



# European Systems of Systems Research Cluster: First joint meeting July 8, 2014, Sophia Antipolis, France

“Systems of Systems” is a new concept in systems engineering that describes large complex systems that consist of many interacting parts with partially autonomous management and continuous evolution and reconfiguration of the overall system. Examples of Systems of Systems are railroad systems, the European air traffic control system, large industrial complexes or the European electric power grid. **Such systems, essential to the European economy and the well being of European Citizen, pose big challenges for methods and computer tools for their analysis, engineering, management and control.** The European Union has therefore attributed funding under its Seventh Framework Programme for research, technological development and demonstration to four new projects in this area, under the Information and Communications Technologies Sub-program. After 9 months of work, the four projects convened for a joint discussion and evaluation meeting during July 7-9, 2014 in Sophia Antipolis, France. More than 50 participants from the collaborative research projects [AMADEOS](#) (*Architecture for Multi-criticality Agile Dependable Evolutionary Open Systems-of-Systems*), [Local4Global](#) (*Systems of Systems that act locally for optimizing globally*) and [DYMASOS](#) (*Dynamic Management of Physically Coupled Systems of Systems*) and the Support Action [CPSoS](#) (*Towards a European Roadmap on Research and Innovation in Engineering and Management of Cyber-physical Systems of Systems*) presented first results and future plans and discussed with representatives of the European Commission.



***From smart power grids to green transportation systems, energy efficient building and ecologically sustainable industrial production, improved engineering and the management of Systems of Systems will have a strong impact on the everyday lives of European citizens.***

The Support Action CPSoS, which initiated the meeting, provides a forum and an exchange platform for the four projects and bridges to a broad set of experts from application domains and on engineering and management tools and methods.

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.

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.

The project coordinators very much appreciated the possibility to meet with the other cluster projects, declaring:

*Prof. Sebastian Engell, TU Dortmund, Germany. Project Coordinator of CPSoS and DYMASOS:*

The engineering and management of Systems of Systems poses big challenges to develop methods and theoretical concepts to analyse their behaviour and to provide tools and solutions for real-world problems. In the joint discussion meeting, first successful applications to industrial problems were shown and a lively discussion about the concepts that are used to characterise Systems of Systems was triggered. It helped to shape the future scope and research directions of the area.





*Prof. Andrea Bondavalli, Università degli Studi di Firenze, Italy. Project Coordinator of AMADEOS:*

The cluster meeting was an excellent opportunity for the AMADEOS Consortium to compare ideas and thoughts with colleagues working in the cluster projects. The joint workshop fostered the opportunity to develop a lively community on SoS and enhance the possibility to create communication channels and exchanges between projects.

*Prof. Elias Kosmatopoulos, Centre for Research and Technology Hellas, Greece. Project Coordinator of Local4Global:*

The outcome of the cluster meeting was a very useful one for Local4Global. The idea of having all SoS-related projects being reviewed at the same place and time, gave us the great opportunity not only to discuss with the other projects their results and identify our project shortcomings but also to better coordinate our actions so as to make sure that all four SoS-related project can work as a whole.

The four projects are issuing a [joint newsletter on news and activities](#) of the SoS projects, the first issue has been circulated already before the meeting. Please subscribe below to receive all editions of the newsletter. The projects agreed on future joint activities as e.g. invited sessions at conferences, benchmark problems and student education. The next joint Cluster Meeting with a public plenary session will be held in Florence, Italy, in May 2015.

## About the projects:

**AMADEOS:** The objective of AMADEOS is to bring time awareness and evolution into the design of System-of-Systems (SoS), to establish a sound conceptual model, a generic architectural framework and a design methodology, supported by some prototype tools, for the modelling, development and evolution of time-sensitive SoSes with possible emergent behaviours. Special emphasis is placed on evolution, emergence, dependability (e.g. safety, availability) and security, considering embedded devices and the cloud as the execution platform.

**CPSoS:** CPSoS provides a forum and an exchange platform for Systems of Systems-related communities and ongoing projects, focusing on the challenges posed by the engineering and the operation of technical systems in which computing and communication systems interact with large complex physical systems. Its approach is simultaneously integrative, aiming at bringing together knowledge from different communities, and applications driven.



**DYMASOS:** The project will develop new methods for the distributed management of large physically connected systems with distributed autonomous management and global coordination. The research will be driven by case studies in electrical grid management and control, including the charging of electric vehicles, and industrial production.

**Local4Global:** The main objective of Local4Global - Systems of Systems that act locally for optimizing globally - is to develop, test and evaluate a new groundbreaking, generic and fully-functional methodology/system for controlling Technical Systems of Systems (TSoS) where - as in the case of «natural» systems such as biological systems, the human brain, animal herds (swarms), teams of interacting/cooperating humans and ecological systems - autonomous constituent systems reacting and interacting depend only on their local environment in order to optimize the emerging TSoS performance at the global level.

**Webpage dedicated to the European Systems of Systems Research Cluster:**

<http://www.cpsos.eu/research-in-sos/>

**Read the first newsletter and subscribe for the joint newsletter [here](#)**

