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Trends in Large Scale Systems-of-Systems for Multi-National Missile Defense

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A Missile Defense System (MDS), outside of a specific application within a single country of manufacture, is architecturally a system-of-systems (SoS). It is a coupling (sometimes tight or loose depending on configuration) of independently managed components, subsystems, and discrete systems that must work together in difficult environments against capable threats. We define a Multinational Missile Defense System (MNMDS) as an MDS with these and other complex characteristics. We describe a number of drivers of the future of command and control in a MNMDS in the areas of engineered resilient systems, human-machine teaming, and regionalization. We then look at the large-scale SoS implications, network-centric operations (resource allocation and dynamic networks) and the systems concepts that embrace computational intelligence as a means for a more automated MDS.

Biographies

Tod M. Schuck received a B.S. in electrical engineering from Georgia Tech in 1989, an M.S. in electrical engineering from Florida Tech in 1994, and a Ph.D. in systems engineering from the Stevens Institute of Technology in 2010 concentrating in knowledge representation in distributed, network-centric systems. He has worked extensively as a DoD/US Navy employee solving real-world problems for the Warfighter in the areas of data classification for cooperative and non-cooperative sensor systems. Since 1999, Dr. Schuck has been with Lockheed Martin RMS where he is currently a Principal Member of the Engineering Staff specializing in information and knowledge fusion representation and distribution for surface, air, and missile defense combat systems. Dr. Schuck has been an adjunct professor at Johns Hopkins University and currently instructs a unique class on Command and Control (C2) at Rowan University.

James C. Kilian holds a B.S. in Astronomy and B.A. in Mathematics from University of Kansas, an M.A. in Astrophysics from Boston University, and a Ph.D. in Electrical Engineering from Worcester Polytechnic Institute. His primary research areas of interest include computer vision, pattern recognition, machine learning, automated inference, data fusion, and automatic target recognition. Dr. Kilian is a Systems Engineer Principal at LM/RMS with responsibilities for architectures, algorithm development and system analysis for target discrimination and mission planning applications. Prior to coming to Lockheed Martin, he led the development, at Raytheon, of target classification algorithms for the upgraded early warning radar as part of its missile defense mission. Prior to that he was a Principal Scientist at Creative Optics, Inc. serving as principal investigator on several SBIR phase I,II, and III projects in the areas of characterization and analysis of automatic and aided target acquisition systems.