

Editorial

Dear Reader,

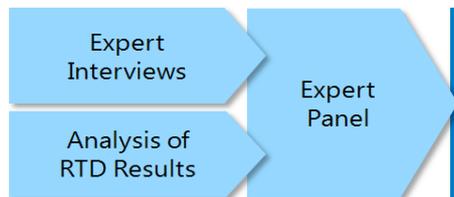
It is our pleasure to present to you the third issue of our Road2SoS newsletter. As you know, the ultimate objective of the Road2SoS project is the development of research and engineering roadmaps in the field of Systems of Systems (SoS). In elaborating these roadmaps, we are following a bottom-up approach – enquiring in four promising application domains which research needs and technological challenges exist to successfully implement SoS approaches in each of

these domains. Also, we are looking to identify economic, social, political or legal barriers that may exist and we are asking what the SoS development in these domains is driven by. Today, in each domain, a clear vision exists of what a mature, full-blown SoS implementation could look like in the future and the numerous benefits it is thought to bring to the domain. The roadmaps, we believe, are going to show the way to get there by outlining RTD and innovation strategies for Europe in the field of Systems of Systems.

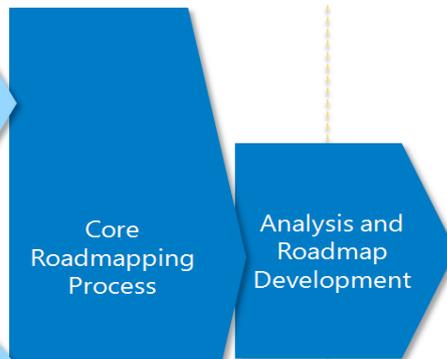
Following broad analysis in the first months of the Road2SoS project we have embarked on the core roadmapping process in recent months. Experts from all four application domains have been involved in intense workshops to elaborate a first version of an SoS roadmap in each application domain. Please read further on page 3.

Yours sincerely  
The Road2SoS Consortium

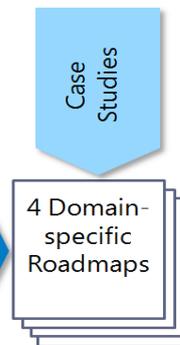
**WP1 – Technological perspective**



**WP3 – Roadmapping Process**



**WP4 – Case Studies**



**WP2 – Socio-economic perspective**



Today

Data sources and sequence of work to be carried out within Road2SoS on the way to complete roadmaps and case studies

Development of strategic research and engineering roadmaps in Systems of Systems Engineering and related case studies

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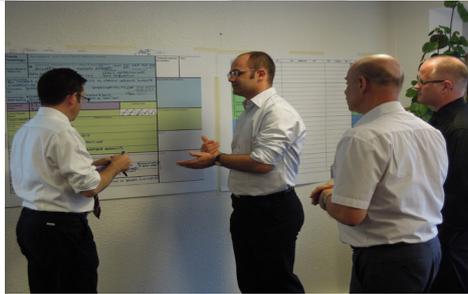
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Road2SoS is co-financed by the European Commission under the 7th Framework Programme

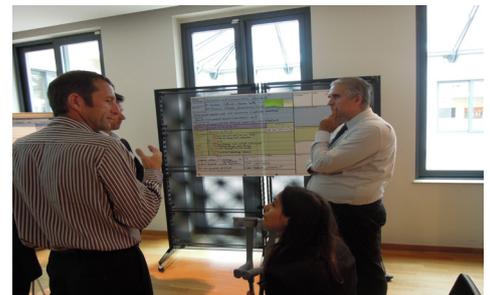


Roadmapping workshops series concluded

In the recent months, four full-day roadmapping workshops have been conducted with experts from each of the four application domains examined in the Road2SoS project: A workshop on SoS in the domain of multi-site industrial production (Brussels), a workshop on SoS in the domain of multi-modal traffic control (Paris), a workshop on SoS in the domain of distributed energy generation / smart grids (Paris), and a workshop on SoS in the domain of emergency and crisis management (Madrid). In each workshop, involved domain experts have reflected and complemented early versions of domain-specific SoS roadmaps and provided us with the rich input to develop these domain roadmaps into mature strategic documents.



We thank everyone who traveled to Brussels, Paris, or Madrid to join us for the workshops - your expertise has provided us with a multitude of important perspectives which enables us to develop holistic, valid SoS roadmaps.



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## Show Case - System of Systems for Improved Transportation

An example of a bottom-up, collaborative initiative that informs and engenders a complementary top down SoS approach is the Sustainable Mobility and Accessibility Research and Transportation (SMART) program at the University of Michigan.

SMART is executing a series of pilot projects for its New Mobility Hub concept working with communities around the world to link existing service, product, technology, and design options and innovations together to create previously unrecognized transportation solutions. New Mobility Hubs use the bottom-up approach to create neighborhood up to metropolitan area level systems of systems. While each hub is geographically dispersed from other hubs, it is also comprised of geographically dispersed, independent transportation and supporting systems such as bus stops, taxi stands, ATMs, and WiFi hotspots that bring new capabilities and opportunities for people and businesses.

Definition of the functioning components of the New Mobility Hub network continues with the identification of interfaces and the application of standards that provide the stable, defining measures that governments, industry, entrepreneurs, and users can utilize to create new open, plug-and-play products and services: "New Mobility hub networks exemplify seamless door to door solutions that support a personalized, customized, connected portfolio of transportation services, products, technologies and design, much like our personalized telecommunications portfolios that connect i-Pod, laptop,

desktop, Google, cell phone, etc..

A New Mobility Hub network is a series of ubiquitous hubs, or transfer points around a city where connections can be made easily from one mode or service to another seamlessly. For example one might arrive at a vibrant hub on a bus or train having reserved a car share vehicle with one's cell phone-based traveler information and fare payment technology. Quickly and conveniently one can gain access to the car-share vehicle at the hub, transfer to the car share vehicle as needed, and drop it off at another hub. At that subsequent hub, one might pick up a bike, share vehicle or decide to stay at the hub and use the satellite office, or pick the children up from daycare, or browse in a bookstore". Finally, SMART's New Mobility Hub networks are examples of applying the SoS methodology to previously disassociated, yet geographically proximate clusters of transit systems, multiple transportation modes, fare payment methods, communication networks, businesses, and information resources to make communities aware of the existing assets available to them.

SMART has used a simple exercise of bringing a local area's transportation stakeholders together around a map of the community to identify where existing transportation and communication systems are located. From this exercise the community creates an initial version of a community transportation and communication SoS that had not been previously seen. This initial version provides the basis for a beginning system conceptual framework that establishes a common understanding of the new system and identifies the existence of potential interfaces between the constituent systems. SMART's New Mobility Hubs demonstrate that the first gains from applying a SoS process are the identification and integration of the existing capabilities into a larger SoS that provides new functionality to the community.

*Extract from: Parker (2010): "Applying a System of Systems Approach for Improved Transportation"*

*A System of Systems (SoS) is an integration of a finite number of constituent systems which are independent and operatable, and which are networked together for a period of time to achieve a certain higher goal (Jamshidi, 2009)*

Further characteristics of SoS are:

- SoS can be expected to show emergent behavior.
- The constituent systems may be geographically distributed.
- SoS can be expected to evolve over time.

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## Current projects applying System of System approaches

### **GEOSS - Decision-support by globally available data about our planet**

The Global Earth Observation System of Systems (GEOSS) will provide decision-support tools to a wide variety of users. As with the Internet, GEOSS will be a global and flexible network of content providers allowing decision makers to access an extraordinary range of information at their desk.

Read more at <http://www.earthobservations.org/geoss.shtml>

### **IBM's traffic prediction pilot**

The traffic engineers of x cities and IBM were able to predict traffic volume and flow with over 90 percent accuracy up to 30 minutes in advance. As a result, travelers would be able to better plan ahead and determine whether they should leave at a different time, plan an alternative route or use a different way of transportation.

Read more at <http://www-03.ibm.com/press/us/en/pressrelease/40140.wss>

### **COBWEB - Saving the planet by applying SoS**

The Citizen Observatory Web (COBWEB) project will develop an "observatory framework" that will make it easier for citizens to collect environmental data suitable for use in research, decision making and policy formation. "This work aims to enable the citizen to use the Mobile Internet to benefit the Earth in a direct and obvious way, locally and therefore globally." (Peter Burnhill, EDINA)

Read more at <http://www.realwire.com/releases/Environment-Systems-Begins-Work-on-COBWEB-Citizen-Science-Project>

### **Shared e-Fleet - Efficient use of electric vehicles**

Supported by the integration of traffic- and energy-systems electric vehicles can be commonly used very efficiently: Shared e-Fleet – a project sponsored by the ministry of economics and technology in Germany – is a project which aims at exactly this goal.

Read more at <http://www.shared-e-fleet.de/>

### **IMSK - Smart detection of critical situations**

The Integrated Mobile Security Kit (IMSK) aims at detecting critical situations for example at mass events such as football games by providing a System of Systems solution. By combining various technologies with human forces IMSK also has the potential to be the next tool against terrorism attacks.

Read more at <http://www.heise.de/tp/artikel/37/37138/1.html>

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## Joint Roadmapping Session with COMPASS Project

In appreciation of the SoS concept, its promising applications and expected benefits for European businesses, the European economy and society, Road2SoS has been co-financed in the 7th Framework Programme to develop roadmaps to draw the path from the present to a future vision of SoS in multiple application domains. But we are certainly not alone in the European SoS ecosystem. As in our previous newsletter, we would like to introduce a notable SoS-related project: The COMPASS project.

The COMPASS consortium is a group of researchers and companies committed to collaborative research on model-based techniques for developing and maintaining SoS.

The COMPASS project is motivated by the perception that - although SoS approaches are promising for the design of innovative products and services - take-up of SoS approaches is somewhat hampered by the complexity caused by the heterogeneity and independence of the constituent systems, and the difficulty of communication between their diverse stakeholders. Developers lack models and tools to help make trade-off decisions during design and evolution leading to sub-optimal design and rework during integration and in service. The work of the COMPASS consortium is inspired by the vision that complex SoSs can be successfully and cost-effectively engi-

neered using methods and tools that promote the construction and early analysis of models.\*

Among the activities in the COMPASS project is the development of a roadmap centered around the topic of SoS simulation and modeling. In this context, Road2SoS has been kindly invited by the COMPASS project to a joint workshop on March 18, 2013 in Trieste to discuss roadmapping approaches and study interim Road2SoS results. The workshop has been a successful event and we thank our colleagues from the COMPASS project for their interest in the Road2SoS approach and results and the fruitful discussion.

Website of the COMPASS project:  
<http://www.compass-research.eu>

\* Source: <http://www.compass-research.eu/>, April 26, 2013

## Upcoming events

**EIT Conference on Fostering Innovation and Strengthening Synergies within the EU**  
Dublin, Ireland

April 29-30, 2013

For more information on the event please refer to:  
<http://eit.europa.eu/events/event-information/fostering-innovation-and-strengthening-synergies-within-the-eu/>

**Future Internet Assembly (FIA) 2013: "Future Internet accelerates Innovation"**  
Dublin, Ireland

May 8-10, 2013

For more information on the event please refer to:  
<http://www.fi-dublin.eu>

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**SOSE 2013: 8th Annual System of Systems Engineering Conference**

Maui, Hawaii, USA

June 2-6, 2013

For more information on the event please refer to:  
<http://sose2013.org/>

**ARTEMIS Summer Camp**

Madrid, Spain

June 11-12, 2013

More information will follow soon on [http://www.artemis-ju.eu/upcoming\\_events](http://www.artemis-ju.eu/upcoming_events)

**KSEE 2013- Kongsberg Systems Engineering Event: "Systems Integration, when the going really gets tough."**

Kongsberg, Norway

June 13-14, 2013

For more information on the event please refer to:  
<http://ksee.no/>

**MECO 2013 - The 2nd Mediterranean Conference on Embedded Computing**

Budva, Montenegro

June 16-20, 2013

For more information on the event please refer to:  
<http://www.embeddedcomputing.me/en/products-services/meco>

**23rd Annual INCOSE (International Council on Systems Engineering) International Symposium**

Philadelphia, PA, USA

June 24-27, 2013

For more information on the event please refer to:  
<http://www.incose.org/symp2013/>

**5th International Conference on Changeable, Agile, Reconfigurable and Virtual Production (CARV2013)**

Munich, Germany

October 6-9, 2013

For more information on the event please refer to:  
<http://www.carv-production.com/>

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