



Cluster of EU FP7 Projects ON SYSTEMS OF SYSTEMS

Issue n°
4

Newsletter • June 2016

Contents

- 1 Welcome from Prof. S. Engell, Project Coordinator CPSoS
- 2 Cyber-physical Systems of Systems Research: Looking Back and Ahead
- 4 News from CPSoS
- 5 CPSoS Workshops
- 5 AMADEOS Research Topics
- 7 DYMASOS Research Topics
- 8 Local4Global Research Topics
- 8 PICASSO – EU-US ICT Collaboration
- 9 Events Reports from the Cluster Projects
- 10 Systems of Systems Related Events
- 11 Publications of the Cluster Projects
- 11 Editorial Information

Welcome from Prof. Sebastian Engell, Project Coordinator of CPSoS

Dear Readers,
 This is the fourth and last newsletter of the CPSoS project on behalf of the FP7 project cluster of Systems of Systems projects. The mission of CPSoS was to define a European Research Agenda on Cyber-physical Systems of Systems and to network between the researchers in this area. I am proud to say that we have fully achieved our goals. The Working Groups of CPSoS included 35 experts from the fields of transportation and logistics, electric grids, process automation, and methods and tools for the engineering of cyber-physical systems of systems, including delegates of the other cluster projects. Over a series of meetings and public workshops, and based on feedback from experts from small and large enterprises, we have developed the Proposal of a European Research and Innovation Agenda on Cyber-physical Systems of Systems and published it as an illustrated brochure which you can find under www.cpsos.eu/roadmap. Most elements of the CPSoS research agenda were integrated in the Strategic Research Agenda (SRA) of the [Artemis Industrial Association](#) which contains a chapter on Cyber-physical Systems of Systems. In two workshops organised by CPSoS in April 2016, the findings of the projects were underpinned by presentations from industry and from academia on current research and development. You can find short reports and the slides of the presentations on the “News/Events” section of the project website ([CPSoS event at CPS Week 2016](#) and [CPSoS Workshop at Hannover Fair 2016](#)). Currently we are in the process of preparing an edited volume on the core research topics in cyber-physical systems of systems. Contributions are still possible, please contact Michel Reniers at m.a.reniers@TUE.nl.
 In closing, I would like to express my sincere thanks to the CPSoS team which made the success of CPSoS possible and even went beyond the already ambitious agenda of the project: Radoslav Paulen and Christian Sonntag at TU Dortmund, Haydn Thompson at Haydn Consulting Ltd., Michel Reniers at TU Eindhoven, and Bertrand Copigneaux, Svetlana Klessova and Dagmar Marron at inno TSD. Dagmar Marron edited this newsletter, as well as the three previous editions, and was the editorial assistant for the edited version of the CPSoS Research Agenda. Special thanks to her for her great care for the details, enormous efforts and patience!



Prof. Sebastian Engell,
Technische Universität Dortmund
Project Coordinator of CPSoS





Cyber-physical Systems of Systems Research

Looking Back and Ahead

Proposal of a European Research and Innovation Agenda on Cyber-physical Systems of Systems

2016-2025

The Research and Innovation Agenda gives an overview of the challenges of various societal and industrial sectors and proposes a way forward for research and innovation in the domain of CPSoS. The CPSoS consortium has identified **three core long-term research challenges** that must be addressed in an inter-disciplinary manner and in collaboration of tool and solution providers, end-users, and research institutions:

- Distributed, reliable and efficient management of cyber-physical systems of systems
- Engineering support for the design-operation continuum of cyber-physical systems of systems
- Towards cognitive cyber-physical systems of systems



In addition, **11 medium-term research and innovation priorities** have been defined that should receive attention and funding during the next 5 years in order to advance towards meeting the core challenges:



Cross-sectorial research and innovation priorities

- System integration and reconfiguration
- Resiliency in large systems
- Distributed robust system-wide optimization
- Data-based System operation
- Predictive maintenance for improved asset management
- Overcoming the modelling bottleneck
- Humans in the loop

Sector-specific priorities

- Integration of control, scheduling, planning, and demand-side response in industrial production systems
- New ICT infrastructures for adaptable, resilient, and reconfigurable manufacturing processes
- Multi-disciplinary, multi-objective optimization of operations in complex dynamic 24/7 systems
- Safe, secure and trusted autonomous operations in transportation and logistics

More details can be found in the full document which is available for download and consultation at <http://www.cpsos.eu/roadmap/>.



Cyber-Physical Systems of Systems Stepping Stones for the Digitalization of Industry

An Outlook from the Commission

After three years the cluster of Systems of Systems projects with the CSA CPSOS and the three RIAs AMADEOS, DYMASOS and Local4Global will come to its end. It is a good time to take a step back and to look at the wider picture.

In our modern world, with all aspects of our lives becoming increasingly digitalized, Systems of Systems will play a crucial role. As the embedded world meets the Internet world there will be an increasing number of interacting systems with strong connectivity in both society and in industry. The growing overall complexity of systems has triggered a paradigm shift and the need to enhance the classical view of Systems Engineering towards Systems of Systems (SoS) Engineering. SoS describes the large scale and dynamically varying integration of many independent, self-contained systems to satisfy needs for services that can only be provided by the system as a whole. Examples of SoS include the electrical grid, a large processing plant with many process units, multi-modal traffic control, and combined heat and power generation.

The field of SoS deals with how to engineer and manage such large interconnected and continuously evolving systems, and is thus fundamental to the realization of their market potential. The EU funded coordination action CPSOS

has compiled a state of the art report and identified the challenges for this field. Methods from different domains need to be combined with systems and domain engineering such as control theory for continuous systems, discrete models from computer science for verification/testing and contract-based assertions, structure formation from physics and market mechanisms and evolution of beliefs from economics and social science. Modelling and simulation are crucial in this effort. Promising results have been obtained in some relatively controlled environments, such as chemical plants and traffic management, as well as on the foundational issue of time management. The EU funded projects AMADEOS, DYMASOS and Local4Global are pacemakers in these developments. Yet in general the application of model-based methods in SoS engineering is still at its beginning and needs to find its way from research labs into practice.

The European Union supports collaborative research and innovation in the area of Systems of Systems with an investment of 30 million Euros. In the wider area of Embedded Systems, Cyber-Physical Systems, Security and Internet of Things circa 150 million Euros per year are earmarked in the Horizon2020 work programme and the Joint Technology Initiative ECSEL. As a flanking measure, the EU supports

networks of competence centres to enable access to digital technologies for any industry in Europe. This is also a key action of the recently published Communication on Digitising European Industry.

Acknowledging the importance of digital platforms for industry, the EU and its member states have jointly launched large-scale innovation projects to demonstrate open, integrated and secure technology and operational platforms for product development, process automation and associated services in the ECSEL JTI programme. ECSEL Lighthouse projects will carry this concept further by including market-pull demands related to societal needs. In addition large scale pilots for Internet of Things platforms will be launched. These actions will also contribute to the design, development, demonstration and testing/validation of platforms for SoS and contribute to the stimulation of the related ecosystem and marketplaces.

In conclusion I congratulate all four projects on their achievements in this important area and wish the partners all success in the pursuit of their research and innovation activities.

Dr. Werner Steinhögl,
Programme officer for Cyber-Physical Systems
at the European Commission, DG CONNECT

CPSoS

A Statement from Industry



It is clear that systems of systems are pervasive in basically all application areas of modern society. In the future the one that can manage the complexity of cyber-physical systems of systems holds a clear competitive advantage. I am impressed by the final research agenda compiled by the CPSoS team based on the workshops with the working groups and external participants.



Dr. Alf Isaksson,
Global Research Area Manager,
Corporate Research ABB AB Västerås, Sweden



Digital Transformation The Silent Revolution: A Great Opportunity for CPSoS

Statement from ARTEMIS

In parallel to the CPS Week event in Vienna, Austria on April 13, 2016, [ARTEMIS Industry Association](#) disclosed its Mars 2016 Strategic Research Agenda (SRA) edition.

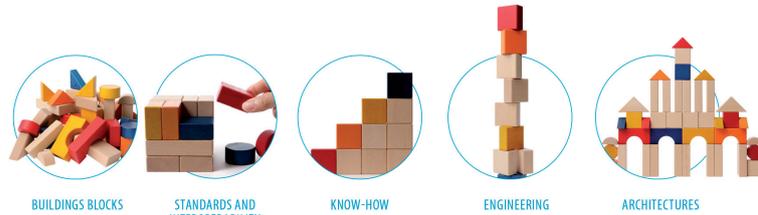
This SRA focuses on the Digital Transformation to open the pathway and accelerate its take-up in various activity areas and markets. It proposes research directions that will enable more agile and shorter development cycle of Cyber-Physical Systems (CPS) through the adoption of design-by-composition and correct-by-construction principles. The SRA highlights the importance of this digital evolution that is now occurring as a silent revolution transforming our way of living and of doing business.

Indeed, CPS technology and more particularly the CPSoS are nowadays playing a crucial role and are widely recognised as core enablers lying at the heart of the development of many innovative products and services. By focusing on providing strong technological capability over the whole value chain, barriers can be removed between application contexts to yield multi-domain, reusable components

("building blocks") for CPS, extending from Systems and to the Systems of Systems across the whole value chain from engineering to applications for the benefit of all industrial sectors from automotive to healthcare, farming and pharmaceuticals...

CPSoS Support Action contributed largely in setting and orienting to new strategic research challenges and innovation strategy of this new SRA, and actively participated in the Working Group drafting it. Indeed, CPSoS figure among the major research chapters

ARTEMIS feeds innovations through



Across the CPS System design flow / supply chain

*To make significant advances in 'design by composition'
To meet the challenges of dependability, cost effectiveness, time to market, ...*

By courtesy from ARTEMIS-IA SRA WG

as CPSoS "pose big challenges in their management and operation as well as in their engineering throughout their life cycle" and are therefore an essential Building Block promoted by the SRA. CPSoS is a strategic research domain to invest in and to explore to master their growing complexity, ensure safety, security and privacy, allow flexibility and facilitate interoperability between various systems.

Laila Gide,
*Advanced Studies Director,
THALES, France*

News from

CPSoS

Edited Volume on Project Outcomes

The CPSoS project is in the process of producing an edited volume with the tentative title "Challenges in Engineering and Management of Cyber-Physical Systems of Systems". The purpose of the book is to introduce the results of the CPSoS project in terms of the long-term research challenges and the medium-term research and innovation priorities, and

to provide support from industry and academia for these viewpoints by means of contributed chapters in the wide area of CPSoS.

The planned publication date is in the first quarter of 2017, and an e-book version will be made available in Open Access.



CPSoS

Workshops

Cyber-Physical Systems of Systems at CPS Week 2016

Vienna, Austria – April 11, 2016

At the occasion of the CPS Week 2016 which assembled more than 1000 researchers in the dynamic field of cyber-physical systems, the CPSoS project organized a [public workshop on Cyber-physical Systems of Systems](#).

The workshop program consisted of an introduction to the key research topics defined by the project, followed by invited presentations from both industry and academia that underpinned their importance and was structured around the three long-term research and innovation areas identified by the CPSoS project.

Discover the workshop program as well as presentations given there [here](#).

Public Workshop of the CPSoS Project at the Hannover Fair 2016

Hannover, Germany – April 26, 2016



The CPSoS project organized the [workshop “Cyber-physical Systems of Systems – The Next Challenge”](#) at Hannover Messe 2016 on April 26th, 2016. The aim of the workshop was to discuss the challenges and the way forward **for the engineering and management of large-scale cyber-physical systems of systems**. It included, among others, the following presentations from leading representatives of the European industry that develop and deploy components of cyber-physical systems of systems or operate such systems, and who presented their views on the state of the art and future of the cyber-physical systems of systems:

- Cyber-physical Systems of Systems in Electric Power Systems and Networks (by Patrick Paniciatici, RTE, France)
- Cyber-physical Systems of Systems in Industrial Automation (by Alf Isaksson, ABB, Sweden)
- The Next Generation in Automated Material Handling Systems: Autonomous Shuttles (by Joost van Eekelen, Vanderlande, Netherlands)
- Cyber-physical Systems of Systems in the ARTEMIS Strategic Research Agenda (by Jürgen Nihaus, SafeTRANS, Germany)

The workshop has attracted participants from entire world (incl. Japan, New Zealand, USA, beside the EU countries). Discussions were stimulated by presentations.

The workshop program as well as presentations given can be consulted [here](#).

AMADEOS

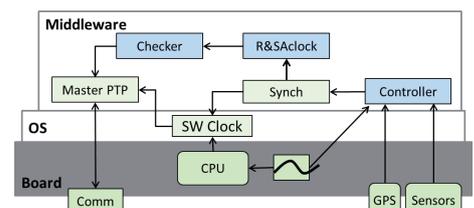
Research Topics

AMADEOS Time-Aware System-of-Systems Architecture

AMADEOS brought attention on the relevance of building a reliable time base to ease the development and execution of distributed, time-critical Systems of Systems (SoSes). Specifically, we propose the Resilient Master Clock (RMC), a low-cost hardware-software solution. The RMC acts as a dependable, accurate global time base that includes local clock correction techniques, self-estimation of time awareness and fault tolerant synchronization solutions. The ultimate goal is to guarantee a consistent global time view across the SoS infrastructure to avoid synchronization problems. The architecture of the RMC

is shown in the Figure and is divided in three layers. The board is composed by a GPS module for time messages reception; Sensors to acquire information from the environment; a communication interface Comm; and finally the CPU and physical oscillator, required to execute and read the physical clock. The OS includes a local software clock (SW Clock) that provides timestamps to the board. The middleware includes a synchronization module that uses GPS time signals to discipline the local clock; a master PTP module for broadcasting time synchronization packets; the R&SAclock, which estimates the uncer-

tainty of the provided time; the checker module that verifies this uncertainty, and the controller, which disciplines the clock when the GPS signal is unavailable.



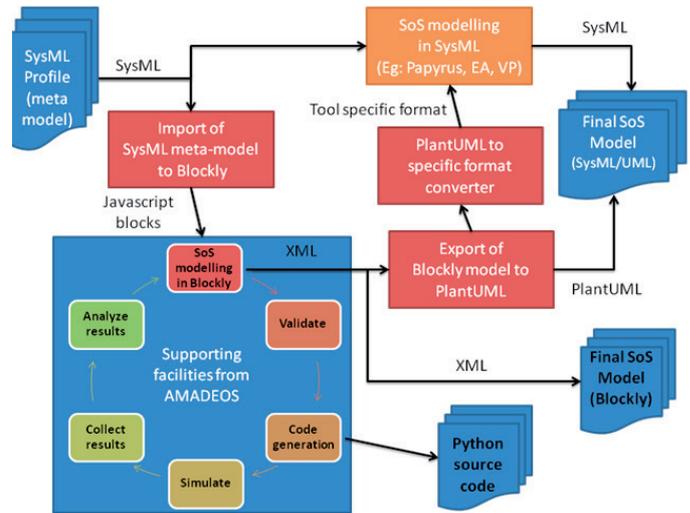
The Resilient Master Clock Architecture

Read more [here](#).



AMADEOS Supporting Facilities

Current SoS design tools are complex and non-intuitive for general SoS designers; also, many of the existing tools expect designers to be well-versed with object-oriented concepts. The AMADEOS supporting facility tool simplifies the task of SoS modelling by reducing the prerequisites to start modelling. It warns their user of common mistakes during modelling and helps in quicker testing of SoSs through simulation. The flow of model-driven engineering using the supporting facility tool is described in the Figure, which is integrated with traditional MDE approaches based on SysML. The starting point is the SysML meta-model that represents the key SoS concepts and their relationships as identified in the AMADEOS Conceptual Model (<http://amadeos-project.eu/documents/public-deliverables/>), which can be transformed to Google Blockly blocks. These blocks may be used in the supporting facility tool to create a SoS model. The supporting facility provides rapid modelling, validating, code-generation, and simulation facilities to the user. The Blockly model can be re-transformed in a SysML model for further refinements or analysis. Specifically, the supporting facility generates three outputs: (i) the model in XML, (ii) Python code-generated for the simulation, and the (iii) SysML version of the model.



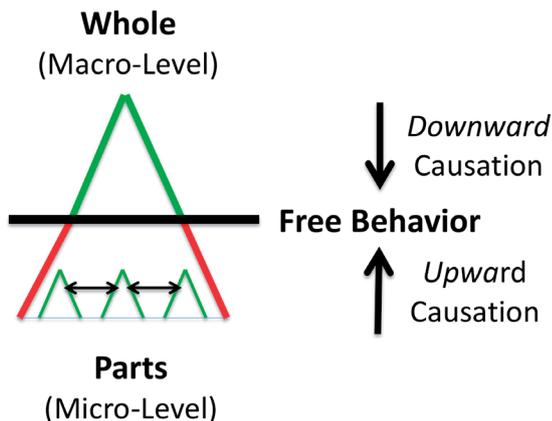
MDE Flow with the supporting facility tool in blockly

Read more [here](#).

Emergence in Cyber-Physical Systems-of-Systems

In Cyber-Physical Systems-of-Systems (CPSoSs) the Constituent Systems (CSs) interact for the purpose to realize emergent services (e.g., optimal energy distribution in smart-grids) that cannot be provided by any of the CSs in isolation. Key to these emergent services is the complex, non-linear composition of the behaviors of CSs which also bears the risk of detrimental emergence (e.g., energy grid blackouts). Hence, there is tremendous need to understand, and realize desired emergent behavior, while there is an even stronger demand to predict,

and prevent detrimental emergence. To this end the AMADEOS Workshop on Emergence in Cyber-Physical Systems-of-Systems (March 10-11 2016, Austria) has brought experts together to establish an agreed definition of emergence in CPSoSs, to clarify the issues around the occurrence of emergent phenomena, and to arrive at design guidelines for the control of emergence. During this workshop the AMADEOS research about multi-level hierarchies and Holons as a framework to study emergence has been presented. A Holon introduces level-relations among neighboring levels in a multi-level hierarchy. At the level above a Holon appears as an emergent whole that can interact with other Holons on the same hierarchical level. At the level below a Holon is composed of its interacting parts (other Holons). The free behavior of parts (see Figure) at the micro-level is dictated by both: upward causation (the universe of possible behavior) and downward causation (imposed constraints by the whole that limit the possible behavior of its parts).



Read more [here](#).



DYMASOS

Research Topics

Coalitional Control for Charging Electric Vehicles in Smart Grids



As we come closer to the future scenario where plug-in electric vehicles (PEV) will constitute a conspicuous sector of the vehicle population, it is clear that the

problem of the energy refill will play a major part in the everyday use of such technology. Within the DYMASOS Work Packages framework, the USE group is concerned with the study of refill pricing strategies, by merging control system formulations together with game theoretic tools. The problem is analyzed from the standpoint of charging managers, i.e., the owners of recharge infrastructures. Following a coalitional game approach for the redistribution

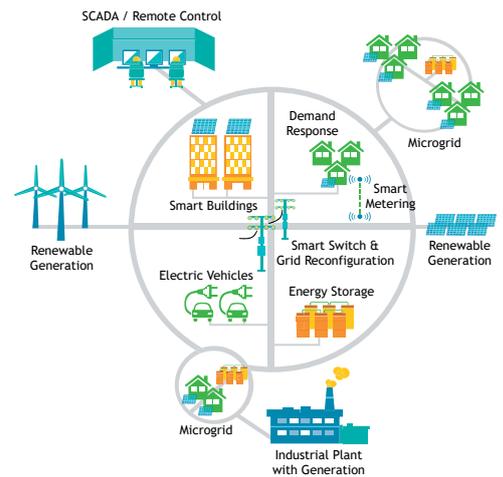
of the derived benefits, the possibilities offered by the joint management of charging stations owned by different enterprises are evaluated. To this aim, a micro-simulation platform has been prepared in order to reproduce the dynamics of a PEV population in an urban setting.

Read more [here](#).

Dynamic Management and Reconfiguration of Electrical Power Distribution Systems

Reliable and efficient functioning of a modern electrical power distribution system, which comprises numerous interacting subsystems (components of distribution system itself, distributed energy sources, storage units, and consumers), is becoming increasingly important due to the growing penetration of distributed intermittent energy sources in power distribution systems. The dynamic interaction of locally managed subsystems gives rise to the complex dynamic behavior of the overall system and can lead to large-scale disruptions, i.e. black-outs in the electric grid. Hence, to achieve optimal operation of the power system, the operator must

take into account dynamic behavior and constraints of the system (e.g., the distribution system topology can be reconfigured but it has to maintain the radial structure). Within DYMASOS, we have developed various predictive control methods for optimal dynamic management of electrical power distribution systems with distributed generation and storage that can cope with scalability issues while maintaining the appropriate level of optimality and constraint satisfaction. The performance of the overall power distribution system is further improved by utilizing reconfiguration of system interconnections in a dynamic management setting.



Read more [here](#).

DYMASOS Engineering Toolchain: A Framework for the Simulation-based Validation of Distributed Management Architectures for CPSoS

The simulation and validation framework which is being developed by the EU project DYMASOS (www.dymasos.eu) supports a structured approach to the implementation of large-scale CPSoS models and management structures. The framework aims at reducing the (currently very large) engineering effort for distributed management architectures while improving the quality of the designed system. This approach allows engineers to equip the management sys-

tem with standardized interfaces, which will significantly increase re-usability of newly developed models, makes the model development much more efficient and less error-prone, makes model components easily re-usable in different scenarios, and enables the developers to easily test and validate different management algorithms on an (existing) model of an industrial CPSoS.

The framework has been successfully applied to validate a price-based coord-

ination architectures on a simulation model of a real-world industrial application example, a petrochemical production complex where different plants are interconnected by networks of mass and energy. In addition, a smaller benchmark use case was implemented to validate decomposition-based management methods.

Read more [here](#).



Local4Global

Research Topics

Real Life Improvements

The first round of **real-life demonstrations** in the Local4Global Energy Efficient Building Use Case has been completed in Aachen, Germany. The Local4Global system was able to provide **30% improvement in terms of energy savings and demand shaping** (exploitation of Renewable Energy Sources) without sacrificing user comfort. This Local4Global system will be integrated in bigger scale, and be further tested with different weather conditions and different occupancy patterns to verify its improvements.



The winning entries in the international innovation contest **Intelligent Energy Management Challenge**, organized by the Swedish Energy Agency and Swedish Incubators & Science Park. The winning entries in the international innovation competition 'Intelligent Energy Management Challenge' come from entrepreneurs in Greece (**CERTH**),

Local4Global: A Winning Technology

A system based on the advances developed by the partner CERTH in the project Local4Global, is among the 4 winners of the

Sweden (**Ferroamp Elektronik & KIC InnoEnergy**) and the United States (**Amzur Technologies**). These entries and their innovative solutions create advantages for their prospective customers by optimizing production and consumption of electricity. The benefits appear in the whole buildings' energy systems where the customers - via a user friendly interface - can control and optimize various features according to their wishes. The contest is arranged by the **Swedish Energy Agency** and **Swedish Incubators & Science Parks**. The municipalities of **Arvika, Göteborg, Eskilstuna, Herrljunga** and **Uppsala** are participating.

PICASSO

EU-US ICT Collaboration

The PICASSO Project: Towards New Avenues in EU-US ICT Collaboration

In January 2016, the H2020 support action **PICASSO** "ICT Policy, Research and Innovation for a Smart Society: towards new avenues in EU-US ICT collaboration", in which several partners of the CPSoS project are key partners, took up its work, with the main objective to reinforce EU-US ICT collaboration in pre-competitive research and innovation in technology areas that are key to solve today's economic and societal challenges.



To achieve its goals, the PICASSO consortium has mobilized an outstanding community of ICT actors that includes representatives of the ICT industries from the EU and the US, domain experts, end users, and policy specialists, as well as representatives of public-private partnerships (PPP) and research and innovation networks. This community is organized in three thematic PICASSO EU-US Expert Groups on 5G Networks (chaired by Prof. Gerhard Fettweis, TU Dresden, Germany), on Big Data (chaired by Dr. Nikos Sarris, Athens Technology Centre, Greece), and on the Internet of Things and

Cyber-physical Systems (chaired by Prof. Sebastian Engell, TU Dortmund, Germany). In addition, the PICASSO Policy Expert Group (chaired by Maarten Botterman, GNKS, Netherlands) will devise policy recommendations that are designed to improve the EU/US ICT collaboration. The project is coordinated by Svetlana Klessova, inno TSD, France.



On May 20, 2016, the PICASSO project held the first meeting of its Expert Groups in the Herbert C. Hoover building, close to the White House, in Washington, D.C. In dedicated Expert Group work sessions and a joint public workshop, the Expert Group members and key actors from US institutions such as NSF, NIST, NITRD, and others, highlighted key technical and policy challenges, needs, and opportunities, increased awareness and visibility of EU and US policies and key programmes, and started on their path to identify promising areas of joint EU-US collaboration.



Events Reports from the Cluster Projects

CPSoS at 20th SafeTRANS Industrial Day

Berlin, Germany – June 3, 2016



On June 3, 2016, the German Research and Innovation Initiative SafeTRANS organized its 20th Industrial Day in Berlin. **SafeTRANS** (“Safety in Transportation Systems”) is a Competence Cluster combining research and development expertise in the area of complex embedded systems in transportation systems, driving research in human centred design, in system and software development methods for embedded systems, as well as in safety analysis and - for avionics and rail - its integration in certification processes, driven by a harmonised strategy addressing the need of the transportation sector.

14:15	Panel 3: Cyber-Physical Systems (CPS): Research Challenges and Research Landscape
14:15	Talk: Cyber-Physical Systems: Potentials and Challenges Prof. Dr. Werner Damm, <i>SafeTRANS</i>
14:35	Panel Discussion Moderator: Prof. Dr. Werner Damm, <i>SafeTRANS</i> Participants: Gérard Cristau, <i>Thales</i> Prof. Dr. Sebastian Engell, <i>TU Dortmund</i> Dr. Stefan Ferber, <i>Bosch Software Innovations GmbH</i> Prof. Dr. Radu Grosu, <i>TU Vienna</i> Dr. Cornel Klein, <i>Siemens</i> Dr. Michael Weber, <i>DLR</i>

The Coordinator of CPSoS, Sebastian Engell, participated in the Panel Discussion on “Cyber-Physical Systems (CPS): Research Challenges and Research Landscape” and highlighted the challenges of systems of systems, e.g. in railway systems, the potential of system-wide optimization, the need to overcome the modelling bottleneck, and the important role of humans in the loop.

AMADEOS Tutorial at the INCOSE IS 2016

Edinburgh, UK – July 16, 2016



26th annual **INCOSE**
international symposium

Edinburgh, UK

July 18 - 21, 2016

AMADEOS results on the conceptual model, on the SysML profile and on the supporting tools for the design of SoSes will be presented as a full-day Tutorial at the upcoming **INCOSE International Symposium in July 2016**. The primary objective of the tutorial is to raise consciousness on the necessity to reduce the cognitive complexity when modelling large SoSs. This major objective will be achieved:

- I. Demonstrating the clarification effects and usefulness of the key elements of the conceptual model;
- II. Illustrating the usefulness of adopting the SysML profile for the high-level design of a SoS architecture, considering different but correlated SoS aspects like Structure, Dynamicity, Evolution, Dependability and Security, Time, Emergence and Multi-criticality;
- III. Showing the potentialities of the supporting Google Blockly tool for the integrated design of the different SoS viewpoints, discussing its role in a comprehensive architectural framework, and showing its interoperability with respect to available Eclipse environments and SysML.



Systems of Systems Related Events

The 2016 American Control Conference (ACC 2016)

July 6 – 8, 2016 – Boston, MA, USA

The ACC is the annual conference of the American Automatic Control Council (AACC), the U.S. national member organization of the International Federation for Automatic Control (IFAC).

It is internationally recognized as a premier scientific and engineering conference dedicated to the advancement of control theory and practice. The ACC brings together an international community of researchers and practitioners to discuss the latest findings in automatic control. The 2016 ACC technical program will comprise several types of presentations in regular and invited sessions, tutorial sessions, and special sessions along with workshops and exhibits. Submissions are encouraged in all areas of the theory and practice of automatic control.

The 26th Annual INCOSE International Symposium

July 18 – 21, 2016 – Edinburgh, United Kingdom

The Annual INCOSE International Symposium is the premier international forum for Systems Engineering. Participants network, share ideas, knowledge and practices, and learn more about the most recent innovations, trends, experiences and issues in Systems Engineering. The symposium in 2016 will focus on the theme “Achieving excellence through Systems Engineering”.

8th IEEE Multi-Conference on Systems & Control (IEEE MSC 2016)

September 19-22, 2016 – Buenos Aires, Argentina

The 2016 IEEE Multi-Conference on Systems and Control (MSC 2016) will take place in NH City & Towers Hotel, Buenos Aires, during September 19-22, 2016 and includes three international conferences sponsored by the IEEE Control Systems Society:

- The IEEE Conference on Control Applications (CCA)
- The IEEE International Symposium on Intelligent Control (ISIC)
- The IEEE Conference on Computer Aided Control System Design (CACSD)

MSC 2016 areas of interest traditionally include a wide range of topics in control systems, technology, and applications. This year, in addition to such topics, new and emerging research areas in control, such as cyber-physical systems, robotics, intelligent autonomous systems, computational intelligence, architectures for intelligent control, control inspired by systems biology, vision in control, and control theory in psychology and sociology, as well as application of control theory in economics, next generation healthcare and healthcare delivery are addressed.

1st IFAC Conference on Cyber-Physical & Human-Systems (CPHS 2016)

7-9 December 2016, Florianopolis, Brazil

The aim in CPHS 2016 is to consider the following objectives through multidisciplinary exchanges as in the previous event H-CPS-I 2014, believing that breaking the barriers between the different disciplines and application domains is essential to detect new open problems and to discuss the actual challenges to be overcome by scientific investigation.

- Human-Machine Symbiosis (e.g. smart prosthetics);
- Humans as operators of complex engineering systems (e.g. aircraft pilots, car drivers, process plant operators and robotic surgery);
- Humans as agents in multi-agent systems (e.g. road automation, traffic management);
- Humans as elements in controlled systems (e.g., comfort control in homes).

The aim of the 1st IFAC Conference CPHS 2016 is then, to exchange information on these topics that are considered of high importance for our now connected society.

IEEE 55th Conference on Decision and Control (CDC)

December 12 – 14, 2016 – Las Vegas, USA

The CDC is recognized as the premier scientific and engineering conference dedicated to the advancement of the theory and practice of systems and control. The CDC annually brings together an international community of researchers and practitioners in the field of automatic control to discuss new research results, perspectives on future developments, and innovative applications relevant to decision making, automatic control, and related areas.

The 20th World Congress of the IFAC

July 9-14, 2017 – Toulouse, France

The IFAC World Congress is the forum of excellence for the exploration of the frontiers in control science and technology, attended by a worldwide audience of scientists and engineers from academy and industry. It offers the most up to date and complete view of control techniques, with the widest coverage of application fields. The 20th IFAC World Congress will feature the 60th anniversary of IFAC. An opportunity to recall the glorious history of Automatic Control and to foresee the answers Automation and Control will provide to social, economic and ecological challenges.



Publications of the Cluster Projects

The cluster projects have issued a number of public project documents that are available for consultation on their respective websites:

AMADEOS

- [Public Deliverables](#)
- [Publications](#)
- [Overview of all Public Documents](#)

DYMASOS

- [Public Deliverables](#)
- [Publications](#)

LOCAL4GLOBAL

- [Journal publications](#)
- [Conference publications](#)

CPSOS

- [Public Deliverables](#)
- [Publications](#)



CONTACT (PROJECT COORDINATORS)

Do you have information to share?
An SoS related event to promote?
Questions? Suggestions?

Contact: d.marron@inno-group.com

or the project coordinators:

AMADEOS – [Andrea Bondavalli](#)

DYMASOS – [Sebastian Engell](#)

Local4Global – [Elias Kosmatopoulos](#)

CPSoS – [Sebastian Engell](#)

Editorial Information

Newsletter of the European Systems of Systems Research and Innovation Cluster, No. 4

Published by:

The CPSoS Project

(CPSoS – Towards a European Roadmap on Research and Innovation in Engineering and Management of Cyber-physical Systems of Systems, a Coordination and Support Action supported by the European Commission under the FP7 programme)



Responsible:
Prof. Dr.-Ing. Sebastian Engell,
Technische Universität Dortmund,
D-44227 Dortmund



Editor:
Dagmar Marron, inno TSD,
F-06902 Sophia Antipolis



Graphical Design:
Deuxième Etage,
F-06600 Antibes