



Cluster of EU FP7 Projects ON SYSTEMS OF SYSTEMS

Issue n°
2

Newsletter • October 2014

Contents

- | | | |
|--|--|--|
| P. 1 Welcome from Prof S. Engell,
Project Coordinator CPSoS
European SoS Research Cluster | P. 4 News from AMADEOS
News from DYMASOS | P. 7 Public Deliverables and
Project Documents |
| P. 2 News from CPSoS | P. 5 DYMASOS Research Topics | P. 8 Publications of the Cluster Projects |
| | P. 6 News from Local4Global
Events organized by the Cluster Projects | P.10 Other SoS Related Events
Contact |

Welcome

from Prof Sebastian Engell,
Project Coordinator of CPSoS

The cluster of European Projects on Systems of Systems is going into its second year by the beginning of October. All projects can look back on a very successful first year. At the cluster project meeting in Sophia Antipolis in July 2014 that was extremely well organized by DYMASOS and CPSoS partner inno TSD and held in a very pleasant environment, reviews of all four projects by external experts and representatives of the European Commission were performed, and the evaluations of all projects were very positive. Moreover, the meeting provided an opportunity to discuss research topics between the collaborating groups and to further clarify the concept of Systems of Systems. For the most part, there is a broad consensus on the characteristics of Systems of Systems, however, the topic of emergent behaviours still is discussed vividly. In this newsletter, you will find short progress reports of the projects and many links to documents that have been produced during the first year. We very much appreciate any feedback, for specific research and innovation topics please contact the individual projects, for feedback on this newsletter and on the concepts of Systems of Systems and Cyber-physical Systems of Systems, please use the link on the last page or write to me directly.



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

European Systems of Systems Research Cluster

The four EU projects on Systems of Systems – **AMADEOS** (Architecture for Multi-criticality Agile Dependable Evolutionary Open System-of-Systems), **CPSoS** (Towards a European Roadmap on Research and Innovation in Engineering and Management of Cyber-physical Systems of Systems), **DYMASOS** (Dynamic Management of Physically Coupled Systems of Systems) and **Local4Global** (System-of-Systems that act locally for optimizing globally) – interact in several ways:

Representatives of the projects AMADEOS, Local4Global and DYMASOS contribute to the three Working Groups that were set up by the CPSoS Support Action to analyse the state of the art in key application domains and in methods and tools for cyber-physical systems engineering and operation and to propose topics for a European research and innovation roadmap.



After 9 months of work, the four projects convened for a joint discussion and evaluation meeting in July 2014 in Sophia Antipolis, France. More than 50 participants from the projects AMADEOS, Local4Global and DYMASOS and the Support Action CPSoS presented first results and future plans and discussed with representatives of the European Commission and external experts.

(Article continues on next page >)





European Systems of Systems Research Cluster

This first joint meeting was an opportunity for the four cluster projects to exchange about different methods and views, and to ensure the liaison between them. In the joint session, presentations were given on

- Optimal Material and Energy Allocation in an Integrated Chemical Production Site (*DYMASOS*)
- A Conceptual Model of Systems of Systems (*AMADEOS*)
- Plug-and-play Optimization and Control in SoS (*Local4Global*)
- Towards a European Roadmap on Research and Innovation in Engineering and Management of Cyber-physical Systems of Systems (*CPSoS*)

You will find more detailed information about this first cluster meeting in the related [project communication](#). Further interactions will be organised around synthesis reports and strategic policy documents. The next joint meeting of the four cluster projects will take place in May 2015, in Florence, Italy, hosted by AMADEOS. It will include a joint Public Workshop on Systems of Systems research and innovation. Last but not least, this second of a total of four joint newsletters that will be published during the lifetime of CPSoS helps to exchange information between the projects and with the broader community of experts in Systems of Systems.

News from **CPSoS**

Public Meeting of CPSoS Working Group 1 in Brussels, Belgium

The second Working Group Meeting of the Transport and Logistics Working Group took place in conjunction with Automotive Megatrends Europe 2014 which was held in Brussels on the 10th and 11th of September 2014.

The conference brought together key industrial, academic and political actors to network and debate business models, technologies and trends that will shape Europe's commercial vehicle and passenger car markets over the next ten years and beyond. The conference attracted over 100 expert speakers and 250 delegates discussing cutting-edge topics including fuel economy, emissions reduction, eMobility and in-car connectivity. CPSoS sponsored the event and widely disseminated the work and outcomes of the Transport and Logistics Working Group over the two days via an exhibition stand. The sessions and panel discussions highlighted that increased connectivity is the future in the sector and offers many advantages for both commercial vehicles and passenger cars. Examples of fuel, emissions and maintenance savings made by a number of key companies operating fleets of vehicles were highlighted and greater safety and fuel economy are promised by increased use of autonomous driving features in future vehicles.

On the second day of conference a Working Group Meeting was held. The objectives of the Working Group Meeting were twofold:

1. Refinement and Comments on State of the Art and Challenges in Transport and Logistics Report
2. Discussion of the Draft Overall Research Priorities put forward by CPSoS



The report was presented over the first half of the meeting, comments were received and clarifications given on the key findings. The Working Group concurred that the report gave a good overview of the state of the art across the different domains and with the recommendations made for future research priorities. Additionally, the draft overall recommendations from CPSoS were discussed. This highlighted the need for clarifications in a number of areas and the need to consider complexity management, risk modelling and management of models.

[Read more >](#)

[Please also consult the related input paper.](#)



Public meeting of CPSoS Working Group 2 at ETH, Zürich, Switzerland:

Workshop on physically connected CPSoS

A public meeting of the CPSoS Working Group 2 on physically connected Cyber-physical Systems of Systems took place on October 1st, 2014 at ETH Zürich. 39 European experts from the domains of process industries, smart grids, smart cities, automation, and systems engineering met to discuss the state of the art and future developments in the engineering and operation of physically connected CPSoS. The workshop was organised jointly by CPSoS and the DYMASOS project.

After presentations on management methods and tools for the engineering of physically connected CPSoS, there were domain-specific breakout sessions on electric grids and smart buildings, process industries, and tool support for physically coupled SoS. The main goal of the breakout sessions was to discuss the future research needs in the respective areas. Lists of research topics in the different domains were discussed and prioritized.



The findings of the workshop will be integrated with the results of the other Working Groups and will be presented as a contribution of CPSoS to the European research roadmap on Cyber-physical systems to the European Commission in December 2014.

[Read more >](#)

Public Meeting of CPSoS Working Group 3 in Bertinoro, Italy:

Workshop on Tools and Methods for CPSoS

The second WG meeting and public event of Working Group 3 on tools for systems engineering and management took place on September 12th, 2014 in Bertinoro, Italy in the form of a Workshop on Tools and Methods for CPSoS. For this workshop presentations had been solicited by means of an open call for presentations. This resulted in several interesting presentations on topics varying from security models for cyber-physical systems (V. Sassone), hierarchical control of large complex plants (C. de Prada), optimization methods for recoverable smart electric grids (L. Petre), a decision support system for Systems of Systems management (M. Fanti) and model-based support for dependable Cyber-physical Systems of Systems (C. Ingram). An invited presentation was delivered by A. Cimatti (member of WG 3) on a formal approach to the design and operation of complex systems.



In the afternoon, the program ended with a presentation and discussion on an analysis of the state of the art in tools and methods for engineering of Cyber-physical Systems of Systems that is being developed in the CPSoS project. The results of the discussion will be reflected in the final version of this document.

[Read more >](#)

CPSoS Working Paper

The main mission of CPSoS is to come up with a proposal of a research agenda in Cyber-physical Systems of Systems for Horizon 2020, the new European Framework Programme, and possibly beyond. CPSoS has produced a [Working Paper "Cyber-physical Systems of Systems - Definition and core research and innovation areas"](#) based on the outcomes of investigations, interviews, contributions from Working Group members and workshops, assembling views and ideas on the scope and research needs in the area.

The latest version of the Working Paper is also available for consultation in the [Publication Repository](#) of the [CPSoS website](#).

The public consultation will be opened early 2015. Today, we already encourage you to provide us with your comments on it. You will thus enable us to include even more experiences, views and ideas and make sure that the final outcome shall be in line with the real needs of most of the parties concerned by the topic.

Please send your comments by email to [Sebastian Engell](#). >



News from AMADEOS

AMADEOS has recently completed its first year. [The AMADEOS project leaflet for the first 9 months](#) was published, and the first project review in July 2014 successfully passed. In the last plenary meeting, which took place on October 13th-15th, 2014, AMADEOS established its current lines of research on the following topics:



deliverables page. Next steps are to build the AMADEOS SoS conceptual model and refine the terminology during the process. The objective is to give the SoS the notion of a global time and to capture evolvability, dynamicity and emergent properties.

SoS Architecture:

The definition of the AMADEOS architecture was started. The building blocks of our architectural framework were identified, and the process of establishing the guidelines on how an SoS architecture should be designed is now ongoing.

SoS Conceptual Model:

All common requirements and common particularities of several SoS from a cross-domain perspective were gathered. The terminology and concepts to be used in the conceptual model was also defined. The results of this work were presented in deliverables D1.1 (SoS, commonalities and requirements) and D2.1. (Basic SoS concepts, glossary and preliminary conceptual model). All public deliverables can be consulted on the AMADEOS web site on the [public](#)

SoS Case Study:

The AMADEOS case study was defined and the use case implementations are currently being implemented. The overall objectives of the case study are to provide electrical vehicle charging in Smart Grids.

News from DYMASOS

First meeting of DYMASOS Industrial Advisory Board in October 2014



The goal of DYMASOS is to develop coordination and management methods for SoS that are industrially applicable. For the usability of the results, it is essential to obtain feedback from industrial end-users and automation vendors during the project work. The DYMASOS project has therefore set up an Industrial Advisory Board (IAB). The members of this group are the industrial partners of DYMASOS and representatives of other European companies from the domain of process industries, smart grids, automation, and system engineering:

ABB (Sweden), ACCIONA Infraestructuras (Spain), ENEL (Italy), Honeywell (Czech Republic), KONČAR - Electrical Engineering Institute Inc (Croatia), MODELON (Germany), NEPIC - North East Process Industry Cluster (UK), RTE - Réseau de Transport d'Electricité (France) and Siemens (Germany).

The first meeting of the DYMASOS IAB was organised in Zürich on the premises of ETH on October 1st, 2014, with the goal to discuss the progress of the DYMASOS project and its alignment with the industrial requirements. It was integrated into a public workshop, jointly organised by CPSoS and DYMASOS.

The interaction between the research project and the Industrial Advisory Board included a review of the four DYMASOS case studies, presentations of the new management methods for Cyber-physical SoS that are being developed in DYMASOS (population management, price based coordination, and coalitional control) and of the DYMASOS engineering platform, and an exchange on the future steps.

The industrial experts' feedbacks about the concept and the developments of the project were very positive and enthusiastic. The DYMASOS consortium thanks all IAB members for their very useful contributions and for their willingness to support the project and its advancements in the area of dynamic management of Systems of Systems.

Comments from DYMASOS IAB members

“ It is good to see that the project addresses real industrial problems. Industrial parks pose similar, but even more challenging problems in the coordination of production and consumption of material and streams of energy across boundaries of companies. In the low carbon future complexity will increase as we link parks with communities and external energy and production systems.”

Mark Lewis, Technical Manager,
NEPIC UK

“ The case studies considered by DYMASOS are highly relevant and the methods that are being developed to manage physically coupled Systems of Systems are highly innovative.”

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



DYMASOS Research Topics

Coalitional games in Systems of Systems

In the Systems of Systems context, one may intuitively think that strong interactions among different subsystems require a dense communication between their respective control agents. Indeed, in several cases the variables of a system can be grouped – often following a natural topology – to highlight weakly coupled clusters. Our challenge is the online identification of subsystems' interactions, and the *consequent adjustment of the control structure* (and thus the associated computational and communicational requirements). This is the rationale leading to *coalitional control*: the formation of coalitions is promoted whenever coupling effects become critical or beneficial for the System of Systems.

Game theory is taken as a basis for the analysis of the interaction of agents and for the design of *cooperative mechanisms* for the management of complex systems. Some notions, in particular those developed within the framework of *noncooperative* games (e.g., the Nash equilibrium) have been extensively applied in the distributed control literature. However, direct applications of *cooperative games* – founded on a coordinated action of the agents (or groups of them) – are still seldom encountered in control engineering. It is our task to extend the cooperative games framework to the modern control engineering challenges.

Within the DYMASOS project, the outcome of this line of research will be applied to the management of the AYESA

plug-in electric vehicles case study. The considered scenarios involve manifold interactions among actors with different and conflicting interests: EV users, charging facilities, managers, as well as externalities represented, e.g., by the power grid and the energy pool.

So far, tools from cooperative game theory have been applied in order to gain an insight into the relevance of the communicational links and the local controllers within a SoS. More specifically, the components of a SoS can be regarded as *players* of a cooperative game whose characteristic function is formulated as an optimality index of the closed-loop performance of the system. It has been shown that given allocation criteria for the game, e.g., the *Shapley value*, provides information about the relevance of the agents involved in the control problem. Specific *allocation criteria can be then employed to distribute the resulting costs or benefits* between the players of the game (particularly suitable if the performance index can be translated into economical units). This idea has proved to be successful when applied to the control of irrigation canals and within the DYMASOS project we are extending these ideas to the electric vehicles case study.

Authors:

Eduardo F. Camacho, Filiberto Fele, Ezequiel González, J.M. Maestre, Carlos Bordons and Miguel Angel Ridao,
Universidad of Seville, Spain

Price-based coordination of the operation of integrated chemical plants

Resource and energy efficiency, small environmental footprint and profitability of large chemical plants are achieved by sharing resources and by using all the material and energy streams that leave one unit in others (energy and material integration). Therefore the different production units that produce a specific material like ethylene, propylene or ammonia are coupled by networks of utilities (steam on several pressure levels as a carrier of thermal energy, cooling water) and materials (e.g. hydrogen). These networks have very limited storage and therefore generation and production must be balanced. How much of a resource is produced or consumed in a unit depends on the production level and on the operational parameters. Therefore the management of an integrated chemical plant poses a challenging optimization problem.

While a fully integrated optimization might be feasible in principle, the size of the problem, the unavailability of data and the management structures of the plants where the units are operated by different business units favour a distributed solution. In such a distributed solution, the operation of the units is optimized locally, and a suitable coordination mechanism has to make sure that the resource production and consumption in the networks are balanced.

Price-based coordination is a possible method to achieve plant-wide optimization without making detailed knowledge of the internals of the subsystems available to others. In this approach, the shared resources are considered as commodities that are traded between the production units on a market, and the prices on the market fluctuate until a balance of production and consumption is reached (called market clearing). The corresponding (marginal) prices of the resources appear as Lagrangian multipliers in the local problems if the site-wide optimization problem is formulated as a distributed optimization problem with global constraints. The only quantities that have to be exchanged between the local problems are the current prices and misbalances on the networks. In the current work in DYMASOS by TU Dortmund and INEOS in Cologne, different methods (ADMM, IUM) for price coordination have been tested on a model of the integrated petrochemical site of INEOS in Cologne. The initial results clearly show that automated market mechanisms can successfully be applied in the management of integrated plants and are coherent with current practice but provide a much faster reaction to variations of demands and of prices of raw materials and of products and to disturbances.

Authors:

Goran Stojanovski, TU Dortmund, Stefan Krämer, INEOS Köln GmbH, Sebastian Engell, TU Dortmund, Germany



R&D Advances

The 2nd Local4Global consortium meeting was held on October 9th, 2014, at IK4-TEKNIKER premises (Eibar, Spain). This was a very constructive meeting, with its main outcomes described as follows:

1 • Methodological Advances:

As far as the methodological advances of Local4Global are concerned, the Local4Global project has finalized and delivered the basic ingredients which will comprise the Local4Global control system methodology. These ingredients concern the Local4Global just-enough-learning mechanism, the Local4Global just-enough-situation-awareness mechanism and the Local4Global distributed optimization mechanisms. The efficient functioning of these three mechanisms has been established both by mathematical analysis and simulation results on SoS test cases. Moreover, these three mechanisms can be integrated towards the Local4Global integrated control system which will function as follows: each of the constituent systems operates locally its control mechanism. Minimal information about the overall SoS performance is also transmitted to each of the constituent systems: such information is used by each of the constituent systems so as to adjust its own local control mechanism at the global aim of globally optimizing the overall SoS performance. The overall scheme can be operated in model-based form (in which case the learning mechanisms of Local4Global are used to fine-tune the model-based controller) or in a fully adaptive mode (in which case no model is required for the system).

2 • Use Cases:

As far as the advances regarding the Use Cases are concerned, the Local4Global partners assigned different working groups responsible for taking care of the experiments. As a first step, these working groups will establish the proper interfaces so as for all involved partners to be able to run the experiments remotely. Both simulation (using elaborate simulation models) and actual experiments will be performed. A short-term goal for the project is to finalize the first iteration of simulation experiments in spring 2015 and to run some real-life experiments in the Building Use Case during the forthcoming winter.

3 • Dissemination & Exploitation (D&E) activities:

As far as the D&E activities are concerned, the Local4Global consortium has set up all the appropriate procedures towards a comprehensive and clear exploitation plan for the 2 use case-related Local4Global products (the Building Local4Global product and the Traffic Local4Global product). Also, many past and forthcoming dissemination activities have been discussed with the most important ones being the 1st Local4Global press release, the set-up of the Local4Global Advisory Committee and the publication of journal and conference papers.

More details on these activities can be found on the [project website](#) >

Events organised by the Cluster Projects

DYMASOS: Mini-symposium at MATHMOD

MATHMOD is a scientific conference on mathematical modelling techniques that is organized once every three years by Vienna Technical University in Vienna, Austria. Motivated by the DYMASOS project, project partner RWTH Aachen, Germany has invited to a Mini-symposium within the conference that focuses on Systems of Systems Modelling. Academic partners of DYMASOS as well as other scientists will be presenting their approaches for modelling, simulating and optimizing Systems of Systems.

MATHMOD will be held on Feb. 18th - 20th, 2015 in Vienna, Austria.

Invited session proposal for the 2015 European Control Conference

Local4Global and DYMASOS have proposed an invited session at the **ECC 2015** which will be held from July, 15th to 17th, in Linz, Austria. The topic of the session is "**New Trends for the Control of Technical System of Systems**". The session proposal contains 5 contributions, 2 from Local4Global and 3 from DYMASOS.



Public Deliverables and Project Documents

The cluster projects have issued the following public project documents :

AMADEOS

- **AMADEOS Project leaflet M9**
- **D1.1** SoS, commonalities and Requirements
- **D2.1** Basic SoS concepts, glossary and preliminary conceptual model

[Consult these documents here >](#)

DYMASOS

- **D1.1** Preliminary report on modeling methods
- **D3.1** Report of coalition analysis methods reported in literature
- **D4.1** DYMASOS Engineering Concept Specification
- **D6.1** DYMASOS communication strategy and visual design
- **D6.2** DYMASOS web site
- **D6.3** DYMASOS Press Release
- **D6.5** Initial dissemination report, including initial dissemination of foreground knowledge

[Consult these documents here >](#)

CPSoS

- **D1.1** Systems of Systems Working Groups: List of Members and Terms of Reference
- **D1.2** Report about first Working Group meeting
- **D2.1a** Report on the second meeting of the Working Group 1 and
- **D2.1b** Input paper "Analysis of the state of the art and future challenges in the application domain related to WG1"
- **D2.2** Report on the second meeting of the Working Group 2, with input paper "Analysis of the state of the art and future challenges in the application domain related to WG2"
- **D2.3** Report on the second meeting of Working Group 3, with input paper
- **D4.1** Web Portal

[Consult these documents here >](#)

Local4Global

- **D2.1** Technical Systems of Systems Modelling and Analysis Requirements
- **D2.2** Technical System of Systems / Local4Global Embedded Software Needs
- **D2.3** Use Case Requirements
- **D6.1.1** Evaluation Plan (1st version)
- **D7.1** Local4Global Website
- **D7.2.1** Press Release 1
- **D7.3.1** M9 Dissemination Activity Report

[Consult these documents here >](#)





Publications of the Cluster Projects

AMADEOS

Systems of Systems Need a Global Time

Invited Keynote Presentation by **Prof. Hermann Kopetz** at the 23rd NIST-ATIS Synchronization Workshop, San Jose, California, USA. June 11, 2014

From Embedded Systems to Systems of Systems

Invited keynote presentation by **Hermann Kopetz** (TUW) IEEE/IFIP Workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS), Reno, NV United States. June 9, 2014

AMADEOS, Architecture for Multi-criticality Agile Dependable Evolutionary Open System-of-Systems

Presentation by **A. Bondavalli** (UNIFI), Plenary meeting of the Italian project PRIN 20103P34XC "TENACE". Ischia Island, Italy, June 4, 2014

Challenges in Smart Grid and ICS Security

Presentation by **Klaus Kursawe** (ENCS), National Cyber Security Center One Conference in The Hague, The Netherlands, June 3, 2014.

How to Secure Critical Infrastructure – The Approach of European Network for Cyber Security (ENCS)

Presentation by **Klaus Kursawe** (ENCS), Cyber Security for Oil and Gas Summit in Amsterdam, The Netherlands, September 30, 2014

Visit the AMADEOS web site for the complete list of dissemination activities on the [events page](#).

Articles with explicit acknowledgement to the project

H. Kopetz.

"A Conceptual Model for the Information Transfer in System of Systems"

Proc. of 17th IEEE Symposium on Object/Component/Service-oriented Real-time distributed Computing, ISORC 2014, Reno, NV, USA, June 10-12, 2014. pp 17-24

L. Montecchi, P. Lollini and A. Bondavalli.

"A DSL-Supported Workflow for the Automated Assembly of Large Stochastic Models".

Proc. of the 10th European Dependable Computing Conference, EDCC 2014. Newcastle, United Kingdom, May 13-16, 2014. pp 82-93

A. Ceccarelli, M. Mori, P. Lollini and A. Bondavalli,

"Introducing Meta-Requirements for Describing System of Systems"

Accepted for the 16th International Symposium on High Assurance System Engineering, HASE 2015, Daytona Beach, Florida, USA, January 8-10, 2015.

Publications related to AMADEOS activities but without explicit acknowledgement to the project

L. Montecchi, N. Nostro, A. Ceccarelli, G. Vella, A. Caruso and A. Bondavalli.

"Model-based Evaluation of Scalability and Security Tradeoffs: a Case Study on a Multi-Service Platform".

Accepted for Electronic Notes in Theoretical Computer Science.

M. Berekmeri, D. Serrano, S. Bouchenak, N. Marchand and B. Robu.

"A Control Approach for Performance of Big Data Systems".

Proc. of 19th World Congress of the International Federation of Automatic Control, IFAC 2014, Cape-Town, South Africa, August 24-29, 2014. pp 152-157





Publications of the Cluster Projects

DYMASOS

R. Paulen and S. Engell:

[DYMASOS – Dynamic Management of Physically Coupled Systems of Systems,](#)

ERCIM News 97, April 2014, Special theme: Cyber-Physical Systems, February 25. pp 51-52, 2014

F. Fele, J.M. Maestre, M. Hashemy, D. Muñoz and E.F. Camacho:
[Coalitional Model Predictive Control of an Irrigation Canal.](#)

Journal of Process Control, 24 (4), pp 314-325, 2014

D. Kampert and U. Epple:

[Outside-In: Simplifying Systems by Integrating the Outside Perspective,](#)

in: Proc. 2014 IEEE 11th International Multi-Conference on Systems, Signals and Devices. Barcelona, Spain, 11-14 February 2014. pp 1-6

R.R. Negenborn and J.M. Maestre:

[Distributed model predictive control: an overview and roadmap of future research opportunities.](#)

IEEE Control Systems Magazine, 34 (4), pp 87-97, 2014

F.J. Muros, J.M. Maestre, E. Algaba, T. Álamo and E.F. Camacho:
[An Iterative Design Method to Constraint coalitional control networks by the shapley Value.](#)

Proc. of the IFAC 19th World Congress, Cape Town, 24-29 August 2014. pp 1188-1193

F.J. Muros, J.M. Maestre, E. Algaba, T. Álamo and E.F. Camacho:

[Constraints on the Shapley Value for a Coalitional Control System.](#)

Proc. of the European Control Conference 2014, Strasbourg, France, 24-27 June 2014. pp 1223-1228

F. Parise, M. Colombino, S. Grammatico and J. Lygeros,
[Mean field constrained charging control policy for large populations of plug-in electric vehicles.](#)

Accepted for the IEEE Conference on Decision and Control, Los Angeles, CA, USA, 15-17 December 2014.

R. R. Negenborn, J. M. Maestre.

[Distributed Model Predictive Control: an Overview of Features and Research Opportunities.](#)

Proc. of the 2014 IEEE International Conference on Networking, Sensing and Control, Miami, FL, USA, 7-9 April, 2014. pp 530-535

S. Nazari, C. Sonntag and S. Engell

[A Modelling, Simulation, and Validation Framework for Large-scale Processing Systems with Distributed Management.](#)

Accepted for PSE/ESCAPE 2015, Copenhagen, Denmark, 31 May – 4 June, 2015

Local4Global

Iakovos Michailidis, Martin Felix Pichler,

Elias B. Kosmatopoulos:

[Multi-Linear State Space Model Identification for Large Scale Building Systems](#)

Sustainable Building Conference 2013, 25th-28th September 2013, Graz, Austria.

Simone Baldi, Iakovos Michailidis, Elias B. Kosmatopoulos and Petros A. Ioannou:

[A 'Plug-n-Play' Computationally Efficient Approach for Control Design of Large-Scale Nonlinear Systems using co-Simulation](#)

Proc. of 52nd IEEE Conference on Decision and Control, December 10-13, 2013, Florence, Italy. pp 436-441

Fütterer, Johannes; Constantin, Ana; Schmidt, Martin; Streblow, Rita; Müller, Dirk; Kosmatopoulos, Elias:

[A multifunctional demonstration bench for advanced control research in buildings monitoring, control, and interface system](#)

Proc. of 39th Annual Conference of the IEEE Industrial Electronics Society, November 10-13 2013, Vienna, Austria. pp 5696-5701

Fütterer, Johannes; Constantin, Ana; Schmidt, Martin; Streblow, Rita; Müller, Dirk:

[Monitoring technique, evaluation methodology and results for a multifunctional building with geothermal energy](#)

Proc. of CISBAT 2013 International Conference, 4-6 September 2013, EPFL, Lausanne, Switzerland. pp 751-756

Baldi, S., Michailidis, I., Kosmatopoulos, E.B., Ioannou, P.A.:

[A "plug and play" computationally efficient approach for control design of large-scale nonlinear systems using cosimulation: A combination of two "ingredients"](#)

IEEE Control Systems Volume 34 (5), pp 56-71, 2014

Baldi, S., Michailidis, I., Kosmatopoulos, E.B.,

Papachristodoulou, A., Ioannou, P.A.:

[Convex design control for practical nonlinear systems](#)

IEEE Transactions on Automatic Control, 59 (7), pp. 1692-1705, 2014

CPSoS

M. A. Reniers and S. Engell:

[A European Roadmap on Cyber-Physical Systems of Systems.](#)

ERCIM News 2014 (97). pp 21-22, 2014



Other Systems of Systems Related Events

IEEE 53rd Annual Conference on Decision and Control (CDC)

December 15 – 17, 2014 - Los Angeles, CA, 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.

8th Vienna International Conference on Mathematical Modelling (MATHMOD 2015)

February 18 – 20, 2015 – Vienna, Austria

The MATHMOD conference series covers theoretic and applied aspects of the various types of mathematical modelling, including equations of various types, automata, Petri nets, bond graphs, qualitative and fuzzy models, etc., for dynamic systems. Scientists and engineers using or developing models or interested in the development or application of various modelling tools are offered an opportunity to present ideas, methods and results and discuss their experiences or problems with experts of various areas of specialisation.

INCOM 2015

May 11 – 15, 2015 – Ottawa, Canada

The general theme of INCOM 2015 is Advanced Information and Manufacturing Systems for a Sustainable Economy. Sustainable economic development, while preserving the planet's resources, is a great challenge in the 21st century. The true achievement of such an economic development model depends crucially on real and significant progress in advanced technologies and innovative methodologies at all levels of design, management, and control of the industrial infrastructure.

PSE2015/ESCAPE25

May 31 – June 4, 2015 – Copenhagen, Denmark

The PSE (Process Systems Engineering) and ESCAPE (European Symposium on Computer Aided Process Engineering) conference series bring together academic and industrial experts to discuss real-world challenges (globalization, energy, environment, health) as well as contributing to the discussions on the widening scope of process systems engineering. The series cover a wide range of topics on the application of computing and systems technology to chemical and biochemical engineering problems.

9th International Symposium on Advanced Control of Chemical Processes (ADCHEM 2015)

(submission still open)

June 7 – 10, 2015 – Whistler, British Columbia, Canada

ADCHEM is a triennial meeting of the International Federation of Automatic Control (IFAC). It will bring together researchers and practitioners to discuss recent developments in the control of chemical, biomedical, and closely related process systems. Both theory and applications will be covered on a variety of topics, including batch process modeling, model-based control, modelling and identification, scheduling and optimization, and others.

The 2015 American Control Conference (ACC 2015)

July 1 – 3, 2015 – Chicago, IL, USA

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 and brings together an international community of researchers and practitioners to discuss the latest findings in automatic control.

European Control Conference (ECC15)

July 15 – 17, 2015 – Linz, Austria

The European Control Conference, which is organized annually under the auspices of the European Control Association (EUCA), brings together academic and industrial professionals in the field of systems and control and promotes scientific cooperation and exchanges within the European Union and between Europe and other parts of the world.

PLEASE PROVIDE YOUR FEEDBACK!

Do you have information to share?

A 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](#)

Or - if not yet done - spend a few minutes to give your feedback via the [CPSoS questionnaire >](#)