

Checking the map on the way to INCOSE 2020 - A review of Model Based Systems Engineering

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Abstract. A key focus area of INCOSE 2020 is Model Based Systems Engineering (MBSE). MBSE is now becoming ubiquitous in the systems engineering community. This is the case in industry, academia, and government, and certainly at INCOSE. The purpose of this panel is to examine the current state of affairs regarding MBSE. The topic will be to hear from the panelists on their different MBSE approaches, what is working, and what is not. The panelists will examine their MBSE approach in terms of languages, methods, tools, organizational approaches and new areas to which it may be applied, etc. The panel should enable the audience to identify common themes and unique aspects that can help them in their MBSE strategies and plans. In the same way that a driver will occasionally check the map to ensure they are going in the right direction, this panel will review MBSE to ensure that we will arrive at the correct destination. It goes without saying that the purpose of the panel is NOT to compare, discuss or advertise any particular commercial or open source tool. Panelists and questioners alike will be reminded of this and discussion immediately stopped if this occurs.

Biography

Matthew Hause (Atego) - MatthewH@Artisansw.com

Matthew Hause is Atego's Chief Consulting Engineer, the co-chair of the UPDM group and a member of the OMG SysML specification team. He has been developing multi-national complex systems for almost 35 years. He started out working in the power systems industry and has been involved in military command and control systems, process control, communications, SCADA, distributed control, and many other areas of technical and real-time systems. His roles have varied from project manager to developer. His role at Atego includes mentoring, sales presentations, standards development and training courses. He has written a series of white papers on architectural modeling, project management, systems engineering, model-based engineering, human factors, safety critical systems development, virtual team management, systems development, and software development with UML, SysML and Architectural Frameworks such as DoDAF and MODAF. He has been a regular presenter at INCOSE, the IEEE, BCS, the IET, the OMG, DoD Enterprise Architecture and many other conferences. Matthew studied Electrical Engineering at the University of New Mexico and Computer Science at the University of Houston, Texas. In his spare time he is a church organist, choir director and composer.

James Ross (John Deere) - RossJamesH@JohnDeere.com

James Ross is the Model Based Systems Development leader at John Deere, responsible for the promotion, standardization and support of model-based development throughout the company. Prior to this position, Jim worked in the Engine Controls group at John Deere in many areas including developing tools, algorithms, and calibrations. Jim first started modeling while working on his Master's degree more than 20 years ago, and has been actively involved in modeling and simulation at John Deere for the past 10 years. Jim received a Bachelor of Science in Electrical Engineering, a Master of Science in Electrical Engineering and a Master of Science in Aerospace Engineering, all from the University of Illinois at Urbana Champaign.

John Watson (Lockheed Martin) - John.Watson@lmco.com

John Watson is a Principal Member Engineering Staff at Lockheed Martin MS2, in Moorestown NJ. John's principle job function is as a systems architect. He has been involved in modeling system architecture efforts in a number of major Lockheed Martin programs. He has over thirty years of industry experience covering a wide spectrum of responsibilities in leading and managing systems and software architecture, design and implementation both in the DoD and the telecommunication commercial industry. Most recently John's focus has been working within Corporate Engineering with the Advanced Practices team providing support and consultation to advance the practice of Model Based Systems Development across Lockheed Martin. John can be reached at: john.watson@lmco.com

Peter Campbell (University of South Australia) - Peter.campbell@unisa.edu.au

Peter Campbell returned to Australia from 20 years in the US in late 2000. Worked on three year contract (2002-05) for CSIRO Complex Systems Science Initiative to introduce complex system simulation tools for agricultural landscape planning. In May 2004, joined the University of South Australia as Professor of Systems Modelling and Simulation. Recent research includes development of two agent based simulations to support organizational change within the Australian Defence Organization, and the development of software agents to replace humans in the loop in defence T&E environments. In October 2010 I joined University of Wollongong as Professor of Infrastructure Modelling in the SMART Infrastructure Facility. Work is in the area of the application of ABM and MBSE to the improvement of the management of large infrastructure development projects. Prior to 2000 I worked at Argonne National Laboratory in US for 15 years where I was involved in the development of advanced agent based modeling methods with application to decision support tools for defence and industry applications. Project lead and designer for ABM tools for energy supply, drug interdiction, hospital work flow, logistics operations and a range of other defence applications.

Sean McGervey (The Johns Hopkins University Applied Physics Laboratory) - Sean.McGervey@jhuapl.edu

Sean McGervey is a Systems Engineer, who has been working at Johns Hopkins University - Applied Physics Laboratory since February 2013. He is currently leading APL's architecture development activities supporting a major ACAT-1 acquisition program for their Sponsor. In addition, Sean has started an MBSE Community of Practice to foster knowledge sharing and collaboration among MBSE practitioners throughout the lab. In support of that goal, he is also developing training courses in applying MBSE using DoDAF and SysML. Prior to joining APL, Sean worked for 15 years in the SEIT Department at Northrop Grumman Corporation in Baltimore, Maryland. During the last few years of that span, Sean co-founded and chaired the Northrop Grumman Corporate Model-Driven Engineering Community of Practice, bringing together MBSE practitioners from across the company's worksites throughout the country. Sean has taught classes and delivered presentations on MBSE to organizations across Northrop Grumman and at several Industry conferences. In addition, he led a technical team based in Baltimore that was driving adoption and standardization of MBSE practices by developing infrastructure and process guidance to assist MBSE practitioners. In October 2012, Sean graduated from Northrop Grumman's Architect Apprenticeship Program, and in January 2013, he won Northrop Grumman's Corporate-wide Innovation Challenge on "Creative Enhancements to Systems Engineering". Sean is an Object Management Group (OMG) Certified Systems Modeling Professional at the Model Builder: Advanced level, and has been active in INCOSE's MBSE Initiative, as well as the OOSEM Working Group of the INCOSE Chesapeake Chapter. Sean has a BS in Engineering Physics from Rensselaer Polytechnic Institute in Troy, New York.

Position Paper

MBSE approaches can enable systems engineers to better manage complexity, increase understanding, and promote communication between stakeholders. But MBSE should be more than creating a model of your system's specifications. It should be about *using* that model as the centerpiece for your engineering development and decision making --- a common repository of data about your system that drives external computational models, feeds mission simulations and affordability models, provides content for automated document generation, and highlights traceability back to our stakeholder's requirements. Systems engineering is at a crossroads. Technology and standards have evolved to the point of providing systems engineers with a plethora of tools, languages, and frameworks to support their use of a model-based systems engineering approach. But many systems engineers still wonder how to properly use these new technologies and

standards to make their jobs easier. Just as having a word processor, an English dictionary, and a table of contents does not make me an award-winning novelist, having a system modeling tool, a book on SysML, and the DoDAF specification does not make me a great systems engineer. Tools, languages, and frameworks do not replace a well-reasoned methodology and good engineering judgment. We as systems engineers need to shift our focus from the “MB” to the “SE” in “MBSE”. What do we need to do good systems engineering, and how do we want models and tools to support our needs? For example, can a system model that represents the design of my system also account for situations when I am choosing between many possible designs in a trade study? And how can I use MBSE to leverage domain knowledge, models, and simulations to verify my design decisions? Or, what if my design features elements that are optional or that can vary from one member of a product line to the next - how do I manage that flexibility in a system model? Now that we have a foundation of tools, languages, and frameworks to build upon, we need to do a “gap analysis” and figure out what is missing to allow MBSE to become a value-added part of doing our jobs as systems engineers.