

System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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Modeling and Simulation for Internet of Things as System of Systems

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Abstract

Department of Defense (DoD) and commercial systems engineers face significant challenges with respect to producing System of Systems (SoS) applications and products. In this presentation, we provide the audience with an understanding of why Modeling and Simulation (M&S) is useful with respect to design and decision-making for the Internet of Things (IoT) as a SoS. In doing so, discuss ways in which M&S can overcome complex SoS issues such as emergent behavior. We also provide real-life examples of M&S capabilities that support the IoT as a SoS in the following areas: training, planning, analysis, design and development, and production. We conclude our discussion with an investigation of future uses of M&S to support IoT as a SoS including extensions of M&S into artificial intelligence and machine learning and using M&S to identify and exploit emergent behavior of complex SoS.

Biography

Paul C. Hershey is with Raytheon IIS, Dulles, Virginia, where he is a Principal Engineering Fellow focusing on modeling and simulation, data analytics, autonomous systems, and cyber security. He received a Ph.D. and M.S., both in electrical engineering, from the University of Maryland, College Park, and an A.B. in mathematics from the College of William and Mary. He has published 37 patents and 60 peer-reviewed technical articles. He is a Distinguished Lecturer on data analytics for the IEEE Systems Council.

Presentation Summary Outline:

1. Introduction	15 Minutes
a. Why is Modeling and Simulation (M&S) Critical to Support the Internet of Things (IoT) as System of Systems (SoS)?	
b. Where does M&S fit in IoT SoS?	
2. Types of M&S to support IoT as SoS and Real-life examples	20 Minutes
a. Training	
i. Remote training	
ii. Real-life examples:	
b. Planning	
i. Systems Modeling	
ii. SoS Modeling	
iii. SoS modeling for experimentation and exploration of emergent behavior	
iv. Real-life examples:	
c. Analytic	
i. Data Analytics Modeling	
ii. Real-life examples	
d. Design and Development M&S	
i. Model-Based Engineering (MBE)	
ii. Agent-based Models	
iii. Real-life examples:	
e. Production M&S	
i. Component Modeling - Cars, Planes, Ships, Satellites	
ii. Real-life examples	
3. Future M&S to Support IoT as a SoS	10 Minutes
a. M&S with Artificial Intelligence and Machine Learning	
b. Using M&S to identify and exploit Emergent Behavior of Complex SoS	
4. Questions and Comments	<u>15 Minutes</u>
Total Time	60 minutes