

EU-US Collaborative Strategic Research Agenda in Systems of Systems

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Abstract. T-Area-SoS (Trans-Atlantic Research and Education Agenda in Systems of Systems) project aims to increase European competitiveness in, and improve the societal impact of, the development and management of Systems of Systems (SoS in a range of sectors through the creation of a mutually agreed EU-US) research agenda. Through validation from established SoSE experts and EU-US workshops, a _Strategic Research Agenda (SRA)_ and a _Thesaurus_ has been delivered to the European commission. These deliverables will create R&D initiatives for Horizon 2020 and other international programmes to deliver outcomes that address societal needs, with exemplars in Energy, Transport, Manufacturing, ICT and Defense, using Engineering of SoS as a mainstream discipline. The thesaurus ensures consistent understanding of SoS concepts across industrial sectors and technical disciplines through collation of SoS engineering terminologies for consistent interpretation of concepts and terms, and provides an artefact that will be of significant assistance to planners of future programmes in SoS engineering. The SRA identifies concrete research initiatives (key priorities and challenges within SoS) between the EU and the US to enhance existing research programmes and set the scene for future programmes.

Biography

Michael Henshaw (Loughborough University) - M.J.d.Henshaw@lboro.ac.uk

Michael Henshaw is Professor of Systems Engineering and leads the Engineering Systems of Systems (EsoS) Research Group. His research focuses on integration and management of complex socio-technical systems, with a particular emphasis on the challenges of through-life management of systems and capabilities. The research topics currently being studied include Network Enabled Capability (NEC), management of knowledge for through-life capability management (TLCM), cyber-security, pilot training, C2, and autonomous robotic systems. Within all these areas there is a strong emphasis on the challenges of interoperability between systems and the importance of including humans and organisations as part of the systems. Michael graduated in applied physics, and his early research focused on laser-plasma interactions investigating various phenomena in applications such as X-ray lasers. He joined British Aerospace (later BAE Systems) as an aerodynamicist and worked for seventeen years in aeronautical engineering tackling problems associated with unsteady aerodynamics (computational and experimental) and, later, multi-disciplinary integration. He was appointed to a chair in Systems Engineering at Loughborough in 2006 to direct the large multi-university, multi-disciplinary programme, NECTISE, that ran from Nov 2005 _ April 2009. Michael is the technical lead for T-AREA-SoS, Academic Director for INCOSE UK, and leads the INCOSE UK Capability Working Group.

Judith Dahmann (The MITRE Corporation) - jdahmann@mitre.org

Judith Dahmann is a principal senior scientist in the MITRE Corporation Center for Advanced Systems Analysis and Acquisition. Dr. Dahmann is currently a Technical Advisor to the Director of Defense Systems and Systems Engineering in the U.S. DoD Under Secretary of Defense for Acquisition, Technology and Logistics. In this capacity, she is part of a team working to develop approaches to the acquisition, development and systems engineering of integrated user capabilities. Dr. Dahmann is also the lead for the MITRE Technical Area Team for Modeling and Simulation. Prior to this, Dr. Dahmann was the Chief Scientist for the Defense Modeling and Simulation Office for the U.S. Director of Defense Research and Engineering, a

position she held from 1995 to April 2000. In her role as Chief Scientist, Dr. Dahmann led the development of the High Level Architecture (HLA), a general-purpose distributed software architecture for the development and interoperation of simulations, initially the DoD standard for distributed simulation and now an IEEE Standard (IEEE 1516). She coauthored *Creating Computer Simulation Systems, An Introduction to the High Level Architecture* (Prentice Hall, 1999) and received the Arthur S. Flemming Award for Outstanding Government Service for her leadership of HLA. Most recently, Dr. Dahmann has been working with the DoD Joint Single Integrated Air Picture Systems Engineer to apply HLA in its systems engineering process based on the OMG Model Driven Architecture (MDA). Dr. Dahmann holds a Bachelor's Degree from Chatham College in Pittsburgh, PA (1972), a Master's Degree from The University of Chicago (1973), and a Doctorate from Johns Hopkins University (1984). She spent a year as a special student at Dartmouth College (1971_72).

John Fitzgerald (Newcastle University) - John.Fitzgerald@ncl.ac.uk

John Fitzgerald is Director of the Centre for Software Reliability at Newcastle University, UK, where he also holds a Chair in Computing Science. His research focuses on usable techniques and tools for formal methods, particularly the Vienna Development Method, and has been applied in industry in areas as diverse as contactless chip design and back office systems for stock trading. His current work addresses modelling and verification for systems-of-systems and embedded systems. He is Coordinator of the EU FP7 COMPASS project, which develops methods and tools for contract-based formal modelling, verification and test generation in SoS engineering. He also works on the development of methodology for cross-disciplinary modelling and co-simulation, particularly of faults and fault tolerance in embedded control software. John studied Computing and Information Systems at Manchester University, UK, before moving to Newcastle to work with the aerospace industry on the design of critical real-time applications. Before taking up his current post, he led verification and design activities in a successful start-up company in the virtualisation sector. He is Chairman of Formal Methods Europe, an international association that aims to promote close collaboration between practitioners and researchers in well-founded methods and tools for systems modelling and design.

Alan Harding (BAE Systems) - Alan.d.harding@baesystems.com

Alan Harding is an Engineering Fellow with BAE Systems plc, where his principal role is the management of the engineering processes used globally by 40,000 engineers. He has 27 years systems engineering experience in defence, aerospace and security, and was appointed a BAE Systems Engineering Fellow reflecting this expertise in October 2010. Alan's specialist areas in systems engineering include Systems of Systems and Architecture, and in recent years he has lead the BAE Systems corporate activities in this area _ seeking to identify practical approaches informed by research outcomes. Alan co-chairs the INCOSE Systems of Systems working group, with his key focus being on sharing good practice across domains. Alan's educational background is a BSc(Hons) degree in Physics from Durham University. Alan is a Chartered Engineer.

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Daniel DeLaurentis is an Associate Professor in Purdue's School of Aeronautics & Astronautics. He leads Purdue's Center for Integrated Systems in Aerospace (ISA), which is home to 20 faculty affiliates, three research staff, and numerous dedicated graduate students. He also leads the ISA Center's largest recent project with the Missile Defense Agency's Enhanced C2BMC program developing agent-based modeling and simulation for development of advanced battle management architectures. His primary research interests are in the areas of problem formulation, modeling and robust system design and control methods for aerospace systems and systems-of-systems (SoS) and analysis of architecture alternatives for both. Dr. DeLaurentis is an Associate Fellow of the American Institute of Aeronautics and Astronautics and served as Chairman of the AIAA's Air Transportation Systems (ATS) Technical Committee from 2008-2010. He is also Co-Chair of the IEEE System of Systems Technical Committee. Dr. DeLaurentis completed his PhD in Aerospace Engineering from the Georgia Institute of Technology.