

Complex Systems Design & Management

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Editors

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Proceedings of the Tenth International
Conference on Complex Systems
Design & Management, CSD&M Paris 2019

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Preface

Introduction

This volume contains the proceedings of the 10th International Conference on “Complex Systems Design & Management” (CSD&M 2019)—refer to the conference Web site <https://www.2019.csdm.fr/> for more details.

The CSD&M 2019 conference was organized by CESAM Community from December 12 to 13, 2019, at the Cité Internationale Universitaire de Paris (France) and managed by Center of Excellence on Systems Architecture, Management, Economy & Strategy (CESAMES).

The conference also benefited from the technical and financial support of many organizations such as Airbus, ArianeGroup, IRT SystemX, MEGA International, and Renault. Our sincere thanks, therefore, to all of them.

Many other organizations were involved in the CSD&M 2019 committees. We would like to thank all their members who helped a lot through their participation and contribution during the one-year preparation of the conference.

Why a CSD&M Conference?

Mastering complex systems requires an integrated understanding of industrial practices as well as sophisticated theoretical techniques and tools. This explains the creation of an annual *go-between* forum at European level—which did not exist before—both dedicated to academic researchers and industrial actors working on complex industrial systems architecture and engineering. Facilitating their *meeting* was actually for us a *sine qua non* condition in order to nurture and develop in Europe the science of systems which is currently emerging.

The purpose of the “Complex Systems Design & Management” (CSD&M) conference is exactly to be such a forum. Its aim is to progressively become *the* European academic-industrial conference of reference in the field of complex industrial systems architecture and engineering, which is a quite ambitious objective. The last nine CSD&M conferences—which were all held in the last part of the

year from 2010 to 2018 in Paris—were the first steps in this direction. In 2018, participants were again almost 230 to attend our two-day conference which proves that the interest for architecture and systems engineering does not fade.

Our Core Academic—Industrial Dimension

To make the CSD&M conference a convergence point between the academic and industrial communities in complex industrial systems, we based our organization on a principle of *parity* between academics and industrialists (see the conference organization sections in the next pages). This principle was first implemented as follows:

- program committee consisted of 50% academics and 50% industrialists,
- invited speakers came in a balanced way from numerous professional environments.

The set of activities of the conference followed the same principle. They indeed consist of a mixture of research seminars and experience sharing, academic articles and industrial presentations, software and training offers' presentations, etc. The conference topics cover the most recent trends in the emerging field of complex systems sciences and practices from an industrial and academic perspective, including the main industrial domains (aeronautics and aerospace, transportation and systems, defense and security, electronics and robotics, energy and environment, healthcare and welfare services, and media and communications, and software and e-services), scientific and technical topics (systems fundamentals, systems architecture and engineering, systems metrics and quality, systemic tools), and system types (transportation systems, embedded systems, software and information systems, systems-of-systems, and artificial ecosystems).

The 2019 Edition

The CSD&M 2019 edition received 25 submitted papers, out of which the program committee selected 16 regular papers to be published in the conference proceedings. The program committee also selected five papers for a collective presentation during the poster workshop of the conference.

Each submission was assigned to at least two program committee members, who carefully reviewed the papers, in many cases with the help of external referees. These reviews were discussed by the program committee during an online meeting that took place by July 3, 2019, and was managed via the EasyChair conference system.

We also chose several outstanding speakers with industrial and scientific expertise who gave a series of invited talks covering all the spectrum of the conference during the two days of CSD&M 2019. The conference was organized around a common topic: “*Systems engineering through the ages*”. Each day

proposed various invited keynote speakers' presentations and a "à la carte" program consisting in accepted paper presentations and in different sessions (sectorial tracks on Day 1 and thematic tracks on Day 2).

Furthermore, we had a "poster workshop," to encourage presentation and discussion on interesting, but "not-yet-polished," ideas. Finally, CSD&M 2019 also offered booths presenting the last engineering and technological news to participants.

August 2019

Guy André Boy
Alan Guegan
Daniel Krob
Vincent Vion

Conference Organization

Conference Chairs

General Chair

Daniel Krob CESAMES and Ecole Polytechnique, France

Organizing Committee Chair

Alan Guegan Sirehna, France

Program Committee Co-chairs

Guy André Boy (Academic Co-chair)	CentraleSupélec & ESTIA Institute of Technology, France
Vincent Vion (Industrial Co-chair)	PSA, France

Program Committee

The program committee consists of 20 members (ten academics and ten industrialists) of high international visibility. Their expertise spectrum covers all of the conference topics.

Academic Members

Co-chair

Guy André Boy CentraleSupélec & ESTIA Institute
of Technology, France

Members

Jutta Abulawi	Hamburg University of Applied Sciences, Germany
Alain Bernard	Ecole Centrale de Nantes, France
Eric Bonjour	ENSGSI, France
Michel-Alexandre Cardin	Imperial College London, UK
Donna Rhodes	MIT, USA
Antoine Rauzy	Norwegian University of Science and Technology, France
Paul Schreinemakers	EMEA INCOSE, Netherlands
Rob Vingerhoeds	ISAE-SUPAERO, France
Bernard Yannou	CentraleSupélec, France

Industrial Members

Co-chair

Vincent Vion	PSA, France
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Members

Christophe Alix	Thales, France
Alain Dauron	Renault, France
Pierre de Chazelles	Airbus, France
Bernardo Delicado	MBDA, Spain
Jérémy Dick	Costain Group, UK
Nicolas Gueit	Safran Aircraft Engines, France
Olivier Hayat	PSA, France
Jonathan Holt	Rolls Royce, UK
Toby Lawrence	Jaguar Land Rover, UK

Organizing Committee

The organizing committee consists of 17 members (academics and industrialists) of high international visibility. The organizing committee is in charge of defining the program of the conference and of identifying the keynote speakers. The organizing committee also has to ensure the functioning of the event (sponsoring, communication...).

Chair

Alan Guegan	Sirehna, France
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Members

Emmanuel Arbaretier	APSYS, France
Jean-François Bigey	MEGA International, France

Philippe Bourguignon	Engie, France
Philippe Bouteyre	TechnipFMC, France
François Coallier	Ecole de Technologie Supérieure, France
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Philippe Gicquel	AFIS, France
Omar Hammami	ENSTA ParisTech, France
Fabien Mangeant	Renault, France
Luca Palladino	Safran, France
Richard Schomberg	EDF, France
Amaury Soubeyran	Airbus, France
Pierre Thory	Sextant, France

Invited Speakers

Plenary Sessions

Alain Tropis	SVP Digital Design Manufacturing & Services, Airbus
Olivier De Weck	Professor of Aeronautics, Astronautics and Engineering Systems, MIT
Michael Webber	Chief Science and Technology Officer, Engie
Florian Guillemet	Executive Director, SESAR Joint Undertaking
Marc Peyrichon	Responsible for Leading System Engineering, Naval Group
Antoine Rauzy	Professor, Norwegian University of Science and Technology
Alexandre Corjon	Alliance Global VP Engineering Electrics/Electronics and System, Renault-Nissan
Daniel Krob	Institute Professor at Ecole Polytechnique, President of CESAMES—INCOSE Fellow

“New Mobilities” Track

Ariel Sirat	Director, IRT AESE Saint Exupery
Franck Davoine	CNRS Researcher, Heudiasyc, UTC Compiègne, Labex MS2T
Michael Jastram	Senior Solutions Architect, Jama Software

“Energy” Track

Alain Poincheval	President, TechnipFMC
Jan Andreas	CEO, Anleg GmbH
Thierry Chevrot	Digiref Project Manager, Total E & P

“Smart Cities” Track

Guillaume Farny	Director, ATEC ITS FRANCE
Serge Salat	President, Urban Morphology and Complex Systems Institute
Gauthier Fanmuy	Systems Engineering Role Portfolio Director, Dassault Systèmes

“Modeling, Simulation, Visualization” Track

Marco Ferrogallini	Vice President, Head of Modeling and Simulations (MBSE), Airbus
Philippe Duluc	CTO, Big Data & Security, Atos

“Industry 4.0” Track

Oussama Cherif	Innovation Director, Five Group
Jean-Marc Chatelanaz	VP, Full Track & Trace, Renault
Paul Labrogère	CEO, IRT SystemX

“Systems-of-Systems” Track

Jakob Axelsson	Senior Research Leader for Systems-of-Systems, RISE SICS
André Ayoun	System Engineering expert, ArianeGroup
Michael Pfenning	Senior Product Manager for Systems Engineering, Aras

“Product Line Engineering” Track

Jérôme Javelle	VP Methods & Tools, Airbus
Khalid Kouiss	R & D Engineer, Faurecia
Nicolas Cottureau	Country Manager & Sigmetrix Channel Manager, Maplesoft

Acknowledgements

We would like to thank all members of the program and organizing committees for their time, efforts, and contributions to make CSD&M 2019 a top-quality conference. Special thanks go to the CESAM Community team who permanently and efficiently managed the administration, logistics, and communication of CSD&M 2019 conference (see <http://cesam.community/en>).

- **Founding partners**

- CESAM Community managed by Center of Excellence on Systems Architecture, Management, Economy & Strategy (CESAMES).

- **Industrial and institutional partners**

- Airbus Group,
- ArianeGroup,
- IRT SystemX,
- Renault.

- **Participating engineering and software tools companies**

- APSYS Airbus,
- Aras,
- Dassault Systèmes,
- Digital Product Simulation,
- Geeglee,
- Intland Software,
- Jama Software,
- Maplesoft,
- MathWorks,
- MEGA International,
- Obeo,

- Persistent Systems,
- PragmaDev,
- Pure-systems,
- Siemens Digital Industries Software.

Contents

Regular Papers

Gas Turbine Design at Rolls-Royce – Exploring the Limitations of a Systems Engineering Approach	3
Jonathan Holt, David Elam, and James Tooke	
Managing the Complexity of Processing Financial Data at Scale - An Experience Report	14
Sebastian Frischbier, Mario Paic, Alexander Echler, and Christian Roth	
Verification of BPMN Models	27
Mihal Brumbulli, Emmanuel Gaudin, and Frédéric Berre	
Synchronization of System Architecture, Multi-physics and Safety Models	37
Michel Batteux, Jean-Yves Choley, Faïda Mhenni, Luca Palladino, Tatiana Prosvirnova, Antoine Rauzy, and Maurice Theobald	
Managing Margins Under Uncertainties Surrogate Modelling and Uncertainty Quantification	49
Kyle Hall, Peter Schroll, and Sanjiv Sharma	
Implementing Organizational Cybernetics for the Next Generation of Digital Business Models	64
Alan Martin Redmond and Loic Chanvillard	
Identifying Focal Points in IT Project Governance Using a Synthetic and Systems Thinking Approach	79
Rani Yesudas, Mahmoud Efatmaneshnik, and Keith Joiner	
MAESTRIA: A New Tool to Support Collaborative Building and Sharing of an Integration, Verification, Validation, and Qualification Strategy	93
Patrick Esteve, Benoit Langlois, Lyes Chabani, Willy Platzter, and Jacky Mouchoux	

School Shootings in the U.S. – Where to Begin 103
Bruce A. Normann and Mo Mansouri

Smart Component Modeling for Complex System Development 117
Philipp Helle, Sergio Feo-Arenis, Andreas Mitschke, and Gerrit Schramm

Dynamic Disruption Simulation in Large-Scale Urban Rail Transit Systems 129
Steffen O. P. Blume, Michel-Alexandre Cardin, and Giovanni Sansavini

A Multiobjective Systems Architecture Model for Sensor Selection in Autonomous Vehicle Navigation 141
Anne Collin, Afreen Siddiqi, Yuto Imanishi, Yukti Matta, Taisetsu Tanimichi, and Olivier de Weck

Simulation Architecture Definition for Complex Systems Design: A Tooled Methodology 153
Jean-Patrick Brunet, Henri Sohier, Mouadh Yagoubi, Mathieu Bisquay, Pascal Lamothe, and Pascal Menegazzi

Towards a Cross-Domain Modeling Approach in System-of-Systems Architectures 164
Boris Brankovic, Christoph Binder, Dieter Draxler, Christian Neureiter, and Goran Lastro

Safety Demonstration of Autonomous Vehicles: A Review and Future Research Questions 176
Tchoya Florence Koné, Eric Bonjour, Eric Levrat, Frédérique Mayer, and Stéphane Géronimi

Posters

Model-Based Specification for System Development with Suppliers 191
Phanikrishna Thota, Simon Hancock, Mario Noriega-Fogliani, and Rodrigo Jimenez

Applications of Systems Thinking for Scooter Sharing Transportation System 192
Christina Caches and Mo Mansouri

Collaborative Decision-Making Challenges in the Dutch Railway System 193
N. Jakubeit, M. Rajabalinejad, A. J. J. Braaksma, and L. A. M. van Dongen

Understanding Stakeholder Interactions Impacting Human Spaceflight Funding Levels 194
Brian M. Gardner and Mo Mansouri

Author Index 195