You are welcome at SAFECOMP 2010, which takes place at a very attractive site, the Schönbrunn Palace Conference Center in Vienna, Austria, with an attractive programme, including scientific papers as well as industrial experience reports.

More information and registration:
www.safecomp.org and www.ocg.at/safecomp2010

The venue: City of Vienna, Schönbrunn Palace Conference Centre
Vienna, the capital of Austria, located at the Danube, often described as Europe’s cultural capital, is a city of unique charm and flair. With about 2 million inhabitants in the area, it’s still a metropolis, but not too large. Vienna is attractive to tourists as a romantically imperial city, with a long historical background and many sightseeing opportunities, and as a city of music, art and culture. Vienna is full of life, and according to Mercer’s 2009 Quality of Living survey, it ranks now first in worldwide quality of living. It may be less well known that Vienna is a City of Science as well, with many research facilities. Vienna is a “green” city – almost surrounded by the green belt of the Vienna Woods, and with many large parks, like the Prater, Lobau, Danube Island, Schönbrunn Park, Stadtpark and so on. Vienna is easy to reach by public transport (railways, airplanes), and provides a very good hotel infrastructure.

The conference venue is the Schönbrunn Palace Conference Centre in the former Apothecaries Wing on the east side of the imperial palace, just one minute to walk from the Underground Station “Schönbrunn”. Nevertheless, contemporary interior design and latest technology are provided for the conference facilities.

SAFECOMP Conference Contacts:
Erwin Schoitsch, AIT Austrian Institute of Technology,
erwin.schoitsch@ait.ac.at
Conference Secretariat: ocg@ocg.at
Schönbrunn Palace Conference Center,
Apothecaries’ Wing, nearest entrance Grünbergstraße,
Meidlinger Gate, 1130 Vienna (see Map [G3], U4 Metro Schönbrunn)
WORKSHOPS, TUTORIALS (details on the web site):

PLEASE REGISTER NOW! (http://www.ocg.at/safecomp2010)

Tuesday, Sept. 14, is a tutorial and workshop day, with currently planned two workshops (fixed) and two tutorials (if enough registrations for the tutorials):

For Workshop and Tutorial participants, SAFECOMP Early Bird rates are still valid until Sept. 7, 2010 !!

(Authors, members of OCG, EWICS, GI and associated computer societies: 440 Euros, others 500 Euros) (later on rates will be 500/550 Euros resp.)

Workshop 1:
S&D4RCES – International Workshop on Security and Dependability for Resource Constrained Embedded Systems

Workshop 2:
ERCIM/DECOS/MOGENTES - Dependable Embedded Systems: Model-based Design and Validation (Automated Test Case Generation) (full day)

Tutorial 1:
Integration and Complexity of Flight Systems - The Role of Data Buses (9:00 - 12:30)

Tutorial 2:
Goal directed Specification, Measurement and Certification of Functionality, Integrity, Privacy, Safety and Security (14:00 - 17:30)

EXHIBITION:

A Technical Exhibition and Tool Fair is open during the whole conference in the communication area where coffee breaks and lunches take place

PROCEEDINGS are published as SPRINGER LNCS 6351
They will be available as part of the participant’s conference package!
Conference Program

SAFECOMP 2010 Key Theme
Critical Embedded Systems – Challenges and Risks

Keynotes (9:30 – 10:15)

Wednesday, 15th Sept.:
"System of Systems Challenges"
(Hermann Kopetz - Vienna University of Technology, Austria)

Thursday, 16th Sept.:
"Murphy Was An Optimist" (Kevin Driscoll - Honeywell Laboratories, USA)

Friday, 17th Sept.:
"Process Control Security: go Dutch! (united, shared, lean and mean)"
(Eric Luijff - TNO, The Hague, The Netherlands)

Preconference - Monday 13th - Tuesday 14th

EWICS TC 7 Meeting: Monday/Tuesday (free of charge)

for details see http://www.ewics.org.

Monday, Sept.13, 2010: TechGate, Donau-City-Straße 1, TechGate Tower, 5th floor, AIT-Safety & Security Department (see Map, U1 Metro, Kaisermühlen-VIC)

Tuesday, Sept. 14, 2010: at SAFECOMP Conference Venue, Schönbrunn Palace Conference Center

Workshops, Tutorials: Tuesday, 14th

Schönbrunn Palace Conference Center

Main Conference - Wednesday 15th - Friday 17th Sept.

Wednesday 15th

9:00 - 9:30 Welcome Addresses

- Lisbeth Mosnik, Austrian Federal Ministry of Transport, Innovation and Technology
- Francesca Saglietti, EWICS Chair, University of Erlangen-Nuremberg, Germany
- Gerald Futschek, Technical University of Vienna, President of the Austrian Computer Society, Austria
- Erwin Schoitsch, Conference Chair, AIT Austrian Institute of Technology, Austria

9:30 - 10:15 Keynote I

System of Systems Challenges
Hermann Kopetz, Vienna University of Technology, Austria

10:15 - 10:45 Coffee Break

10:45 - 12:45 Session 1: System Analysis

Reliability Analysis of Safety-Related Communication Architectures
Oliver Schulz, Jan Peleska, University of Bremen, Germany

A Novel HAZOP Study Approach in the RAMS Analysis of a Therapeutic Robot for Disabled Children
Thomas Gruber, Petr Böhm, AIT Austrian Institute of Technology, Austria

Variability Management of Safety and Reliability Models: An Intermediate Model towards systematic Reuse of Component Fault Trees
Carolina Gomez, Peter Liggesmeyer, TU Kaiserslautern, Germany; Ariane Sutor, Siemens Corp. Research, Munich, Germany

QoS Analysis of Weighted Multistate Probabilistic Networks via Decision Diagrams
Roberta Terruggia, Andrea Bobbio, University Piemonte Orientale, Italy

12:45 - 14:00 Lunch

14:00 - 16:00 Session 2: Safety Cases and Certification

Comparison between IEC 60880 and IEC 61508 for Certification Purposes in the Nuclear Domain
Jussi Lahtinen, Jukka Ranta, Hannu Harju, VTT, Finland; Mika Johansson, Risto Nevalainen, Tampere University of Technology, Finland
Deriving Safety Cases for Hierarchical Structure in Model-Based Development
*Nurlida Basir, Bernd Fischer, University of Southampton, UK; Ewen Denney, NASA Ames Research Center, USA*

Assurance of Automotive Safety - A Safety Case Approach
*Robert Palin, Jaguar Land Rover, Coventry, UK; Ibrahim Habli, University of York, UK*

How to "Survive" a Safety Case According to ISO 26262
*Torsten Dittel, Ford, Cologne, Germany; Hans-Jörg Aryus, SystemA Engineering, Immenstaad, Germany*

**16:00 - 16:30 Coffee Break**

**16:30 - 18:00 Session 3: Aerospace**

Benchmarking Software Requirements Documentation for Space Application
*Paulo Veras, Rodrigo P. Pontes, Emilia Villani, Aeronautical Institute, São José dos Campos-SP, Brazil; Ana Maria Ambrosio, National Institute for Space Research, São José dos Campos-SP, Brazil; Henrique Madeira, Marco Vieira, Aeronautical University of Coimbra, Portugal*

Verifying Mode Consistency for On-Board Satellite Software
*Alexei Iliasov, Alexander Romanovsky, University of Newcastle, UK; Elena Troubitsyna, Linas Laibinis, Abo University, Finland; Kimmo Varpaaniemi, Pauli Väisänen, Dubravka Ilic, Timo Latvala, Space Systems Finland, Finland*

Computational Concerns in the Integration of Unmanned Airborne Systems into Controlled Airspace
*Christopher Johnson, University of Glasgow, Scotland, UK*

**20:00 Welcome Reception**

*City Hall, Restaurant Wiener Rathauskeller*

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**Thursday 16th**

**8:30 - 9:30 Session 4: Error Detection**

Residual Error Probability of Embedded CRC by Stochastic Automata
*Frank Schiller, Tina Mattes, TU Munich, Germany*

ANB- and ANBDmem-Encoding: Detecting Hardware Errors in Software
*Ute Schiffel, Andre Schmitt, Martin Süßkraut, Christof Fetzer, TU Dresden, Germany*

**9:30 - 10:15 Keynote II**

*Murphy Was An Optimist*  
*Kevin Driscoll - Honeywell Laboratories, USA*
10:15 - 10:45 Coffee Break

10:45 - 12:45 Session 5: Validation and Verification

Field Test Methods for a Co-operative Integrated Traffic Management System
Thomas Gruber, Egbert Althammer, Erwin Schoitsch, AIT Austrian Institute of Technology, Austria

100% Coverage for Safety-Critical Software - Efficient Testing by Static Analysis
Daniel Kästner, Reinhold Heckmann, Christian Ferdinand, AbsInt GmbH, Saarbrücken, Germany

MODIFI: A MODel-Implemented Fault Injection Tool
Rickard Svenningsson, Jonny Vinter, Henrik Eriksson, SP Technical Research Inst. of Sweden, Sweden; Martin Törngren, KTH Stockholm, Sweden

Automated Test Coverage Measurement for Reactor Protection System Software Implemented in Function Block Diagram
Eunkyoung Jee, Insup Lee, University of Pennsylvania, USA; Suin Kim, KAIST, Daejeon, Rep. of Korea; Sungdeok Cha, Korea University, Seoul, Rep. of Korea

12:45 - 14:00 Lunch

14:00 - 15:00 Session 6: Testing

Overcoming Non-determinism in Testing Smart Devices: a Case Study
Peter Bishop, CSR City University and Adelard, London, UK; Lukasz Cyra, Adelard, London, UK

Software Testing by People with Autism
Sjaak Brinkkemper, Suzanne Haanappel, Utrecht University, The Netherlands

14:00 - 15:00 EWICS TC7 presentation

EWICS TC7 Subgroup Presentations

16:00 - 16:30 Coffee Break

16:30 - 18:00 Session 7: Critical Infrastructure - Smart Grid

Information Flow Analysis of Energy Management in a Smart Grid
Ravi Akella, Bruce McMillin, Missouri University of Science and Technology, USA

Integrated Cyber-Physical Fault Injection for Reliability Analysis of the Smart Grid
Sahra Sedigh, Bruce McMillin, Ayman Faza, Missouri University of Science and Technology, USA

A Metric for Measuring the Strength of Inter-dependencies
Silvia Ruzzante, Elisa Castorini, Elena Marchei, Vincenzo Fioriti, ENEA, Roma, Italy
18:30 - 19:30 Guided Tour

The guided tour through **Schoenbrunn Castle** will take you through the rooms of the palace showing you the apartments of Emperor Franz Joseph and Empress Elisabeth, as well as the magnificent ceremonial rooms in the central part of the palace. Afterwards a panorama train will take you to **Gloriette**, the belvedere of Schoenbrunn Castle, where the conference dinner will be held.

19:30 Conference Dinner: Schoenbrunn Palace, Gloriette

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Friday 17th

8:30 - 9:30 Session 8: Security and Safety

Security Analysis of Open Building Automation Systems
Wolfgang Granzer, Wolfgang Kastner, Vienna University of Technology, Austria

A UML Profile for Requirements Analysis of Dependable Software
Denis Hatebur, ITESYS GmbH and University Duisburg-Essen, Germany; Maritta Heisel, University Duisburg-Essen, Germany

9:30 - 10:15 Keynote III

Process Control Security: go Dutch! (united, shared, lean and mean)
*Eric Luijff, TNO, The Hague, The Netherlands*

10:15 - 10:45 Coffee Break

10:45 - 12:45 Session 9: Safety Engineering I

Model-Based Safety Engineering of Interdependent Functions in Automotive Vehicles Using EAST-ADL2
*Anders Sandberg, Mecel AB, Gothenburg, Sweden; DeJiu Chen KTH Stockholm, Sweden; Henrik Lönn, Lei Feng, Ramin Tavakoli-Kolagari, Volvo Technology, Gothenburg, Sweden; Lei Feng, Ramin Tavakoli-Kolagari, Volvo Technology, Gothenburg, Sweden; Rolf Johansson, Mentor Graphics, Gothenburg, Sweden; Sandra Torchiaro, CRF, Orbassano, Italy; Andreas Abele, Continental Automotive, Regensburg, Germany*

Experiences in Applying Formal Verification in Robotics
*Dennis Walter, Holger Täubig, Christoph Lüth, German Research Institute for AI, Bremen, Germany*

Evolving a Safe System Design Iteratively
*Alexandre Mota, Edson Watanabe, Felipe Ferri, University of Pernambuco, Brazil; Adriano Gomes, Joabe Jesus, Embraer, Brazil*
An Approach to Using Non Safety-Assured Programmable Components in Modest Integrity Systems

Peter Bishop, CSR City University and Adelard, London, UK; Kostas Tourlas, Nick Chozos, Adelard, London, UK

12:45 - 14:00 Lunch

14:00 - 16:00 Session 10: Safety Engineering II

Development of High-Integrity Software Product Lines Using Model Transformation

Stuart Hutchesson, John McDermid, Aero Engine Controls, Derby & University of York, UK

On the Safety Implications for e-Governance: Assessing the Hazards of Enterprise Information Architectures in Safety-Critical Applications

Christopher Johnson, Stefan Raue, University of Glasgow, Scotland, UK

The Right Degree of Configurability for Safety-Critical Embedded Software in Variable Message Signs

Thomas Novak, Christoph Stoegerer, SWARCO FUTURIT, Perchtoldsdorf, Austria

INDEXYS, A Logical Step Beyond GENESYS - INDustrial EXploitation of the genesYS cross-domain architecture

Andreas Eckel, Christian Fidi, TTTech, Vienna, Austria; Roman Obermaisser TU Vienna, Austria; Paul Milbredt, Audi AG, Germany; Zaid Al-Ars, Delft University of Technology, The Netherlands; Stefan Schneeke, EADS Germany GmbH, Germany; Bart Vermeulen, NXP Semiconductors Netherlands B.V., The Netherlands; György Csertan, OptXware Research and Development Ltd., Hungary; Christoph Scheerer, Thales Rail Signalling Solutions GesmbH, Austria; Neerai Suri, Abdelmajid Khelil, Technical University of Darmstadt, Germany; Gerhard Fohler, Technical University of Kaiserslautern, Germany

16:00 - 16:30 Closing Session

Announcement of SAFECOMP 2011 Best Paper Award

Closing Remarks and Farewell

16:30 - 17:00 Coffee and Wrap Up
Workshops and Tutorials (Programmes and Descriptions)

September 14, Schoenbrunn Palace Conference Centre

Workshop 1:
S&D4RCES – International Workshop on Security and Dependability for Resource Constrained Embedded Systems

Contact: Brahim HAMID, IRIT- University of Toulouse, France

The main focus of S&D4RCES is on the topic of making security and dependability expert knowledge available to Resource Constrained Embedded Systems (RCES) engineering processes. Special emphasis will be devoted to promote discussion and interaction between researchers and practitioners focused on the particularly challenging task to efficiently integrate security and dependability solutions within the restricted available design space for RCES. Furthermore, one important focus is on the potential benefits of the combination of model-driven engineering with pattern-based representation of security and dependability solutions.

The workshop aims to bring together researchers from various fields involved in the development and deployment of RCES with a particular focus on the transfer of results from fundamental research to the industrial development of RCES. We believe that the synergy between researchers working in different aspects of this area will produce important benefits. The objective of this workshop is to foster an exchange of ideas among practitioners, researchers and industry involved in the deployment of secure and dependable resource-constrained embedded systems. The exchange of concepts, prototypes, research ideas, and other results which contribute to the academic arena and also benefit business and industrial communities, is of particular interest. Some of the topics that we seek to include in the workshop are related to the development of models and tools to support the inclusion of security and dependability (SD) issues into the RCES engineering process.

Thus, the workshops targets also audience from communities concentrated on security and dependability beyond the existing MODELS participants. Therefore, we will target the following research communities:

- Engineering of RCES:
  - Model-driven engineering
  - Component-based software engineering
  - Automated software engineering
  - Real-time and highly efficient embedded systems
- Security and dependability
  - SD in model-driven engineering
  - Formal methods in security
  - Security and dependability requirements specification Pattern-based approaches to SD engineering

Contact:

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Phone/fax: +33 (0)5 6150 2386 / 4173
E-mail: brahim.hamid@irit.fr
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<td><em>Enforcing Trust in Embedded Systems Using Models</em></td>
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<td>Christophe Jouvray, Miche SallAntonio Kung</td>
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<td><em>Trust in MDE Components: the DOMINO Experiment</em></td>
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<td>Benoit Baudry, Pierre Bazex, Jean-Charles Dalbin, Philippe Dhaussy, Hubert</td>
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<td>Dubois, Christian Percebois, Erwann Poupart, Laurent Sabatier</td>
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<td><strong>Session 2: research papers- Formalization</strong></td>
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<td><em>Formalization of Smart Metering Requirements</em></td>
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<td>Andreas Fuchs, Sigrid Guergens, Donatus Weber, Christian Bodenstedt, Christoph Ruland</td>
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<td><em>Automated Unit and Integration Testing for Component-based Software Systems</em></td>
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<td><em>Hierarchical Multi-Agent Protection System for NoC based MPSoCs</em></td>
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<td>Slobodan Lukovic, Nikolaos Christianos</td>
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<td>12:45– 14:00</td>
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<td><strong>Session 3: ongoing project and new visions</strong></td>
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<td><em>Security engineering for embedded systems -- the SecFutur vision,</em></td>
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<td>Sigrid Guergens, Carsten Rudolph, Antonio Mana, Simin Nadjm- Tehrani</td>
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<td><em>Model-Based Security and Dependability Patterns in RCES- the TERESA Approach</em></td>
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<td>Brahim Hamid, Cyril Grepet</td>
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<td><em>Towards the Integration of Advanced Engineering Paradigms into RCES: raising the issues for the Model-Driven Product-Line Case</em></td>
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<td>David Gonzalez, Antonio Pérez, Salvador Trujillo</td>
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<td><em>Model-based management of Ubiquitous and Autonomic M2M Services architecture</em></td>
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<td>Khalil Drira</td>
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<td>16:00 – 16:30</td>
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<td>16:30 – 18:00</td>
<td><strong>Session 4: working and discussion</strong></td>
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<td><em>chair: TBA</em></td>
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Workshop 2 (9:00 – 17:30):
ERCIM/DECOS/MOGENTES - Dependable Embedded Systems: Model-based Design and Validation (Automated Test Case Generation) (full day)

Registration free of charge (workshop only, tutorial can be attended independent from SAFECOMP Conference registration)

Participation without a paper is very welcome as well, please register in any case!

Coffee Break and Lunch included.

Session Chairs:
Wolfgang Herzner, Erwin Schoitsch AIT Austrian Institute of Technology
Amund Skavhaug, NTNU, Trondheim

Computers are everywhere – may they be visible or integrated into every day equipment, devices, and environment, outside and inside us, mobile or fixed, smart, interconnected and communicating. Comfort, health, services, safety and security of people depend more and more on these “embedded systems”, and the impact on society as a whole is tremendous – positive and negative.

Thus dependability in a holistic manner becomes an important issue. Technology is developing very fast, and demanding challenges have to be met by research, engineering and education. Smart (embedded) systems are regarded as the most important business driver for European industry. They are a targeted research area for European Research Programmes in Framework 7 and the ARTEMIS Joint Undertaking, and in several other dedicated Programmes. Artemis (“Technology Platform for Advanced Research and Technology for Embedded Intelligence”) and EPoSS (“European Technology Platform (ETP) on Smart Systems Integration”) are the main two ETPs promoting smart embedded systems technology as their objective. Their application is not only in the traditional areas of aerospace, railways, automotive, or process industry and manufacturing, but also in services of all kind, in home appliances (smart environments, smart homes, ambient assisted living) and health care. Co-operative, distributed networked systems and resilient systems (adaptive systems maintaining dependability even in changing environments) add another dimension of functionality and complexity requiring a holistic view of system engineering.

Morning session: 9:00 – 12:30

For the morning session there is a Call for Papers, and proposals for papers (short papers or one-page abstracts) can be sent to the chairpersons directly.

TOPICS for Papers: Suggested topics of interest include, but are not restricted to:

- Hardware/Software Do-Design, System-on-Chip Integration
- Optimized Algorithms for Embedded Systems (power management, embedded vision, networks on chip, communication)
- Industrial Applications and Experience (Automotive, Aerospace, Railways, Manufacturing, Smart Homes, eHealthcare)
- Embedded Intelligence, Ambient Assisted Living Applications
- Adaptive, resilient systems
- Co-operative systems (road safety, co-operative autonomous systems, sensor networks)
- Architectures, Methods, Tools and efficient Processes and Procedures for Design and Development of critical systems (hardware, software)
- Verification and validation of hardware and software, components and systems.
- Interconnected, networked embedded systems, safety and security interdependencies
- Functional Safety Standards and Assessment, Evaluation and Certification/
- Use/integration of COTS hardware and/or software as well as of legacy systems
- Education and Training in the area of Dependable Smart Systems
- Societal Aspects and Impact

In particular, we encourage submissions demonstrating the potential of new approaches by providing case studies, experiments as well as experience and/or quantitative data, from academic, research and industry as well. Papers will be peer reviewed by the IPC (International Program Committee).

Afternoon Session 14:00 – 17:30

The afternoon session is dedicated to papers on “Validation and Verification”, presenting the results of the European FP7 project MOGENTES (Model Based Generation of Efficient Tests for Dependable Systems, contract no. 216679), planned presentations are:

- **14:00 – 14:30** MOGENTES Overview (W. Herzner, AIT)
- **14:30 - 15:00** Modelling and Mutation Testing (UML) (R. Schlick, AIT)
- **15:00 – 15:30** Automated Test Case Generation (TU Graz)
- **15:30 – 16:00** Tool Integration (András Pataricz, Balázs Polgár, Imre Kocsis, András Kövi, Budapest University of Technology and Economics)
- **16:00 – 16:30** Coffee Break
- **16:30 – 16:30** Model based Fault Injection Tool (MIFI, MODIFI) (SP Research Institute of Sweden)
- **16:30 – 17:00** Model Checking (ETH Zurich/University of Oxford)
- **17:00 – 17:30** Plenary discussion, concluding remarks

The papers and presentation material (slides) will be published as ERCIM proceedings after the workshop.

Important dates

Submission of abstracts/paper proposals: Sept. 8, 2010
Notification of acceptance: Sept. 9, 2010
Workshop: September 14, 2010

Contacts:

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erwin.schoitsch@ait.ac.at
Tutorial 1 (half day, 9:00 – 12:30):

Integration and Complexity of Flight Systems - The Role of Data Buses

Reinhard Maier, TTTech Computertechnik, Vienna, Austria

Registration fee (tutorial only, tutorial can be attended independent from SAFECOMP Conference registration): 80 €.

Coffee Break and Lunch included. Handouts will be provided.

Abstract
Increasing cost pressure in the aerospace industry drives the system design optimization and integration of different systems. Sharing resource among different systems provides cost and weight savings, but creates new challenges: increased complexity and an increased need for coordination and complexity management.

Data buses are in the centre of the integration activity and complexity. A particular data bus and architecture may support system engineers in the complexity management and integration effort. Alternatively, data buses can increase the complexity management and create additional challenges and effort.

The tutorial will give an introduction to integrated flight system and discuss the role of the data buses. Different options and their implications are discussed in the context of different system architectures. The tutorial will address the following the questions:

- More integration or less integration
- Field buses and system buses
- Network properties and the system implications
- The future of integrated flight systems

Intended Audience:
System and software engineers for modular, networked, fault tolerant, or safety-critical applications.

Benefits:

- Understanding the properties of different network technologies and their suitability/impact on integration
- Understanding the benefits of time-triggered technologies
- Understanding the trade-offs between more or less integration
- Increase knowledge of field buses and system buses
- Get an understanding about the future of integrated flight systems

About the lecturer:
Reinhard Maier holds a masters degree in computer science from the Vienna University of Technology (real time systems group of Prof. Kopetz) and a masters degree in business from the Vienna University.

Reinhard Maier is the lead of aerospace product management at TTTech Computertechnik, Vienna, Austria. He participated in the development and certification of flight control systems, engine controls, avionics for general aviation, and electric power systems. His research interest include real-time buses and fault tolerant real-time systems. He has authored many papers published in the IEEE magazines and other journals.
Contact:

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Tel: +43 1 585 34 34-947, Fax: +43 1 585 34 34-90
Email: reinhard.maier@tttech.com
http://www.tttech.com
Tutorial 2 (half day, 14:00 - 17:00)


Hans-Ludwig Hausen, FRAUNHOFER, St Augustin, Germany

Registration fee (tutorial only, tutorial can be attended independent from SAFECOMP Conference registration): 80 €.

Coffee Break and Lunch included. Handouts will be provided.

Aim:

Overall aim of the course is to make the attendees familiar with the methods and principles of software metrication and certification for procedural, object-oriented and agent-based systems. The focus is on directed quality specification, measurement, scaling and assessment as part of an industry proven, standardized procedure for concurrent software quality assurance and final evaluation for certification. A prime objective of the tutorial is to show how the core quality characteristics (i.e. functionality, integrity, privacy, safety and security) can be effectively identified and operationally specified within the conditions and constraints of present day software and system engineering and management procedures. In conclusion attendees will see that assessment and certification of COTS, SOUP and Bespoke software can be conducted by one tailorable procedure.

Motivation and Scope:

Software quality is the most important concern in industry today. Measurement and assessment are the key elements for effective software quality assurance as well as for sustainable software process improvement. In order to deliver quality products designers, testers as well as managers have to be able to apply mature techniques for measuring and assessing software artifacts.

Global competition in distributed and consortial development and application of software requires effective techniques for management and engineering of COTS (commercial off the shelf) or SOUP (software of unknown pedigree) and as well as of Bespoke systems. Throughout its whole lifetime a system is specified and evaluated with respect to various views and attributes. Managers as well as engineers, therefore, have to use mature measurements and metrics to be able to communicate professionally on requirements, specifications, designs and implementations. Consequently, one has to specify and validate features and metrics on each layer of a system. In application driven research a number of approaches to software metrics have been investigated. Building on that experience we know what and how software is to be specified for effective quality assessment and what and how metrics are to be defined and applied.

The course starts with basic principles of measurement and metrics. Second and main topic is metrics-based quality engineering for development and application. Language-based metrication is the third topic. Here, we demonstrate that metrics can be effectively integrated into compilers or interpreters. The course is focussed on metrics for programming concept to be found in the most recent programming languages (e.g. C++, Java, ) or mark-up languages (e.g. SGML, XML). The metrication approach discussed, therefore, is applicable to all kind of software, from procedural through object-oriented to agent-based systems.

The tutorial will cover the methods and principles of information and software system quality assurance (comprising test, measurement and assessment) for procedural, object-oriented or agent-
based dependable software systems. Assessment of both the software product as well as the software process will be discussed with respect to its relevance for such acceptance assessments. A standardized process model for measurement, assessment and certification of dependable software will be used to make the attendees familiar with this comprehensive assessment procedure and to learn how to embed it into current standardized or non-standardized software processes.

**Tutorial level:**
The level of the course will be intermediate. Emphasis will be given to selected advanced topics depending on the requirements and needs of participants.

**Required experience, background, expected audience:**
The course will discuss topics of quality and productivity, which are of high importance to software and system engineers, configuration managers, quality managers, project managers, product managers and key developers. Attendees should be familiar with software quality assurance techniques, such as inspection, testing, verification or validation. A basic knowledge in math and some knowledge on software methods and tools might be helpful to actively participate in the course. Software designers, managers and quality assurance staff and managers will benefit most from the tutorial.

**Outline:**
1. Welcome and Introduction (10 min)
2. Quality Objectives and Standards (30 min)
3. Modelling of Products, Processes, Methods, and Tools (30 min)
4. Quality Modelling and Assessment (40 min)
5. Software Metrics and Metric Aggregation (40 min)
6. Evaluation and Certification Guides (20 min)
7. Summary and Conclusions (10 min)

**About the lecturer:**
**Hans-Ludwig Hausen** holds degrees in Electrical Engineering from the University of Wuerzburg-Schweinfurt and in Computer Science from the Technical University of Berlin. He is currently a Senior Researcher at Fraunhofer and lecturer in the following areas:

Dedicated and general Information Systems (IS), Computer Aided Software Engineering (CASE), Computer Supported Collaborative Work (CSCW), Software and Systems Quality Engineering (SQE), Business Process Engineering (BPE), as well as in Conformance Testing and Certification (CTC) for national and international projects in a number of application domains (office and embedded systems, archive and library systems, healthcare systems).

Based on that experience of more than 25 years as manager, consultant, advisor and lecturer he has written a large number of reviewed publications on information storage and retrieval systems, software engineering environments, software quality and productivity, process engineering and on team ware resp. groupware (about 130 papers and 3 books). At present he works on Software Systems, Quality Engineering and Risk Assessments in Cooperative Systems, Embedded Systems Design, Intelligent Content and Semantics, Personal Health Systems, Risk Assessment and Patient Safety, Computer and Data Treatment as well as Service and Software Architectures, Infrastructures and Engineering. He is Principal Technical Consultant for the German Government and the European Commission. Further details on [http://www.scope.gmd.de](http://www.scope.gmd.de)

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