2-Summer-School-2008-.html

The Summer School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

ARTIST2 South-American School for Embedded Systems 2008

August 25-29, 2008 Universidade Federal de Santa Catarina, Florianopolis, Brazil http://www.artist-embedded.org/artist/-ARTIST-2-South-American-School-.html

The purpose of the school is to foster the well-established and dynamic research cooperation in the field of embedded systems between groups in Europe and South America, by allowing South-American students (specially graduate), to meet European researchers.

Artist2 Summer School in China 2008

http://www.artist-embedded.org/artist/-Artist2-Summer-School-in-China-.html July 12-18, 2008 Shanghai, China

ARTIST2 has organized the 3rd edition of a school on Embedded Systems Design in Shanghai. This year, the school was organized in collaboration with the SEI/ECNU and the LIAMA.

ARTIST2 meeting on Integrated Modular Avionics

November 12-13, 2007 Roma, Italy http://www.artist-embedded.org/artist/-ARTIST2-meeting-on-Integrated-.html

Integrated Modular Avionics (IMA) has set the principles of standardized components and interfaces of hardware and software in aircraft, applied for the first time in the development of the Airbus A380.



WESE'07: WS on Embedded Systems Education

http://www.artist-embedded.org/artist/-WESE-07-.html October 4-5, 2007 Salzburg, Austria (within ES Week)

This third workshop on the subject has brought researchers, educators, and industrial representatives together to assess needs and share design, research, and experiences in embedded systems education.

Foundations of Component-based Design

http://www.artist-embedded.org/artist/-Foundations-of-Component-based-.html September 30th, 2007 Salzburg, Austria - within <u>EmSoft</u> / <u>ES Week</u>

Discuss recent results on component-based design with emphasis on design frameworks for real-time systems encompassing heterogeneous composition and models of computation.

First European-SouthAmerican School for Embedded Systems

<u>http://www.artist-embedded.org/artist/-First-European-SouthAmerican-.html</u> August 21-24, 2007 Universidad Argentina de la Empresa (UADE), Buenos Aires -Argentina

The purpose of the school is to foster the well established and dynamic research cooperations in the field of embedded systems between groups in Europe and South America, by allowing south-american students (specially graduate), to meet european researchers.

Artist2 / UNU-IIST School in China - 2007

http://www.artist-embedded.org/artist/-Artist2-UNU-IIST-School-in-China-.html August 1-10, 2007 Suzhou (near Shanghai), China

ARTIST2 has organized, in collaboration with UNU-IIST, the 2nd edition of a school on embedded systems design in Suzhou (near Shanghai).

Artist2 - Foundations and Applications of Component-based Design

http://www.artist-embedded.org/artist/-Foundations-and-Applications-of-.html October 26th, 2006 Seoul, South Korea

The workshop gathered researchers from computer science and electrical engineering to discuss recent results on component-based design with emphasis on design frameworks for real-time systems encompassing heterogeneous composition and models of computation. Especially frameworks for handling non-functional and resource constraints, design under conflicting dependability criteria, trade-offs between average performance and predictability.

WESE'06 - Embedded Systems Education

http://www.artist-embedded.org/artist/-EmSoft-06-Workshop-on-Embedded..html October 26th, 2006 Seoul, Korea

This second workshop on the subject has brought researchers, educators, and industrial representatives together to assess needs and share design, research, and experiences in embedded systems education.



ARTIST2 / UNU-IIST Spring School in China 2006

April 3-15, 2006 Xi'an, China http://www.artist-embedded.org/artist/-ARTIST2-UNU-IIST-China-School-.html

The first ARTIST / UNU-IIST Spring School gathered more than 50 participants, of which approximately 40 were students from the top universities in mainland China.

Joint US-EU-TEKES workshop

June 21-22 2006 Helsinki, Finland http://www.artist-embedded.org/artist/Joint-US-EU-TEKES-workshop.html Workshop held under the auspices of NSF, the EU's IST Program and Tekes, the Science and Technology Agency of Finland.

Artist International Collaboration Days 2003 - Trends in Embedded Systems Design

October 12th 2003 – Philadelphia http://www.artist-embedded.org/artist/Artist-International-Collaboration,452.html

ACM - Special Issue on Education

http://www.artist-embedded.org/artist/ACM-Special-Issue-on-Education,449.html

This special issue of the ACM Transactions in Embedded Computing Systems aims to provide the basis for integrated undergraduate and graduate curricula covering the essential areas of knowledge for tomorrow's embedded systems engineers and researchers. Guest Editors <u>Alan Burns Alberto Sangiovanni-Vincentelli</u> - UC Berkeley

ARTIST International Collaboration Days - 2005

July 7-8, 2005 Paris, France http://www.artist-embedded.org/artist/ARTIST-INTERNATIONAL-COLLABORATION.html

Component-based Engineering for Embedded Systems Transatlantic Research Agenda on Future Challenges in Embedded Systems Design

Conference on EU-Korea Collaboration on Embedded Systems

http://www.artist-embedded.org/artist/Conference-on-EU-Korea,450.html

The purpose of this workshop was to identify important topics in the area of Embedded Systems where strong synergy between Korean and EU teams would have the greatest benefit. The aim was to achieve a common understanding and background on which future collaborative actions and joint projects can be based.

Artist International Collaboration Days 2003 - Education in Embedded Systems Design <u>http://www.artist-embedded.org/artist/Artist-International-Collaboration,451.html</u> *October 11th 2003 – Philadelphia*



3. Organisation of Schools

3.1 Schools directly Organized and Funded by ArtistDesign in Year 2.

Artist regularly organizes the following major schools (which are also considered as International Collaboration events). Each of these will have a 2010 edition within ArtistDesign:

- <u>Summer School in Europe</u> A flagship event for Artist.
- <u>ARTIST Summer School in China 2010</u> This will be the fifth edition of the school, to be held again in Beijing, but at Beida University, July 17-25th 2010.
- <u>ARTIST School in SouthAmerican 2010</u> This will be the fourth edition of this popular school.
- <u>ARTIST Summer School in North Africa, 2010</u> In addition, the NoE will organize its first summer school in North Africa, in Rabat, Morocco in July 2010.

In addition, the NoE organizes smaller-scale engineering and post-doctoral schools, which will continue in Y3 (2010) under ArtistDesign.

3.2 ARTIST Summer School in Europe 2009

September 7-11, 2009 Autrans (near Grenoble), France http://www.artist-embedded.org/artist/-ARTIST-Summer-School-in-Europe-.html

This fifth edition was a major event in the field of embedded systems design. Feedback has been quite positive: The technical programme was of high quality with ample time to go into detail on technical topics, the level of off-line discussions and contacts were excellent, and the social programme meshed well with the objectives and context of the school. We had 85 participants (out of 150 applicants) and 16 invited speakers. As a result, the school and the ArtistDesign NoE have increased in visibility and recognition.

The Summer School offered a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

3.2.1 Overview

The ARTIST Summer School 2010 was held in the beautiful Vercors mountains in Autrans, near Grenoble, Sept 7-11. The school was organised by the ArtistDesign European Network of Excellence on Embedded Systems Design, which gathers 31 top European institutions. Artist's mission is to coordinate European research in the area around an ambitious joint research agenda, and to spread excellence through targeted events such as international workshops, schools and seminars.

Artist has a strong tradition in organising top-quality schools. This was the fith edition of yearly schools on embedded systems design, and is meant to be exceptional in terms of both breadth of coverage and invited speakers.





3.2.2 Speakers & Programme

This school brought together some of the best lecturers from Europe and the USA, in a one week programme, and be a fantastic opportunity for interaction.

- <u>Sensor Networks: Theoretical Challenges and Practical Applications</u> **Professor Tarek Abdelzaher** (University of Illinois, Urbana Champaign, USA)
- <u>Mobile Cyber-Physical Systems</u>
 Professor Luis Almeida (University of Porto, Portugal)
- <u>Machine-assisted design and analysis of certifiably secure protocols</u> **Professor Michael Backes** (Saarland University, Germany)
- <u>Techniques for multiprocessor real-time scheduling</u> **Professor Sanjoy Baruah** (University of North Carolina at Chapel Hill, USA)
- Designing scalable and predictable SoC communication fabrics
 Professor Luca Benini (University of Bologna, Italy)
- <u>Tools for Distributed Embedded Systems</u> **Dr. Jan Beutel** (*ETH Zurich, Switzerland*)
- <u>Design Automation Methods for Digital Microfluidic Biochips</u> **Professor Krishnendu Chakrabarty** (*Duke University, USA*)
- <u>Service-oriented architecture based distributed Control and Automation Systems</u> **Dr. Ing. Armando Walter Colombo** (Schneider Electric Gmbh, Germany)
- <u>Embedded Systems at THALES: the Artemis challenges for an industrial group</u> **Dr. Gilbert Edelin** (*Thales Research & Technology, France*)
- <u>The HiPEAC 2012-2020 vision</u>
 Professor Koen De Bosschere (Ghent University, Belgium)
- <u>Synchronous Programming, and its use for Modeling Non-synchronous Systems</u> **Prof. Nicolas Halbwachs** (VERIMAG Laboratory, France)



- <u>The Role of Time in Embedded System Design</u> **Prof. Dr. Dr.h.c. Hermann Kopetz** (*TU Vienna, Austria*)
- <u>Validation, Performance Analysis and Synthesis of Embedded Systems</u> **Prof. Kim Larsen** (*Aalborg University, Denmark*)
- Everything you (n)ever wanted to know about caches Dr. Jan Reineke (Saarland University, Germany)
- <u>Scalable Software for MPSoCPlatforms</u> **Professor Lothar Thiele** (*ETH Zurich, Switzerland*)
- <u>Timing Analysis and Timing Predictability:</u> <u>extension to multi-processor systems</u>
 Prof. Dr. Dr. h.c. mult. Reinhard Wilhelm (Saarland University, Germany)
- <u>Verification and Synthesis of Concurrent Programs</u> **Dr. Eran Yahav** (*IBM T.J. Watson Research Center, USA*)

The General Chairs for the school were <u>Joseph Sifakis</u> and <u>Bruno Bouyssounouse</u> (VERIMAG Laboratory).

Videos are available online

3.2.3 Participants

INB: We selected approximate	ly one out of every two applicants.	
Thomas Bøgholm	Aalborg University	Denmark
Stefana Nenova	AbsInt	Germany
Christian Huembert	AbsInt Angewandte Informatik GmbH	Germany
Christoph Cullmann	AbsInt Angewandte Informatik GmbH	Germany
Olha Honcharova	AbsInt Angewandte Informatik GmbH	Germany
Stephan Zimmer	AbsInt Angewandte Informatik GmbH, Saarbruecken	Germany
Patrick Andrianiaina	AIRBUS FRANCE - CNAM (Conservatoire Nationale Des Arts Et Métiers)	France
Onur Derin	ALaRI Institute, Faculty of Informatics, Universita Della Svizzera Italiana	Switzerland
Vaclav Simek	Brno University of Technology	Czech Republic
Zdenek Vasicek	Brno University of Technology	Czech Republic
José Andrés Otero Marnotes	Center For Industrial Electronic (CEI). UPM	Spain
Risat Mahmud Pathan	Chalmers University of Technology, Göteborg	Sweden
Saoussen Anssi	Continental Toulouse - CEA Saclay	France
Kone Cheick Tidjane	CRAN (Research Centre For Automatic Control)	France
Andreas Kern	Daimler AG	Germany
Matthias Traub	Daimler AG	Germany
Frederico Santos	DEE-ISEC, IEETA-DETI-UA	Portugal
Andrea Ceccarelli	Department of Systems And Informatics, University of Florence	Italy
Mohammad Mostafizur Rahman Mozumdar	Dept Of Electronics, Politecnico Di Torino	Italy

NB: We selected approximately one out of every two applicants.

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Francesco Brancati	Dipartimento Di Sistemi E Informatica, University of Florence	Italy
Sebastian Voss	EADS Innovation Works	Germany
John F. Schommer	Embedded Software Laboratory, RWTH Aachen University	Germany
Milos Blagojevic	Embedded Systems Institute	Netherlands
Barbara Jobstman	EPFL	France
Jian-Jia Chen	ETH Zurich	Switzerland
Matthias Keller	ETH Zurich	Switzerland
Gerd Kainz	Fortiss GmbH	Germany
Emil Cozac	Freescale Semiconductor	France
Adrián Noguero	Fundación European Software Institute (ESI)	Spain
Craig Moore	Ghent University	Belgium
Ahmed AbdelHamid	IMEC	Belgium
Jahanzaib Imtiaz	InIT (Institut Industrial IT)	Germany
Gregor Papa	Jozef Stefan Institute	Slovenia
Uros Legat	Jozef Stefan Institute	Slovenia
Gabriel Hospodar	Katholieke Universiteit Leuven (KUL)	Belgium
Sara Dersten	Malardalen University, Vasteras	Sweden
Paolo Burgio	Micrel Lab - University of Bologna	Italy
Antonio Del Giudice	Micropi	Italy
Alessandro Mignogna	P.A.R.A.D.E.S. Scarl (Rome) - Scuola Superiore Sant'Anna (Pisa)	Italy
Orlando Ferrante	Parades S.c.a.rl. & University Of Roma La Sapienza	Italy
Risang Yudanto	Politecnico Di Torino	Italy
Al-Khateeb Anwar	Politecnico Di Torino	Italy
Mo Haghighi	Queen Mary University of London	United Kingdom
Georgeta Igna	Radboud Universiteit Nijmegen	Netherlands
Faranak Heidarian	Radboud University Nijmegen	Netherlands
John MacGregor	Robert Bosch GmbH	Germany
Ashraf Armoush	RWTH Aachen University	Germany
Irina Gaponova	Technical University Munich (Technische Universität München)	Germany
Andre Seffrin	Technische Universitaet Darmstadt-Cased Institute	Germany
Benjamin Engel	Technische Universität Dresden	Germany
Michael Roitzsch	Technische Universität Dresden	Germany
Chafic Jaber	TELECOM ParisTech-Freescale Semiconducteurs	France
Arnaud Grasset	THALES Research & Technology	France
Ahlem Mifdaoui	Toulouse University-ISAE	France
Andrea Flexeder	TU Muenchen	Germany
Florian Dittmann	TWT GmbH Science & Innovation	Germany

JPASE

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Victor Pollex	Ulm University	Germany
Rauf Salimi Khaligh	Universitaet Stuttgart	Germany
Marcus Shawky	Université De Technologie De Compiègne	France
Ricardo Marau	University of Aveiro	Portugal
Rui Santos	University of Aveiro	Portugal
Alessio Bonfietti	University of Bologna	Italy
Ángela Del Barrio Fernández	University of Cantabria	Spain
Laura Barros Bastante	University of Cantabria	Spain
Mario Collotta	University of Catania	Italy
Noubissi Agnès Cristèle	University of Limoges, XLIM, SSD Team	France
Silviu Craciunas	University of Salzburg	Austria
Oussama Tahan	University of Technology of Compiègne - HEUDIASYC Laboratory	France
Ivan Minakov	University of Trento	Italy
Ville Rantala	University of Turku	Finland
Tjerk Bijlsma	University of Twente	Netherlands
Martin Stigge	Uppsala University	Sweden
Nan Guan	Uppsala University	Sweden
Joe Hoffert	Vanderbilt University	United States
Joseph Porter	Vanderbilt University	United States
Emmanuel Sifakis	Verimag Laboratory	France
Nicolas Berthier	Verimag Laboratory	France
Paraskevas Bourgos	Verimag Laboratory	France
Rajarshi Ray	Verimag Laboratory	France
Saddek Bensalem	Verimag Laboratory	France
Giovanni Funchal	Verimag-STMicroelectronics	France
Armin Wasicek	Vienna University of Technology	Austria
Wolfgang Puffitsch	Vienna University of Technology	Austria

3.2.4 Organisation

- General Chairs: Joseph Sifakis, Bruno Bouyssounouse
- Programme Committee: <u>ArtistDesign Strategic Management Board</u> (<u>http://www.artist-embedded.org/artist/-Strategic-Management-Board,938-.html</u>)

3.2.5 Grants

Participants will be charged 180€ for students, 360€ for non-students (VAT included). The remaining costs are covered by a grant paid for by the European Commission via the ArtistDesign Network of Excellence on Embedded Systems Design.

The registration costs + grant covered:

- Lodging and meals from Sunday dinner to Friday lunch
- Rental for the premises (Hotel Escandille in Autrans)
- Chartered buses to/from Lyon St Exupéry on Sunday Sept 6th and Friday Sept 11th



3.2.6 Poster for the school

ARTIST Summer School in Europe, 2009

5th Edition

Autrans (near Grenoble), France - 5 days starting Monday Sept 7th 2009

- Sensor Networks: Theoretical Challenges and Practical Applications Professor Tarek Abdelzaher (University of Illinois, Urbana Champaign, USA)
- Mobile Cyber-Physical Systems
 Professor Luis Almeida (University of Porto, Portugal)
- Machine-assisted design and analysis of certifiably secure protocols Professor Michael Backes (Saarland University, Germany)
- Techniques for multiprocessor real-time scheduling Sanjoy Baruah (University of North Carolina at Chapel Hill, USA)
- Designing scalable and predictable SoC communication fabrics Professor Luca Benini (University of Bologna, Italy)
- Tools for Distributed Embedded Systems Dr. Jan Beutel (ETH Zurich, Switzerland)
- Design Automation Methods for Digital Microfluidic Biochips Professor Krishnendu Chakrabarty (Duke University, USA)
- Service-oriented architecture-based distributed Control and Automation Systems Dr. Ing. Armando Walter Colombo (Schneider Electric Gmbh, Germany)
- Embedded Systems at THALES: the Artemis challenges for an industrial group Dr. Gilbert Edelin (Thales Research & Technology, France)
- The HiPEAC 2012-2020 vision
 Professor Koen De Bosschere (Ghent University, Belgium)
- Synchronous Programming and Languages Professor Nicolas Halbwachs (Verimag Laboratory, France)
 The Role of Time in Embedded System Design Prof. Dr. Dr. C. Hermann Scool: (TU Vienna, Austria)
- Amelysis and Synthesis of Embedded Systems Inversity, Denmark) Validation, Performance Prof. Kim Larsen (Aalung) Prof. Kim Larse
- nted to know about caches versity, Germany) Everything you (n)eve Dr. Jan Reineke (Salaria
- ftware for latforms h, Switzerland) Professor
- ctability. Timing Analysis and Prof. Dr. Dr. Inc. mult.
- Verification and Synth Dr. Eran Yahav (IBM Take)

Organisation

Organised and funded by the ArtistDesign European Network of Excellence on Embedded Systems Design:

- · General Chairs:
- Joseph Sifakis (Verimag Laboratory)
- Bruno Bouyssounouse (Verimag Laboratory) Steering Committee: ArtistDesign Strategic Management Board

For further information and videos of the lectures: http://www.artist-embedded.org/artist/ARTIST-Summer-School-in-Europe.html

ArtistDesign Grants The ArtistDesign Network of Excellence provides grants for

persons attending the Summer School, covering: · Registration for the school

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- Meals and lodging during the school
- · Transportation by bus to/from Grenoble and St Exupéry airport





3.3 ARTIST Summer School in China 2009

July 19-24, 2009 Tsinghua, China

<u>http://www.artist-embedded.org/artist/-ARTIST-Summer-School-in-China-2009-.html</u> The Summer School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts. 70 students attended.

3.3.1 Overview

The ArtistDesign European Network of Excellence on Embedded Systems Design organized the 4th edition of a school on Embedded Systems Design in Tsinghua, July 19-24, 2009.

This year, the school was organized in collaboration with the University of Tsinghua and the LIAMA. It was open in priority to Chinese students. We believe that this will open opportunities for collaboration with Chinese research teams.

Contents

The school offers a full week consisting of four in-depth tutorials on state-of-the-art techniques for the design and analysis of embedded systems given by leading experts.

Objective

We aim to provide a forum for young professors, lecturers, researchers, postgraduates (advanced master and PhD students) working in the fields of real-time communication, memory management, design, implementation, validation and performance analysis of embedded systems as well as engineers from industry with practical background with the development of embedded systems.

• Targeted Audience

The school was open for participation for everybody, however, some previous training and/or experience in fundamentals of computer science as well as knowledge of computer architecture is required. Participants will be selected according to their CVs submitted to the organization committee.



3.3.2 Speakers & Programme



Professor Luis Almeida

University of Porto, Portugal

Luis Almeida is currently an associate professor at the Electrical and Computer Engineering Department of the University of Porto and a member of the Electronics and Telematics Engineering Institute of Aveiro in which he coordinated the Electronic Systems Lab between 2003 and early 2008. He is also a senior member of the IEEE, Computer Society, member of the Strategic Management Board of the EU/ICT NoE ArtistDesign, leader of the Real-Time Networks activity in that NoE, and a Trustee of the RoboCup Federation.



His current interests are in real-time communication protocols for embedded systems with an emphasis on mechanisms to support predictable operational flexibility as needed for dynamic QoS management, graceful degradation and open distributed real-time systems in general. He is also interested in control architectures for teams of autonomous mobile robots, focusing on distributed architectures to support global coordination and data fusion, and in flexible control approaches, particularly for networked control. He is a co-author of more than 150 refereed publications in international scientific conferences and journals in the areas of interest, and co-author of 3 patents and 6 book chapters, having participated in several EU and national projects and given numerous invited talks and short courses about related topics. He regularly participates in the organization and program committees of scientific events in the Real-Time Systems and Robotics communities, including RTSS, ECRTS, DATE, SIES, WFCS, ETFA and RoboCup.

Course:

Real-Time Communication in Embedded Systems: Techniques, Technologies and Applications

Abstract:

The proliferation of integrated communication interfaces within embedded computing platforms allowed an unprecedented level of distribution and integration that has been pushing frameworks such as Networked Embedded Systems (NESs), Wireless Sensor Networks (WSNs) and Mobile Ad hoc Networks (MANETs). In many applications, particularly involving transmission of live monitoring data, feedback control data or interactive multimedia data, there are timing constraints that must be respected for the applications to be effective. This requires bounded responses not only from the processors but also from the network. In this course we will analyse the concepts, techniques and technologies used at the network level to provide timely communication. In particular we will start from current trends in embedded systems design and from there we will address the timing issues in the network, the temporal control of communication, the protocol stack and its layers, we will revisit some related protocols covering both wired and wireless technologies, including CAN, FlexRay, Ethernet, WiFi and IEEE 802.15.4, we will analyse the traffic model and scheduling issues, and finally we will discuss some on-going related research projects.





Professor Christoph Kirsch

University of Salzburg, Austria

Christoph Kirsch received the Dr.Ing. degree from Saarland University, Saarbruecken, Germany, in 1999 while at the Max Planck Institute for Computer Science in Saarbruecken. He then worked as Postdoctoral Researcher at the Department of Electrical Engineering and Computer Sciences of the University of California, Berkeley. Since 2004, he is full



professor and holds a chair at the Department of Computer Sciences of the University of Salzburg, Austria.

His research interests are in concurrent programming and systems, virtual execution environments, and embedded real-time software. Dr. Kirsch co-invented the Giotto and HTL languages, and leads the JAviator unmanned-aerial-vehicle project for which he received an IBM faculty award in 2007. He co-founded the International Conference on Embedded Software (EMSOFT), has been general co-chair of ESWEEK 2008, and is general chair of LCTES 2009. He has been invited to serve on program committees of CASE, Coordination, DATE, EMSOFT, EUC, EuroSys, LCTES, OOPSLA, RTAS, RTSS, and VEE.

Course:

Explicit, Dynamic Memory Management with Temporal and Spatial Guarantees

Abstract:

This course gives an introduction to the problem of explicit, dynamic memory management in systems that require temporal and/or spatial guarantees. Predictable memory management is key to introducing many higher-level programming abstractions to such systems. The course will focus on allocating, deallocating, and accessing contiguous pieces of memory using techniques ranging from basic but unpredictable methods such as Best-fit and First-fit to the latest, fully predictable method called Compact-fit. Students will hear about the fundamental problem of managing contiguous pieces of memory (fragmentation), and learn how to deal with it in general (compaction, coalescing) but also in real time (partial compaction) and in the presence of concurrency (incremental compaction).



Professor Kim Guldstrand Larsen

University of Aalborg, Denmark

Kim Guldstrand Larsen (1957) is Professor in Computer Science at Aalborg University (1993-), and has been Industrial Professor at Twente University, The Netherlands (2000-2007). He is currently director of CISS, the Centre for Embedded Software Systems, a national centre of excellence within ICT bridging between industry and research (2002-). He is the leader of the Modeling and Validation Cluster within the ArtistDesign European Network of Excellence, and is director of the DaNES project (Danish Network for Intelligent Embedded Systems).



His research interests include modeling, verification, performance analysis of real-time and embedded systems with application and contributions to concurrency theory and model checking. In particular since 1995 he has been prime investigator of the tool UPPAAL and co-founder of the company UP4ALL International. He has published more than 150 publications in international journals and conferences as well as co-authored 6 software-tools.

He 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 a member of the steering committee for the ETAPS conference series, the CONCUR conference series, the TACAS conference series and the FORMATS workshop series. He is member of the Royal Danish Academy of Sciences and Letters, Copenhagen, and is member of the Danish Academy of Technical Sciences.

Course:

Validation, Performance Analysis and Synthesis of Embedded Systems

Abstract:

Model-driven development is a key to dealing with the increasing complexity of embedded systems, while reducing the time and cost to market. The use of models should permit early assessment of the functional correctness of a given design as well as requirements for resources (e.g. energy, memory, and bandwidth) and real-time and performance guarantees. Thus, there is a need for quantitative models allowing for timed, stochastic and hybrid phenomena to be modeled and analyzed.

UPPAAL is a tool for modeling, simulating and verifying real-time and hybrid systems, developed collaboratively by BRICS at Aalborg University and Department of Computer Systems at Uppsala University since the beginning of 1995 (see <u>www.uppaal.com</u>). UPPAAL and the branches CORA and TIGA provide an integrated tool environment for modeling, validation, verification and synthesis of real-time systems modeled as networks timed automata, extended with data types and user-defined functions. The lectures will provide details on the expressive power of timed automata in relationship to embedded systems as well as details on the power and working of the UPPAAL verification engine.

During the lectures the demonstration and application of the UPPAAL tool suite will be given on a number of practical and industrial cases. Particular attention will be given to the theory of the underlying formalisms of the UPPAAL tool suite, including: timed automata, priced timed automata, and (priced) timed games addressing a number of associated decision problems related to model-checking and optimal scheduling and strategies. The lectures will highlight the by now classical region-construction underlying the decidability of several of these problems. Also, the frontier of decidability will be drawn including pointing out a number of open problems.



Professor Jan Madsen

Technical University of Denmark

Jan Madsen is Professor in computer-based systems at DTU Informatics at the Technical University of Denmark (2002-), where he is currently heading the section on Embedded Systems Engineering. He is the leader of the Hardware Platforms and Multiprocessor System-on-Chip Cluster within the EU/IST Network of Excellence ArtistDesign and member of the Strategic Management Board of ArtistDesign. He is



He is serving on the panel of Computer Science in the Swedish National Research Council in 2007 and 2009. He has been Program Chair of DATE'07 and CODES'00, and General Chair of CODES'01. He is member of the steering committee of the CODES-ISSS (ESWEEK). He is or has served on many program committees, including SIES, ARC, NOCS, LCTES, DAC, CODES-ISSS, ISSS, CODES, RTSS, DATE, and PARC.

Course:

Mapping Applications onto Multi-Core Platforms

Abstract:

One of the challenges in modern embedded system design is to map the application onto a multi-core platform such that essential requirements are met. In order to do so at an early stage in the design process, where not all parts have been implemented or even designed, a system-level model of the application executing on the multi-core platform is needed. This model should allow for an accurate modeling of the global performance of the system, including the interrelationships among the diverse processors, software processes and physical interfaces and inter-connections. This course gives an introduction to the problem of mapping applications onto multi-core platforms. The process of mapping covers the allocation of tasks to processors of the platform and the definition of their execution order, i.e. the task scheduling. The course will focus on task scheduling for parallel systems. It will cover basic architectures for multi-core platforms (homogeneous and heterogeneous architectures) and how to model these, as well as how to model the application as a parallel program. The course will cover both basic scheduling algorithms (handling static scheduling) and more advanced algorithms, which are able to handle consequences of the, often complex, communication structures of the platform. The course will cover issues of real-time systems, including real-time operating systems (handling dynamic scheduling), as well as other quantitative aspects such as power consumption and memory usage. Finally, the course will give an introduction to how quantitative aspects of such systems may be formally modeled and analyzed.



3.3.3 Organisation

Coordination Committee

- Bouyssounouse Bruno (ArtistDesign European Network of Excellence)
- Gu Ming (Tsinghua University Beijing)
- He Ji Feng, Academician of CAS, East China Normal University, Shanghai
- Hong Mei, Peking University
- Joloboff Vania (LIAMA)
- Sifakis Joseph (Verimag Laboratory)
- Wang Yi (Uppsala University)
- Zhou Chaochen , (Institite of Software Beijing)

Institutions

- ARTIST NoE
- \circ LIAMA Sino French Lab in Computer Science, Automation and Applied Mathematics
- Tsinghua University

Local Organisation

- o Vania Joloboff
- Tang Lin (LIAMA)

3.3.4 Grants

The ArtistDesign NoE paid all costs for the speakers (travel, lodging, meals).

All costs for students were handled locally:

- Registration fees for Master, PhD or Postdoc students amounts to 150 RMB, and 500 RMB for non-students. Registration fees include proceedings for the school, lunches, breaks and social events.
- Housing is provided on demand at Tsinghua's student dormitories at an additional 750 RMB for the duration of the school.
- The costs for speakers are covered by a grant paid for by the European Commission via the ArtistDesign Network of Excellence on Embedded Systems Design.



3.3.5 Poster for the School





3.4 ARTIST School in South America 2009

August 3-7, 2009 Buenos Aires, Argentina http://www.artist-embedded.org/artist/-ARTIST-SummerSchool-SouthAmerica-.html

3.4.1 Overview

This third edition in Buenos Aires, Argentina, sought to continue strengthening the cooperation between Europe and South America in the area of embedded systems, both at educational and research levels. For this purpose, the school provided state-of-the-art courses on embedded systems oriented towards advanced students and young researchers.

Since its first edition in 2007, the school has been the ground for cross-fertilization between Europe and South America, students and researchers share and interchange knowledge and problems, in an open-minded way.

In 2009, the school was colocated with the Escuela de Ciencias Informáticas (ECI), regularly organized by the Department of Computer Science of University of Buenos Aires. The ARTIST program focused on system-level programming and analysis, related with very important issues such as time and dynamic memory management.

Venue and local organization. The school took place August 3-8, 2009 at the Department of Computer Science of Facultad de Ciencias Exactas y Naturales of Universidad de Buenos Aires, Argentina (UBA). It was organized in conjunction with the Escuela de Ciencias Informáticas (ECI), annually held at UBA since 1987 (<u>http://www.dc.uba.ar/events/eci/2009/</u>).

Past Editions

- <u>2008</u> Universidade Federal de Santa Catarina (UFSC), Florianopolis, Brazil
- 2007 Universidad Argentina de la Empresa (UADE), Buenos Aires, Argentina

3.4.2 Speakers

Mario Aldea, University of Cantabria, Spain

Mario Aldea Rivas received his degree in Physics (Electronics) from the University of Cantabria (Spain) in 1992. Since then, he has been working at the Computers and Real-Time group of that university where, in 2003, he obtained his Ph. D. with a thesis on flexible scheduling in real-time operating systems. He obtained an Assistant Professor position in 2003 and is an Associate Professor since 2007. He has carried out an intense teaching and research activity on Operating Systems and Programming Languages for embedded realtime applications. His main research interests are: real-time operating systems, real-time programming languages and flexible scheduling.



His work has had impact on the real-time extensions of the POSIX and Ada 2005 international standards. As a part of his research activity he has developed MaRTE OS: a real-time operating system for embedded applications that implements the POSIX minimal real-time profile. MaRTE OS is used by a number of companies and universities all around the world.

Course: MaRTE OS: POSIX operating system for real-time embedded applications This course presented the main real-time operating system services defined in the <u>POSIX</u> minimum real-time profile. These services allow application developers to write portable



applications that meet their real-time requirements, and that may be implemented on small embedded systems.

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During the course, <u>MaRTE OS</u> will be used as the platform to run the examples and exercises. MaRTE OS is a free implementation of the POSIX minimum real-time profile. It is designed for embedded systems and provides a development environment for Ada, C, C++, or mixed language real-time applications.

The course will describe the main features of MaRTE OS, its architecture and some implementation details. Also the MaRTE OS cross development environment will be presented.

Christoph Kirsch, University of Salzburg, Austria

Christoph Kirsch received the Dr.Ing. degree from Saarland University, Saarbruecken, Germany, in 1999 while at the Max Planck Institute for Computer Science in Saarbruecken. He then worked as Postdoctoral Researcher at the Department of Electrical Engineering and Computer Sciences of the University of California, Berkeley. Since 2004, he is full professor and holds a chair at the Department of Computer Sciences of the University of Salzburg, Austria. His research interests are in concurrent programming and systems, virtual execution environments, and embedded real-time software. Dr. Kirsch co-invented the Giotto and HTL languages, and leads the JAviator



unmanned-aerial-vehicle project for which he received an IBM faculty award in 2007. He cofounded the International Conference on Embedded Software (EMSOFT), has been general co-chair of ESWEEK 2008, and is general chair of LCTES 2009. He has been invited to serve on program committees of CASE, Coordination, DATE, EMSOFT, EUC, EuroSys, LCTES, OOPSLA, RTAS, RTSS, and VEE.

Explicit, dynamic memory management with temporal and spatial guarantees This course gives an introduction to the problem of explicit, dynamic memory management in systems that require temporal and/or spatial guarantees. Predictable memory management is key to introducing many higher-level programming abstractions to such systems.

The course will focus on allocating, deallocating, and accessing contiguous pieces of memory using techniques ranging from basic but unpredictable methods such as Best-fit and First-fit to the latest, fully predictable method called Compact-fit.

Students will hear about the fundamental problem of managing contiguous pieces of memory (fragmentation), and learn how to deal with it in general (compaction, coalescing) but also in real time (partial compaction) and in the presence of concurrency (incremental compaction).

3.4.3 Participants

The were a total of 35 participants who were regularly present every day. Participants came from all over Argentina. There was a fair distribution of PhD, Master, and undergraduate students, and Faculty members. The academic level of all students was recognised to be very good (many of them have already published scientific papers in conferences of the filed).

There were participants from Research Centers and Labs in related technology areas, such as radio- astronomy and transportation.

Most participants work as Research Engineers in the ICT industry. In particular, there were participants from the government-owned corporation ARSAT, devoted to engineering and development of national satellites, and Core Security, a private company providing security testing software solutions.

- Acevedo Romero, Adolfo Javier

- La Sala, Gustavo

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- Alta, Luis Ignacio
- AntuÒa, Alejandro
- AriÒo, Rodrigo
- Asteasuain, Fernando fasteasuain
- Baracat, Juan Antonio
- Braberman, Vlctor
- Calvo, Aureliano
- Catalano, Nicol·s
- Chaparro, Marcos Ariel
- Chari, Guido Martin
- Donari, David
- Fern·ndez, Federico
- Fervari, Raul Alberto
- Galeotti, Juan Pablo
- Garbervetsky, Diego
- Gonz·lez, Rodrigo
- K^nig, Fabian

- Lo Monaco, Gabriel
- LÛpez, David
- Martinez Garbino, Lucio JosÈ
- Monteverde, Daniel
- Neisen, Ariel
- Olivero, Alfredo
- Padulo, Maximiliano
- Paez, Francisco Ezequiel
- Pelorosso, Rodrigo HÈctor
- Pinna CortiÒas, Juan MartÌn
- Rouaux, MartÌn
- Siless, Viviana
- Suarez Rovere, Victor Manuel
- Taboada, Alejandro
- Tonietti, Santiago Martìn
- Yovine, Sergio

3.4.4 Funding

Besides ArtistDesign financial support to cover lecturers' travel and local expenses, organization costs and printing materials were covered via ECI funds.

3.4.5 Concluding remarks.

This third edition was very successful.

- The courses were very interactive. They have generated lively discussions, during the courses and at coffee breaks and lunches, between participants and speakers. Moreover, interactions continued afterwards by e-mail.
- The joint organization with ECI proved to be postive, since it helped:
 - establishing cross-links between embedded systems' research and other ICT and related areas, and
 - attracting participants from all over Argentina, in particular from several leading companies and research labs.
- There were several meetings to discuss potential cooperative research projects in the areas of dynamic memory management and real-time embedded operating systems, including co- directing PhD and Masters' students.



3.5 Embedded Systems Seminar (for the EC Embedded Systems Unit)

June 18-19, 2009 Brussels, Belgium

http://www.artist-embedded.org/artist/-Embedded-Systems-Seminar-.html A seminar for project officers in Brussels.

This was a seminar organised at the request of the European Commission's Embedded Systems Unit, to allow members of the unit (mainly project officiers) to become more familiar with technical topics in embedded systems design.

It was organised by the ArtistDesign Network of Excellence (Bruno Bouyssounouse).

3.5.1 Programme

Thursday, June 18th 2009

12:00 lunch

- 13:30 Introduction to Embedded Systems Design Joseph Sifakis – VERIMAG Laboratory
- 15:00 break
- 15:30 Adaptive Embedded Systems Karl-Erik Årzén – Lund University
- 17:00 closing

Friday, June 19th 2009

- 8:45 welcome
- 9:00 **Multi-Core Architectures** Luca Benini – University of Bologna
- 10:30 break
- 10:50 **Networks and Middleware** Luis Almeida – University of Porto
- 12:20 lunch
- 13:40 **Testing and Verification** Kim Larsen – Aalborg University / CISS
- 15:10 break

15:30 **Compilers and Timing Analysis** Sebastian Hack – Saarland University

17:00 closing

3.5.2 Speakers and Courses

Professor Luis Almeida (University of Porto, Portugal)

Course: Networks and Middleware

Abstract:

Computer comunication technologies have strongly evolved along the past decades and have deeply affected many domains, embedded systems included. They fostered the proliferation of distributed embedded systems,



exploiting potential advantages such as increased modularity, maintainability, dependability and composability, and are now paving the way for networks of embedded systems targeting cooperative devices for unbounded connectivity. Network protocols became, thus, fundamental components in this distributed scenario to support the necessary interoperability among the computing elements. On the other hand, developing applications for such distributed platforms became more complex, requiring an effective middleware layer to provide adequate abstractions and cooperation models.



In this talk we will do a brief tour of networking and middleware technologies for embedded systems. Starting from the basics of digital communication, we will visit relevant issues in the physical and data link layers of the communication protocol stack, observe several examples of existing network protocols that are typically used in embedded systems of different kinds and discuss common middleware layers and their properties. Finally, the talk will also point to open issues and on-going efforts in this domain.

Professor Karl-Erik Arzen (Lund University, Sweden)

Course: Adaptive Embedded Systems

Abstract:

An embedded hardware-software system is adaptive, if it can modify its behavior and/or architecture to changing requirements. Adaptivity is increasingly important as the complexity and autonomy of embedded systems increases. Adaptivity is required both off-line at design-time and on-line at run-time. Off-line adaptivity is required to handle changing system specifications and to support platform-based or product-family based development. On-line adaptivity is required to be able to

dynamically respond to changing conditions and contexts and through this improve performance and resource utilization. The changes can involve different types of resource requirements, changing system objectives, and changing external conditions. Adaptivity is a cross-cutting system characteristic that affects both hardware and software. At the softwarelevel adaptivity is mainly concerned with flexible and adaptive resource scheduling, e.g., CPU time scheduling. At the hardware-level adaptivity includes both adaptation of operation modes, e.g., supply voltage and clock frequency, and dynamic management of hardware resources, e.g., processing elements and memory. This keynote will discuss why we need adaptivity in embedded systems, what we really mean by adaptivity and give example of how adaptivity can be achieved. The relations between adaptivity, robustness, sustainability, predictability and dependability will be discussed. Connections will be made between adaptivity in embedded systems and adaptivity in the field of control.

Professor Luca Benini (University of Bologna, Italy)

Course: Multi-Core Architectures

Abstract:

In this talk I will give an overview of recent trends in many-core platforms for embedded computing. The shift toward many-core architectures has been imposed by technology reasons (power consumption and design closure issues in nanometer technology) and not by the "coming of age" of parallel programming models, compilation, analysis and verification environments. Thus, we may be building terascale architectures that we cannot program efficiently (in terms of performance and power). Even



worse, we may not be able to give any guarantees on execution timing, constraints and realtime properties of applications.

This is a challenge AND an opportunity for the software design and verification community: I will give some views on what is being done in hardware and software, what could be done, and what I hope will be done to build efficient and predictable multi-core platforms.

Professor Sebastian Hack (Saarland University, Germany)

Course: Compilers and Timing Analysis

Abstract:

Run-time guarantees play an important role in the area of embedded systems and especially hard real-time systems. These systems are typically subject to stringent timing constraints which result from the interaction with the surrounding physical environment. Therefore, a schedulability analysis has to be performed which guarantees that all timing constraints will be met. All existing techniques for schedulability analysis require the knowledge of safe upper bounds on the execution times of each task in the system. These upper bounds they should be tight, i.e., the overestimation should be as small as possible.

In modern microprocessor architectures caches and pipelines are key features for improving performance. Unfortunately, they make the analysis of the execution behaviour of instructions very difficult since this behaviour now depends on the execution history. Therefore, the classical approaches to worst case execution time prediction are not directly applicable or lead to results exceeding the real execution time by orders of magnitude.

The problem of determining safe and precise upper bounds on execution times has been solved for tasks with uninterrupted execution executed on quite complex uniprocessor architectures. The methods and tools (developed in Europe!) have been used in the certification of the Airbus A380.

Professor Brian Nielsen (CISS, Aalborg University, Denmark)

Course: Testing and Verification of Embedded Systems

Abstract:

Embedded Software systems have high demands on quality, correctness and reliability. At the same time it is growing dramatically in size and complexity. Besides functional correctness, quantitative aspects including real-time constraints and constraints on quality of services are of utmost importance. In today's industrial practice, validation is primarily done using testing, and typically consumes between 30% and 50% of software development resources.

Automated model-based testing and verification are advanced promising techniques to improve current practice in terms of both quality and cost. A key point is that testing and verification are complementary techniques that need to be effectively combined to provide a coherent solution. In both cases, abstract models play an important role, either for early analysis of model-properties, or for generating and executing test cases. Moreover, tool implementers often face the same algorithmic challenges.

This lecture will explain the key points of testing and verification of embedded systems, survey the principal issues and challenges, as well as exemplify new techniques and tools.







Year 2 D4-(2.0)-Y2



Joseph Sifakis (VERIMAG Laboratory, France)

Course: Introduction to Embedded Systems Design

Abstract:

The development of a satisfactory Embedded Systems Design Science provides a timely challenge and opportunity for reinvigorating Computer Science.

JPASE

Embedded systems are components integrating software and hardware

jointly and specifically designed to provide given functionalities, which are often critical. They are used in many applications areas including transport, consumer electronics and electrical appliances, energy distribution, manufacturing systems, etc. Embedded systems design requires techniques taking into account extra-functional requirements regarding optimal use of resources such as time, memory and energy while ensuring autonomy, reactivity and robustness.

Jointly taking into account these requirements raises a grand scientific and technical challenge: extending Computer Science with paradigms and methods from Control Theory and Electrical Engineering. Computer Science is based on discrete computation models not encompassing physical time and resources which are by their nature very different from analytic models used by other engineering disciplines. We summarize some current trends in embedded systems design and point out some of their characteristics, such as the chasm between analytical and computational models, and the gap between safety critical and best-effort engineering practices. We call for a coherent scientific foundation for embedded systems design, and we discuss a few key demands on such a foundation: the need for encompassing several manifestations of heterogeneity, and the need for design paradigms ensuring constructivity and adaptivity.

We discuss main aspects of this challenge and associated research directions for different areas such as modelling, programming, compilers, operating systems and networks.

3.6 ARTIST Graduate Courses in Y2 (2009)

ARTIST Graduate Course: Automated Formal Methods for Embedded Systems - 2009 June 17-25, 2009 DTU - Lyngby, Denmark

http://www.artist-embedded.org/artist/-Automated-Formal-Methods-2009-.html

The aim of this course was to introduce advanced topics in connection with models, analysis and verification of embedded systems. The course will cover theory and applications, and hands-on experience with state-of-the-art tools.

The topics vary from year to year. The focus this year was on:

- Real time validation of embedded systems based on timed automata and the Uppaal tool suite, including priced timed automata and timed games, and Uppaal CORA, Uppaal TIGA and Uppaal Tron.
- Model-Based Development and Validation of Multirobot Cooperative System.
- Analysis of systems with resource constraints.





ARTIST Graduate Course on Embedded Control Systems 2009

June 8-12, 2009 Scuola Superiore Sant'Anna - Pisa, Italy

http://www.artist-embedded.org/artist/-ARTIST-Embedded-Control-2009-.html

The course has two main objectives:

- Introducing the most important concepts and methodologies used to develop a real-time embedded system, including fundamentals of real-time scheduling, control and distributed systems;
- Showing how to apply these concepts to develop simple real-time control applications using an embedded platform specifically developed for education.

The course is developed in five days, each dedicated to a specific topic:

- The first day introduces the basic principles of real-time computing and illustrates the most significant results on real-time scheduling.
- The second day is devoted to the embedded platform and the kernel, to enable participants to quickly write a simple real-time demo, using the methodologies they learnt in the previous day.
- The third day is focused on real-time control and explains how to design control applications taking timing constraints into account, and how to use control techniques to make real-time systems more adaptive to dynamic changes.
- The fourth day is dedicated to real-time networks and addresses the problems of synchronization and medium access control that are encountered in distributed embedded systems, together with an analysis of end-to-end latencies.
- The fifth day is dedicated to practical experience and implementation. The participants can interact with the teachers to propose a real-time control application, preferably distributed, either in a simulated environment or for controlling one of the platforms that will be provided by the teachers.

Also supported by:





3.7 Previous Schools and Seminars on Embedded Systems Design Organised by ARTIST

The following schools have been organised by Artist FP5, and the Artist2 FP6 Network of Excellence:.

ARTIST2 Summer School 2008 in Europe

September 8-12, 2008 Autrans (near Grenoble), France http://www.artist-embedded.org/artist/-ARTIST2-Summer-School-2008-.html

The Summer School offers a number of foundational tutorials, accompanied by a selection of lectures on exciting emerging technologies and industrial applications - given by leading scientific and/or industrial experts.

ARTIST2 South-American School for Embedded Systems 2008

August 25-29, 2008 Universidade Federal de Santa Catarina, Florianopolis, Brazil http://www.artist-embedded.org/artist/-ARTIST-2-South-American-School-.html

Second edition of the ARTIST South American School.

Artist2 Summer School in China 2008

July 12-18, 2008 Shanghai, China http://www.artist-embedded.org/artist/-Artist2-Summer-School-in-China-.html

ARTIST2 has organized the 3rd edition of a school on Embedded Systems Design in Shanghai. This year, the school was organized in collaboration with the SEI/ECNU and the LIAMA.

Real-Time Kernels for Microcontrollers: Theory and Practice

June 23-25, 2008 Pisa, Italy http://www.artist-embedded.org/artist/-Real-Time-Kernels-for-.html

The course on Real-Time Kernels for Microcontrollers aims to introduce the basic concepts of Real-time Systems targeted to Embedded Systems, which are often implemented using microcontrollers. The course will briefly illustrate the theoretical background of real-time scheduling, resource-aware techniques, and wireless communication based upon the IEEE 802.15.4 protocol.

ARTIST2 Graduate Course on: Automated Formal Methods for Embedded Systems 2008 June 16-24, 2008 DTU - Lyngby, Denmark http://www.artist-embedded.org/artist/-Automated-Formal-Methods-for-.html

In the lectures, we will introduce a comprehensive set of state-based models as well as automatic procedures for their analysis. The exercise classes will complement this by providing hands-on experience with appropriate verification tools.

ARTIST2 Graduate Course on Embedded Control Systems

May 26-30, 2008 Stockholm, Sweden http://www.artist-embedded.org/artist/-Graduate-Course-on-Embedded-.html

The course provides an account of state of the art theory and techniques that address the connection and integration of the areas of Control systems and Embedded systems.



First European-SouthAmerican School for Embedded Systems

August 21-24, 2007 Universidad Argentina de la Empresa (UADE), Buenos Aires – Argentina http://www.artist-embedded.org/artist/-First-European-SouthAmerican-.html

The purpose of the school is to foster the well established and dynamic research cooperations in the field of embedded systems between groups in Europe and South America, by allowing south-american students (specially graduate), to meet european researchers.

Artist2 / UNU-IIST School in China - 2007

August 1-10, 2007 Suzhou (near Shanghai), China http://www.artist-embedded.org/artist/-Artist2-UNU-IIST-School-in-China-.html

ARTIST2 will organize, in collaboration with UNU-IIST, the 2nd edition of a school on embedded systems design in Suzhou (near Shanghai).

ARTIST2 PhD Course on: Automated Formal Methods for Embedded Systems

June 4-12, 2007 DTU - Lyngby, Denmark http://www.artist-embedded.org/artist/-ARTIST2-PhD-Course-on-Automated,851-.html

In the lectures, we will introduce a comprehensive set of state-based models as well as automatic procedures for their analysis. The exercise classes will complement this by providing hands-on experience with appropriate verification tools.

ARTIST2 Graduate Course on Embedded Control Systems

May 7-11, 2007 Lund, Sweden http://www.artist-embedded.org/artist/-ARTIST-Graduate-Course-on-Embedded-.html

The objective of the course is to provide an overview of the main principles and technologies for supporting the development of embedded control systems.

Real-Time Microcontroller Systems: OSEK Standard and experiments on $\mu controller$ devices

March 26-28, 2007 RETIS Laboratory, Scuola Superiore Sant'Anna, Pisa, Italy http://www.artist-embedded.org/artist/-OSEK-Standard-and-Multicore-.html

Training course on Real-Time Systems for Microcontrollers: OSEK Standard and experiments on microcontroller devices *Organised in conjunction with Evidence Srl*

ARTIST2 - MOTIVES 2007

February 19-23, 2007 Trento, Italy <u>http://www.artist-embedded.org/artist/-MOTIVES-2007-.html</u>

ARTIST2 Winter School 2007 offers foundational tutorials and lectures on exciting emerging technologies and industrial applications - given by leading scientific and industrial experts.

First European Laboratory on Real-Time and Control for Embedded Systems

July 10-14, 2006 Pisa, Italy http://www.artist-embedded.org/artist/-First-European-Laboratory-on-Real-.html



Real-Time distributed embedded systems play a crucial role in our society including several application domains such as automotive, telecommunications, robotics, and multimedia systems. These systems generally work under precise timing constraints, to achieve the required level of performance and predictability. Consequently, embedded systems design requires expertise in several disciplines, including control theory, networking, real-time computing, and operating systems.

ARTIST2 / UNU-IIST Spring School in China 2006

April 3-15, 2006 Xi'an, China http://www.artist-embedded.org/artist/-ARTIST2-UNU-IIST-China-School-.html

The first ARTIST / UNU-IIST Spring School gathered more than 50 participants, of which approximately 40 were students from the top universities in mainland China.

ARTIST2 Graduate Course on Embedded Control Systems

April 3-7, 2006 Prague, Czech Repbulic http://www.artist-embedded.org/artist/-ARTIST2-Graduate-Course-on-.html

The objective of the Course is to provide an overview of the main principles and technologies for supporting the development of embedded control systems.

ARTIST2 Summer School 2005

September 29th - October 2nd 2005 Nässlingen, Sweden http://www.artist-embedded.org/artist/-ARTIST2-Summer-School-2005-.html

ARTIST2 Summer School on Component & Modelling, Testing & Verification, and Statical Analysis of Embedded Systems


4. Organisation of Workshops

4.1 Workshops Organized by the ArtistDesign NoE in Y2 (2009)

JPASE

These are all world-class events, featuring top speakers, organised and funded by the ArtistDesign NoE in Y2 (2009).

See the links provided for details. As a rule, we always the slides and other pertinent materials available to the general public, via the Artist web portal.

The general format is 1-day, 30-50 participants. Please access the link to get further details.

UML&FM'2009

December 8th, 2009 Rio de Janeiro, Brasil http://www.artist-embedded.org/artist/-UML-FM-2009-.html

UML is the de facto standard for modelling various aspects of software systems in both industry and academia, despite the inconvenience that its current specification is complex and its syntax imprecise.

WESH 2009

December 7th, 2009 Eindhoven - The Netherlands http://www.artist-embedded.org/artist/-WESH-2009-.html

The goal of this workshop is to strengthen the connections between academic research and industry, or to be more precise, to increase the understanding in the academic world of industrial issues in embedded systems engineering and together come to a shared agreement on research directions that seem worthwhile to pursue. The speakers at the workshop work at different medical companies or are participants in the ArtistDesign network with extensive experience in healthcare.

CRTS 2009

December 1st, 2009 Washington, D.C., USA (co-located with RTSS 2009) http://www.artist-embedded.org/artist/-CRTS-2009-.html

This workshop (CRTS 2009) provides a forum for researchers and technologists to discuss the state-of-the-art, present their work and contributions, and set future directions in compositional technology for real-time embedded systems. The technical program of CRTS 2009 will consist of invited talks and paper presentations.

WSS'09

October 16th, 2009 Grenoble, France (within ES Week) http://www.artist-embedded.org/artist/-WSS-09-.html

The workshop aims at bringing the software generation and software synthesis communities together and at identifying research problems which should be addressed by the scientific community.

WESE'09

October 15th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-WESE-09-.html

As embedded system designs grow more complex and the time to market diminishes, quality embedded systems education becomes more and more important. This fifth workshop on the



subject aims to bring researchers, educators, and industrial representatives together to assess needs and share design, research, and experiences in embedded systems education.

RePP 2009

October 15th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-RePP-2009,1122-.html

The RePP workshop is concerned with embedded systems that are characterized by efficiency requirements on the one hand and critical constraints on the other. Such systems occur in many industry-relevant embedded application domains such as avionics, automotive, railway systems, power plants, construction machinery, and robotics.

NWPT '09

October 14-16, 2009 Lyngby, Denmark http://www.artist-embedded.org/artist/-NWPT-09-.html The NWPT series of annual workshops is a forum bringing to

The NWPT series of annual workshops is a forum bringing together programming theorists from the Nordic and Baltic countries (but also elsewhere)

WFCD - Foundations and Applications of Component-based Design 2009

October 11th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-WFCD-2009-.html

The workshop aims to discuss recent results on component-based design with emphasis on design frameworks for real-time systems encompassing heterogeneous composition and models of computation. The focus is not only on fundamental results but also on their implementation in methods and tools and their concrete application in areas such as automotive, avionics, consumer electronics and automation.

APRES'09

October 11th, 2009 Grenoble, France, within ESWeek 2009 http://www.artist-embedded.org/artist/-APRES-09-.html

Adaptive systems can respond to environmental changes including hardware/software defects, resource changes, and non-continual feature usage. As such, adaptive systems can extend the area of operations and improve efficiency in the use of system resources. However, adaptability also incurs overhead in terms of system complexity and resource requirements. The purpose of the workshop is to discuss new and on-going research that is centered on the idea of adaptability as first class citizen and consider the involved tradeoffs.

SEEC'09

October 8-9, 2009 Trento, Italy

http://www.artist-embedded.org/artist/-SEEC-09-.html

The focus of the workshop is on energy efficiency as an alternative source of energy. Data shows that alternative energy sources alone are insufficient to meet the increasing demand. Higher efficiency is therefore required to address the energy problem, and is important also from an environmental point of view. Emphasis will be on addressing the problem from a system standpoint.

IRTAW-14

October 7-9, 2009 Portovenere, Italy

http://www.artist-embedded.org/artist/-IRTAW-14-.html

For over 20 years the series of International Real-Time Ada Workshop meetings has provided a forum for identifying issues with real-time system support in Ada and for exploring possible



approaches and solutions, and has attracted participation from key members of the research, user, and implementer communities worldwide.

ACES^{MB} 2009

October 6th, 2009 Denver, Colorado, USA (in conjunction with MODELS 2009) http://www.artist-embedded.org/artist/-ACES-MB-09-.html

The objective of this workshop is to bring together researchers and practitioners interested in model-based software engineering for real-time embedded systems. We are seeking contributions relating to this subject at different levels, from modelling languages and semantics to concrete application experiments, from model analysis techniques to model-based implementation and deployment. Given the criticality of the application domain, we particularly focus on model-based approaches yielding efficient and provably correct designs. Concerning models and languages, we welcome contributions presenting novel modelling approaches as well as contributions evaluating existing ones.

VVPS 2009

September 19-20, 2009 Thessaloniki, Greece (within ICAPS 2009) http://www.artist-embedded.org/artist/-VVPS-2009-.html

Planning and scheduling (P&S) systems are finding increased application in safety- and mission-critical systems that require a high level of assurance. However tools and methodologies for verification and validation (V&V) of P&S systems have received relatively little attention. The goal of this workshop is to initiate an ongoing interaction of the P&S and V&V communities to identify specialized and innovative V&V tools and methodologies that can be applied to P&S.

WCET 2009

June 30th, 2009 Dublin, Ireland (just before ECRTS'09) http://www.artist-embedded.org/artist/-WCET-2009-.html

The goal of the workshop is to bring together people from academia, tool vendors and users in industry that are interested in all aspects of timing analysis for real-time systems. The workshop fosters a highly interactive format with ample time for in-depth discussions.

OSPERT 2009

June 30th, 2009 Dublin, Ireland (in conjunction with ECRTS09) http://www.artist-embedded.org/artist/-OSPERT-2009-.html

Developers of Real-Time Operating Systems (RTOS) are faced with many challenges arising from two opposing needs: extreme optimisation of resource usage (processor, energy, network bandwidth, etc.) and dynamic configuration, flexible scheduling, component-based development and deployment, etc. While real-time systems continue to be used in many small embedded applications, real-time services are being introduced and used in general- purpose operating systems. Notable examples are the various flavours of Linux that provide support to time-sensitive applications.

Mapping Applications to MPSoCs 2009

June 29-30, 2009 Schloss Rheinfels, St. Goar, Germany

http://www.artist-embedded.org/artist/-map2mpsoc-2009-.html

The aim of the workshop is to provide a forum for brainstorming and road-mapping the future of mapping applications to MPSoCs. Knowledge about constraints and directions for future MPSoC architectures should be collected. Existing mapping techniques should be briefly presented and analyzed. Directions for future research should be proposed and evaluated.



Runtime Verification 2009

June 26-28, 2009 Grenoble, France http://www.artist-embedded.org/artist/-Runtime-Verification-.html

The objective of RV'09 is to bring scientists from both academia and industry together to debate on how to monitor and analyze the execution of programs, for example by checking conformance with a formal specification written in temporal logic or some other form of history tracking logic. The purpose might be testing a piece of software before deployment, detecting errors after deployment in the field and potentially triggering subsequent fault protection actions, or the purpose can be to augment the software with new capabilities in an aspect oriented style. The longer term goal is to investigate whether the use of lightweight formal methods applied during the execution of programs is a viable complement to the current heavyweight methods proving programs correct always before their execution, such as model checking and theorem proving.

UML&AADL'2009

June 2nd, 2009 Potsdam, Germany

http://www.artist-embedded.org/artist/-UML-AADL-2009-.html

All aspects of the representation, analysis, and implementation of Distributed, Real-time and Embedded systems (DRE) system behaviour and/or architecture models.

SCOPES 2009

April 23-24, 2009 Nice, France <u>http://www.artist-embedded.org/artist/-SCOPES-2009-.html</u> 12th International Workshop on Software and Compilers for Embedded Systems

FeBID 2009

April 16th, 2009 San Francisco, USA

http://www.artist-embedded.org/artist/-FeBID-2009-.html

The Fourth International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks (FeBID 2009) will be held April 16 in San Francisco, California, USA. The FeBID 2009 workshop will offer a unique opportunity for researchers and practitioners to discuss recent and innovative results in applying control theory to controlling performance of computing systems and networks. It will provide a forum to exchange ideas and experiences on practical control system design and implementation and to identify future directions and challenges in aligning feedback control techniques with traditional performance modeling and simulation.

HSCC 2009

April 13-15, 2009 San Francisco, California

http://www.artist-embedded.org/artist/-HSCC-2009-.html

HSCC'09 is the 12th in a series of successful annual meetings dedicated to research in embedded reactive systems involving the interplay between symbolic/discrete and continuous dynamical behaviors. Academic as well industrial researchers are invited to exchange information on the latest developments of applications and theoretical advancements in the analysis, design, control, optimization, and implementation of hybrid systems.



DySCAS 2009

February 18th, 2009 Volvo Office Brussels, Belgium http://www.artist-embedded.org/artist/-DySCAS-2009-.html

The DySCAS public results dissemination workshop will highlight the advances made during the project. You will learn about a future embedded automotive technology which has sophisticated capabilities to configure itself in context-aware ways to meet the quality-of-service requirements of applications, to automatically optimize resource usage, and to dynamically detect and resolve certain categories of fault.

4.2 Upcoming ArtistDesign Workshops organised and funded by ArtistDesign

Here is the list of workshops currently planned for 2010. Further workshops are panned over the course of the year. Please access the links to get further details.

UML&AADL'2010

March 24th, 2010 University of Oxford, UK

http://www.artist-embedded.org/artist/-UML-AADL-2010-.html

All aspects of the representation, analysis, and implementation of Distributed, Real-time and Embedded systems (DRE) system behaviour and/or architecture models.

GREEMBED 2010

April 12th, 2010 Stockholm, Sweden, (organized in conjunction with CPSWEEK 2010) http://www.artist-embedded.org/artist/-GREEMBED-2010-.html

GREEMBED 2010 aims at bringing together experts, researchers, and practitioners, from the embedded systems community, who are interested on research and development of embedded system infrastructures, methods, and tools for green and smart energy-efficient applications.

FESA 2010

April 12th, 2010 KTH, Stockholm (Sweden) (within CPS Week) http://www.artist-embedded.org/artist/-FESA-2010-.html

A key fundamental challenge in developing embedded systems is that of managing their complexity while providing products of the desired quality, and at the right cost considering the whole life-cycle. As one important means to handle complexity, architecture description languages (ADL's) have emerged as a means to formally describe software and hardware architectures, providing a basis for analysis of system properties such as reliability and performance, and for synthesis (e.g. generating glue code). The dominating views provided by ADLs is that of describing the system structure, mainly with the notion of black box (SW/HW) components, following the lines of compositionality where the idea is that system properties can be derived from a configuration of components and their externally visible properties.

WARM 2010

April 12th, 2010 Stockholm, Sweden (within CPS Week) http://www.artist-embedded.org/artist/-WARM-2010-.html

The focus of WARM is software-based approaches to adaptive resource management for soft or adaptive embedded real-time applications, e.g., multimedia applications or non-safety critical control applications. Special emphasis will be given to multi-resource management, in particular including CPU time and power consumption. Special emphasis will also be given to multi-core platforms.

SCOPES 2010

June 28-30, 2010 Schloss Rheinfels, St. Goar, Germany <u>http://www.artist-embedded.org/artist/-SCOPES-2010-.html</u> 13th International Workshop on Software and Compilers for Embedded Systems



Mapping Applications to MPSoCs 2010

June 29-30, 2010 St. Goar, Germany

http://www.artist-embedded.org/artist/-map2mpsoc-2010-.html

The aim of the workshop is to provide a forum for brainstorming and road-mapping the future of mapping applications to MPSoCs. Knowledge about constraints and directions for future MPSoC architectures should be collected. Existing mapping techniques should be briefly presented and analyzed. Directions for future research should be proposed and evaluated.

WCET 2010

July 6th, 2010 Brussels, Belgium (in conjunction with the 22nd Euromicro) <u>http://www.artist-embedded.org/artist/-WCET-2010-.html</u>

The Euromicro Technical Committee organizes a number of satellite events attached to its 22nd International Real-Time Systems Conference. This workshop will be the 10th in the series of WCET workshops that started at the 2001 Euromicro conference. A number of special highlights are planned to celebrate this jubilee. The workshop will be organized and funded by the ArtistDesign Network of Excellence.

OSPERT 2010

July 6th, 2010 Brussels, Belgum (in conjunction with ECRTS10) http://www.artist-embedded.org/artist/-OSPERT-2010-.html

Research on innovative RTOS architectures and services is a hot topic. Developers of Real-Time Operating Systems (RTOS) are faced with many challenges arising from two opposing needs: extreme optimisation of resource usage (processor, energy, network bandwidth, etc.) and dynamic configuration, flexible scheduling, component-based development and deployment, etc. While real-time systems continue to be used in many small embedded applications, real-time services are being introduced and used in general-purpose operating systems. Notable examples are the various flavours of Linux that provide support to timesensitive applications.



4.3 Previous ARTIST Workshops on Embedded Systems Design

JPASE

- 4.3.1 Previous ARTIST Workshops in 2008
- <u>Mapping of Applications-to MPSoCs -</u> <u>ArtistDesign Working Meeting</u> *November 27-28, 2008*
- Embedded Systems: Industrial Applications <u>'08</u> November 12-13, 2008
- <u>WS on Multicores: Theory and Practice</u> October 28th, 2008
- <u>UML&FM'08</u> October 27th, 2008
- WESE'08: WS on Embedded Systems Education October 23rd, 2008
- <u>Workshop on Foundations and Applications</u> of Component-based Design (WFCD'2008) October 19th, 2008
- <u>ACES^{MB} 2008</u> September 29th, 2008
- <u>ARTIST2 Summer School 2008 in Europe</u> September 8-12, 2008
- <u>ARTIST2 South-American School for</u> <u>Embedded Systems 2008</u> August 25-29, 2008
- Artist2 Summer School in China 2008 July 12-18, 2008
- MoCC 2008 July 3-4, 2008
- WCET'08 July 1st, 2008
- OSPERT 2008 July 1st, 2008
- 4.3.2 Previous ARTIST Workshops in 2007
- <u>Synchron 2007</u> November 26-30, 2007
- <u>ARTIST2 meeting on Integrated Modular</u> <u>Avionics</u> November 12-13, 2007
- WESE'07: WS on Embedded Systems Education October 4-5, 2007
- Foundations of Component-based Design September 30th, 2007
- <u>Between Control and Software</u> (in honor of Paul Caspi) September 28th, 2007
- <u>First European-SouthAmerican School for</u> <u>Embedded Systems</u> *August 21-24, 2007*

- Movep'08 June 23-27, 2008
- <u>Real-Time Kernels for Microcontrollers:</u> <u>Theory and Practice</u> June 23-25, 2008
- <u>COMES 2008</u> June 17-18, 2008
- <u>ARTIST2 Graduate Course on: Automated</u> <u>Formal Methods for Embedded Systems</u> <u>2008</u> June 16-24, 2008
- <u>Mapping Applications to MPSoCs 2008</u> June 16-17, 2008
- <u>ARTIST2 Graduate Course on Embedded</u> <u>Control Systems</u> May 26-30, 2008
- <u>ArtistDesign Workshop on Design for</u> <u>Adaptivity</u> May 13-14, 2008
- DataFlow Modeling for Embedded Systems 2008 May 5th, 2008
- APRES'08 April 21st, 2008
- <u>SLA++P'2008</u> April 5th, 2008
- <u>ARTIST2 Timing Analysis activity meeting</u> <u>2008</u> March 13th, 2008
- <u>ArtistDesign Automotive Systems Day 2008</u> March 12th, 2008
- ATESST Open Workshop March 3rd, 2008
- <u>ARTIST2 PhD Course on: Automated</u> <u>Formal Methods for Embedded Systems</u> June 4-12, 2007
- <u>2nd Int'l ARTIST Workshop on Control for</u> <u>Embedded Systems</u> May 31st -June 1st 2007
- <u>ARTIST2 Graduate Course on Embedded</u> <u>Control Systems</u> May 7-11, 2007
- <u>Towards a Systematic Approach to</u> <u>Embedded System Design</u> *April 20th, 2007*
- NeRES 2007 April 2nd, 2007
- <u>Real-Time Microcontroller Systems: OSEK</u>



- <u>Artist2 / UNU-IIST School in China 2007</u> August 1-10, 2007
- FCC 2007 July 4-5, 2007
- <u>ARTIST WS: Tool Platforms for ES</u> <u>Modelling, Analysis and Validation</u> July 1-2, 2007
- 4.3.3 Previous ARTIST Workshops in 2006
- <u>ARTIST2 Workshop on Basic Concepts in</u> <u>Mobile Embedded Systems</u> December 4-5, 2006
- <u>ARTIST2 Workshop on Timing Analysis in</u> <u>the Industrial Development Process (ISoLA</u> <u>2006)</u> November 17th, 2006
- <u>MoCC Models of Computation and</u> <u>Communication</u> November 16-17, 2006
- <u>Artist2 Foundations and Applications of</u> <u>Component-based Design</u> October 26th, 2006
- <u>WESE'06 Embedded Systems Education</u> October 26th, 2006
- ATVA China 2006 October 23-26, 2006
- <u>First European Laboratory on Real-Time</u> and Control for Embedded Systems July 10-14, 2006
- <u>CORDIE'06: Concurrency, Real-Time and</u> <u>Distribution in Eiffel–like Languages</u> July 4-5, 2006
- 4.3.4 Previous ARTIST Workshops in 2005
- <u>ARTIST2 Summer School 2005</u> September 29th - October 2nd 2005
- <u>WESE'05 ARTIST2 Workshop on</u> <u>Embedded Systems Education</u> September 22nd, 2005
- <u>31st EUROMICRO Conference Special</u> <u>session: Model Driven Engineering (MDE)</u> August 30th - September 3rd 2005
- <u>ACM-IEEE MEMOCODE'2005</u> July 11-14, 2005
- <u>IST/NSF: Transatlantic Research Agenda</u> on Future Challenges in Embedded <u>Systems Design</u> July 8th, 2005

Standard and experiments on µcontroller devices March 26-28, 2007

- <u>ARTIST2 MOTIVES 2007</u> February 19-23, 2007
- <u>ARTIST2 Workshop on Requirements for</u> <u>Flexible Scheduling in Complex Embedded</u> <u>Systems</u> June 16th, 2006
- <u>ARTIST2 Workshop on Execution Platforms</u> / <u>Cluster Meeting</u> May 22-23, 2006
- <u>ARTIST2 Workshop on Specification and</u> <u>Verification of Secure Embedded Systems</u> *May 18th, 2006*
- <u>ARTIST2 / UNU-IIST Spring School in</u> <u>China 2006</u> April 3-15, 2006
- <u>ARTIST2 Graduate Course on Embedded</u> <u>Control Systems</u> April 3-7, 2006
- <u>ARTIST2 Workshop Beyond AutoSar</u> March 23-24, 2006
- <u>ARTIST Workshop at DATE'06</u> March 10th, 2006

- <u>EU/US: Component-based Engineering for</u> <u>Embedded Systems</u> July 7th, 2005
- <u>ARTIST Seminar on Adaptive Real-Time</u> <u>Systems</u> June 20-23, 2005
- <u>ARTIST Workshop at DATE'05</u> March 11th, 2005
- First S.Ha.R.K. Workshop February 28th -March 4th 2005



5. Keynotes, Tutorials provided to the Embedded Systems Community

ArtistDesign partners have a very deep impact on the global embedded systems community, as is attested in the following direct contributions.

5.1 Modeling and Validation

5.1.1 Modeling

Keynote: Reliable Embedded Multimedia Systems? Twan Basten - Computer Engineering Seminar, University of Wisconsin - Madison, Madison, WI, 21 September 2009 http://homepages.cae.wisc.edu/~saluja/seminars/schedule.html

Keynote: Reliable Run-time Adaptation in Resource-constrained Embedded Systems *Twan Basten - Royal Institute of Technology (KTH), Stockholm, Sweden, 25 May 2009*

Keynote: Reliable Run-time Adaptation in Resource-constrained Embedded Systems *Twan Basten - ECE Seminar, Carnegie Mellon University, Pittsburgh, PA, 17 September 2009* <u>www.ece.cmu.edu/news/seminar/2009/fall/basten_09_17_09.pdf</u>

Keynote: Design-Space Exploration of High-Tech Embedded Systems Twan Basten - ESI Symposium, Eindhoven, Netherlands, 8 December 2009 http://www.esi.nl/frames.html?/events/esi_symposium_2009/

Keynote: Reliable Dynamic Embedded Data Processing Systems

Twan Basten - IPA Fall Days on Quantitative Methods for Embedded Systems, Noordwijk aan Zee, Netherlands, 26 November 2009 http://www.win.tue.nl/ipa/activities/falldays2009

Keynote: Reliable Run-time Adaptation in Resource-constrained Embedded Systems *Twan Basten - CeDICT Workshop on Dependable ICT Systems, Utrecht, Netherlands, 24 April* 2009

http://nirict.3tu.nl/meetings-nirict/24-04-09CeDICT/

Keynote: Dataflow Analysis Revisited

Twan Basten - ST-Ericsson, Eindhoven, 19 February 2009

Keynote: Modeling and Exploration of Printer Data-Paths

Roelof Hamberg - ESI Symposium, Eindhoven, Netherlands, 8 December 2009 http://www.esi.nl/frames.html?/events/esi_symposium_2009/

Keynote: A Performance Analysis Tool for Scenario-Aware Streaming Applications Bart Theelen - IPA Fall Days on Quantitative Methods for Embedded Systems, Noordwijk aan Zee, Netherlands, 25 November 2009 http://www.win.tue.nl/ipa/activities/falldays2009

Keynote: "A profile for embedded systems development"

Sébastien Gérard and Huascar Espinoza. Invited Talk. 4th International School on MDD for



Distributed, Realtime and Embedded systems, Aussois (France), 20-24 April 2009. <u>http://www.mdd4dres.info/</u>

Keynote: From Boolean to Quantitative System Specifications

Tom Henzinger - Invited talk - Workshop on Quantitative Analysis of Software (QA'09), on June 28, 2009 in Grenoble, France http://www.eecs.berkeley.edu/~sseshia/ga09/

Keynote: "Multiparadigm modeling in the Mechatronics domain"

Martin Törngren. *Invited Talk.* Bellairs Computer Automated Multi-Paradigm Modeling workshop 2009. <u>http://msdl.cs.mcgill.ca/conferences/CAMPaM/2009/</u>

Keynote: " "What are visionary and futuristic domains where advances in CPS will have broad impact?""

Christoph Kirsch, *Invited Panelist.* CPSWEEK 2009, San Francisco <u>http://varma.ece.cmu.edu/CPS-Forum/</u> and <u>http://varma.ece.cmu.edu/CPS-Forum/Presentations/Kirsch.pdf</u>

Keynote: Collaborate to Innovate, by Alberto Sangiovanni Vincentelli, annual customer meeting TSMC

San Jose', April 21st

This is the annual conference held by TSMC in United States. This year there were more than 2,000 attendants from all over the world. The keynote addressed the issues of system level design and the novel direction of research in the area of advanced electronics and energy efficient buildings. The angle taken was that the new challenges for the electronic and system industry can only be tackled with rigorous design methodologies and tools that support collaboration.

Lectio Magistralis: EDA: 40 years of innovation, by Alberto Sangiovanni Vincentelli Strathclyde University, Glasgow, August 10, 2009

This lecture was given to the members of the Royal Society of Edinburgh and to other invited guests in the occasion of the Maxwell Award ceremony. Alberto Sangiovanni Vincentelli presented how EDA was born and what were its early challenges. In addition, the raise of the EDA industry and the key contributions to the field were outlined.

Symposium: European Universities and Researchers as Sources of Innovation in Finland, Italy and Silicon Valley

European Entrepreneurship & Innovation Thought Leaders Seminar, Stanford University,04/09 Alberto Sangiovanni Vincentelli presented his view on the innovation scenarios in US and Europe and what can be done to improve the communication between the two innovation communities especially in the area of embedded systems.

Keynote: Component-based construction of real-time systems in BIP.

Joseph Sifakis. -- 21st International Conference, CAV 2009, Grenoble, June 2009 http://www-cav2009.imag.fr/

Keynote: The quest for correctness-beyond a posteriori verification. Joseph Sifakis. -- 16th International SPIN Workshop, Grenoble, June 2009 http://ti.arc.nasa.gov/event/spin09/

Keynote: Embedded systems design - Scientific challenges and work directions. Joseph Sifakis. – DATE 2009, Nice, April 2009 <u>http://www.date-conference.com/date09/</u>



Keynote: Component-Based Construction of Heterogeneous Real-Time Systems in BIP.

Joseph Sifakis. – Petri Nets 2009, Paris, June 2009 http://petrinets2009.lip6.fr/

Keynote: Embedded systems design - Scientific challenges and work directions.

Joseph Sifakis. – SEFM 2009, Hanoi, November 2009 http://www.iist.unu.edu/sefm2009/

Conference: International Conference on Embedded Software (EMSOFT)

Grenoble -- October 12 - 16, 2009

The International Conference on Embedded Software (EMSOFT) brings together researchers and developers from academia, industry, and government to advance the science, engineering, and technology in embedded software development. EMSOFT is part of the 2009 Embedded Systems week.

http://www.emsoft.org/

Conference : ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES 2009)

Dublin, Ireland, June 19-20, 2009

The ArtistDesign-supported ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES) continued in 2009 its tradition of being the premier forum for presentation of research results on leading edge issues in embedded systems. The CfP attracted 81 submissions including 31 papers from the Americas, 33 from Europe, and 17 papers from Asia. Each paper was reviewed by 3 PC members and 1 external reviewer. The PC accepted 18 papers that cover a variety of topics, including programming languages and compiler optimizations, scheduling, architectures and multicores, and runtime system support in embedded systems.

http://www.cse.psu.edu/lctes09/

Workshop : ArtistDesign Workshop on Embedded Systems in Healthcare 2009 *Eindhoven, The Netherlands, 7 December 2009.*

The goal of the Workshop on Embedded Systems in Healthcare is to strengthen the connections between academic research and industry, or to be more precise, to increase the understanding in the academic world of industrial issues in embedded systems engineering and together come to a shared agreement on research directions that seem worthwhile to pursue. The speakers at the workshop work at different medical companies or are participants in the ArtistDesign network with extensive experience in healthcare. The topics include "How to design long lasting devices for a fast changing world?", "Cochlear Implant Systems: today's challenges in embedded firmware design", and "Embedded Contributions to an Intensive Care Safety Concept".

http://www.artist-embedded.org/artist/WESH-2009.html

Workshop : 2nd International Workshop on Model Based Architecting and Construction of Embedded Systems (ACES^{MB} 2009)

ACM/IEEE 12th Int. Conf. on Model Driven Engineering Languages and Systems *Denver, Colorado, USA – October 6th, 2009*

The development of embedded systems with real-time and other critical constraints raises distinctive problems. In particular, development teams have to make very specific architectural choices and handle key non-functional constraints related to, for example, real-time deadlines and to platform parameters like energy consumption or memory footprint. In this context, the last few years have seen an increased interest in using model-based engineering (MBE) techniques. MBE techniques are interesting and promising for the following reasons: They allow to capture dedicated architectural and non-functional information in precise (and even

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formal) domain-specific models, and they support a layered construction of systems, in which the (platform independent) functional aspects are kept separate from architectural and nonfunctional (platform specific) aspects, where the final system is obtained by combining these aspects later using model transformations. The topics handled in the workshop were: Architecture description languages (ADLs); Domain specific design and implementation languages; Languages for capturing non-functional constraints; Component languages and system description languages.

http://www.artist-embedded.org/artist/Overview,1706.html

Workshop : Second IEEE International workshop UML and Formal Methods 11th International Conference on Formal Engineering Methods

Rio de Janeiro, Brasil – December 8th, 2009

Many interest groups from a research perspective are in favour of the creation of this workshop. For more than a decade now, the two communities of UML and formal methods have been working together to produce a simultaneously practical (via UML) and rigorous (via formal methods) approach to software engineering. UML is the de facto standard for modelling various aspects of software systems in both industry and academia, despite the inconvenience that its current specification is complex and its syntax imprecise. The fact that the UML semantics is too informal have led many researchers to formalize it with all kinds of existing formal languages, like OCL, Z, B, CSP, VDM, Petri Nets, UPPAAL, HOL, Coq, PVS etc. This second workshop will be open to various subjects as the main objective is to encourage new initiatives of building bridges between informal, semi-formal and formal notations. http://www.artist-embedded.org/artist/Overview,1663.html

Workshop : Fourth IEEE International workshop UML and AADL

14th International Conference on Engineering of Complex Computer Systems *Potsdam, Germany – June 2nd, 2009*

New real-time systems have increasingly complex architectures because of the intricacy of the multiple interdependent features they have to manage. They must meet new requirements of reusability, interoperability, flexibility and portability. These new dimensions favour the use of an architecture description language that offers a global vision of the system, and which is particularly suitable for handling real-time characteristics. Due to the even more increased complexity of distributed, real-time and embedded systems (DRE), the need for a model-driven approach is more obvious in this domain than in monolithic RT systems. The purpose of this workshop is to provide an opportunity to gather researchers and industrial practitioners to survey existing efforts related to behaviour modelling and model-based analysis of DRE systems.

http://www.artist-embedded.org/artist/Overview,1579.html

Workshop: Dagstuhl Seminar "Design and Validation of Embedded Systems"

Dagstuhl -- September 30 - October 4, 2009

The aim of this seminar was to discuss topics related to systems with concurrency in a broad set of application domains. We had a broad participation reflecting the various approaches to the problem, including language design, compiler construction, program analysis, formal methods, and testing. To focus the discussions, the seminar also included participants from application areas (embedded reactive systems, robotics, middleware, operating systems, and virtual machines) who have strong interests in verification. We hope these discussions inspired researchers to come up with long-term and practical solutions for the design and verification of concurrent systems. The seminar gathered almost 50 participants.

http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=09361



Workshop: 2nd International Workshop on Verification and Validation of Planning and Scheduling Systems

Toulouse -- September 29th, 2009

This ARTIST workshop is held in conjunction with ICAPS 2009. Verification techniques, such as model checking, and planning techniques have many commonalities. Planning and scheduling (P&S) systems are finding increased application in safety- and mission-critical systems that require a high level of assurance. Experience has shown that most errors are in domain models, which can be inconsistent, incomplete or inaccurate models of the target domains. However tools and methodologies for verification and validation (V&V) of P&S systems have received relatively little attention. The objective of this workshop is to maintain an interaction between the V&V and P&S communities, to identify specialized and innovative V&V tools and methodologies that can be applied to P&S. Topics of interest include: V&V of domain models, using technologies such as static analysis, theorem proving, and model checking; consistency and completeness of domain models; domain model coverage metrics; regression, stress and boundary testing; runtime verification of plan executions; generation of robust plans; compositional verification of domain models; how to structure domain models which are more amenable to static analysis; inspection methods; the relationship between timed automata and domain models; investigations of the impact wrt. V&V of procedural versus declarative plan models: etc..

http://www-vvps09.imag.fr/

5.1.2 Validation

Conference: 21th International Conference on Computer-Aided Verification Grenoble – June 26th- July 2nd, 2009

Verimag has organised CAV 2009, the major conference on computer-aided verification which had been held for the first time in Grenoble 20 years ago. The conference and its satellite workshops have attracted more than 350 participants for a period of week, and featured many embedded-oriented presentations.

http://www-cav2009.imag.fr/

Workshop: 9th International Workshop on Runtime Verification

Grenoble – June 26th- June 28th, 2009

This ARTIST workshop is held in conjunction with CAV 2009, the objective of RV'09 is to bring scientists from both academia and industry together to debate on how to monitor and analyze the execution of programs, for example by checking conformance with a formal specification written in temporal logic or some other form of history tracking logic. The purpose might be testing a piece of software before deployment, detecting errors after deployment in the field and potentially triggering subsequent fault protection actions, or the purpose can be to augment the software with new capabilities in an aspect oriented style. The longer-term goal is to investigate whether the use of lightweight formal methods applied during the execution of programs is a viable complement to the current heavyweight methods proving programs correct always before their execution, such as model checking and theorem proving. This year's workshop is organized as a satellite event of CAV.

http://www-rv2009.imag.fr/

Workshop: 2nd International Workshop on Verification and Validation of Planning and Scheduling Systems



Toulouse -- September 29th, 2008

This ARTIST workshop is held in conjunction with ICAPS 2009. The first VVPS workshop was held with ICAPS in 2005 in Monterey, California: http://planning.cis.strath.ac.uk/vvpsws. Verification techniques, such as model checking, and planning techniques have many commonalities. Planning and scheduling (P&S) systems are finding increased application in safety- and mission-critical systems that require a high level of assurance. Experience has shown that most errors are in domain models, which can be inconsistent, incomplete or inaccurate models of the target domains. However tools and methodologies for verification and validation (V&V) of P&S systems have received relatively little attention. The objective of this workshop is to maintain an interaction between the V&V and P&S communities, to identify specialized and innovative V&V tools and methodologies that can be applied to P&S. Topics of interest include: V&V of domain models, using technologies such as static analysis, theorem proving, and model checking; consistency and completeness of domain models; domain model coverage metrics; regression, stress and boundary testing; runtime verification of plan executions; generation of robust plans; compositional verification of domain models; how to structure domain models which are more amenable to static analysis; inspection methods; the relationship between timed automata and domain models; investigations of the impact wrt. V&V of procedural versus declarative plan models; etc..

http://www-vvps09.imag.fr/

Automatic test generation of Reactive and timed systems, T. Jéron MSR'09 (<u>http://msr09.irccyn.ec-nantes.fr/</u>), Nantes, France French colloquium on modelling, analysis and command of reactive and real-time systems.

Automatic test generation of Reactive and timed systems, T. Jéron ETR'09 summer school (Ecole d'été Temps réel, <u>http://etr09.telecom-paristech.fr/</u>), Paris, France, 31/08-04/09. Summer school on methods, techniques and tools for real-time systems.

EJCP (Ecole Jeunes Chercheurs en Programmation, <u>http://ejcp2009.inria.fr/</u>) Rennes, France, June 2009. Summer school organized by V. Rusu on modelling, analysis of computer systems.

GASICS Workshop on Games for Design, Verification and Synthsis. Co-located with CAV'09, Grenoble, June 28, 2009. <u>www.lsv.ens-cachan.fr/Events/gasics09/</u>

<u>GASICS</u> is an ESF project of the <u>EUROCORES programme LogICCC</u> (Modelling intelligent interaction – Logic in the Humanities, Social and Computational sciences). It studies game theoretic formalizations of interactive computational systems and algorithms for their analysis and synthesis. Our aim is to extend the existing notions of games played on graphs introduced by computer scientists. Currently, most of the games played on graphs are of the sort "two-player zero-sum", we aim to extend them to "multiple-player non-zero-sum", and show the applicability of the new theory to the analysis and synthesis of interactive computational systems.

The aim of this workshop is to bring together researchers working on game-related subjects, and to discuss on various aspects of game theory in the fields where it is applied. The workshop will be composed of two invited talks, together with contributed talks on the following (non-exhaustive) list of relevant topics:

- Adapted notions of games for synthesis of complex interactive computational systems
- Games played on complex and infinite graphs



- Games with quantitative objectives
- Game with incomplete information and over dynamic structures
- Heuristics for efficient game solving.

QUANTLOG Workshop on Quantitative Logics July 11, 2009, Rhodes, Greece Satelite event of ICALP 2009 *guantlog09.web.auth.gr/*

The Workshop on Quantitative Logics (QUANTLOG 2009) will take place in Rhodes, Greece, July 11, 2009 as a satellite event of the 36th International Colloquium on Automata, Languages and Programming (ICALP 2009). It is organized under the auspices of the <u>Department of Mathematics</u> of the <u>Aristotle University of Thessaloniki</u>. The aim of the workshop is to provide a forum for researchers interested in the topic of quantitative logics to present their new results and to combine their efforts in the further development of the topic, with emphasis to its connection with automata theory as well as to practical applications.

Invited Tutorial: Validation, Performance Analysis and Synthesis of Embedded Systems Kim G. Larsen, ARTIST Summer School in Europe, September 7-11, 2009, Autrans, France

Keynote: Verification and Performance Analysis of Embedded Systems Kim G. Larsen, TASE, 3rd IEEE International Symposium on Theoretical Aspects of Software Engineering, July 29 - 31, 2009, Tianjin, China

Invited Tutorial: *Real-Time Systems Validation and Synthesis* Kim G. Larsen, ARTIST Summer School in China, July 19-24, 2009, Tsinghua University, Beijing, China

Invited Tutorial: *Real-Time Systems Validation and Synthesis* Kim G. Larsen, Software Engineering Summer School, July 15-22, SEI East China Normal University, Shanghai, China

Invited Talk: Quantitative and Compositional Model Checking Kim G. Larsen, Seventh International Andrei Ershov Memorial Conference, June 15-19, 2009, Novosibirsk, Russia,

Invited Talk: Verification and Performance Analysis of Real-Time and Embedded Systems Kim G. Larsen, Joint China/Denmark Symposium on ICT, April 21-23, 2009, Odd Fellow Palæ, Copenhagen.

Keynote: Verification and Controller Synthesis of Real-Time Systems Kim G Larsen. 3rd International Conference on Fundamentals of Software Engineering, FSEN09, April 15-17, Kish Island, Iran

Invited talk Kim G. Larsen Formal Methods for Components and Objects (FMCO'09)

Invited Talk: *Playing Games with Timed Interfaces* Kim G Larsen COMBEST meeting on Interfaces, Rennes, France, March 3-4 2009. Invited Talk: *Probabilistic Modal Transition Systems*

Kim G. Larsen, COMBEST meeting on Interfaces, Rennes, France, March 3-4 2009. Keynote: *"Timing and Performance Analysis: Static Analysis versus Model Checking"*



Invited talk Joost-Pieter Katoen Nordic Workshop on Programming Theory

Invited talk Joost-Pieter Katoen IFIP WG 2.2 on Programming Concepts and Methodology

Invited talk Joost-Pieter Katoen CDC Workshop on Stochastic Hybrid Systems

Invited talk Joost-Pieter Katoen Formal Methods for Components and Objects (FMCO'09)

Invited talk Joost-Pieter Katoen Soiree FMWeek 2009

5.2 Software Synthesis, Code Generation and Timing Analysis

5.2.1 Software Synthesis and Code Generation

Tutorial: S. Mamagkakis and P. R. Panda 'Memory Architectures and Software Transformations for System Level Design', ASP-DAC 2009

Yokohama, Japan, - January, 2009

In this tutorial a memory-aware system level design flow was presented that can address strict power and performance budgeting problems by customizing both the underlying memory architectures/organizations, as well as by transforming the system-level source code to generate an input for system-level design that is better tuned to the memory architectures and organizations. Such a "memory-aware" system level design flow can result in LSI designs exhibiting superior performance, power and memory footprint characteristics.

http://www.aspdac.com/aspdac2009/tutorial/

Course: Peter Marwedel, Rainer Leupers: Retargetable Compilation

Lugano, Switzerland, Feb. 16-19 & Feb 23-25, 2009

The course consisted of two parts: the first part (by Peter Marwedel) focused on memoryarchitecture aware compilation. The second part (by Rainer Leupers, RWTH Aachen) focused on processor retargetability. The course was supported by ALARI.

http://www.alari.ch

Invited talk: From Embedded Systems to Cyber-Physical Systems: Does the Name Change Matter? – Inauguration of the Uppsala Programming for Multicore Architectures Research Center (UPMARC)

Uppsala, Sweden, March 26, 2009 Objectives: Providing an overview over Embedded Systems Research at Dortmund Speaker: Peter Marwedel (TU Dortmund) http://www.it.uu.se/research/upmarc/inauguration

SPECIAL SESSION – Programming MPSoC Platforms: Roadworks Ahead! (Multicore Applications Special Day) DATE 2009

Nice, France, – April 23, 2009

This panel session was organized by R. Leupers (RWTH Aachen) and moderated by M. de Lange (ACE). The goal of this session was to consolidate today's different MPSoC programming approaches, and to provide focus for future R&D activities. M. Bekooij from NXP also participated in this special session.

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http://www.date-conference.com/date09/conference/date09-session-12-1

Workshop: Software & Compilers for Embedded Systems (SCOPES) 2009

Nice, France – April 23-24, 2009

SCOPES focuses on the software generation process for modern embedded systems. Topics of interest include all aspects of the compilation process, starting with suitable modelling and specification techniques and programming languages for embedded systems. The emphasis of the workshop lies on code generation techniques for embedded processors. The exploitation of specialized instruction set characteristics is as important as the development of new optimizations for embedded application domains. Cost criteria for the entire code generation and optimization process include run time, timing predictability, energy dissipation, code size and others. Since today's embedded devices frequently consist of a multi-processor system-on-chip, the scope of this workshop is not limited to single-processor systems but particularly covers compilation techniques for MPSoC architectures.

In addition, this workshop puts a spotlight on the interactions between compilers and other components in the embedded system design process. This includes compiler support for e.g. architecture exploration during HW/SW codesign or interactions between operating systems and compilation techniques. Finally, techniques for compiler aided profiling, measurement, debugging and validation of embedded software were also covered by this workshop, because stability of embedded software is mandatory.

SCOPES 2009 was the 12th workshop in a series of workshops initially called "International Workshop on Code Generation for Embedded Processors". The name SCOPES has been used since the 4th workshop. The scope of the workshop remains software for embedded systems with emphasis on code generation (compilers) for embedded processors.

SCOPES 2009 was organized by Heiko Falk from TU Dortmund and was held as DATE Friday Workshop. There were many discussions between cluster members at SCOPES (starting already on the eve before the sessions), at DATE, making the entire week the key joint event in spring.

http://www.scopesconf.org/scopes-09

Meeting: 2nd Workshop on Mapping Applications to MPSoCs, 2009

St. Goar, Germany - June 29-30, 2009

This is the flagship workshop of this cluster. For the second edition, it was possible to attract researchers from all over the world as presenters. For example, Soonhoi Ha of Seoul National University presented his work on the HOPES system. Also, Jürgen Teich from the University of Erlangen-Nürnberg presented his work on the SystemCoDesigner. New presenters also included Tajana Simunic (UCSD) and Qiang Xu from the Hong Kong City University. This way, we managed to establish links to key researchers outside the network and potential new affiliate members. A discussion on benchmarks was started. The workshop is now a key forum for discussions in this area. Attendees expressed their strong interest to continue this series of informal workshops as a platform for discussions.

http://www.artist-embedded.org/artist/-map2mpsoc-2009-.html

Keynote: S. Mamagkakis 'Emerging multicore hardware platforms and their software support challenges', ECRTS 2009

Dublin, Ireland, – July, 2009

In this keynote talk, the latest developments and future directions of hardware MPSoC platforms for nomadic embedded applications were presented. Next to the hardware perspective, the software related challenges of these emerging MPSoC platforms were discussed and some of the proposed parallelization and memory hierarchy management



solutions were evaluated. This keynote is also relevant for the Scheduling and Resource Management activity.

http://ecrts09.dsg.cs.tcd.ie/keynote-speaker.php

Special Series of presentations: P. Marwedel: Overview of work from Dortmund

Seoul (Korea), Fukuoka (Japan), Singapore, Delhi (India), – Aug. 3-14, 2009

In a special sequence of presentations, P. Marwedel provided a survey of research work from Dortmund, including work in the ArtistDesign context, at Samsung (Seoul, Korea), Seoul National University (Korea), Kyushu University (Fukuoka, Japan), NTU and NSU Universities (Singapore) and IIT Delhi (India).

Invited Talk: P. Marwedel: 7th IEEE East-West Design & Test Symposium – EWDTS'09

Moscov, Russia, - Sept. 19.2009

This talk provided an overview over research activities in the "Design Automation for Embedded Systems" group at TU Dortmund.

http://www.ewdtest.com/conf/

Workshop: 5th Workshop on Embedded Systems Education, 2009

Grenoble, France, – October 15, 2009

Embedded system education is still a very young area and frequently restricted to teaching the details of microcontroller programming. A long-term objective of this workshop is to improve the visibility of work in the area and to stimulate the introduction of broader curricula. In 2009, P. Marwedel was the main organizer of the workshop. Visibility was improved by the inclusion of the proceedings in the ACM digital library. Presenters included top researchers from the US and Asia. Attendees were extremely satisfied with the quality of the presentations.

http://www.artist-embedded.org/artist/-WESE-09-.html

Workshop: 1st Workshop on Software Synthesis, 2009

Grenoble, France, - October 16, 2009

An increasing amount of software is not written manually any more. Rather, software is synthesized from abstract models of the required functionality. Software synthesis has been implemented in various disperse communities. The workshop aimed at bringing these communities together. Presenters at this workshop presented industrial as well as academic results. Attendees agreed on the necessity of more work in this area. The workshop was organized by P. Marwedel and A. Sangiovanni-Vincentelli.

http://www.artist-embedded.org/artist/-WSS-09-.html

Invited Talk: C. Lengauer on the proposal "Manycore" for a DFG National Research Intiative, Yearly Meeting: GI Working Group for Software Engineering for Parallel Systems (SEPARS)

Saarbrücken, Germany, -- November 6, 2009

The talk stressed the necessity for a national research initiative on the topic of Manycore software technology. It also sketched a number of new opportunities that manycore platforms offer. At the meeting, Lengauer was elected onto the Board of SEPARS.

Invited Talk: P. Marwedel: IP – Embedded Systems Conference

Grenoble, France, - Dec. 3, 2009

This talk provides an overview over results presented at the first two Rheinfels workshops on mapping applications to MPSoCs.

http://www.design-reuse.com/ipesc09/program/

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5.2.2 Timing Analysis

Invited Talk: Predictable Multi-Cores Verimag – February 13, 2009 Reinhard Wilhelm was invited to give this talk at a local colloquium at Verimag to explain the PROMPT design principles on predictable multi-core architectures.

Keynote: The PROMPT Design Principles for Predictable Multi-Core Architectures SCOPES

Nice - April 24, 2009

Reinhard Wilhelm gave at keynote at the SCOPES conference on the PROMPT design principles invented in the PREDATOR project. These principles are designed to facilitate the development of multi-core architectures to with efficiently predictable good worst-case performance. The talk presented the development process and its connections to established industrial standards and trends such as Integrated Modular Avionics (IMA) and the Automotive Open System Architecture (AUTOSAR).

< http://www.scopesconf.org/scopes-09/keynote.html>

ARTIST Summer School in Europe 2009

Autrans – September 7-11, 2009 The Artist Summer School included invited talks by several researchers, including Luca Benini, Jan Beutel, Jan Reineke, Lothar Thiele and Reinhard Wilhelm. <<u>http://www.artist-embedded.org/artist/Overview,1633.html</u>>

Workshop: Shape Analysis, Timing Analysis PUMA Workshop

San Servolo Island, Venice - Oct. 5-6, 2009

Reinhard Wilhelm gave talks on Shape Analysis and on Timing Analysis at the PUMA workshop. This workshop is an annual event held by the PUMA Graduate School of LMU (Ludwig-Maxmilians-Universität, Munich) and TU Munich. < http://puma.in.tum.de/wiki/Venice 2009>

Keynote: Embedded Systems - Trends, Successes, Challenges 10th Anniversary of the Hasso-Plattner Institute

Potsdam - Nov. 18, 2009

To celebrate its 10th anniversary, the Hasso-Plattner-Institute holds a conference "Informatik-Impulse". Reinhard Wilhelm is invited to present an overview of the challenges in embedded systems world and to give an outlook onto future developments.

Keynote: Timing Analysis and Timing Predictability

Tag der Informatik

RWTH Aachen – December 4, 2009

Reinhard Wilhelm is invited to give a talk introducing timing analysis and timing predictability in embedded systems. The current challenges and existing timing analysis algorithms will be discussed as well as the additional challenges posed by multi-core systems and approaches to achieve predictability for them.

< http://www.nets.rwth-aachen.de/content/current_events/tdi/pro/index.html>



Keynote : From Performance to Time-Predictability 9th Architectures and Compilers for Embedded Systems (ACES) Symposium Edegem, Belgium – September 7-8, 2009

This keynote was given by Peter Puschner (TU Vienna). It outlined the problems of building predictable hardware/software systems and discussed strategies for constructing systems that provide both temporal predictability and performance.

http://www.elis.ugent.be/aces/index.php?page=activities

Invited Talk : Timing Analysis of Real-Time Software Workshop on Quantitative Analysis of Software

Grenoble, France – June 28, 2009

This invited presentation was given by Raimund Kirner. It gave insights into the principles of worst-case execution time analysis and explained current challenges, including transformation of flow information and hardware modelling in the presence of timing anomalies. Further, our research on measurement-based timing analysis was presented.

http://www.eecs.berkeley.edu/~sseshia/qa09/

Workshop : 9th Int'l Workshop on Worst-Case Execution Time Analysis (WCET'09)

Dublin, Ireland – June 30th, 2009

On June 30, 2009, thirty-five people from nine countries and three continents met in Trinity College, Dublin, to hold the 9th International Workshop on Worst-Case Execution Time Analysis (WCET'09, <u>http://www.artist-embedded.org/artist/WCET-2009.html</u>). The workshop was organised as a satellite event of the 21st Euromicro Conference on Real-Time Systems (ECRTS'09, <u>http://ecrts09.dsg.cs.tcd.ie</u>). ArtistDesign supported the workshop by paying the travel costs of the invited speaker, Prof. Petru Eles (Linköping) and the workshop chair, Dr. Niklas Holsti (Tidorum Ltd),. and the costs of printing and distributing the proceedings ("Worst-Case Execution Time Analysis", ISBN 978-3-85403-252-6, books@ocg.at, Volume 252). ArtistDesign participants presented several of the workshop papers.

Tutorial : Multicore and Hard Real-Time Systems Swedish Multicore Day

Kista, Sweden – Sept 4, 2009

This tutorial was given by Björn Lisper, and was primarily directed to practitioners in industry. It described the inherent problems with timing predictability for conventional multicore architectures, and gave an account for ongoing research in the area. http://www.sics.se/multicoredays

Tutorial : WCET Analysis: Problems, Methods and Time-Predictable Architectures Acaces 2009. Fifth International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems

Terrassa (near Barcelona), Spain – July 12-18, 2009

The annual ACACES summer school is organized by the European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC). The invited tutorial on WCET analysis and time-predictable hardware/software architectures was given by Peter Puschner (TU Vienna).

http://www.hipeac.net/acaces2009/



5.3 Operating Systems and Networks

5.3.1 Resource Aware Operating Systems

Keynote: Enrico Bini (SSSA): "Real-Time Scheduling for Control Systems" 17th International Conference on Real-Time and Network Systems (RTNS 2009) Paris, France – October 26th, 2009

The talk presented an overview of the techniques that can be used to design control systems taking performance requirements and schedulability constraints into account.

http://rtns09.ece.fr/index_fichiers/Schedule.html - Speaker

Tutorial: Graduate Course on Embedded Control Systems: Theory and Practice

Scuola Superiore Sant'Anna, Pisa, Italy – June 8-12, 2009

<u>Objectives</u>: The course was aimed at providing the fundamentals concepts of real-time computing systems, including scheduling, resource management and timing analysis; introducing the OSEK/VDX standards, taking as a reference implementation the Erika Enterprise kernel; showing how to apply such concepts in practice, with examples based on the Flex platform and the Microchip dsPIC DSC microcontrollers; teaching participants how to develop simple control applications using Erika Enterprise with code generation from functional models.

<u>Organizers:</u> Giorgio Buttazzo (Scuola Superiore Sant'Anna), Karl-Erik Arzen (Lund University), Luis Almeida (University of Porto), Ettore Ricciardi (ISTI-CNR, Pisa).

URL: http://www.artist-embedded.org/artist/ARTIST-Embedded-Control-2009.html

Workshop: CyberRescue@RTSS2009

Washington DC, December 1, 2009

<u>Objectives</u>: CyberRescue@RTSS2009 is an international competition for simulated robotic agents that is held in conjunction with the Real-time Systems Symposium (RTSS'09) in Washington DC. The event is sponsored by the ArtistDesign NoE.

Organizers: Tullio Facchinetti (University of Pavia) and Luis Almeida (University of Porto).

URL: http://robot.unipv.it/cyberrescue-RTSS09/

Workshop: XII Spanish workshop on Real-Time Systems

UC3-Madrid, 5-6 february 2009 Yearly workshop for researchers on Real-Time Systems

Tutorial: Software models for distributed real-time data distribution in avionics

Getafe (Madrid), Spain – 28th October, 2009 Master on Aircraft Systems Integration, EADS-UC3M Airbus center, organized by Marisol García-Valls, UC3M.

PROMETEO (Spanish National Industry Platform on Embedded Systems)

Madrid, SPAIN – October 28th, 2009 Presentation of iLAND project to National researchers and Industry.

ARTEMIS Autum Event (Held joinly with ITEA2)

Madrid, SPAIN – October 29-30, 2009



Presentation of iLAND project to European and National Authorities and Industrial and Research community.

JPASE

5.3.2 Scheduling and Resource Management

Keynotes

Alan Burns,

Adaptive/reconfigurable servers,

Compositional Theory and Technology for Real-Time Embedded Systems (CRTS,2009), Washington, USA, December 2nd, 2009.

Stylianos Mamagkakis Emerging multicore hardware platforms and their software support challenges, 21st EUROMICRO Conference on Real-Time Systems - ECRTS 2009, Dublin, Ireland, July 2nd, 2009 http://ecrts09.dsg.cs.tcd.ie/keynote-speaker.php

Stylianos Mamagkakis

Adaptive solutions for the emerging reliability and multicore resource management challenges, 2nd Workshop on Adaptive and Reconfigurable Embedded Systems - APRES 2009, Grenoble, France, October 11th, 2009 within ESWEEK 2009 http://www.artist-embedded.org/artist/Keynote.html

Marisol García-Valls Software models for distributed real-time data distribution in avionics, Master on Aircraft Systems Integration, EADS-UC3M Airbus center, Getafe (Madrid), October 28th, 2009.

Marisol García-Valls Resource Management for Multimedia Embedded Systems, Master on Industrial Automation and Informatics, Department on Systems Engineering and Automation, Technical University of Valencia, Spain, July 1st-3rd 2009.

Luis Almeida

A Dynamic Scheduling Approach to Designing Flexible Safety-Critical Systems Seminar at the CISTER research Unit, Polytechnic Institute of Porto, Portugal, 5 June 2009.

Workshops

OSPERT 2009

Year 2 D4-(2.0)-Y2



http://www.artist-embedded.org/artist/-OSPERT-2009-.html

Fifth International Workshop on Operating Systems Platforms for Embedded Real-Time Applications, Dublin, Ireland, June 30, 2009.

XII Spanish Workshop on Real-Time Systems

http://www.it.uc3m.es/jtr2009

University Carlos III de Madrid, 5-6 February, 2009.

CRTS 2009

http://www.artist-embedded.org/artist/CRTS-2009.html

Second Workshop on Compositional Theory and Technology for Real-Time Embedded Systems, Washington DC, USA, December 1, 2009.

IRTAW 2009

14th International Real-Time Ada Workshop, Italy, 7-9 September (sponcered in part by ArtistDesign).

Tutorials

Alan Burns

Scheduling and Timing Analysis for Safety Critical Systems

Safety Critical Systems Club (SCSC), London, Oct 2009.

Tutorial focused on verification of the timing properties of safety-critical real-time systems, looking at the standard ways of scheduling and analysing the concurrent software that typically executes within embedded systems. These techniques are crucial for safety-critical systems where there is a need for a high level of assurance that timing constraints will be satisfied in all situations, even those that are very rare.

http://www.safety-club.org.uk/main.html

5.3.3 Real-Time Networks

Invited talk: Mário Alves, Quality of Service in Wireless Sensor Networks: towards the eQualiSer...

Event: 1st Int. School on Cyber-Physical and Sensor Networks - SensorNets 2009 *Monastir, Tunisia – 17-21 December 2009*

Addresses the issues behind the support for Quality of Service in WSNs. <u>http://www.sensornets-school.org</u>

Invited talk: Marisol García-Valls, *Middleware for Avionics* **Event:** Master in Avionic Systems Integration 2008-2009 Airbus Center, *Getafe, Madrid, Spain – 28th October 2009*

Addresses the issues on integrating real-time middleware in ground segments for control of aircraft missions, areas in wich **UC3M** is performing active research.



Invited talk: Luis Almeida, *Mobile Cyber-Physical Systems* **Event:** ArtistDesign Summer School in Europe 2009 *Autrans, France – 7-11 September 2009*

Addresses the issues behind the coordination of small teams of mobile sensing/actuating agents focusing on the wireless communication issues researched by Aveiro and now UnivPorto.

http://www.artist-embedded.org/artist/Programme,1636.html#Almeida

Invited talk : Luis Almeida, *Taming the Flexibility versus Safety Challenge in Distributed Embedded Systems*

Conference name: Seminar at the 1st tubs.CITY Symposium, Tech. Univ. Braunschweig *Braunschweig, Germany – 1-3 July 2009*

Focuses on the flexibility versus safety conflict and addresses several perspectives of flexibility as well as the techniques that were developed in Aveiro to support them.

http://city.tu-braunschweig.de/index.php/en/events/symposium-2009/workshops/embeddedcommunication-

Invited talk : Luis Almeida, *Networks and Middleware* **Event:** Seminar at European Community Embedded Systems Unit *Brussels, Belgium – 18-19 June 2009*

Focuses on the flexibility versus safety conflict and addresses several perspectives of flexibility as well as the techniques that were developed in Aveiro to support them. http://www.artist-embedded.org/artist/Programme,1652.html

Invited talk : Luis Almeida, A Dynamic Scheduling Approach to Designing Flexible Safety-Critical Systems

Institution: Seminar at the CISTER research Unit, Polytechnic Institute of Porto *Porto, Portugal – 5 June 2009*

Focuses on the flexibility versus safety conflict and addresses mainly the scheduling issues. <u>http://www.cister.isep.ipp.pt/activities/SEMINARS/%28S%2825ohbe55j1gkob55jmibsx45%29%</u> <u>29/Distinguished.ashx</u>

Invited talk : Luis Almeida, *Has the time come to flexible safety-critical systems?* Event: Final DySCAS Workshop (FP6-STREP project) *Brussels, Belgium – 18 February 2009*

Raises awareness to the issues related with the flexibility versus safety conflict, the benefits that are associated with a combination of both aspects and the challenges in achieving such combination.

http://www.dyscas.org/final_workshop.htm

Invited talk : Luis Almeida, *Challenges of flexible real-time communication* **Institution:** Doctoral Program, Dep. of Automatic Control and Systems Engineering, University of the Basque Country

Bilbao, Spain – 21 January 2009

States the benefits that are inherent to flexible communication with timing guarantees and the challenges that need to be overcome to achieve it. It is a re-edition of the talk with the same title given at the Artist2 Summer School in Europe 2008, at Autrans.

Workshop : SensorNets 2009 – 1st Int. School on Cyber-Physical and Sensor Networks *Monastir, Tunis – December 17-21, 2009*



This is a three and a half days school focusing on sensor networks and involving a broad set of researchers from that specific community. In particular it has a substantial involvement of the team from **Porto** with the collaboration from other teams within and outside Europe. <u>http://www.sensornets-school.org/</u>

Workshop: APRES 2009 – 2nd Workshop on Adaptive and Reconfigurable Embedded Systems

Conference name : within the ESWEEK 2009 – 2nd Embedded Systems Week *Grenoble, France – October 11, 2009*

This workshop was organized jointly with the Transversal Activity on Design for Adaptivity and with the cooperation of **UnivPorto**, **Mallorca**, **Lund**, University of Pennsylvania - **UPenn** (US) and University of **Waterloo** (Canada). The fact that it is referred in this deliverable reflects the predominance of networking and middleware issues. The materials of the workshop are available online in the workshop website. The proceedings of the workshop were also published as a special section of ACM's **SIGBED Review**

http://www.artist-embedded.org/artist/Overview,1765.html

Workshop : RTN 2009 – 8th Workshop on Real-Time Networks

Conference name : ECRTS 2009 – 21st EUROMICRO Conference on Real-Time Systems *Dublin, Ireland – June 30, 2009*

This workshop was the 8th in its series and focused on the current technological challenges of developing communication infrastructures that are real-time, reliable, pervasive and interoperable. It provides a relaxed forum for discussing those challenges taken has basis a restricted set of papers and a couple of invited keynotes. http://www.hurray.isep.ipp.pt/rtn09/index.php

Tutorial : Luis Almeida, *Real-Time Communication for Embedded Systems* **Institution:** Course at ENSIAS, University Mohammed V *Rabat, Morrocco – 22-24 October, 2009*

18h course covering the concepts, techniques, technologies and applications of real-time networks.

Tutorial : Luis Almeida, *Real-Time Communication in Embedded Systems: Techniques, Technologies and Applications*

Event: ArtistDesign Summer School in China 2009 *Beijing, China – 20-24 July, 2009*

6h course covering the techniques, technologies and applications of real-time networks with a focus on traffic scheduling issues.

http://www.artist-embedded.org/artist/Overview,1630.html

Tutorial : Luis Almeida, Paulo Pedreiras, *Networks for Embedded Control Systems* **Event:** ArtistDesign Graduate Course on Embedded Control Systems: Theory and Practice *Pisa, Italy – 8-12 June, 2009*

4h lecturing covering the techniques, technologies and applications of real-time networks focusing on the protocol stack, plus 1h laboratory for hands-on session. <u>http://www.artist-embedded.org/artist/Overview,1673.html</u>

Tutorial : Mário Alves, *The wireless sensor networks standards and COTS landscape: can we get QoS and "calm technology"?"*



Event: 6th European Conference on Wireless Sensor Networks - EWSN'09 *Cork, Ireland – 11 February, 2009* <u>http://ewsn09.v6testbed.net.</u> <u>http://www.ewsn.org/tutorial.html</u> <u>http://artwise.cister-isep.info/publications.php</u>

5.4 Hardware Platforms and MPSoC

5.4.1 Platform and MPSoC Design

Seminar: Integrated Control-Path Design and Error Recovery in the Synthesis of Digital Microfluidic Biochips

Lyngby, Denmark – October 27th, 2009

Krishnendu Chakrabarty (Duke University) visited DTU on October 27 for a full day workshop with the aim to discuss and plan joint research within the area of biochips. During the event, Krishnendu gave a seminar on "Integrated Control-Path Design and Error Recovery in the Synthesis of Digital Microfluidic Biochips".

Tutorial: Mapping applications onto Multi-Core Platforms ARTIST Summer School in China

Beijing, China - July 19-24, 2009

Jan Madsen gave a tutorial/course on the challenges of mapping applications onto a multi-core platform. The course covered basic and advanced scheduling algorithms for task scheduling on parallel systems. <u>http://www.artist-embedded.org/artist/Overview,1630.html</u>

Mini Keynote : *Mapping bio-chemical applications onto microfluidic-based biochips* 9th International Forum on Embedded MPSoC and Muliticore

Savannah, Georgia, USA – August 2-7, 2009

Jan Madsen gave an in-depth technical presentation on the challenges of mapping biochemical applications onto microfluidic-based biochips. The presentation discussed similarities and new challenges as compred to online dynamic reconfigurability of digital reconfigurable multicore architectures. <u>http://www.mpsoc-forum.org/2009/index.html</u>

Presentation: Identifying Inter-Task Communication in Shared Memory Programming Models

ArtistDesign/HiPEAC2 workshop (IWOMP'09)

Dresden, Germany– June 3-5, 2009

Per Larsen from DTU presented work on extending OpenMP for multicore programming, by having constructs to help identifying the actual inter-task communication. https://iwomp.zih.tu-dresden.de/

Presentation: Data-dependencies and Thread Interaction in Parallel Loops ArtistDesign workshop on Mappinf Applications to MPSoC Schloss Rheinfels, St. Goar, Germany– June 29-30, 2009

Per Larsen from DTU presented the initial work on extending OpenMP for multicore programming. <u>http://www.artist-embedded.org/artist/Overview,1614.html</u>



Workshop: ESTIMedia 2009: Workshop on Embedded Systems for Real-Time Multimedia, October 15-16, 2009, Grenoble, France

The aim of this workshop was to bring together people from different multimedia-related research communities (e.g., software, architectures, real-time systems, DSP, compilers, multimedia applications) who have worked separately, but did not interact sufficiently to address the challenges facing the design of hardware and software for multimedia systems. http://www.science.uva.nl/events/ESTIMedia09/

Workshop: Smart and Efficient Energy Council (SEEC'2009)

Invited talk: "Energy-neutral distributed sensing for proactive energy management in buildings and plants"

October 8-9, 2009, Trento, Italy

Speaker: Luca Benini

Luca Benini gave a talk on the system challenges of designing wireless sensor networks, particular emphasizing the challenges of making these systems self-powered using energy harvesting tecniques. The focus of the workshop was on energy efficiency as a major contributor to the green economy

http://www.artist-embedded.org/artist/-SEEC-09-.html

Tutorial: S. Mamagkakis and P. R. Panda 'Memory Architectures and Software Transformations for System Level Design', ASP-DAC 2009

Yokohama, Japan, - January, 2009

In this tutorial a memory-aware system level design flow was presented that can address strict power and performance budgeting problems by customizing both the underlying memory architectures/organizations, as well as by transforming the system-level source code to generate an input for system-level design that is better tuned to the memory architectures and organizations. Such a "memory-aware" system level design flow can result in LSI designs exhibiting superior performance, power and memory footprint characteristics.

http://www.aspdac.com/aspdac2009/tutorial/

Keynote: D. Verkest 'Multimedia systems in a changing technology landscape', ESTIMedia 2009

Grenoble, France, - October, 2009

Silicon IC technology scaling delivers the required transistor densities to meet the computational needs of multimedia systems, however, at an ever increasing cost. Changes in the technology landscape influence multimedia systems architectures, resulting in design challenges and opportunities. In this presentation, we provided a glimpse of this technologydesign interaction in the context of multimedia systems, touching upon multi-core architectures, 3D chip-stacking, and embedded MEMS technology.

http://www.science.uva.nl/events/ESTIMedia09/keynotes.html

Keynote: S. Mamagkakis 'Emerging multicore hardware platforms and their software support challenges', ECRTS 2009

Dublin, Ireland, - July, 2009

In this keynote talk, the latest developments and future directions of hardware MPSoC platforms for nomadic embedded applications were presented. Next to the hardware perspective, the software related challenges of these emerging MPSoC platforms were discussed and some of the proposed parallelization and memory hierarchy management solutions were evaluated. This keynote is also relevant for the Scheduling and Resource Management activity. http://ecrts09.dsg.cs.tcd.ie/keynote-speaker.php



Keynote: Giovanni De Micheli: `System-Level Design Technologies for Heterogeneous Distributed Systems', CATRENE, Dresden 2009 and SIES, Lausanne, 2009

Smart micro/nano systems will foster a revolution in health and environmental management, with the final objective of improving security and quality of ife. At the same time, they will create a large market of components and systems, and a renewed perspective for electronic design and manufacturing companies. Such systems will be the fundamental building blocks of wearable and ambient systems, to gather and integrate heterogeneous data in real time and to operate and communicate in a wireless and ultra low power mode. The design of these systems will be enabled by the hybridization of manufacturing technologies which enables us to attain unprecedented levels performance as well as to integrate electronic and fluidic circuits with sensors and actuators. To accomplish this ambitious goal, new technologies and architectures must be matched and tailored to the operational environment by solving novel an challenging design and optimization problems, through the creation of novel design methodologies and tools.

Keynote: Giovanni De Micheli: `Design of Micro/Nano Systems for a healthier and safer tomorrow', FETCH, Chexbres 2009.

Intellgent microsystems will revolutionize health and environmental management systems and will be the core of large-scale distributed systems capable of collecting, integrating and analyzing large-scale data. Such systems will be realized through an hybridization of technologies that will merge sensors, electronic, processing and communication components. We expect this area to do a driving force in the semiconductor and system sectors of the European economy.

5.4.2 Platform and MPSoC Analysis

Invited talk: Predictable Implementation of Real-Time Applications on Multiprocessor Systems on Chip,

Ninth International Workshop on Worst-Case Execution Time Analysis

Dublin, Ireland - June 30, 2009.

Speaker: Petru Eles

With this occasion several results obtained in the ARTIST context have been made accessible to an international audience. They are related, in particular, to the predictability of applications running on multiprocessor systems with shared communication infrastructure. http://www.artist-embedded.org/artist/Overview,1611.html

Invited Talk : On-line Timing Analysis in Organic Computing and Self-healing Systems (Rolf Ernst)

Symtavision NewsConference 2009

Braunschweig, Germany - Oct 01, 2009

The SymTA/S NewsConference is an annual event organized by the Symtavision GmbH that brings together engineers, managers, technology experts and researchers in the field of embedded real-time systems. Rolf Ernst was invited to present current research results to this audience. http://www.symtavision.com/newsconference2009.html

Keynote : Adaptive solutions for the emerging reliability and multicore resource management challenges (S. Mamagkakis)



2nd Workshop on Adaptive and Reconfigurable Embedded Systems - APRES 2009 *Grenoble, France, October 11th, 2009 within ESWEEK 2009*

In this talk, the reliability and resource management challenges of the emerging multicore platforms were discussed and the proposed adaptive solutions were evaluated. As technology scaling approaches nanoscale dimensions, we expect integration to move even further, thus increasing dramatically the number of cores on a chip and enabling the mapping of a higher number of software applications. The main challenges that arise are related with run-time resource management of shared multicore platform resources and variability and reliability issues that are linked with nanoscale technology.

http://www.artist-embedded.org/artist/Keynote.html

Invited Talk : Mapping Applications onto Multicore Platforms (Jan Madsen) ARTIST Summer School in China

Tsinghua University, Beijing, China – July 20 - 24, 2009

The course gave an introduction to the problem of mapping applications onto multi-core platforms. The process of mapping covers the allocation of tasks to processors of the platform and the definition of their execution order, i.e. the task scheduling. The course focused on task scheduling for parallel systems. It covered basic architectures for multi-core platforms (homogeneous and heterogeneous architectures) and how to model these, as well as how to model the application as a parallel program. The course covered both basic scheduling algorithms (handling static scheduling) and more advanced algorithms, which are able to handle consequences of the, often complex, communication structures of the platform. The course covered issues of real-time systems, including real-time operating systems (handling dynamic scheduling), as well as other quantitative aspects such as power consumption and memory usage. Finally, the course gave an introduction to how quantitative aspects of such systems may be formally modeled and analyzed.

http://www.artist-embedded.org/artist/Overview,1630.html

Keynote: Predictability vs. Efficiency in the Multicore Era: Fight of Titans or Happy Ever after?

CAV (Computer Aided Verification), Grenoble, France – July 2009 Luca Benini, DEIS Università di Bologna,

The talk gave an overview of recent trends in multi-core platforms for embedded computing. The shift toward multicore architectures has been imposed by technology reasons (power consumption and design closure issues in nanometer technology) and not by the "coming of age" of parallel programming models, compilation, analysis and verification environments. Thus, we may be building terascale many-cores architectures that we cannot program efficiently. Even worse, we may not be able to give any guarantees on execution timing, constraints and real time properties of applications. This is a challenge AND an opportunity for the software design and verification community: The talk gave some views on what is being done, what could be done to build efficient and predictable multi-core platforms.

Keynote: Trends of terascale computing chips in the next ten years IEEE ASICON

ChangSha, China - October 2009.

Invited talk by Zhonghai Lu, Axel Jantsch, KTH

Invited talk: MoVES - A Framework for Modeling and Verifying Embedded Systems The 21st International Conference on Microelectronics

Marrakech, Morocco – December, 2009



The talk gave an overview of the MoVES framework. MoVES is being developed to assist in the early phases of embedded systems design. A system is modelled as an application running on an execution platform. The MoVES framework can be used to conduct schedulability analysis and has the potential to reason about different types of resource usage such as memory usage and power consumption. Through the use of a number of small examples, the capabilities of MoVES to model and analyze embedded systems were demonstrated.

Keynote Lothar Thiele (ETHZ): `Scalable software for MPSoC platforms',

FETCH, Chexbres 2009.

The keynote presentation summarized the work done in ARTISTDesign together with partners from RWTH Aachen and TIMA Grenobles in mapping applications onto MPSoC platforms. It focussed on the integration of various tools and future challenges: http://sites.google.com/site/fetch2009/programme.

Keynote Lothar Thiele (ETHZ): `Component-based schedulability analysis', 4th International School on Model Driven Development for Distributed Realtime Embedded Systems

Aussois, France – April 20-24, 2009.

The talk describes an environment to map applications to Multiprocessor Platforms which is based on ARTISTDesign cooperations. The corresponding platform enables the specification, simulation, performance evaluation and mapping of distributed algorithms. Major characteristics are scalability and multi-resolution methods for validation and estimation that combine simulation-based and analytic approaches: http://www.mdd4dres.info/lectures/thiele.

Invited Talk Lothar Thiele (ETHZ): `Distributed Embedded Systems: Reconciling Computation, Communication and Resource Interaction`, Seventh International Andrei Ershov Memorial Conference «PERSPECTIVES OF SYSTEM INFORMATICS»

Akademgorodok, Russia - June 15 - 19, 2009.

Embedded systems are characterized by a close interaction between computation, communication, the associated resources and the physical environment. The solution of the above complex analysis and design problems relies on our abilities to properly deal with some of the following challenges:

Challenge 1: Designing component models whose interfaces talk about extra-functional properties like time, energy and resource interaction.

Challenge 2: Designing models of computation that talk about functional component properties and resource interaction.

Challenge 3: Developing system design methods that lead to timing-predictable and efficient embedded systems.

It will be necessary to (re)think the classical separation of concerns which removed very successfully physical aspects from the concept of computation. It will be necessary to (re)combine the computational and physical view of embedded software. The presentation covered the following aspects: Component-based performance analysis of distributed embedded systems (Modular Performance Analysis): basic principles, methods and tool support. Real-time Interfaces: from real-time components to real-time interfaces, adaptivity and constraints propagation. Application examples that show the applicability of the concepts and their use in embedded system design http://psi.nsc.ru/psi09/.

Keynote Lothar Thiele (ETHZ): `Predictability and Efficiency in Wireless Sensor Networks`, First Annual Conference, Center for Informatics and Information Technology



Braunschweig Germany - 2009

Recently, there has been lots of interest in various aspects of wireless sensor networks. They can be characterized by a potentially large number of individual nodes that perform sensor, computation and communication tasks. These small embedded systems are interconnected via wireless links. Application domains can be found in environmental monitoring, logistics, security, safety, health and building automation. Much of the research and development effort in this area has been devoted to increase the efficiency of these massively distributed embedded systems in terms of computing power, memory space, communication bandwidth and energy. On the other hand, predictability of the system functionality in terms of functionality, timing and battery lifetime has only been of secondary interest. The talk covers several novel techniques that can be used to design predictable and efficient large scale distributed embedded systems. Two application scenarios will be described where these methods have been successfully applied. Results of the ETHZ-UNIBO cooperation in ARTISTDesign have been presented. <u>http://city.tu-bs.de/index.php/en/events/symposium-2009</u>.

Keynote Lothar Thiele (ETHZ): 'Distributed Embedded Systems - Reconciling Computation, Communication and Resource Interaction'. 5th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2009)

August 24-26 2009.

The keynote presentation related to results obtained in ARTISTDesign in terms of designing MPSoCs with predictable timining behaviour. It relates to the cooperation with Bologna in terms of predictable communication fabrics, TDMA scheduling optimization and associated analysis methods. <u>http://www.cs.cityu.edu.hk/rtcsa2009/</u>

Invited Talk Lothar Thiele (ETHZ): 'Scalable Software for MPSoC Platforms' . ARTISTDesign Summer School

Autrans (near Grenoble), France - September 7-11, 2009

The presentation describes an environment to map applications onto MPSoC platforms. The corresponding platform enables the specification, simulation, performance evaluation and mapping of distributed algorithms. Major characteristics are scalability and multi-resolution methods for validation and estimation that combine simulation-based and analytic approaches. http://www.artist-embedded.org/artist/Programme,1636.html#Thiele

Invited Talk Jan Beutel (ETHZ): 'Tools for Distributed Embedded Systems'. ARTISTDesign Summer School

Autrans (near Grenoble), France - September 7-11, 2009

Although a decade has passed since prominent visions of wireless sensor networks were put forth by Estrin, Pister and others designing such systems today is more an art dominated by experience than a coordinated process yielding predictive results. In this lecture, we will review the current state-of-the-art and define what is actually hard (and new) about this (new?) class of systems. For this purpose we will learn about the PermaSense project, a sensor network deployed in an extremely hazardous environment on glaciated peaks in the Swiss Alps. The main characteristics of the design and testing strategies used in the development of the PermaSense application will be presented and discussed in the light of a holistic system design goal. We will continue to discuss recent achievements in the area of multi-contextual and automated test and validation tools developed at ETH Zurich. The talk will end with a look ahead at a proposed future system design methodology that should allow a tighter integration of virtual and real-world design spaced, which we feel is a necessity for a successful adoption



of larger and more complex networked embedded systems. <u>http://www.artist-embedded.org/artist/Programme,1636.html#Beutel</u>

Tutorial Lothar Thiele: 'Complex Distributed Systems: Managing very complex distributed systems with real-time constraints' .COMES Autumn School on Complexity Management in Embedded Systems

Lugano, Switzerland - November 16 - 20, 2009

It becomes one of the major challenges in the design process to analyze specific characteristics of a system design, such as end-to-end delays, buffer requirements, or throughput in an early design stage, to support making important design decisions before much time is invested in detailed implementations. Because of the import role of resource interaction, these components not only need to talk about functional properties but also about resource interaction. In the presentation, we covered the following aspects of system level performance analysis of distributed embedded systems: a. Approaches to system-level performance analysis (simulation-based vs. analytic methods, review of existing methods and tools). Requirements in terms of accuracy, scalability, composability and modularity. b. Modular Performance Analysis (MPA): basic principles, methods and tool support. c. Examples that show the applicability, the embedding into design space exploration, and a comparison to simulation-based approaches. The tutorial covered joined results with TU Braunschweig on Performance Analysis and University Bologna on MPSOC Design. http://www.alari.ch/comes/

Workshop : ESTIMedia 2009

Workshop on Embedded Systems for Real-Time Multimedia,

Grenoble, France - October 15-16, 2009

The aim of this workshop was to bring together people from different multimedia-related research communities (e.g, software, architectures, real-time systems, DSP, compilers, multimedia applications) who have worked separately, but did not interact sufficiently to address the challenges facing the design of hardware and software for multimedia systems. http://www.science.uva.nl/events/ESTIMedia09/

Workshop : ArtistDesign WP6 Cluster Meeting on Hardware Platforms and MpSoC

Braunschweig, Germany – June 25/26 2009

The main objective of this meeting was a mutual update on the joint research progress of the WP6 cluster participants, but speakers from the relevant industrial domains traditionally join (in tradition to previous years). The meeting was organized by Rolf Ernst (TU Braunschweig). All cluster members were present with several people. Other participants included Matthias Gries, Gregor Stellpflug (Intel Labs), Nico Feiertag, Kai Richter (Symtavision), Fabian Wolf (Volkswagen). The meeting has highlighted key problems in the design and analysis of upcoming embedded systems and suggested solutions in different stages of maturity. Topics included performance analysis, reliability, adaptivity, and early design space exploration. The meeting has shown that formal methods as developed in this project are increasingly adopted in the industrial design practice.

https://webmail.ida.ing.tu-bs.de/twiki/bin/view/Main/ArtistDesignClusterMeeting

Workshop : Embedded Communication TUBS.city Symposium

Braunschweig, Germany – July 1-3, 2009

Tubs.CITY, the TU Braunschweig Center for Informatics and Information Technology, was founded by 28 faculty members of computer science, electrical engineering, information



technology, and economics to support and coordinate the research activities in the field. At the end of its first year, tubs.CITY organized a symposium inviting leading scientists from all over Europe to discuss recent trends in computer science and information technology. The workshop "Embedded Communication" featured talks from many ArtistDesign partners and industrial affiliates (for example Lothar Thiele, ETHZ, Markus Kampmann, Ericsson, Kees Goossens, NXP, Marco Bekooij, NXP, Marco Di Natale, Scuola Sup. di Sant' Anna, Luis Almeida, University of Porto, Kai Richter, Symtavision, Guido Stromberg, Infineon AG).

http://city.tu-braunschweig.de/index.php/en/events/symposium-2009/workshops/embedded_ communication-

Tutorial: Networks on chip.

Short course at Fudan University, *Shanghai, China - June 2009,* Talk by A. Jantsch and Z. Lu, KTH

Seminar: Resource allocation for quality of service on-chip communication.

University of Cantabria Santander, Spain - February 2009, Talk by A. Jantsch, KTH

Tutorial: Advanced Topics in Embedded Systems DTU graduate course 02917 Advanced Topics in Embedded Systems *Technical University of Denmark, Denmark - June 24, 2009*

Aske Brekling from DTU gave a tutorial on using MoVES followed by hands-on lab sessions.

Seminar: PhD-seminar at Tallinn Technical University

Tallinn Technical University - April 29, 2009 Michael R Hansen from DTU gave a seminar on efficient model checking for duration calculus

ARTIST Graduate Course: Automated Formal Methods for Embedded Systemsormal

Technical University of Denmark, Denmark – June 17-25, 2009

DTU organized the yearly ARTIST graduate course. Lectures on UPPAAL by Alexandre Davids and Marius Mikucionis and lab sessions. In the lectures, the theory of timed automata, including priced timed automata and timed games, was introduced and lab exercises gave hands-on experience with the Uppaal tool suite. Lectures by Jüri Vain on model-based development and validation of multi-robot cooperative systems. Followed by Lab exercises based on the Uppaal tool suit. Lectures on MoVES and Duration Calculus by Michael R. Hansen, Jan Madsen and Aske Brekling with focus on analysis of systems with resource constraints.

Conference Organization Lothar Thiele (ETHZ, program chair): IEEE Symposium on Industrial Embedded Systems 2009

EPFL Lausanne, Switzerland - July 8 - 10, 2009.

Application domains have had a considerable impact on the evolution of embedded systems, in terms of required methodologies and supporting tools and resulting technologies. Systems-on-Chips (SoCs) are increasingly making inroads into the area of industrial automation to implement complex field-area intelligent devices which integrate the intelligent sensor/actuator functionality by providing on-chip signal conversion, data processing, and communication functions. There is a growing tendency to network field-area intelligent devices around industrial type of communication networks. Similar trends appear in the automotive electronic systems where the Electronic Control Units (ECUs), typically implemented as heterogeneous system-on-chip, are networked by means of one of safety-critical communication protocols



such as FlexRay, for instance, for the purpose of controlling one of vehicle functions; electronic engine control, ABS, active suspension, etc. The design of this kind of networked embedded systems (this includes also hard real-time industrial control systems) is a challenge in itself due to the distributed nature of processing elements, sharing common communication medium, and safety-critical requirements, to mention some.

The aim of the symposium was to bring together researchers and practitioners from industry and academia and provide them with a platform to report on recent developments, deployments, technology trends and research results, as well as initiatives related to embedded systems and their applications in a variety of industrial environments.

Keynote Talks by Members of ARTISTDesign: Scaling in the Third Dimension: Communication Architectures and Memory Hierarchies in an Integrated 3D World, Luca Benini, DEIS Università di Bologna, Italy. System-Level Design Technologies for Heterogeneous Distributed Systems Giovanni de Micheli, EPFL, Switzerland. Embedded Systems Evolution - Design Complexity and the Timing Beast. Rolf Ernst, Technische Universität Braunschweig, Germany. http://sies2009.epfl.ch/.

Workshop Organization Lothar Thiele (ETHZ): Workshop on Reconciling Performance with Predictability (RePP),

Grenoble, France - October 15, 2009, during the ESWEEK

The RePP workshop is concerned with embedded systems that are characterized by efficiency requirements on the one hand and critical constraints on the other. Such systems occur in many industry-relevant embedded application domains such as avionics, automotive, railway systems, power plants, construction machinery, and robotics. Offline guarantees for the satisfaction of critical constraints have to be derived by appropriate methods. The difficulty of deriving guarantees strongly depends on the predictability properties of the systems, in particular of the employed processor architecture, the software design discipline, the operating system including the scheduling strategy, the communication mechanism, and the used middleware. However, at the same time, system efficiency is measured by means of averagecase behaviour under different criteria such as performance, utilization of resources, and power consumption. Unfortunately, it can be observed that in computer system design the gap between average-case and worst-case behaviour increases rapidly. The technical reasons for the limited time-predictability are well known, for example the variation and non-determinism of the system environment and the interference caused by the use of shared resources. The workshop will discuss approaches that atttack the combination of the two goals, the improvements of worst-case predictability and of average-case performance, on all system layers and in the layering principle itself. Predictable architectures, resource-aware compilers, scheduling considering worst-case and average-case performance will be considered. Of particular importance will be the abstraction mechanism used for structuring systems, which has to consider resources as first-class citizens. The workshop has been co-organized by ARTISTDesign participants Lothar Thiele (ETH Zurich) Reinhard Wilhelm (University Saarland), Bengt Jonsson (Uppsala). http://www.tik.ee.ethz.ch/~jchen/RePP/



5.5 Transversal Integration

5.5.1 Design for Adaptivity

Keynote : Real-Time Scheduling for Control Systems, (Enrico Bini SSSA)

17th International Conference on Real-Time and Network Systems RTNS 2009, *Paris, France – October 26th, 2009*

The talk presents an overview of the techniques that can be used to design control systems taking performance requirements and schedulability constraints into account.

Invited Talk : On-line Timing Analysis in Organic Computing and Self-healing Systems (Rolf Ernst, TU Braunschweig)

Symtavision NewsConference 2009.

Braunschweig, Germany - Oct 01, 2009

The SymTA/S NewsConference is an annual event organized by the Symtavision GmbH that brings together engineers, managers, technology experts and researchers in the field of embedded real-time systems. Rolf Ernst was invited to present current research results to this audience highlighted the demand for adaptive systems. *(see also see also activity report Platform and MpSoC Analyis)*

http://www.symtavision.com/newsconference2009.html

Keynote: Challenges in Adaptivity for Embedded Real-time Systems (Gerhard Fohler, TUKL)

Opening Event for Call on Embedded Systems of FIT-IT, a funding initiative of the Austrian Federal Ministry for Transport, Innovation, and Technology, Vienna, Austria, 2009 09 25

Invited Talk : On verification and validation of real-time control systems: formal approaches vs simulation (Karl-Erik Årzén, ULUND) Caltech Workshop on Verfication and Validation

Pasadena, US – 23-24 September, 2009

The objective of the workshop was to bring together experts in control, computer science, and networking from academia, industry and US governmental agencies and promote exchange of ideas and establishment of interdisciplinary collaborations within the field of verification and validation.

http://www.cds.caltech.edu/~murray/wiki/Caltech_Workshop_on_Verification_and_Validation

Keynote: Adaptive solutions for the emerging reliability and multicore resource management challenges (S. Mamagkakis, IMEC)

2nd Workshop on Adaptive and Reconfigurable Embedded Systems - APRES 2009

Grenoble, France, October 11th, 2009 within ESWEEK 2009

In this talk, the reliability and resource management challenges of the emerging multicore platforms were discussed and the proposed adaptive solutions were evaluated.

http://www.artist-embedded.org/artist/Keynote.html

Invited talk: Taming the Flexibility versus Safety Challenge in Distributed Embedded Systems (Luis Almeida, UPorto)



1st tubs.CITY Symposium, Tech. Univ. Braunschweig

Braunschweig, Germany - 1-3 July 2009

Focuses on the flexibility versus safety conflict and addresses several perspectives of flexibility as well as the techniques that were developed in Aveiro to support them.

http://city.tu-braunschweig.de/index.php/en/events/symposium-2009/workshops/embeddedcommunication-

Invited talk: Has the time come to flexible safety-critical systems? (Luis Almeida, UPorto)

Final DySCAS Workshop

Brussels, Belgium - 18 February 2009

Raises awareness to the issues related with the flexibility versus safety conflict, the benefits that are associated with a combination of both aspects and the challenges in achieving such combination.

http://www.dyscas.org/final_workshop.htm

Workshop : Fourth International Workshop on Feedback Control Implementation and Design in Computing Systems and Networks (FeBID 2009), Cyber-Physical Systems Week,2009

San Francisco, US – April 16, 2009

Traditional practice in performance modeling focuses on using a variety of techniques including mathematical modeling, simulation, and analysis to understand the behavior of systems for the purpose of better design and evaluation. As IT systems, networks, and services become increasingly complex, this task becomes ever more difficult. In recent years, there has been considerable success in applying feedback control theory to analyzing and designing run-time IT control systems. Feedback control theory complements traditional modeling by providing formal mechanisms to dynamically control behavior of systems at run-time.

The FeBID series of workshops offer a unique opportunity for researchers and practitioners to discuss recent and innovative results in applying control theory to controlling performance of computing systems and networks. It provides a forum to exchange ideas and experiences on practical control system design and implementation and to identify future directions and challenges in aligning feedback control techniques with traditional performance modeling and simulation. The workshop program consisted of one invited plenary talk and 12 submitted papers. The workshop was co-chaired by Karl-Erik Årzén (ULUND) and several of the members of this activity participated in the PC. The workshop was co-funded by Artist.

http://controlofsystems.org/febid2009/

Workshop: Second Workshop on Adaptive and Reconfigurable Embedded Systems (APRES 09), Embedded Systems Week, 2009

Grenoble, France – October 11, 2009

This was the second workshop in the APRES series which is co-funded by Artist. It aims at discussing new and on-going research in the development and use of adaptive and reconfigurable embedded systems and gathering feedback from the embedded systems community at large. Of particular interest are new concepts and ideas for modeling and analyzing tradeoffs of embedded and real-time systems, novel algorithms and mechanisms to realize adaptation and reconfigurability, and experience reports with practical or industrial case studies. The workshop was co-organized by Luis Almeida, Karl-Erik Årzén (members of the activity), and Sebastian Fischmeister, Insup Lee, and Juilan Proenza (non-members), with


several of the Artist partners in the programming committee. The workshop contained 12 submitted paper and Stylianos Mamagkakis of IMEC gave a very appreciated plenary presentation. The number of participants at the workshop was around 25. The papers of the workshop will be published by SIGBED Review.

http://www.artist-embedded.org/artist/Overview,1765.html

Course: ARTIST Graduate Course on Embedded Control Systems

Pisa, Italy – June 8-12, 2009

The fifth annual ARTIST Graduate Scool on Embedded Control Systems was organized and delivered by Giorgio Buttazzo and Mauro Marinoni (SSSA), Karl-Erik Årzén and Anton Cervin (ULUND), Paolo Gai (Evidence), Luis Almeida (UPorto), and Paulo Pedreiras (UAveiro).

The objectives of the course were to:

- Introduce the most important concepts and methodologies used to develop a real-time embedded system, including fundamentals of real-time scheduling, control and distributed systems;
- Show how to apply these concepts to develop simple real-time control applications using an embedded platform specifically developed for education.

http://www.artist-embedded.org/artist/Overview,1673.html

Meeting: Annual Activity Meeting

Pisa, Italy - April 2-3, 2009

Objectives for the meeting: Organize the activities during Year 2. Present the adaptive resource management related activities in FRESCOR, ACTORS, DysCAS together with the work at UPC/SSSA, DTU, and IMEC.

Organizer: Karl-Erik Årzén (ULUND) & Giorgio Buttazzo (SSSA)

Participating groups: ULUND, SSSA, TUKL, University of York, IMEC, UPorto, KTH, UPC, UPM, UCatania, DTU, UCantabria, Universidad Carlos III de Madrid, NXP, IPP Conclusions:

- The structure for a wiki-based white paper on embedded system adaptivity was outlined and set up. Initial contents were added.
- It was decided that the activity should take the initiative to an one-day workshop on adaptive resource management to be held in conjunction with the Cyber-Physical Systems Week in Stockholm, Sweden in April 2010. This should also constitute the annual activity meeting for 2010.

Web site: http://www2.control.lth.se/ArtistAdapt/index.php/Main Page/Meetings/Pisa Apr 2009

Meeting : BIP – DOL, 13th Oct. 2009

Grenoble, France

Objectives for the meeting: The main goal of this meeting was to introduce the available execution platforms of the DOL framework and try to find a suitable one for BIP. Organizer: Verimag

Other participants: Verimag, ETHZ

Conclusions : There are three execution platforms available from the DOL framework, i.e., the SHAPES platform, the broad band cell engine, and the DOL/MPARM simulator. It was concluded that the DOL/MPARM is suitable for the BIP timed model.

Year 2 D4-(2.0)-Y2



Meeting: Real-time Parameters, 1st Oct. 2009

Zurich, Switzerland

Objectives for the meeting: Establish a set of server-based resource-reservation strategies and their suitability for dynamic reconfigurations in resource-constraint systems. Organizer: ETHZ

Other participants: ETHZ, SSSA

Conclusions: The well-known server-based resource-reservation strategies are not designed to be adaptive therefore, new methods and strategies are needed that can guarantee resource-reservations during configuration changes. A new server-based strategy and a mechanism for reconfiguration have been proposed. This is currently investigated jointly by ETHZ and SSSA.

Meeting : DySCAS Open Workshop Brussels, Belgium – February 18, 2009 Objectives for the meeting: Dissemination of the results of the "Dynamically Self-configuring Automotive Systems" (DySCAS) FP6 project Organizer: Volvo (coorganised and funded by Artist) Conclusions : <u>http://www.artist-</u> <u>embedded.org/docs/Events/2009/DySCAS/DySCAS%20workshop%20February%2018%20-</u> %20Summary_MT.pdf Web site: http://www.artist-embedded.org/artist/DySCAS-2009,1555.html

In addition KTH has had several meetings within the context of of the Dyscas project with Offis (ArtistDesign partner), Volvo (affiliated ArtistDesign partner), and Bosch, Daimler, Enea and Univ. of Grenwich.

5.5.2 Design for Predictability and Performance

Keynote: Reinhard Wilhelm USAAR: Embedded Systems - Trends, Successes, Challenges

10th Anniversary of the Hasso-Plattner Institute

Potsdam - Nov. 18, 2009

To celebrate its 10th anniversary, the Hasso-Plattner-Institute holds a conference "Informatik-Impulse". Reinhard Wilhelm is invited to present an overview of the challenges in embedded systems world and to give an outlook onto future developments.

Invited talk: *Petru Eles, Linköping:* **Predictable Implementation of Real-Time Applications** on Multiprocessor Systems on Chip,

Ninth International Workshop on Worst-Case Execution Time Analysis

Dublin, June 30, 2009.

With this occasion several results obtained in the ARTIST context have been made accessible to an international audience. They are related, in particular, to the predictability of applications running on multiprocessor systems with shared communication infrastructure.

Keynote : *Peter Puschner (TU Vienna):* **From Performance to Time-Predictability 9th Architectures and Compilers for Embedded Systems (ACES) Symposium** *Edegem, Belgium – September 7-8, 2009*

This keynote outlined the problems of building predictable hardware/software systems and discussed strategies for constructing systems that provide both temporal predictability and

performance.

http://www.elis.ugent.be/aces/index.php?page=activities

Keynote: *Reinhard Wilhelm USAAR:* Timing Analysis and Timing Predictability Tag der Informatik

RWTH Aachen – December 4, 2009

Reinhard Wilhelm is invited to give a talk introducing timing analysis and timing predictability in embedded systems. The current challenges and existing timing analysis algorithms will be discussed as well as the additional challenges posed by multi-core systems and approaches to achieve predictability for them.

http://www.nets.rwth-aachen.de/content/current_events/tdi/pro/index.html

Keynote: Reinhard Wilhelm USAAR: The PROMPT Design Principles for Predictable Multi-Core Architectures

Software & Compilers for Embedded Systems (SCOPES) 2009

Nice, France – April 24, 2009

The presentation proposes design principles for multi-core architectures to provide efficiently predictable good worst-case performance as needed for embedded control in the aeronautics and automotive industries supporting the Integrated Modular Avionics (IMA) and the Automotive Open System Architecture (AUTOSAR) development trends. One background challenge for the talks is that proving the correctness of a modern high-performance processor is beyond the reach of verification methods, and that even the chances to derive reliable and precise bounds on execution times are endangered by exactly these developments.

This talk presents a development process oriented at achieving predictability at all levels of the architecture hierarchy.

http://www.scopesconf.org/scopes-09

Keynote : Lothar Thiele, ETHZ: Distributed Embedded Systems - Reconciling Computation, Communication and Resource Interaction

15th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2009)

Peijing, China – August, 2009

Developing associated system design methods that lead to timing-predictable and efficient embedded systems imposes a major challenge. The presentation covered various attempts to address the above challenges, their use in embedded system design and various open issues. http://www.cs.cityu.edu.hk/rtcsa2009/keynotell_abs.htm

Invited Talk: Reinhard Wilhelm USAAR: Predictable Multi-Cores

Verimag – February 13, 2009.

Reinhard Wilhelm was invited to give this talk at a local colloquium at Verimag to explain the PROMPT design principles on predictable multi-core architectures.

Tutorial : *Peter Puschner (TU Vienna* **WCET Analysis: Problems, Methods and Time-Predictable Architectures**

Acaces 2009. Fifth International Summer School on Advanced Computer Architecture and Compilation for Embedded Systems

Terrassa (near Barcelona), Spain – July 12-18, 2009

The annual ACACES summer school is organized by the European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC). The invited tutorial on WCET analysis and time-predictable hardware/software architectures was given by Peter Puschner (TU Vienna). A complete lecture of the tutorial was dedicated to techniques for constructing time-predictable real-time embedded systems.

http://www.hipeac.net/acaces2009/

Year 2



Workshop : Reconciliating Performance and Predictability ESWEEK

Grenoble, France – October, 2009

The RePP workshop was concerned with embedded systems that are characterized by efficiency requirements on the one hand and critical constraints on the other. Such systems occur in many industry-relevant embedded application domains such as avionics, automotive, railway systems, power plants, construction machinery, and robotics. The slides from the workshop provide interesting contributions to the area of characterization and realization of predictability. To this report, we also append the minutes from the discussion at the end of the workshop.

http://www.tik.ee.ethz.ch/~jchen/RePP/

Workshop : Software & Compilers for Embedded Systems (SCOPES) 2009

Nice, France – April 23-24, 2009

SCOPES focuses on the software generation process for modern embedded systems. Topics of interest include all aspects of the compilation process, starting with suitable modeling and specification techniques and programming languages for embedded systems. The emphasis of the workshop lies on code generation techniques for embedded processors. The exploitation of specialized instruction set characteristics is as important as the development of new optimizations for embedded application domains. Cost criteria for the entire code generation and optimization process include runtime, timing predictability, energy dissipation, code size and others. Since today's embedded devices frequently consist of a multi-processor system-on-chip, the scope of this workshop is not limited to single-processor systems but particularly covers compilation techniques for MPSoC architectures.

SCOPES 2009 was organized by Heiko Falk, one of the essential contributors to ArtistDesign from TU Dortmund.

http://www.scopesconf.org/scopes-09

Workshop: Shape Analysis, Timing Analysis PUMA Workshop

San Servolo Island, Venice - Oct. 5 and 6, 2009

Reinhard Wilhelm gave talks on Shape Analysis and of Timing Analysis at the PUMA workshop. This workshop is an annual event held by the PUMA graduate school of LMU and TU Munich.

< http://puma.in.tum.de/wiki/Venice_2009>

ARTIST Summer School in Europe 2009

Autrans – September 7-11, 2009

The Artist Summer School included invited talks by several researchers, including Luca Benini, Jan Beutel, Jan Reineke, Lothar Thiele and Reinhard Wilhelm. <u>http://www.artist-embedded.org/artist/Overview,1633.html</u>

5.5.3 Integration Driven by Industrial Applications

Keynote: Collaborate to Innovate, by Alberto Sangiovanni Vincentelli, annual customer meeting TSMC

San Jose', April 21st

This is the annual conference held by TSMC in United States. This year there were more than 2,000 attendants from all over the world. The key note addressed the issues of system level design and the novel direction of research in the area of advanced electronics and energy efficient buildings. The angle taken was that the new challenges for the electronic and system



industry can only be tackled with rigorous design methodologies and tools that support collaboration.

Keynote: Integration means to achieve industry and academia collaboration, by Martin Törngren, Embedded Conference Scandinavia,

Stockholm, Sweden - October 13-14, 2009.

This conference originated as an industrial fair, but this year Swedish universities were invited both as presenters and to the exhibition, with the idea to stimulate a dialogue. Apart from the special session "A new economy and a new world" – there was also a well visited panel debate, discussing how to achieve improved collaboration between industry and academia. Various mechanisms and drivers to achieve this were discussed, including the role of funding agencies.

http://www.embeddedconference.se/index.php?Itemid=47

Keynote: S. Mamagkakis 'Adaptive solutions for the emerging reliability and multicore resource management challenges'

2nd Workshop on Adaptive and Reconfigurable Embedded Systems - APRES 2009 Grenoble, France, October 11th, 2009 within ESWEEK 2009

In this talk, the reliability and resource management challenges of the emerging multicore platforms were discussed and the proposed adaptive solutions were evaluated. As technology scaling approaches nanoscale dimensions, we expect integration to move even further, thus increasing dramatically the number of cores on a chip and enabling the mapping of a higher number of software applications. The main challenges that arise are related with run-time resource management of shared multicore platform resources and variability and reliability issues which are linked with nanoscale technology.

http://www.artist-embedded.org/artist/Keynote.html

Keynote: D. Verkest 'Multimedia systems in a changing technology landscape',

7th IEEE Workshop on Embedded Systems for Real-Time Multimedia

Grenoble, France, - October, 2009 within ESWEEK 2009

Silicon IC technology scaling delivers the required transistor densities to meet the computational needs of multimedia systems, however, at an ever increasing cost. Changes in the technology landscape influence multimedia systems architectures, resulting in design challenges and opportunities. In this presentation, we provided a glimpse of this technology-design interaction in the context of multimedia systems, touching upon multi-core architectures, 3D chip-stacking, and embedded MEMS technology.

http://www.science.uva.nl/events/ESTIMedia09/keynotes.html

Keynote: S. Mamagkakis 'Emerging multicore hardware platforms and their software support challenges'

21st Euromicro Conference on Real-Time Systems

Dublin, Ireland, - July, 2009

In this keynote talk, the latest developments and future directions of hardware MPSoC platforms for nomadic embedded applications were presented. Next to the hardware perspective, the software related challenges of these emerging MPSoC platforms were discussed and some of the proposed parallelization and memory hierarchy management solutions were evaluated. This keynote is also relevant for the Scheduling and Resource Management activity.

http://ecrts09.dsg.cs.tcd.ie/keynote-speaker.php



Lectio Magistralis: EDA: 40 years of innovation, by Alberto Sangiovanni Vincentelli *Strathclyde University, Glasgow, August 10, 2009*

This lecture was given to the members of the Royal Society of Edimburgh and to other invited guests in the occasion of the Maxwell Award ceremony. Alberto Sangiovanni Vincentelli presented how EDA was born and what were its early challenges. In addition, the raise of the EDA industry and the key contributions to the field were outlined.

Symposium: European Universities and Researchers as Sources of Innovation in Finland, Italy and Silicon Valley

European Entrepreneurship & Innovation Thought Leaders Seminar, Stanford Universit, April 20

Alberto Sangiovanni Vincentelli presented his view on the innovation scenarios in US and Europe and what can be done to improve the communication between the two innovation communities especially in the area of embedded systems.

Symposium: The how and why of Promoting Entrepreneurship Abroad,

Hoover Institution, Stanford University, May 21st

Alberto Sangiovanni Vincentelli moderated a panel and gave a speech on how US can use innovation as a foreign policy lever to increase its reach and positive impact. Participants to the seminar included Condoleeza Rice, George Schulz and four US ambassadors.

Workshop: Embedded Communication (see also Activity 6.2 Platform and MpSoC Analysis) -- TUBS.city Symposium

Braunschweig, Germany – July 1-3, 2009

tubs.CITY, the TU Braunschweig Center for Informatics and Information Technology, was founded by 28 faculty members of computer science, electrical engineering, information technology, and economics to support and coordinate the research activities in the field. At the end of its first year, tubs.CITY organized a symposium inviting leading scientists from all over Europe to discuss recent trends in computer science and information technology. The workshop "Embedded Communication" featured talks from many ArtistDesign partners and industrial affiliates (for example Lothar Thiele, ETHZ, Markus Kampmann, Ericsson, Kees Goossens, NXP, Marco Bekooij, NXP, Marco Di Natale, Scuola Sup. di Sant' Anna, Luis Almeida, University of Porto, Kai Richter, Symtavision, Guido Stromberg, Infineon AG). http://city.tu-braunschweig.de/index.php/en/events/symposium-2009/workshops/embeddedcommunication-

Workshop: Smart and Efficient Energy Council (SEEC'2009)

Invited talk: "Energy-neutral distributed sensing for proactive energy management in buildings and plants"

October 8-9, 2009 Trento, Italy

Speaker: Luca Benini

Luca Benini gave a talk on the system challenges of designing wireless sensor networks, particular emphasizing the challenges of making these systems self-powered using energy harvesting tecniques. The focus of the workshop was on energy efficiency as a major contributor to the green economy.

http://www.artist-embedded.org/artist/Overview,1800.html

Tutorial: S. Mamagkakis and P. R. Panda 'Memory Architectures and Software Transformations for System Level Design'

15th Asia and South Pacific Design Automation Conference (ASP-DAC)

Yokohama, Japan, - January, 2009

In this tutorial a memory-aware system level design flow was presented that can address strict power and performance budgeting problems by customizing both the underlying memory architectures/organizations, as well as by transforming the system-level source code to generate an input for system-level design that is better tuned to the memory architectures and



organizations. Such a "memory-aware" system level design flow can result in LSI designs exhibiting superior performance, power and memory footprint characteristics. http://www.aspdac.com/aspdac2009/tutorial/

Conference: Industrial Embedded Systems

International Symposium on Industrial Embedded Systems (SIES)

Lausanne, Switzerland – 8-10 July, 2009

Anders Tranberg-Hansen from DTU gave a talk on "Exploration of a Digital Audio Processing Platform Using a Compositional System Level Perfromance Estimation Framework".

Conference: CODES+ISSS Embedded Systems Week

Grenoble, France – 11-16 October, 2009 Jan Madsen from DTU gave a talk on "A Compositional Modelling Framework for Exploring MPSoC systems".

Symposium: ESI Symposium Invited talk: Design-Space Exploration of High-Tech Embedded Systems

8 December 2009, Eindhoven, Netherlands

Speaker: Twan Basten

Twan Basten gave a talk outlining the development of a design-space exploration toolset that leverages the results of various formal modelling and analysis techniques to support the exploration of the large design-spaces of high-tech embedded systems.

Fall school: IPA Fall Days on Quantitative Methods for Embedded Systems Invited talk: "Reliable Dynamic Embedded Data Processing Systems"

26 November 2009, Noordwijk aan Zee, Netherlands

Speaker: Twan Basten

Twan Basten gave a talk about ways to achieve reliable operation of data-intensive embedded systems, in a context with both intra- and inter-application dynamism. Dataflow analysis for models that capture the various operating modes of an application allows a model-driven design-space exploration, while compositional reasoning about trade-off configurations allows run-time adaptation to changing operating conditions.

Computer Engineering Seminar, University of Wisconsin

Invited talk: "Reliable Embedded Multimedia Systems?"

21 September 2009, Madison, Madison, WI, USA

Speaker: Twan Basten

Twan Basten gave a talk covering various throughput and buffer analysis techniques for dataflow graphs, exploring how these techniques can be used in a compilation flow for Chip MultiProcessors (CMPs) that is able to cope with the increasingly dynamic nature of modern multimedia systems. The talk furthermore outlined a run-time adaptation solution for CMPs, that forms a basis for the reliable dynamic reconfiguration of the system.

Electrical & Computer Engineering Seminar, Carnegie Mellon University

Invited talk: "Reliable Run-time Adaptation in Resource-constrained Embedded Systems"

17 September 2009, Pittsburgh, PA, USA

Speaker: Twan Basten

Twan Basten gave a talk outlining how the concepts of Pareto algebra can be used to provide solutions for run-time adaptation problems. Two specific parameterized and compositional run-time adaptation solutions for Chip MultiProcessors (CMPs) and Wireless Sensor Networks



(WSNs). The parametrization allows a trade-off between the quality of the result and the required computational resources. Compositionality ensures scalability of the solutions.

CSE seminar, KTH, Stockholm

Invited talk: "Reliable Run-time Adaptation in Resource-constrained Embedded Systems"

May 25, 2009, Stockholm, Sweden

Speaker: Twan Basten

Twan Basten gave a talk outlining how the concepts of Pareto algebra can be used to provide solutions for run-time adaptation problems. Two specific parameterized and compositional run-time adaptation solutions for Chip MultiProcessors (CMPs) and Wireless Sensor Networks (WSNs). The parametrization allows a trade-off between the quality of the result and the required computational resources. Compositionality ensures scalability of the solutions.

Workshop: "Dependable ICT Systems"

Invited talk: "Reliable Run-time Adaptation in Resource-constrained Embedded Systems"

April 24, 2009, Utrecht, Netherlands

Speaker: Twan Basten

Twan Basten gave a talk outlining how the concepts of Pareto algebra can be used to provide solutions for run-time adaptation problems. Two specific parameterized and compositional run-time adaptation solutions for Chip MultiProcessors (CMPs) and Wireless Sensor Networks (WSNs). The parametrization allows a trade-off between the quality of the result and the required computational resources. Compositionality ensures scalability of the solutions.

Seminar at ST-Ericsson, Netherlands

Invited talk: "Dataflow Analysis Revisited"

February 19, 2009, Eindhoven, Netherlands

Speaker: Twan Basten

Twan Basten gave a talk covering throughput and buffer analysis techniques for dataflow models, including parametric and scenario-aware techniques for throughput. The dataflow model of computation provides an interesting compromise between expressiveness and analyzability, that allows the use in a compilation flow for multiprocessor systems-on-chip that is able to cope with the increasingly dynamic nature of modern multimedia systems.

Conference: IEEE MASCOTS, Imperial College London

Keynote lecture: "Time for a change!"

Speaker: B.R. Haverkort

September 21-23, 2009, London

Boudewijn Haverkort gave a keynote address in which he discusses the achievements of 25 years of research in the area of model-based performance evaluation of computer and communication systems; what has been reached, but foremost, what has not been reached yet and what should be worked upon in the future.

Fall school: IPA Fall Days on Quantitative Methods for Embedded Systems Invited tutorial: "Predictable Wafer Scanner Design"

Speakers: B.D. Theelen (J.P.M. Voeten, T. Hendriks, J. Schuddemat)

November 23-27, 2009, Noordwijk, Netherlands

Bart Theelen presented a case study performed at ASML, where formal performance modeling methods have been applied to identify bottlenecks in a critical subsystem of ASML's wafer scanner. The methods also helped in proposing various improvements to this subsystem.

Fall school: IPA Fall Days on Quantitative Methods for Embedded Systems



Invited tutorial: "A Performance Analysis Tool for Scenario-Aware Streaming Applications"

Speakes: B.D. Theelen

November 23-27, 2009, Noordwijk, Netherlands

Bart Theelen presented a model checking approach for computing the performance of dynamic dataflow models. The approach covers various types of worst/best-case and average-case performance metrics and relies on a very efficient generally applicable state-space reduction technique.

Symposium: ESI Symposium Invited talk: "Model-Based Testing applied to an Electronic Passport"

8 December 2009. Eindhoven. Netherlands

Speaker: Jan Tretmans

Jan Tretmans gave a talk outlining the ideas and principles of model-based software testing. An an application he demonstrated how model-based testing was applied to the new electronic passport leading to fully automatically generated tests performing over 1,000,000 protocol steps on an actual passport.

Summer school: Ecole Jeunes Chercheurs en Programmation Invited tutorial: "Software Testing"

Speaker : Jan Tretmans

June 3-12, 2009, Dinard/Rennes, France.

Jan Tretmans gave a one-day tutorial on software testing divided into two parts. The first part was devoted to general principles and the state of practice in software testing. The second part concentrated on the theory of model-based testing and how models of software can be used to algorithmically generate test suites.

Workshop: Chess IPS TechnoSessie

Invited talk: "Model-Based Testing applied to an Electronic Passport"

Speaker: Jan Tretmans,

October 20, 2009, Haarlem, Netherlands

Jan Tretmans presented the ideas and principles of model-based software testing where a specification model is used to automatically generate test cases. An an application he demonstrated how model-based testing was applied to testing the new electronic passport leading to fully automatically generated tests performing over 1,000,000 protocol steps on an actual passport.

Workshop on FP7 STREP Quasimodo at FMweek

Invited talk: "Model-Based Testing of Embedded Systems"

Speaker: Jan Tretmans

November 6, 2009, Eindhoven, Netherlands

Jan Tretmans presented the ideas and principles of model-based software testing where a specification model is used to automatically generate test cases. As an example he discussed conformance testing of an access protocol of a wireless sensor network. This presentation was part of a series of three presentations where the wireless sensor network itself, the verification of the access protocol using model checking, and model-based testing of the access protocol were presented.

Workshop: Thales IVV Workshop Speaker: Jan Tretmans Invited talk: "Model-Based Testing" March 16, 2009, Hengelo, Netherlands



Jan Tretmans presented the ideas and principles of model-based software testing where a specification model is used to automatically generate test cases, positioning model-based testing in the context of other model-based activities, such model-checking, model simulation, model analysis, model construction through process mining, etc.

Workshop on FP7/STREP Quasimodo at FMweek

Panelist: Jeroen Voeten

November 6, 2009, Eindhoven, Netherlands

The pannel discussed in what way industries could benefit best from the scientific innovations in quantitative formal methods.

Symposium: ESI Symposium

Invited talk: Performance and Flexibility for ASML Execution Platforms

8 December 2009, Eindhoven, Netherlands

Speaker: Jeroen Voeten

Jeroen Voeten presented a model-based performance prediction and optimization approach and its application to a performance-critical subsystem of an industrial wafer scanner.



6. ArtistDesign Web Portal

The ArtistDesign web portal is the direct continuation of the Artist2 NoE's web portal.

JPASE

All mechanisms, procedures, and existing information are preserved and will continue to evolve within the ArtistDesign NoE. In Year 2, we upgraded to SPIP version 2.0.9, a major undertaking that needed to be sub-contracted to the company that initially created the website.

6.1 Objectives and Background Information

The ArtistDesign Web Portal is a major tool for Spreading Excellence within the Embedded Systems Community. Its aim is rather ambitious: to be the focal point of reference for events and announcements of interest to the embedded systems community.

The web portal disseminates information about contacts (ArtistDesign core and affiliated partners), the ArtistDesign JPA activities, as well a fairly thorough set of links to sites of interest to the embedded systems community.

As can be seen, a great deal of effort has been put into the web site, both for ergonomics / graphical quality, as for the contents.

The web site includes several features that help keep it coherent and up to date:

- Authorised users (principally, the ArtistDesign partners) can access the back end of the site to modify and update information directly. The changes are immediately visible on the site, which greatly streamlines the updating process.
- o It's possible to track changes and go back to previous versions of individual web pages.
- Events are automatically sorted by date, and transferred to 'Past Events'. When appropriate.
- Structural information (hierarchy of pages) is maintained automatically.
- Ergnomics are set for the entire site. The "look and feel" of the site is always homogeneous thoughout the site. It's possible to change these ergonomics, and these changes are applied homogeneously throughout the site, via automated machanisms.

6.2 Structure

The structure of the ArtistDesign web site is visible on the Site Map: <u>http://www.artist-embedded.org/artist/spip.php?page=plan</u>).

Year 2 D4-(2.0)-Y2



6.3 Analysis of Visits to the Portal

The main conclusion from this analysis is that visits to the site are largely driven by the ARTIST events organised (workshops, conferences, schools), and that this drives visits to the other sections: "Embedded Systems Links", and "Research and Integration".

It is important to note that a deep analysis of the pertinence and effectivity of the web portal would need to go beyond the numerical analysis provided here. The real impact of a website is in whether or not the members of the community find the information relevant, and how it helps them in their daily tasks.

6.3.1 Number of Visits

Year 1



Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb kB F/kB In/kB Out

In comparison with Y1, the curve of visits really shows decreased activity in the summer months.

Although the overall, access to the site in Year 2 has been less than in Year 1, this does not necessarily imply that it has less impact. For example, if key information (eq: the program or registration or venue) is missing from a workshop page, then it can logically be expected that visitors will return often, generating more traffic for what is, finally, lower impact and useability.



6.3.2 Visits Distribution within the site

The tables below show the distribution of visits to the various parts of the portal.

Year 1

15. About the Artist2 NoE	1.5%	
20. Participants	10.8%	
▶ 25. Research and Integration	7.4%	
▼ 30. Dissemination	54.5%	
▶ 20. Workshops	31.7%	
30. Schools and Seminars	19.1%	
60. Publications	2.1%	
70. Contributions to Standards	1.6%	
▼ 35. Embedded System Links	20.4%	
10. Journals	2.5%	
20. Conferences	1.8%	
30. Standards	0.7%	
35. Tools and Platforms	3.7%	
40. Main Projects	2.7%	
50. Position Papers	1.2%	
55. Roadmaps	0.9%	
60. Newsletters and Magazines	1%	
70. Announcements	5.6%	
▶ 40. intranet	1.1%	
▶ 70. Artist2 Reviews	3%	
71. ArtistDesign Reviews	0.6%	I
76. Reporting on Mobility	0.7%	

Year 2

▶ 10. Home Page	1.2%
▶ 15. About the Artist2 NoE	4.7%
▶ 16. About the ArtistDesign NoE	1.8%
▶ 20. Participants	7%
25. Research and Integration	0.4%
* 30. Dissemination	64.2%
▶ 20. Workshops	45.5%
25. Past Workshops	0.3%
▶ 30. Schools and Seminars	15.1%
40. International Collaboration	0.4%
60. Publications	0.6%
70. Contributions to Standards	1.3%
80. Course Materials Available Online	0.6%
91. Calendar of Events	0.3%
▶ 35. Embedded System Links	11.7%
▶ 40. intranet	2.1%
41. Intranet	0.9%
▶ 71. ArtistDesign Reviews	4.9%



In comparison to Y1, there has been a significant (50%) drop in access to the "Embedded Systems Links" section of the portal, which probably explains much of the lower access to the site overall. Access to the workshops section remains high (proportionally higher than Year 1).

6.4 Plans for Year 2

In year2, we plan to add Google Analytics to the Artist Web Portal, to get a finer-grain analysis of the web access to the site.



7. Joint Papers

7.1 Thematic Cluster: Modeling and Validation

7.1.1 Activity: Modeling

- [Gen09] Roman Obermaisser and Hermann Kopetz (Eds). L. Benini, , S. Bensalem, M. Borth, et al. Genesys - A Candidate for an Artemis Cross-Domain Reference Architecture for Embedded Systems. Südwestdeutscher Verlag für Hochschulschriften (SVH), Saarbrücken, 2009. ISBN 978-3-8381-1040-0.
- [LTS+09] J. Lapalme, B.D. Theelen, N. Stoimenov, J.P.M. Voeten, L. Thiele, E. Aboulhamid. Y-Chart Based System Design: A Discussion on Approaches. In: Nouvelles approches pour la conception d'outils CAO pour le domaine des systèmes embarqués. Université de Montréal, 2009. Invited article.
- [OBG+09] Iulian Ober, Stefan Van Baelen, Susanne Graf, Mamoun Filali, Thomas Weigert, Sébastien Gérard, "Model Based Architecting and Construction of Embedded Systems", in M.R.V. Chaudron, editor, MoDELS 2008 Workshops, Lecture Notes in Computer Science (LNCS), vol. 5421, Springer-Verlag, pp. 1-4, Berlin, Germany, 2009.
- [PBB+09] Robert Passerone, Imen Ben Hafaiedh, Albert Benveniste, Daniela Cancila, Arnaud Cuccuru, Wermer Damm, Alberto Ferrari, Sébastien Gérard, Susanne Graf, Bernhard Josko, L. Mangeruca, T. Peikenkamp, Alberto Sangiovanni-Vincentelli and François Terrier, Meta-models in Europe: Languages, Tools and Applications, in IEEE Design & Test of Computers (IEEE Computer Society), Special Issue on Metamodeling for Design and Test, Volume 26, Number 3, pp. 38-53, Mai/June 2009.
- **[BCH+09]** R. Bloem and K. Chatterjee and T.A. Henzinger and B. Jobstmann. Better Quality in Synthesis through Quantitative Objectives. In Computer Aided Verification (CAV). pp. 140--156. 2009.
- [BGH+09] R. Bloem, K. Greimel, T. Henzinger, B. Jobstmann. Synthesizing Robust Systems, In *Formal Methods in Computer Aided Design (FMCAD'09), 2009*
- [DHLN09] L. Doyen, T. Henzinger, A. Legay, D. Nickovic. Robustness of Sequential Circuits, submitted for publication, 2009.
- **[HKMS09]** T.A. Henzinger, C.M. Kirsch, E.R.B. Marques, A. Sokolova. Distributed, Modular HTL. Proc. Real-Time Systems Symposium (RTSS), 2009
- **[CDL+09]** Benoit Caillaud, Benoit Delahaye, Kim G. Larsen, Mikkel Larsen, Axel Legay, and Andrzej Wasowski. Compositional design methodology with constraint Markov chains. under submission
- **[BFL+09]** Patricia Bouyer, Ulrich Fahrenberg, Kim G. Larsen, and Nicolas Markey. Quantitative modeling and analysis of embedded systems. under submission
- **[BFL+09]** Patricia Bouyer, Uli Fahrenberg, Kim Guldstrand Larsen, and Nicolas Markey. Exponentially priced timed automata. under submission
- [CBL+09] P. Caspi, A. Benveniste, R. Lublinerman, and S. Tripakis. Actors without directors: A kahnian view of heterogeneous systems. In Hybrid Systems Computation and Control, HSCC09, volume 5469 of Lecture Notes in Computer Science, 2009



[ACG+09] M. Alras, P. Caspi, A. Girault, and P. Raymond. Model-based design of embedded control systems by means of synchronous intermediate model. In proc. of ICESS-09, 6th IEEE International Conference on Embedded Systems and Software, Hangzhou, China, 5 2009.

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- [PWP+09] Yiannis Papadopoulos, Martin Walker, David Parker, Henrik Lönn, Martin Törngren, DeJiu Chen, Rolf Johansson. Semi-Automatic FMEA Supporting Complex Systems with Combinations and Sequences of Failures. SAE paper number 2009-01-0738. SAE World Congress, 2009.
- **[WPP+09]** Martin Walker, Yiannis Papadopoulos, David Parker, Henrik Lönn, Martin Törngren, DeJiu Chen, Rolf Johansson, Anders Sandberg. Semi-Automatic FMEA supporting complex systems with combinations and sequences of failures. SAE International Journal of Passenger Cars – Mechanical Systems. October 2009 2(1): 791-802.
- **[TCM+09]** Martin Törngren, DeJiu Chen, Diana Malvius and Jakob Axelsson. Model based development of automotive embedded systems. Invited chapter. Handbook on Automotive Embedded Systems. Editors Nicolas Navet and Francoise Simonot-Lion. Taylor and Francis CRC Press Series: Industrial Information Technology. 2009.
- [CFJ+09] Philippe Cuenot, Patrik Frey, Rolf Johansson, Henrik Lönn, Yiannis Papadopoulos, Mark-Oliver Reiser, Anders Sandberg, David Servat, Ramin Tavakoli Kolagari, Martin Törngren, Matthias Weber. The EAST-ADL Architecture Description Language for Automotive Embedded Software. Invited chapter in the LNCS volume on "Model-Based Engineering of Embedded Real-Time Systems", Holger Giese, Bernard Rumpe, Bernard Schätz, Editors. To appear 2009
- [RBB+09] J.-B. Raclet, E. Badouel, A. Benveniste, B. Caillaud, A. Legay and R. Passerone. Modal Interfaces: Unifying Interface Automata and Modal Specifications. Proceedings of EMSOFT: Conference on Embedded Software, ACM, 2009, pp.87-96.
- **[RBB+09]** J.-B. Raclet, E. Badouel, A. Benveniste, B. Caillaud and R. Passerone. Why are Modalities Good for Interface Theories? Proceedings of ACSD: Application of Concurrency to System Design, IEEE Computer Society Press, 2009.
- [MTSG09] Y. Ma, J.-P. Talpin, S. Shukla, T. Gautier. "Distributed Simulation of AADL Specifications in a Polychronous Model of Computation," International Conference on Embedded Software and Systems ICESS'09, pp.607-614, May 2009. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5066706&isnumber=5066609
- [BPST09] J. Bijoy, H. Patel, S. Shukla, J.-P. Talpin. Generating Multi-Threaded code from Polychronous Specifications. Electr. Notes Theor. Comput. Sci. 238(1): 57-69 (2009)
- [SVY+09] A. Sangiovanni-Vincentelli, G. Yang, S. Shukla, A. Mathaikutty, J. Sztipanovits. "Metamodeling: An Emerging Representation Paradigm for System-Level Design," IEEE Design & Test of Computers. vol.26, no.3, pp.54-69, May-June 2009. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5167508&isnumber=5167496
- [ESS*09] Sinem Coleri Ergen, Alberto Sangiovanni-Vincentelli, Xuening Sun, Riccardo Tebano, Sayf Alalusi, Giorgio Audisio, and Marco Sabatini, *The Tire as an Intelligent Sensor*. Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on Volume: 28 Issue: 7 July 2009 Page(s): 941-955
- **[OEH*09]** Roman Obermaisser, Christian El Salloum, Bernhard Huber, and Hermann Kopetz, *From a Federated to an Integrated Automotive Architecture* Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on Volume: 28 Issue: 7 July 2009 Page(s): 956-965
- **[WGR*09]** Reinhard Wilhelm, Daniel Grund, Jan Reineke, Marc Schlickling, Markus Pister, and Christian Ferdinand, *Memory Hierarchies, Pipelines, and Buses for Future Architectures*



in Time-Critical Embedded Systems. Systems IEEE Transactions on CAD, Special Issue on DATE 08 Automitive Day Volume: 28 Issue: 7 July 2009 Page(s): 966-978

[SRN09] Simon Schliecker, Jonas Rox, Mircea Negrean, Kai Richter, Marek Jersak, and Rolf Ernst, System Level Performance Analysis for Real-Time Automotive Multi-Core and Network Architectures. Architectures Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on Volume: 28 Issue: 7 July 2009 Page(s): 979-992

7.1.2 Activity: Validation

[BBG09] C. Baier, N. Bertrand, M. Grosser. Probabilistic Acceptors for Languages over Infinite Words. In 35th Conference on Current Trends in Theory and Practice of Computer Science, LNCS, Volume 5404, Pages 19-33, Spindleruv Mlyn, Czech, 2009.

[BBBB09] C. Baier, N. Bertrand, P. Bouyer, T. Brihaye. When are timed automata determinizable?. In 36th International Colloquium on Automata, Languages and Programming (ICALP'09), LNCS No 5556, Pages 43-54, Rhodes, Greece, July 2009.

[KGMM09a] G. Kalyon, T. Le Gall, H. Marchand, T. Massart. Computational Complexity for State-Feedback Controllers with Partial Observation. In 7th International Conference on Control and Automation, ICCA'09, Christchurch, New Zealand, December 2009.

[KGMM09b] G. Kalyon, T. Le Gall, H. Marchand, T. Massart. Control of Infinite Symbolic Transition Systems under Partial Observation. In European Control Conference, Pages 1456-1462, Budapest, Hungary, August 2009.

[BCW+09] D. Berwanger, K. Chatterjee, M. De Wulf, L. Doyen, and T. A. Henzinger. <u>Alpaga: a</u> tool for solving parity games with imperfect information. *Proceedings of the 15th International Conference on Tools and Algorithms for the Construction and Analysis of Systems* (TACAS), Lecture Notes in Computer Science 5505, Springer, 2009, pp. 58-61.

[DR09] L. Doyen and J.-F. Raskin. <u>Antichains for the automata-based approach to model-checking</u>. *Logical Methods in Computer Science* 5(1:5), 2009.

[HHKV10] T. Henzinger, T. Hottelier, L. Kovács and A. Voronkov (2010). "Invariant and Type Inference for Matrices". Proc. of <u>VMCAI 2010</u>. (to appear)

[HKMS09] T. Henzinger, C. M. Kirsch, E. R. B. Marques, A. Sokolova. Distributed, Modular HTL, in Real-Time Systems Symposium (RTSS'09), 2009.

[HMW09] T. A. Henzinger, M. Mateescu, and V. Wolf. <u>Sliding-window abstraction for infinite</u> <u>Markov chains</u>. *Proceedings of the 21st International Conference on Computer-Aided Verification* (CAV), Lecture Notes in Computer Science 5643, Springer, 2009, pp. 337-352.

[WSPFPGANPSEFRS09] Florian Wildschütte, Detlef Scholle, Stefan Poon, Lei Feng, Magnus Persson, Javier García, Richard Anthony, Tahir Naseer, Claes Pihl, Thomas Söderqvist, Cecilia Ekelin, Viktor Friesen, Achim Rettberg and Jan Söderberg. D4.3 Evaluation Report. Deliverable 4.3, DySCAS-Dynamically Self Configuring Automotive Systems, IST project no. FP6-IST-2006-034904, February, 2009. Downloadable: <u>http://www.dyscas.org/downloads.htm</u>

[FCDLLLW09] Benoit Caillaud, Benoit Delahaye, Kim G. Larsen, Mikkel Larsen, Axel Legay, and Andrzej Wasowski. Compositional design methodology with constraint markov chains. Under submission.

[BFLM09] Patricia Bouyer, Uli Fahrenberg, Kim Guldstrand Larsen, and Nicolas Markey. Exponentially priced timed automata. Under submission.



[CJL09] Franck Cassez, Jan Jacob Jessen, Kim G. Larsen, Jean-François Raskin, Pierre-Alain Reynier:. Automatic synthesis of robust and optimal controllers - an industrial case study. In Hybrid Systems: Computation and Control, 12th International Conference (HSCC 2009), volume 5469 of LNCS, pages 90{104. Springer, 2009.

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[BCDL09] Peter Bulychev, Thomas Chatain, Alexandre David, and Kim G. Larsen. Efficient onthe-fly algorithm for checking alternating timed simulation. In Proceedings of FORMATS09. 2009.

[CDL09] Thomas Chatain, Alexandre David, and Kim G. Larsen. Playing games with timed games. In Proceedings of IFAC Int. Conference on Analysis and Design of Hybrid Systems (ADHS'09), Accepted for publication, 2009.

[DLL09] Alexandre David, Kim G. Larsen, and Didier Lime. UPPAAL TIGA 2009 towards realizable strategies. In Proceedings of Workshop on Games for Design, Verification and Synthesis, GASICS, Grenoble, 2009 (to appear), 2009.

[NSK09] Martin R. NeuhŠu§er, Marielle Stoelinga, and Joost-Pieter Katoen. Delayed Nondeterminism in Continuous-Time Markov Decision Processes. In Foundations of Software Science and Computation Structures (FoSSaCS). pages 364Đ379. Volume 5504 of LNCS. Springer-Verlag, 2009.

[HKD09] Tingting Han, Joost-Pieter Katoen, and Berteun Damman. Counterexample Generation in Probabilistic Model Checking. IEEE Transactions on Software Engineering, 35(2):241D257, 2009.

[BHKL09] Benedikt Bollig, Peter Habermehl, Carsten Kern, and Martin Leucker. Angluin-Style Learning of NFA. In Proceedings of the Twenty-first International Joint Conference on Artificial Intelligence (IJCAI-09). pages 1004Đ1009. AAAI Press, 2009.

[BHI*09] Marius Bozga, Peter Habermehl, Radu Iosif, Filip Konecny and Tomas Vojnar. Automatic Verification of Integer Array Programs. *In the International Conference on Computer Aided Verification, CAV '09, June. 26th 2009, Grenoble, France.*

7.2 Thematic Cluster: SW Synthesis, Code Generation and Timing Analysis

7.2.1 Activity: Software Synthesis and Code Generation

RWTH Aachen, NXP, UC Irvine

R. Leupers, S. Ha, A. Vajda, R. Doemer, M. Bekooij and A. Nohl: Programming MPSoC Platforms: Road Works Ahead, DATE 2009

TU Dortmund, ETH Zürich

Paul Lokuciejewski, Heiko Falk, Sascha Plazar, Peter Marwedel, Lothar Thiele: Multi-Objective Exploration of Compiler Optimizations for Real-Time Systems, submitted to ISORC 2010

IMEC vzw., TU/e

S.V. Gheorghita, M. Palkovic, J. Hamers, A. Vandecappelle, S. Mamagkakis, T. Basten, L. Eeckhout, H. Corporaal, F. Catthoor, F. Vandeputte, K. De Bosschere: *A System Scenario*



based Approach to Dynamic Embedded Systems, ACM Transactions on Design Automation of Electronic Systems (TODAES), Volume 14, Number 1, (2009)

IMEC vzw., NTUA

Baloukas, C.; Temmerman, M.; Keller, A.; Mamagkakis, S.; Catthoor, F.; Soudris, D. and Demeyer, S.: Abstract and concrete data type optimizations at the UML and C/C++ level for dynamic embedded software. In Book Chapter of Behavioral Modelling for Embedded Systems and Technologies: Applications for Design and Implementation, p.55-84, (2009)

7.2.2 Activity: Timing Analysis

R. Wilhelm, D. Grund, J. Reineke, M. Schlickling, M. Pister and C.Ferdinand: <u>Memory</u> <u>Hierarchies, Pipelines, and Buses for Future Architectures in Time-Critical Embedded</u> <u>Systems</u>, IEEE TCAD, July 2009

D. Grund, J. Reineke, and G. Gebhard. *Branch target buffers: WCET analysis and timing predictability*. In Proceedings of the 15th International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), August 2009.

S. Wilhelm and B. Wachter. *Symbolic state traversal for WCET analysis*. Proceedings of the International Conference on Embedded Software (EMSOFT), October 2009.

M. Abdel Maksoud, M. Pister, and M. Schlickling. *An Abstraction-Aware Compiler for VHDL Models*. In Proceedings of the International Conference on Computer Engineering and Systems, December 2009.

7.3 Thematic Cluster: Operating Systems and Networks

7.3.1 Activity: Resource Aware Operating Systems

- 1. Luca Abeni, Luigi Paolopoli, Claudio Scordino, Giuseppe Lipari, "Resource Reservations for General Purpose Applications", IEEE Transactions on Industrial Informatics, Volume 5:1, Pages 12-21, February 2009.
- 2. Konstanteli, K., Kyriazis, D., Varvarigou, T., Cucinotta, T. and Anastasi, G. "Real-Time Guarantees in Flexible Advance Reservations". In Computer Software and Applications Conference, 2009. COMPSAC '09. 33rd Annual IEEE International, pages 67-72, 2009.
- Cucinotta, T., Anastasi, G. and Abeni, L. "Respecting Temporal Constraints in Virtualised Services". In Computer Software and Applications Conference, 2009. COMPSAC '09. 33rd Annual IEEE International, pages 73-78, 2009.
- 4. Tommaso Cucinotta, Luigi Palopoli, "QoS Control for Pipelines of Tasks Using Multiple Resources," IEEE Transactions on Computers, IEEE Computer Society Digital Library, 23 July 2009.
- Tommaso Cucinotta, Antonio Mancina, Gaetano Anastasi, Giuseppe Lipari, Leonardo Mangeruca, Roberto Checcozzo, Fulvio Rusinà, "A Real-time Service-Oriented Architecture for Industrial Automation," IEEE Transactions on Industrial Informatics, Vol. 5, n. 3, pp. 267-277, August 2009.
- Tommaso Cucinotta, Kleopatra Konstanteli, Theodora Varvarigou "Advance Reservations for Distributed Real-TimeWorkflows with Probabilistic Service Guarantees", to appear in Proceedings of the IEEE International Conference on Service-Oriented Computing and Applications (SOCA 2009), Taipei, Taiwan, December 2009.



- 7. Tommaso Cucinotta, Luca Abeni, Luigi Palopoli, Fabio Checconi "The Wizard of OS: a Heartbeat for Legacy Multimedia Applications", in Proceedings of the 7th IEEE Workshop on Embedded Systems for Real-Time Multimedia, Grenoble (ESTImedia 2009), Grenoble, October 2009.
- Tommaso Cucinotta, Giuseppe Lipari, Luigi Palopoli, Luca Abeni, Rodrigo Santos "Multilevel feedback control for Quality of Service Management", in Proceedings of the 14th IEEE International Conference on Emerging Technologies and Factory Automation, Palma de Mallorca (ETFA 2009), Spain, September 2009.
- 9. Fabio Checconi, Tommaso Cucinotta, Manuel Stein "Real-Time Issues in Live Migration of Virtual Machines", in Proceedings of the 4th Workshop on Virtualization and High-Performance Cloud Computing (VHPC 2009), Delft, The Netherlands, August 2009.
- 10. Kleopatra Kostanteli, Dimosthenis Kyriazis, Theodora Varvarigou, Tommaso Cucinotta, Gaetano Anastasi, "Real-time guarantees in flexible advance reservations", in Proceedings of the 2nd IEEE International Workshop on Real-Time Service-Oriented Architecture and Applications (RTSOAA 2009), Seattle, Washington, July 2009.
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